# Knowledge-based Capital and Growth: What Do We Know and What Do We Need to Know?



**Discussion by**
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# Takeaways from the Two Papers

- Investment in intangible capital appears to be large and growing
  - Statistical agencies have developed measures of investment in some types of intangibles (e.g., software, certain types of R&D), but these are only a portion of the total investment in intangibles

- Evidence suggests that investments in intangible capital have made significant contributions to productivity growth
  - Positive spillovers from investments in intangibles
  - Complementarities between investments in intangible capital and investments in ICT

- Positive spillovers from investment in intangibles provide a possible rationale for policies to encourage such investments

# U.S. Investment in Intangibles, 1948-2007



Source: Hulten (2013)
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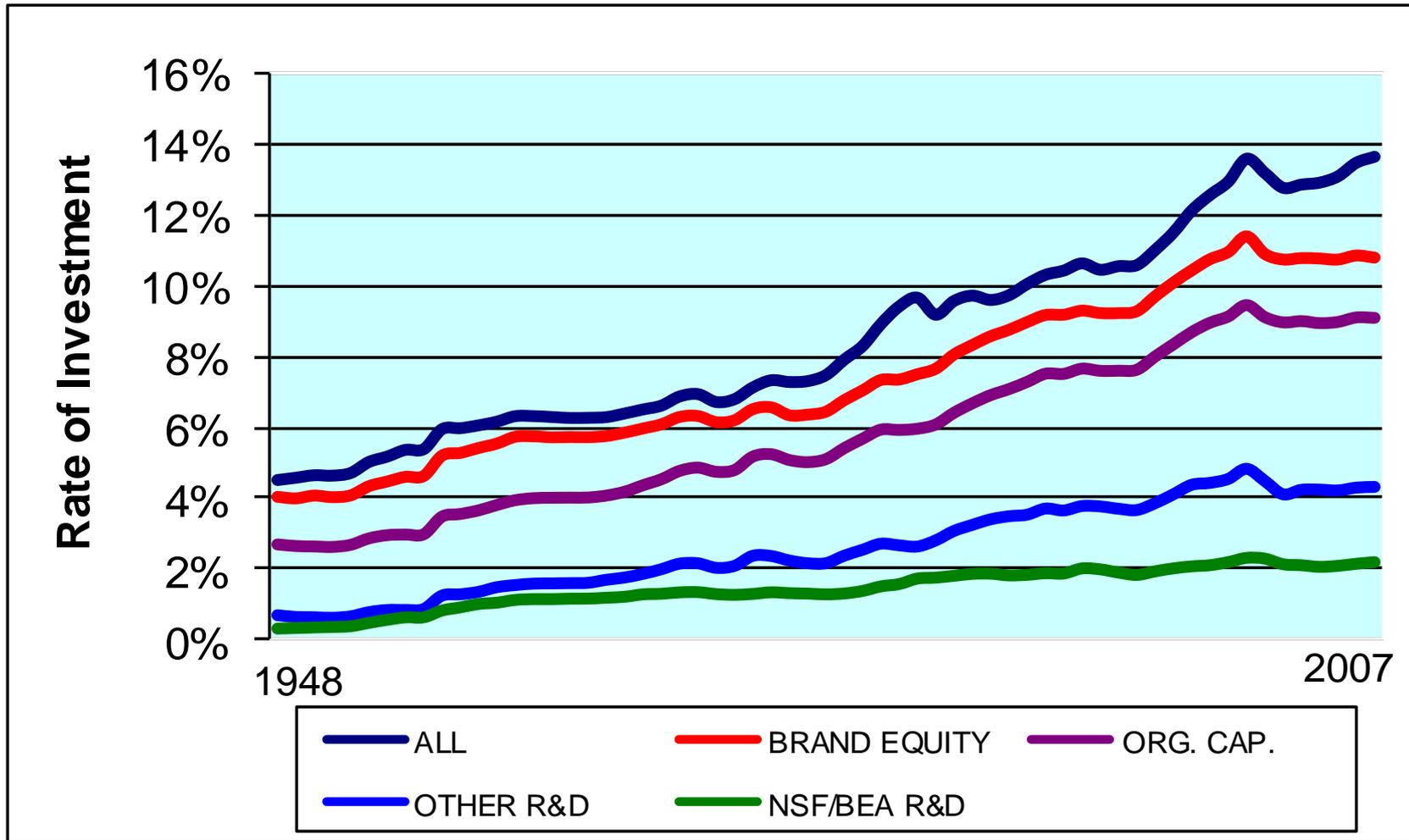
# Moving Forward Will Require
# Careful Attention to Measurement Issues

