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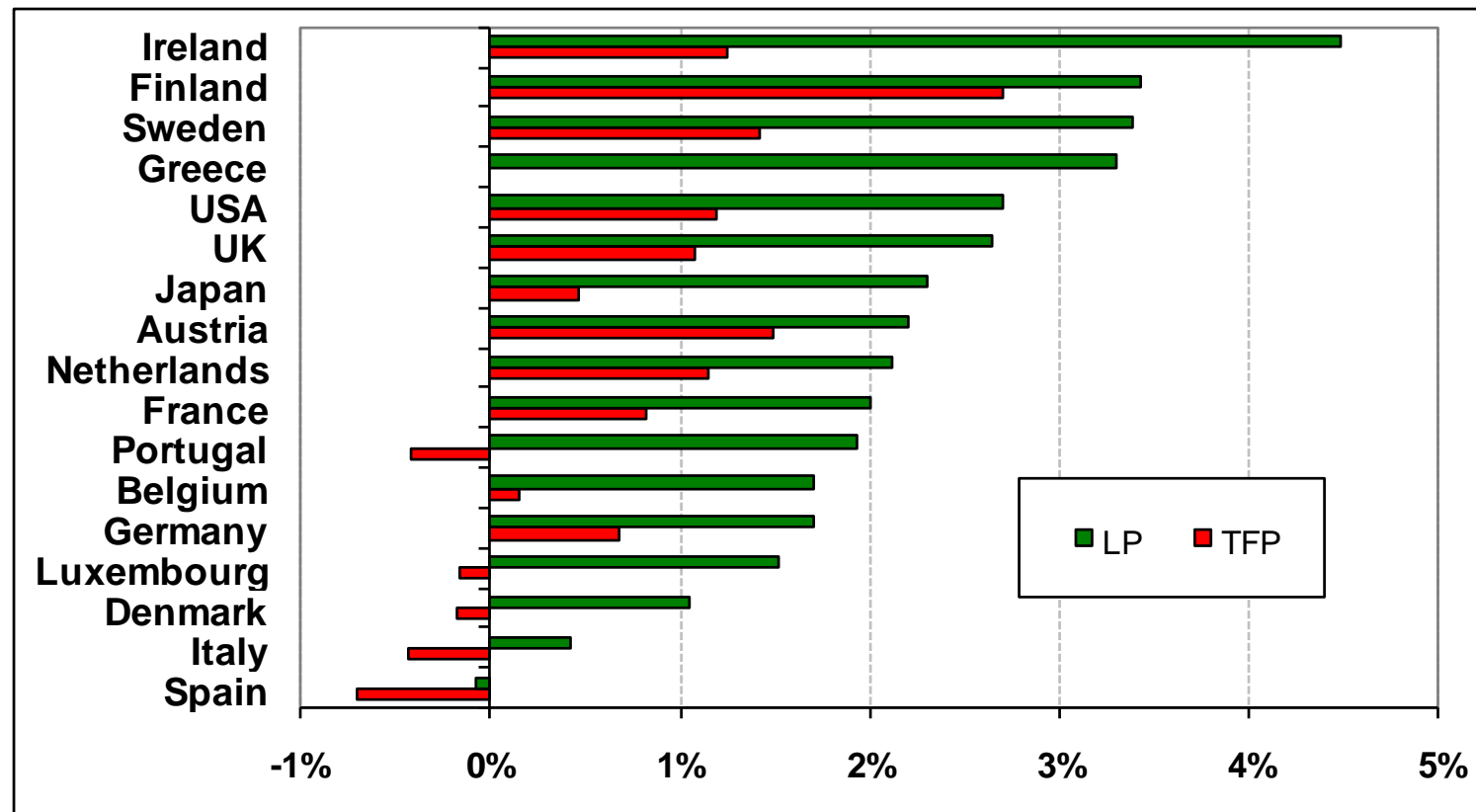
Intangible Investment and Productivity Growth in Sweden

Harald Edquist

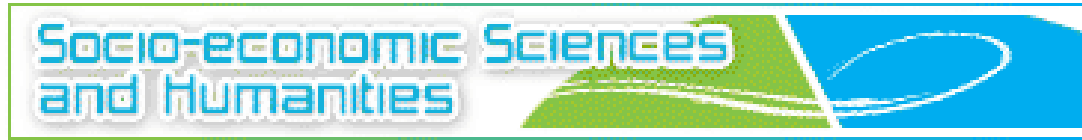
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Labor and total factor productivity growth in the business sector in EU-15, Japan and the US 1995–2007



Source: EU KLEMS (2009)



Background

- Recovery from crisis in the 1990s
- Market reforms in the 1980s
- Information and communication technology (ICT)
- High TFP growth



Corrado, Hulten and Sichel (2006) framework

- **Computerized information**
(software and computerized databases)
- **Innovative property**
(R&D, mineral explorations, copyright and license costs, product development in financial industries and design)
- **Economic competencies**
(brand equity, vocational training and organizational capital)



Questions

- How large was intangible investment in Sweden?
- How large was intangible investment compared to other countries?
- How important is intangible investment for productivity growth?
- Has investment in intangibles been driven by manufacturing or the service sector?

