MEASURING KNOWLEDGE-BASED CAPITAL

Some findings and open questions

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BETTER POLICIES FOR BETTER LIVES

Addressing measurement challenges (1/2)

1. International harmonisation of estimates

- INTAN-Invest: published harmonised macro estimates of investment in KBC for 27 European countries + US.

2. Improving measurement at disaggregated levels

- Sectoral level: number of national initiatives (Japan, Korea, UK, France). A clear need for coordination emerged.
- Firm level surveys: UK and Italy have launched pilot surveys. Results are still very preliminary.

Addressing measurement challenges (2/2)

3. Developing measurement guidelines for assets for which these do not exist (e.g. design, econ. competencies)

- INDICSER project: develop the labour cost measurement of a number of assets (training, OC, R&D, ICT).
- Design: Barcelona Design Council is leading efforts to create a Frascati-like manual on the measurement of design.

4. Capitalisation parameters (e.g. depreciation rates, deflators)

- Price deflators for R&D: Corrado, Goodridge and Haskel (2011).

OECD work on KBC measurement

1. International harmonisation of estimates

- Expert meetings organised at the OECD.

2. Improve measurement at disaggregated levels: sectoral level

- Estimate Organisational Capital (OC) for the US at the sectoral level.
- Construction of sectoral level series of investment in Software, R&D and OC for OECD countries. – ***Work is underway***.

3. Develop measurement guidelines for assets for which these do not exist

- Estimation of SNA series of R&D investment from FM-based survey info.
- Construction of indicators of the "quality" of firms' innovative property.
- Developed a task-based approach to measuring OC.

4. Capitalisation parameters

- Depreciation rates for OC – calculated from labour mobility data;
- Depreciation rates for R&D – calculated from patent renewal data.

Measurement of Innovative Property: **Input side**

Implementation of the "OECD Handbook on Deriving Capital Measures of Intellectual Property Products".

- Going from Frascati Manual survey-based expenditure, focusing on performers and funders...
- ... to SNA series of investments focusing on producers and consumers.
- Difficulties arise when:
  - Determining ownership, especially for the Higher Education sector;
  - Identifying R&D expenditures that count as GFCF, possible double-counting of capital and software expenditures;
  - Accounting for exports and imports;
  - Finding correct price deflators to construct capital stocks;
  - Paying attention to the unit of analysis, i.e. establishment or enterprise.
- Work is still underway, but results look promising.

Measurement of Innovative Property: **Output side**

- Construction of indicators related to the “quality” of innovative property of firms (outlined in WPIA(2011, 2012)6).
- Intended as the technology and economic value of patented inventions and their possible impact on subsequent innovations.
- Results suggest that there are stark differences in relevance and quality of inventive output of firms.
- Effect of framework conditions (barriers to entry in technological markets, financing constraints, governmental policies) are being investigated.

Measurement of Innovative Property: **Depreciation rates**

- Follows a revealed preference argument - renewal of patents signals usefulness of knowledge and R&D output.
- Relies on literature suggesting:
  - patenting highly correlated with R&D expenditure & contemporaneous with R&D expenditures (Griliches, 1998; Hall, Griliches and Hausman, 1986)
  - patent renewal data can be used to calculate returns to R&D (Pakes and Schankerman, 1984).
- Uses patent renewal data from the European Patent Office, matched with ORBIS® firm data.
- Average renewal period for all sectors of **12.7 years.**
- This leads to **8%** (linear) depreciation rate, lower than 15% usually assumed.

Measurement of Economic Competencies: **Inputs**

- STI Working Paper DSTI/DOC(2012)5.
- Follows economic and management literature:

  *Organisational Capital is defined as a **set of tasks** likely to affect the medium to long-run functioning of a firm.*
- OC traditionally measured as 20% of wages paid to managers (Corrado, Hulten and Sichel (CHS, 2005, 2009)
- Uses information from the US **Occupational Information Network (O*NET)** database to identify occupations contributing to Organisational Capital (OC).
- Identifies 84 US occupations, of which 22 are managers, as OC-related occupations.
- Estimate sectoral level investment in OC applying the CHS methodology to employment and earnings data from the US Current Population Survey.

