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Skill Formation and Innovation - A Macro and Micro Perspective

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Skills and innovation

- Role of skills in development and innovation process
- Attempt to outline some concepts in this context
  - Relevant issue for developed and catching-up economies
- Crucial issue in the context of
  - The Lisbon strategy
  - Structural change
  - Ageing society
- Are the conclusion similar for developed and catching-up economies?

Working at the frontier or catching-up –the big picture

- Europe has been successfully catching-up after WWII (see Aghion, 2006)
- Successful development based on capital accumulation and institutions which supported this process
- Favourable institutions and policies: limited competition in product markets, large firms financed by banks and by government subsidies, educational systems emphasising primary, secondary, and specialised undergraduate educations, rigid labour markets that favoured the accumulation of experience within firms over mobility across firms.
- By the late 1980s European firms had caught-up with the worlds best performers in terms of the capital-labour ratio and productivity levels
- Capital accumulation and technological imitation were exhausted as sources for economic growth

Arriving at the frontier – what´s next?

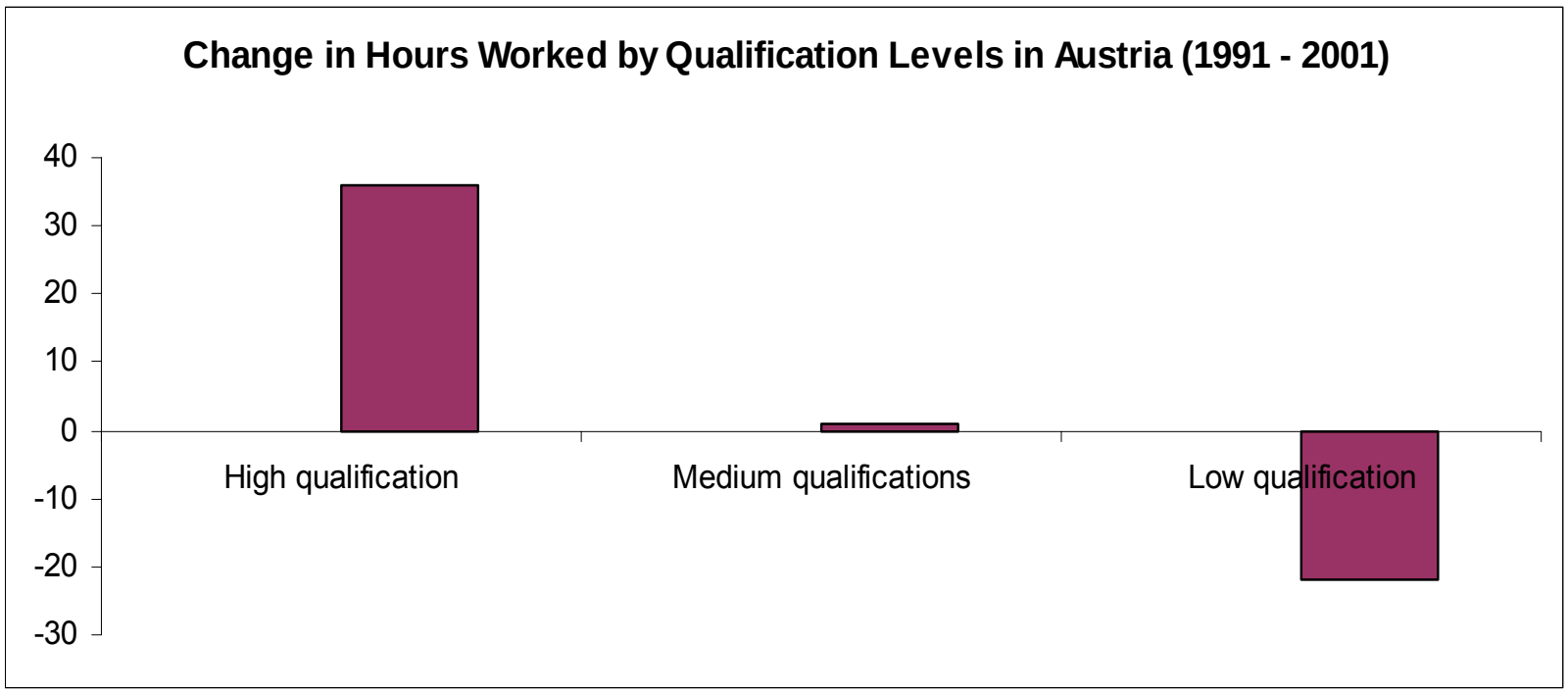
- Innovation is the source for growth if the enterprise/industry/country has approached the technological frontier.
- What kind of innovation is meant: product/process/radical?
- Europe had not developed the institutions to profit from this source of growth – notably innovation
- Sources of growth at the frontier:
  - Competition and entry
  - Education
  - Efficient labour markets
  - Financial development, and
  - The conduct of macroeconomic policy over the business cycle.