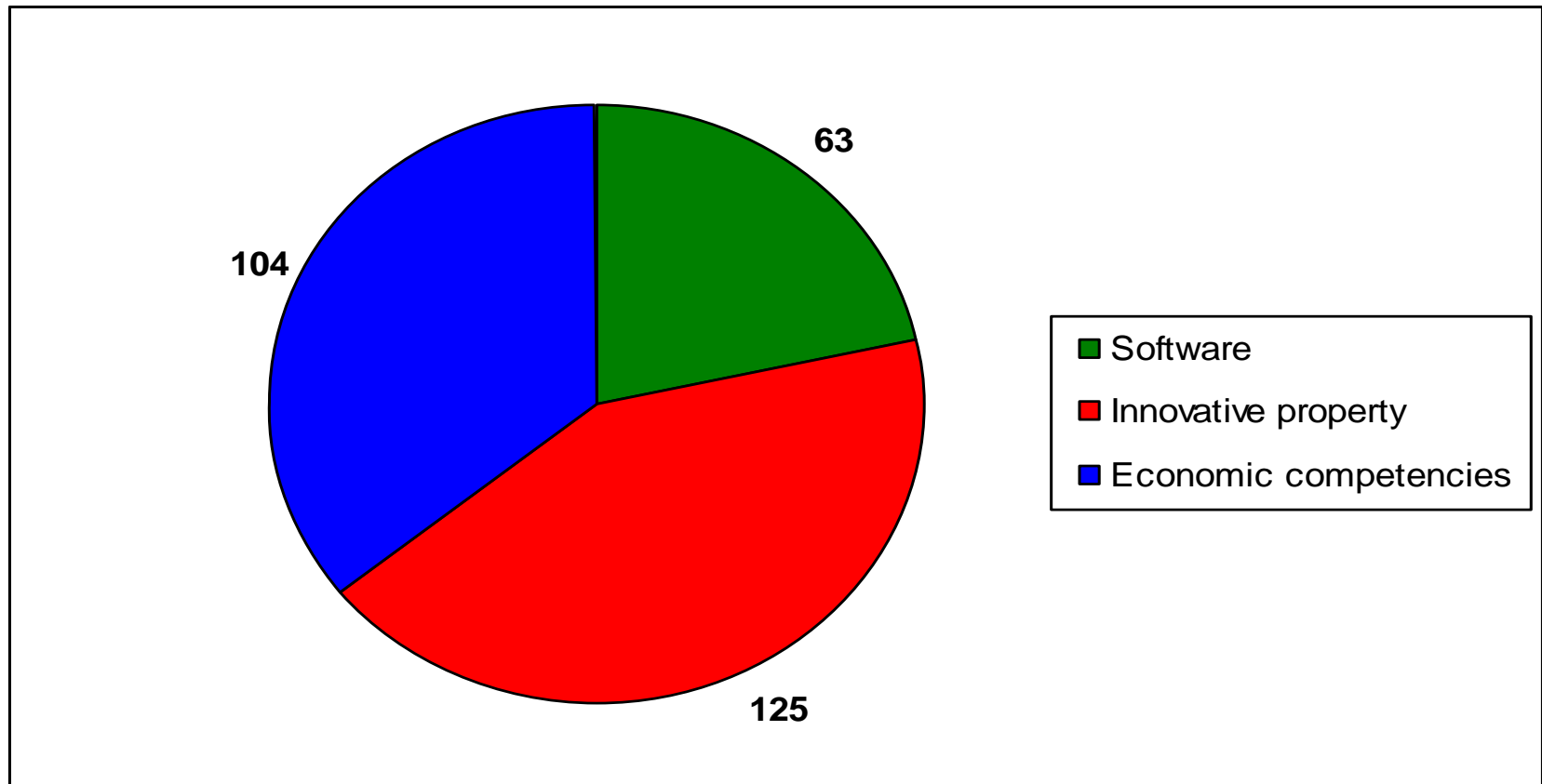


Sources

| <i>Intangible assets</i> | <i>Sources</i> |
|---|----------------------------------|
| Software | EU KLEMS |
| Research and development | OECD ANBERD |
| Mineral exploration | SGU |
| Copyright and license cost | Statistics Sweden |
| Product development in financial industries | EU KLEMS |
| Design | Statistics Sweden |
| Brand equity | IRM, Statistics Sweden |
| Vocational training | Statistics Sweden |
| Organizational capital | Affärsvärlden, Statistics Sweden |