Measurement of Economic Competencies: **Inputs**

Results suggest:

- At the aggregate level, task-based estimated are on average 90% higher than manager-based estimates.
- At the sectoral level, services emerge as large investors in OC.
- When controlling for employment or value-added, Chemicals, Petroleum and Electronics manufacturing also appear as large investors in OC.
- In services sectors the ratio of purchased to own-account investment in OC is higher than in manufacturing sectors.

Measurement of Economic Competencies: **Inputs**

- Extension of this analysis to other countries:
  - UK: British Skills Survey;
  - Germany: Qualification and Working Conditions Survey.
- Preliminary results suggest that the task-based definition of OC can be applied beyond the US, and that results differ across countries.
- Programme for International Assessment of Adult Competencies (PIAAC):
  - data to be published in October 2013;
  - contains detailed information of tasks performed;
  - available for 23 OECD countries.

Measurement of Economic Competencies: **Depreciation rate**

- CHS assumption on depreciation rate of OC is 40%.
- Preliminary firm level survey evidence (UK, IT) suggests rates between 18 to 25%.
- Literature on labour mobility suggests:
  - Unexpected voluntary resignations or quits have a disruptive effect on firm organisation and performance;
  - Labour turnover varies by occupation and skill level.
- Use labour mobility data for the US (job tenure and job turnover) to determine the average tenure of OC related occupations by sector and derive sectoral level depreciation rates for OC.

Open issues

- What do we know for sure, which we can use for evidence-based policy making?
- What we would need/like to know but we don't?
- Measurement agenda: low-hanging fruits? Long term objectives?
- Double counting, complementarities, spillovers: how to address them?
- "To disclose or not to disclose": measuring and disclosing KBC at the firm level.
- Were all KB assets created equal? E.g. R&D vs Marketing.

