“New” view on growth theory and consequences for RI policies

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Overview

1. “New” view on growth theory

2. Knowledge spillovers

3. Consequences for Research Policies
1. New view on growth theory
1.1 From exogenous to endogenous growth

- Exogenous growth: impossibility to modify the long term rate of growth whatever be the policy

- The growth is blocked by decreasing returns and depends only on the (exogenous) labour force increase

- If non decreasing returns: possibility to increase the growth of accumulative factors (capital, R&D, other intangibles, skills, etc.) then to endogeneize long term rate of growth by adequate policies (R&D, human capital, etc.)
1. New view on growth theory

1.2 Knowledge spillovers increase returns

- P. Romer takes this hypothesis and then starts the endogenous growth theory.
- But how to conciliate the necessity of decreasing returns for the microeconomic equilibrium with these macro non decreasing ones?
- The brilliant idea of Romer (1990) is to think to the knowledge « externalities » or knowledge « spillovers » or « transfer » : A R&D effort or innovation that appears in a firm gives information to other firms and then increase their productivity.
- Macro economic productivity of research is then superior to private one.
1. New view on growth theory
1.3 Three families of new growth theory

- Ha and Howitt (2007) distinguish three families:
    - Growth is increasing with the level of R&D
    - Growth is decreasing with the stock of knowledge
1. New view on growth theory

1.3 Three families of new growth theory

  - Growth depends on intensity of R&D

- In the three families R&D is the sole factor of growth but new extension on other innovation assets: ICT, other intangibles,…

- However we must keep in mind that the knowledge spillovers are in the core of the new theories
2. Knowledge spillovers

2.1 Characterization

- Whenever research and innovation appears in a firm there is knowledge transfers to:
  - Other firms of the sector
  - Other sectors
  - Other countries

- These transfers are conveyed by:
  - Patenting
  - Conferences, Publications
  - Network organizations
  - Workers mobility, etc.
2. Knowledge spillovers
2.2 How to measure knowledge spillovers?

- General methodology for assessing knowledge flow is patent citations from EPO and USPTO.
- The main idea: the cited patent sends a piece of knowledge to the citing patent and each patent can be assigned to a sector and a country.
- For instance a patent that describes improvement in a steam turbine used to generate electricity is a knowledge transfer from power equipment sector to the electricity generation sector.
- At the end square matrix with country sector (cf. Belderbos and Mohnen (2013) for the SIMPATIC project).
2. Knowledge spillovers
2.3 Some key figures on R&D and knowledge spillovers

Mansfield (1977), Hall Mairesse and Mohnen (2009) based on microeconometric works:

- The rate of return on private R&D (10-30%) is higher than the return on physical capital

- When including knowledge spillovers the social rate of return of R&D is twice larger than the private rate (~50%)

- The cost-benefit analysis of R&D expenditures must include these externalities
3. Consequences for Research Policies

3.1 Needs for research policies

- All these new ideas and results make economists believe that the level of R&D efforts (~1.9% in EU and ~3% in US) is too low.
- The positive knowledge externalities call for “redressing policies”
  - Aids and subsidies: tax cut, CIR, National and European grants, structural funds for research, Investissements d’avenir, etc.
- High risk level of investment in R&D creates difficulties of access to financial markets
  - New financial instruments to reduce risk:
    - Risk sharing finance facility (Commission, EIB)
    - Business Angel
    - Venture Capital
3. Consequences for Research Policies
   3.2 Needs for assessment of research policies

- Not limited to direct and indirect productivity of research but to the whole socio economic aspects: GDP, employment, revenues, inequalities and even on sustainable development

- For this reason, assessment will be based on micro economic studies but also on macro models
3. Application to Research Policies

3.3 An example: The Barcelona objective of 3% effort

- Two phases
  1) Maturation period
     - Inflationary pressure
     - Deficits
     - GDP expenses related (Multiplier effect)
     - Employment above GDP
  2) Innovation
     - Competitiveness
     - Internal demand

- Results after 20 years (NEMESIS model):
  - 11% more GDP
  - 10 millions more jobs created
3. Consequences for Research Policies
3.4 Conditions for a successful research policy

- Generally simulations give good economic results although it appears some divergences between models’ results: R&D policies may create growth and jobs.

- However R&D policies may not be successful. It is not due to R&D and innovation properties, that are favourable, but to conditions that prevail at the times of the implementation of policies:

  - Will the public aid be a substitute to private finance for a project that would have been undertaken anyway? (Crowding-in or “leverage effect”)
3. Consequences for Research Policies

3.4 Conditions for a successful research policy

- Is there enough scientist, engineers very high skilled, to implement extra R&D? If it is not the case, R&D effort will increase the cost of research
- Are the goods and services market structures adapted to absorb the new products issued from innovation (problem of normalization)
- Are the financial instruments efficient enough to avert the risk
- Are the public subsidies allocated with efficiency?
- Are the other innovation assets (O.I, ICT) adapted to policy
Conclusion

- The theoretical virtues of R&D investment allowed a “renewal” of growth theories.

- We have seen that the knowledge externalities are in the core of this new vision. These externalities need strong research policies to redress the market failure.

- We have also noticed that the assessments of R&D policies give fairly good macro results.

- But we know also that R&D policies need rather stringent conditions to be successful.
Conclusion

- However, although some areas need very important structural reforms it is vital that these reforms do not prevent the implementation of R&D policies, especially the “deleveraging” must not imply to cut the finance for these policies.

- John and Williams computed in 1998 what would have been the optimal level of research for the US, taking into account knowledge spillovers: more than four times the current level with almost 12% of GDP.

- The future of research is to extend to other innovation factors than R&D such as ICT, competencies, organization, etc.
Thank you for your attention

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