R&D, innovation and productivity gains

Evidence from top R&D investors

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Serving society
Stimulating innovation
Supporting legislation

Why focusing on the R&D-productivity link?

There is a number of drivers of productivity:
External factors (e.g. regulations), managerial abilities, quality of labour and capital inputs, firm structure (vertical/horizontal integration), market competition, trade, investments in ICT and R&D, innovations

- R&D plays a key role as it leads to innovation, competitive edge, higher quality of labour and capital, internationalization

Overview of empirical analyses of the R&D-productivity link using data from world's top R&D investors

Other factors influencing the R&D-productivity link

- internationalisation
- cooperation
- investment in intangible assets, like training or design

From findings ⇨ identification of policy conclusions to support policy intervention

Literature on the effects of R&D on firm performance (seminal work of Griliches)

- General finding: R&D&I investments enhance firm productivity
- Source of R&D: returns from public R&D<than private R&D, but long-run effects of public R&D are higher
- Sectoral heterogeneity: R&D returns are higher in hi-tech sectors
- Cross-country differences: no differences in R&D returns (OECD, Germany vs Sweden, France vs US)
- Knowledge spillovers: R&D returns increase with the R&D of techn.ly similar firms
- Firm heterogeneity: variations in size, R&D, technologies, ownership, exporting etc. explain differences in R&D returns

Top R&D investors:
EU R&D Scoreboard panel data set

- R&D and physical capital investments, net sales, operating profits, market cap, employees and on the subsidiaries structure
- The most ~ 2800 R&D-intensive firms from 2004 to 2012
- 3-digit sectors and geographical location of the HQs

Advantages
- Firm-level data allow analysis of firm heterogeneity (size, age, production tech. etc.) and firm dynamics (reallocation of resources due to e.g. expansion/contraction)
- Current sample of top investors covers 90% of world total BERD

Disadvantages
- Geographical and size coverages

R&D and productivity: evidence for top R&D investors

- Different measures (labour pr., TFP, efficiency) and different methodologies (accounting approach, technological frontier) confirm the positive R&D returns, especially for companies operating in high-tech sectors.

- Reverse pattern for the returns to physical capital

- R&D returns non-linear: positive productivity growth only after a "critical mass" of R&D

- R&D increases firm efficiency, margin of improvement is larger in low-tech sectors

- EU-US productivity gap is largely explained by the (lower) level of R&D spending in EU. US firms have higher R&D returns than their EU counterparts.

- Across EU, firms in South EU (Italy, Spain, Portugal and Greece), have similar productivity levels to firms located in North EU, but R&D returns are lower.

➢ Other factors than R&D could explain this heterogeneity (e.g. non-tech innovation, uncertainty)

R&D-productivity: contributing factors

- Multinationality of EU firms:
  - Measure of degree of multinationality using the number and geographical dispersion of subsidiaries in non-EU countries
  - Positive correlation with R&D investments but negative correlation with productivity (hp: organizational complexity)

- Cooperation:
  - Positive relationship between past R&D cooperation and TFP
  - Higher level of productivity among cooperative companies and higher productivity growth for the innovative ones

- Intangible assets:
  - Investments in job training, design and marketing positively affects firms' innovativeness, especially when combined with R&D investment

Policy conclusions

Key role of an effective national and EU-level policy support for business R&D

- Need for differentiated policy tools across countries, sectors and companies, given the heterogeneity of the impact of R&D investment on firm's productivity

> different impacts of R&D on productivity, depending on their tech. level and location (country specific institutional factor may hinder growth by e.g. innovation- or investment-unfriendly regulation)

- Need to pair business R&D support with a broader set of innovation policies

> collaborative and multinational nature of European innovation support facilitates knowledge and capability transfer across firms and countries.

Ongoing and future work

- Firm structure: degree of vertical/horizontal integration and the impact on R&D returns
- Role of labour and capital markets flexibility
- Complementing EU Scoreboard panel data with greenfield FDI and M&A
- …

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