Thank you

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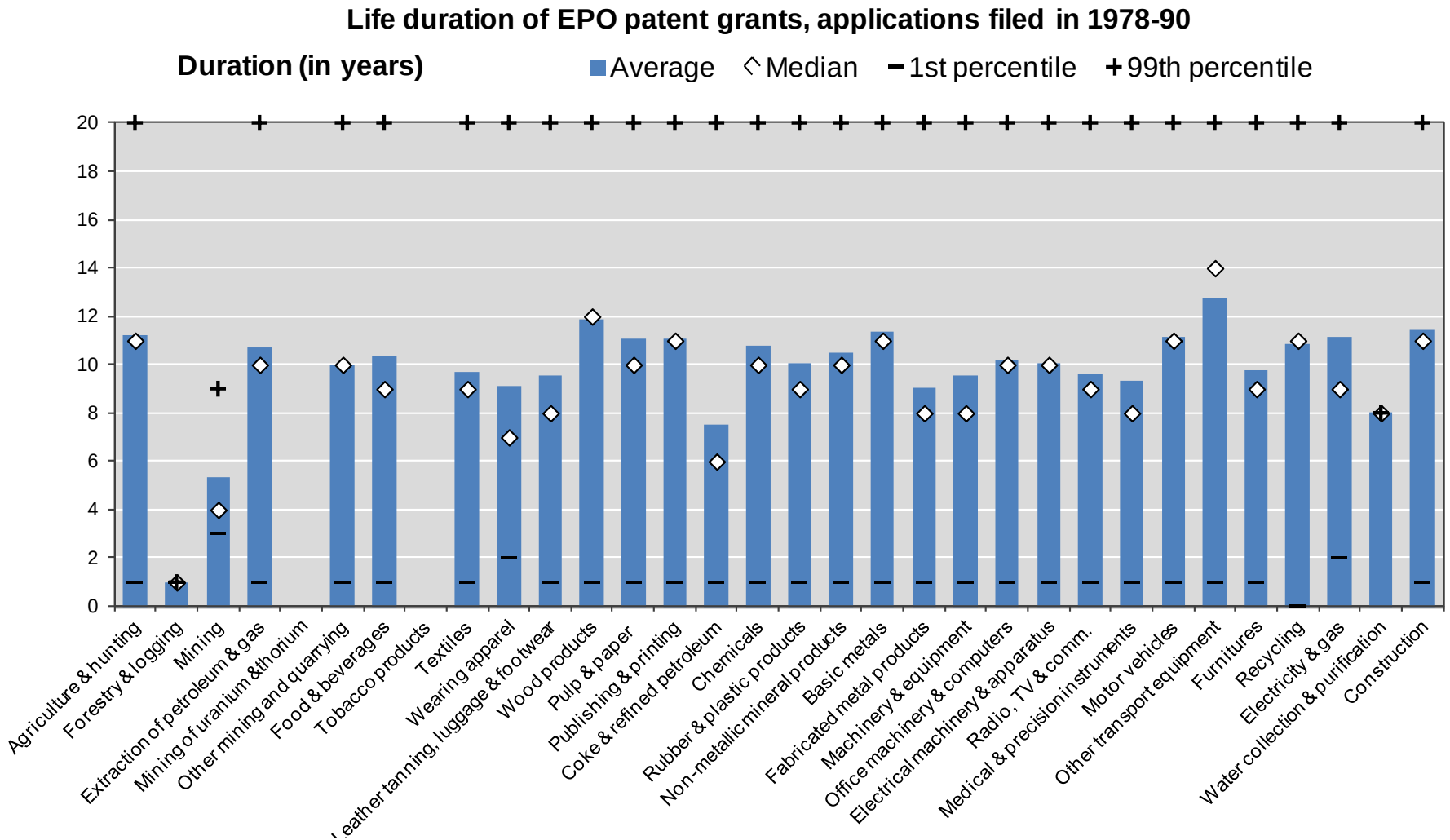