Working at the frontier - Education

- Is the European education system growth maximising?
  - 39% of US population aged 25-64 hat attained tertiary education against only 23% in Europe
  - US devotes 2.3% of its GDP to tertiary education versus only 1.3% in Europe
- The difference in tertiary education is a big deal if radical innovation is to be stimulated
  - Primary and secondary education are in many cases sufficient to implement existing technologies
- Depending on the distance to the frontier different returns to investment in tertiary education exist
- More tertiary education increases flexibility of economies to react to changes in technologies
  - Substantial part of growth differences between Europe and the US can be attributed to differences in the level of tertiary education
  - Increasing average school attention by one year would increase long term potential output by 6%

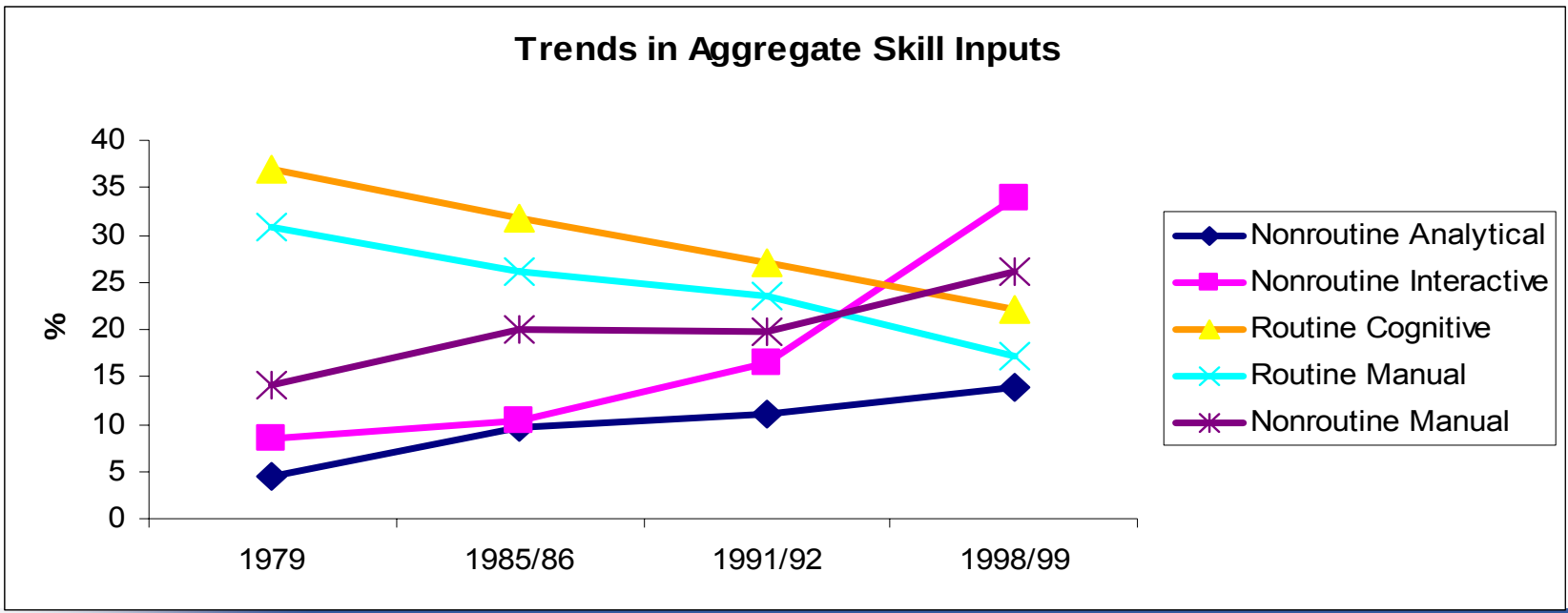
Trends in skill formation

- Continuous upskilling to be observed in major industrial countries
  - Increase of more educated employees
  - Increasing returns to education