- Work to date makes strong case that investment in intangible capital is large and has important effects, but development of robust measures will be a long-term effort
  - Data on nominal spending for software and R&D are relatively good, but even for these categories of intangibles, estimates have required assumptions about asset lives, depreciation rates and price deflators
  - Complete and consistent data on nominal spending not presently available for most other types of intangibles
  - Agree with Corrado, Haskel and Jona-Lasinio (2013) that use of input cost deflators likely leads to understating value of investment in intangibles, but hard to know by how much
- Open question whether firms will have a reason to maintain records from which necessary information can be derived

# Estimates of the Spillover Benefits of Investment in Intangibles

- Basic estimating equation used by Corrado, Haskel and Jona-Lasinio to look for evidence of spillovers is:

$$\Delta \ln TFP_{c,t} = \beta_1 \Delta \ln \left( K_{c,t}^{ICT} / L_{c,t} \right) + \beta_2 \Delta \ln \left( K_{c,t}^{NonICT} / L_{c,t} \right) + \beta_3 \Delta \ln \left( R_{c,t} / L_{c,t} \right)$$
$$+ \beta_4 \Delta \ln L_{c,t} + \lambda_c + \lambda_t + v_{c,t}$$

  - Estimated using country-level data on market value added
  - Instrumental variables estimation used to address endogeneity and measurement error concerns
  - Positive coefficients on capital variables interpreted as evidence of positive spillovers

- Coefficients in preferred specification suggest positive spillovers from investment in intangibles

- Estimates for all of the major individual types of intangible capital also suggest positive investment spillovers

# Estimates of the Spillover Benefits of Investment in Intangibles (continued)

- Choice of instruments and lag specifications are described by the authors as exploratory; suggests some caution

- Model specification treats each country-year as an independent observation, but the economies of the countries in question (EU members) are highly integrated
  - If there are international spillovers, the model is mis-specified
  - One way to test for this might be to include foreign intangibles in each country's production function

- Test for spillovers rests on the assumption that firms are perfectly competitive
  - Changes in TFP could reflect changes in markups rather than changes in actual productivity

# Estimates of the Spillover Benefits
# of Investment in Intangibles (continued)

- Finding that there are spillovers for all of the major types of intangibles makes me nervous about the estimates
  - Seems plausible that investments in R&D, design and organizational capital could have positive spillovers, insofar as all of these lead to observable outcomes that other firms can copy or build upon
  - Seems much less plausible that investments in firm-specific training or brand equity should have positive spillovers; I would expect the value of these investments to be fully appropriated by the investing firm
- These questions about the estimates notwithstanding, this is exciting work that seems to me to be asking important questions and beginning to address them in a thoughtful way

# Policy With Regard to Investment in Intangibles

- Hulten makes the important point that, if there are positive spillovers from investments in intangibles, the private sector will tend to invest too little in these types of capital

- Paper outlines a number of policies that may influence firm investments in intangible capital, including:
  - Macroeconomic policy (strength of demand and certainty about future demand)
  - Regulatory policy (ease of doing business)
  - Tax policy (cost of making different types of investments)
    - Many investments in intangible capital already receive very favorable tax treatment, because they can be expensed
  - Education policy (availability of workers with the skills to perform knowledge-based work, extension activities)

# Policy With Regard to Investment in Intangibles (continued)

- Not all types of investment in intangibles are alike
  - There is a strong conceptual argument for supporting investments in types of capital for which the return cannot be fully appropriated by the investing firm (e.g., R&D, design, organizational capital)
  - Harder for me to make the same argument for types of capital for which I would expect the return to be fully appropriated (e.g., firm-specific training, brand equity)

- As noted by Hulten, increased investment in intangibles—like technological progress more generally—may be good for a society in the long run, but costly for affected workers in the short to medium run
  - Policy has a role to play here as well
  - Providing workers who suffer displacement the opportunity for retraining and perhaps limited wage supplements much more appealing than allowing affected individuals to move onto government support programs