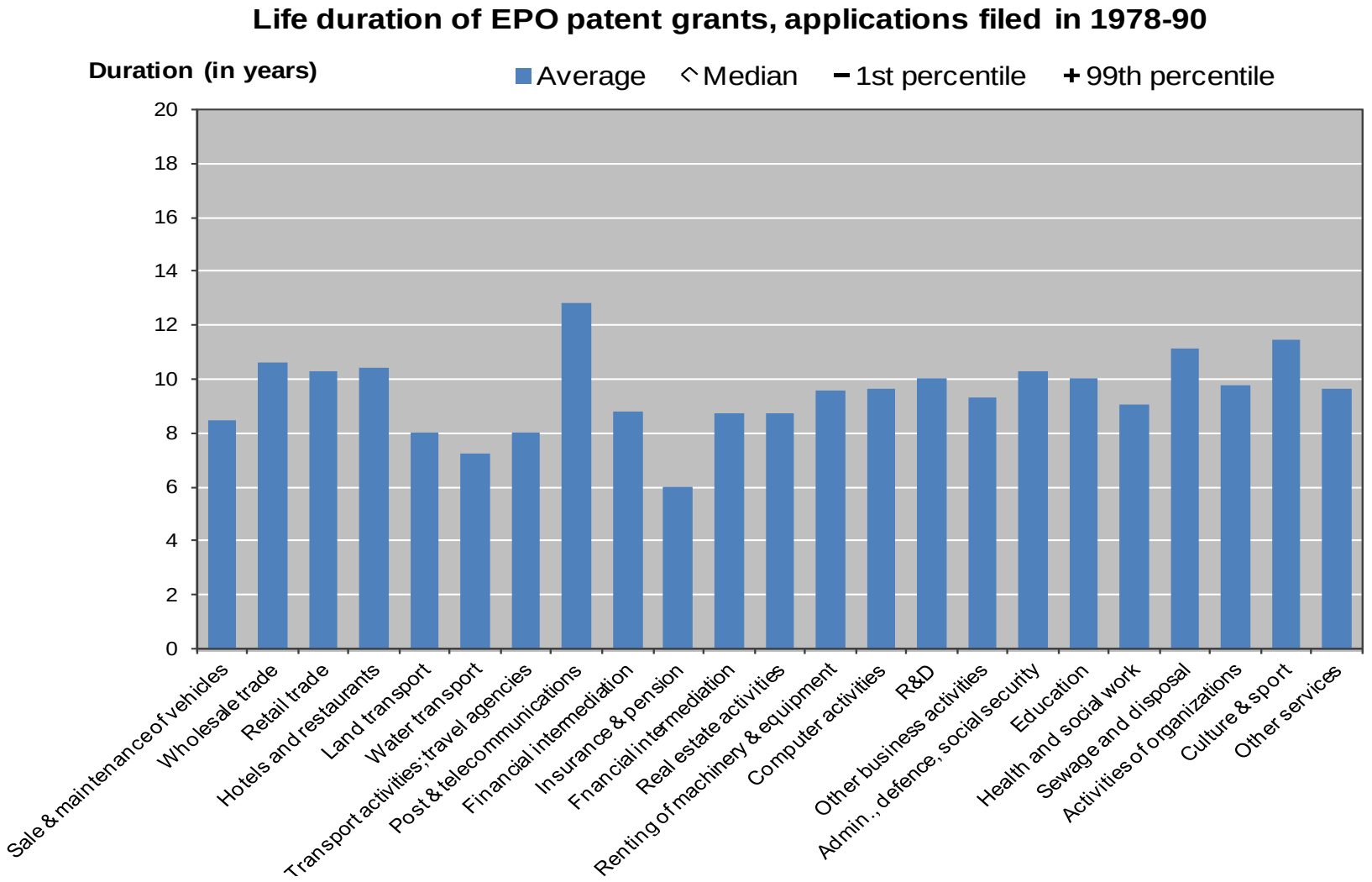
Measurement of Innovative Property: **Depreciation rates**