Trends in Skill Formation – Statistical Evidence

- Is this development triggered by increased demand or increased supply?
- Skill biased technological change or structural change at industry level?
- Decrease in „routine cognitive“ and „routine manual“ skills
- Trends observable across employees with high, medium or low level of education but more pronounced for persons with high level of education (see Spitz-Oehner, 2006)



Factors impacting on the skill structure

- Robust correlation between computer-based technologies and the use of highly skilled employees at various level of aggregation support this hypothesis
- Overall 85% of education upgrading is implied by computerisation – supply push is not important
- Remainder caused by change in workforce composition
- Process innovation in the form of ICT diffusion
  - Complimentary investment in retraining of employees, organisational change

Skill Formation and Innovation at the Micro Level

- Not evident that returns to innovation are always positive
- Complimentary capabilities – e.g. marketing and distributions skills – were considered important
- Lack of skill (qualified people) are continously reported in innovation surveys as one of the most important hampering factors for innovation – less innovation
- Skills are seen as important component of absorptive capacities and complement both internal and collaborative R&D
- Accumulation of knowledge capital (internal and external) may also enhance innovation performance and productivity growth
- Complimentarities between ICT, skills and organisational change

Empirical testing of the relationship between skills and innvovation

- While general assumption of a positive relationshiop is taken for granted few robust multi-industry studies exist
- Falk – Leo (2004) find a positive relationship between the share of persons with tertiary education and the introduction of innovation and the level of R&D spending
- Leiponen (2005) finds – based on Finnish data - statistical significant complementarities between technical skills and innovation and technical skills and R&D collaboration activities
- Internal skills may complement external collaboration and thus be a prerequisite for successful collaboration
- Subsidies for innovating firms maybe disappointing if firms do not possess the requisite complimentary skills
- Firms must either possess or develop these complimentary skills in the innovation process – this expands the set of potentially successful innovators in the economy.

Promotion of skills in innovation policy

- Various attempts to influence skill structure when promoting innovation activities
- Count on the Trendchart website revealed
  - 109 “Innovation Skills”
  - 90 “Future Skills Base”
- Obviously programmes were allocated to these categories if they had some fitting components but their main focus may be somewhere else
- Is the compensation of skills during the innovation process or the introduction of specific training programmes sufficient?

Some conclusions

- Economic policy strategy should differ depending on distance to the technological frontier because the returns to measures are different
  - Close to frontier investment in tertiary education have higher returns while for catching-up countries investments into primary and secondary education may be more rewarding
  - Developing a long term education strategy is a must
- Sectoral composition might also be taken into consideration when designing economic policy strategies
- Having sufficient skilled persons increases
  - the chances of success of innovation projects
  - the likelihood of successful technology diffusion
- Changing the skill structure is a longterm process – changing it in the course of innovation activities might be difficult
- Skill requirements for innovation might be an additional motivation to rethink changes in the education system and to emphasise LLL

Complimentary reading and references

- Aghion, P., A Primer on Innovation and Growth, Bruegel Policy Brief, October 2006
- Falk, M., Leo, H., Die Innovationsaktivitäten der österreichischen Unternehmen, Empirische Analysen auf Basis der Europäischen Innovationserhebung 1996 und 2000, WIFO, 2004
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- Leo, H. (Coordination), Falk, R., Friesenbichler, K., Hölzl, W. Mehr Beschäftigung durch Wachstum auf Basis von Innovation und Qualifikation, Teilstudie 8, WIFO Weißbuch, 2006
- Spitz-Oener, A. Technical Change, Job Tasks, and Rising Educationsl Demands: Looking outside the Wage Structure, Journal of Labour Economics, vol. 24, no. 2, 2006.

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