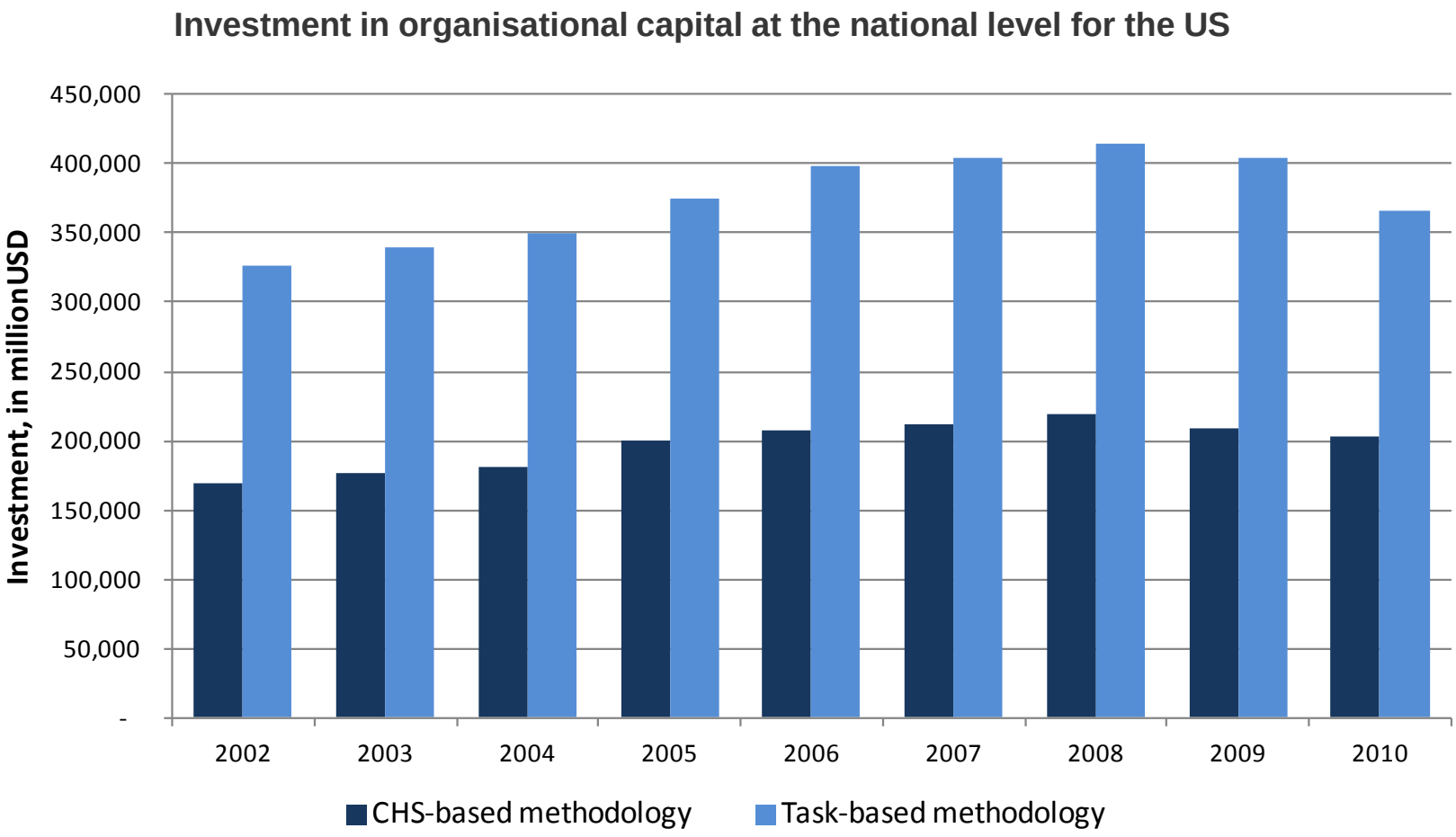
Source: OECD calculations based on the Worldwide Patent Statistical database (PATSTAT) and Worldwide Legal Status database (INPADOC), EPO, October 2011; and ORBIS© database, BvD, December 2010.

Measurement of Innovative Property: **Depreciation rates**



Source: OECD calculations based on the Worldwide Patent Statistical database (PATSTAT) and Worldwide Legal Status database (INPADOC), EPO, October 2011; and ORBIS© database, BvD, December 2010.

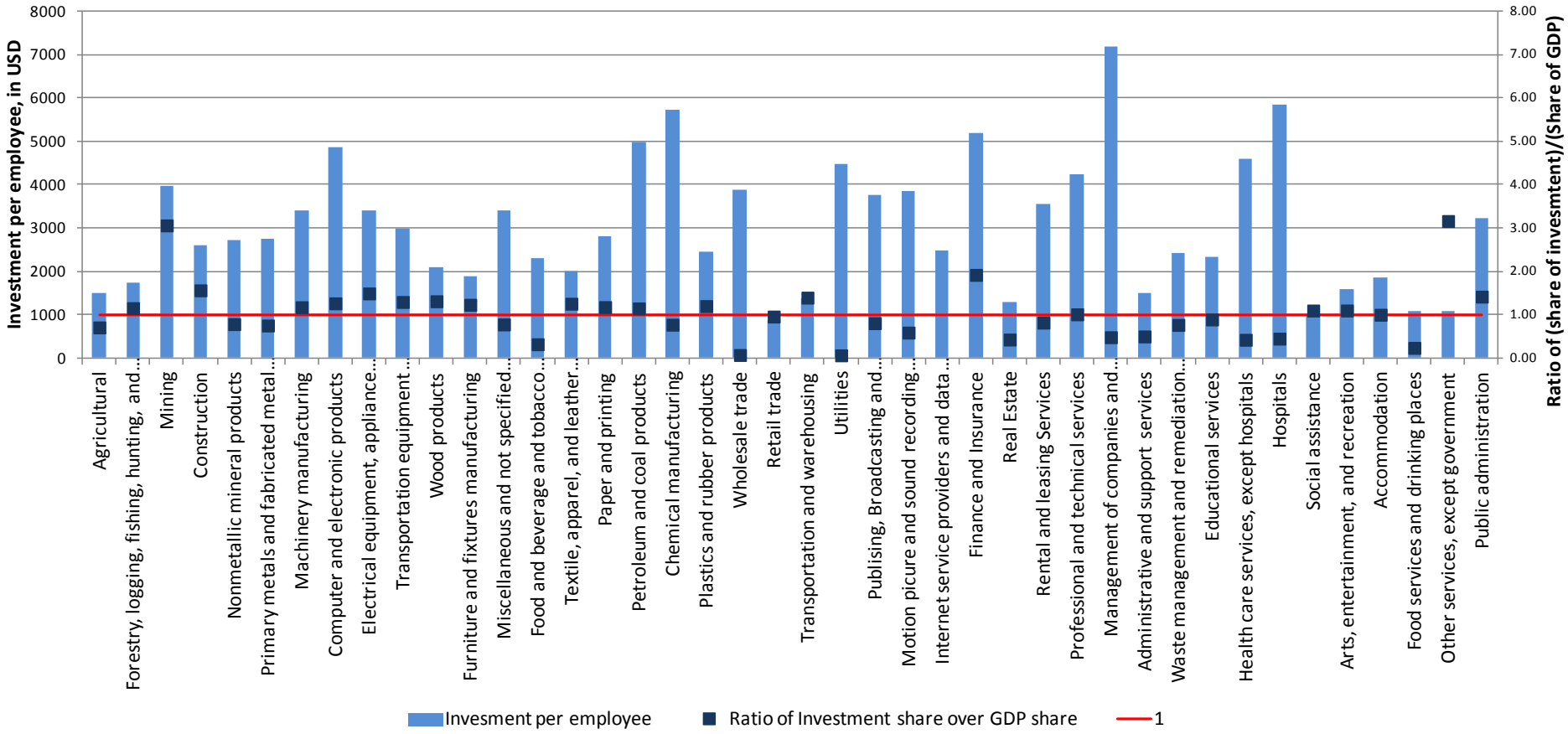
Measurement of Economic Competencies: **Inputs** (1/3)



Source: OECD calculations based on the earnings data by occupation and industry from the Annual Social and Economic (ASEC) Supplement of the Current Population Survey (CPS), US Bureau of Labor Statistics, 2003-2011.

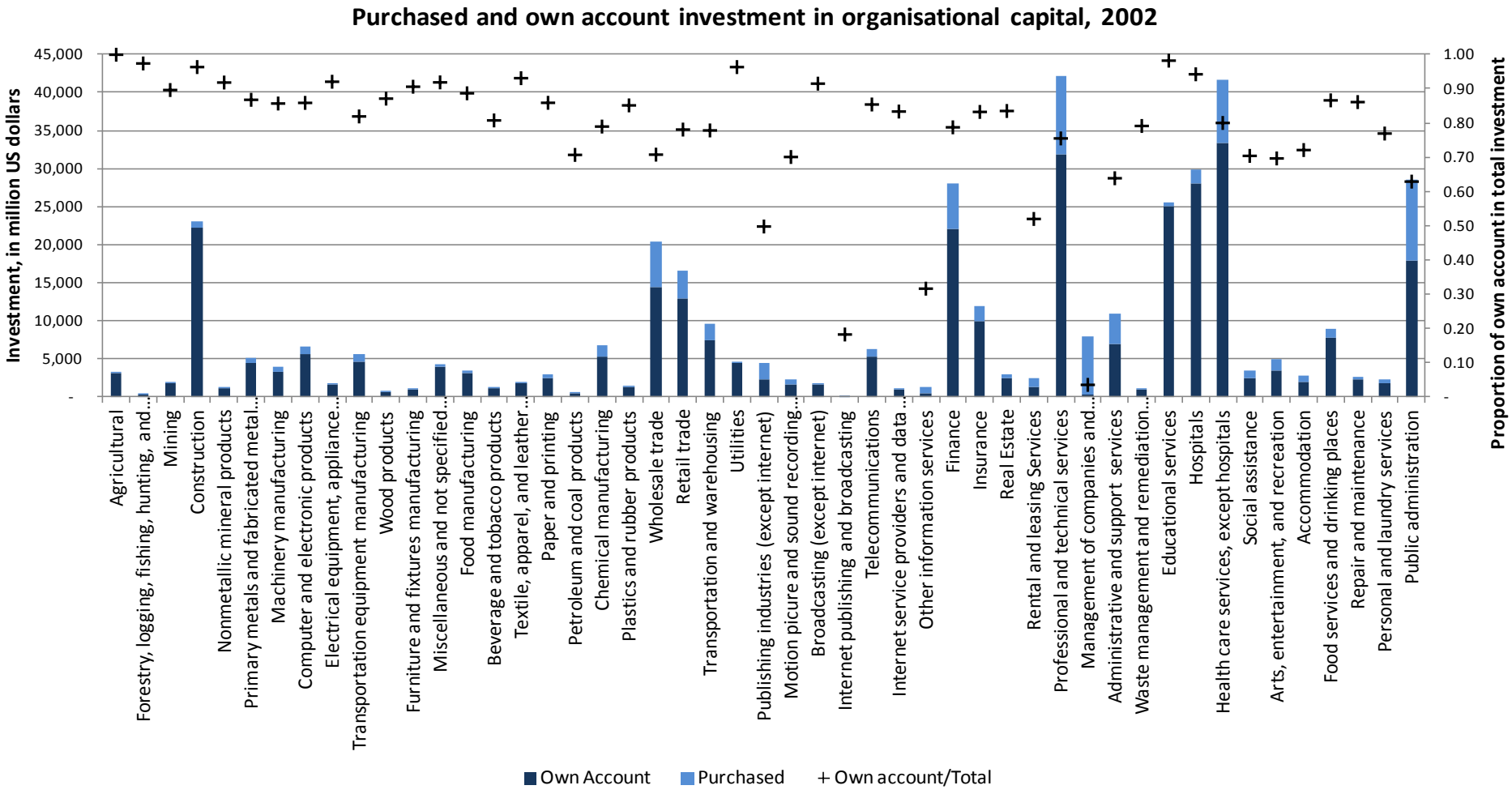
Measurement of Economic Competencies: **Inputs** (2/3)

Sectoral estimates of organisational capital investment per employee and ratio of sector investment share to sector GDP share, yearly average, 2002-2010



Source: OECD calculations based on the earnings data by occupation and industry from the Annual Social and Economic (ASEC) Supplement of the Current Population Survey (CPS), US Bureau of Labor Statistics, 2003-2011, and GDP-by-Industry data from the US Bureau of Economic Analysis.

Measurement of Economic Competencies: **Inputs** (3/3)



Source: OECD calculations based on revenues of the Management Consulting Services (NAICS 5416-1) industry data from the Services Annual Survey and the Non-Employer Statistics, US Census Bureau, 2002-2010 and from historical benchmark Input-Output tables from the US Bureau of Economic Analysis, 2002