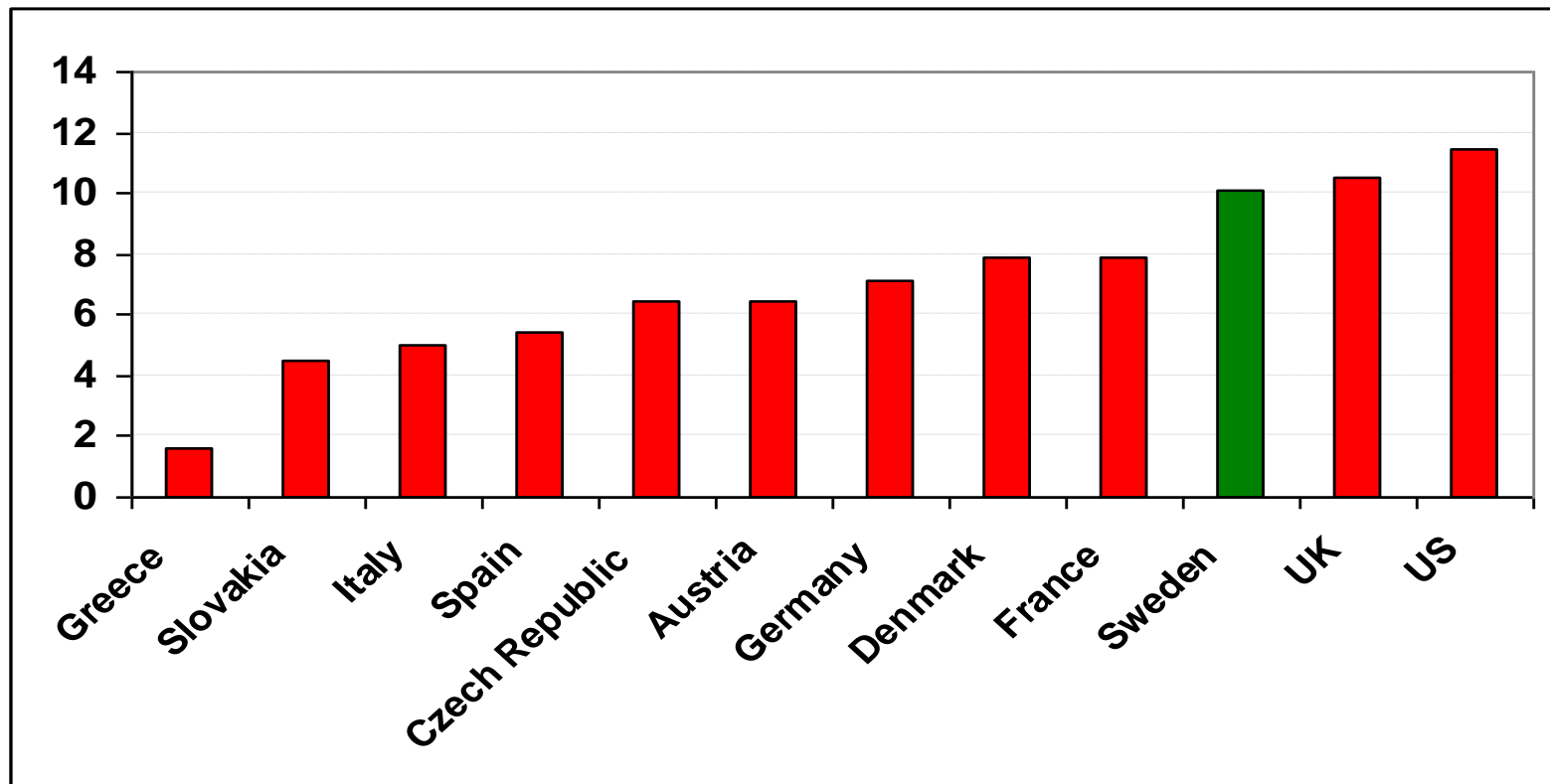
Investment in intangibles in the Swedish business sector in 2006 was 292 bn SEK



Source: Edquist (2010)



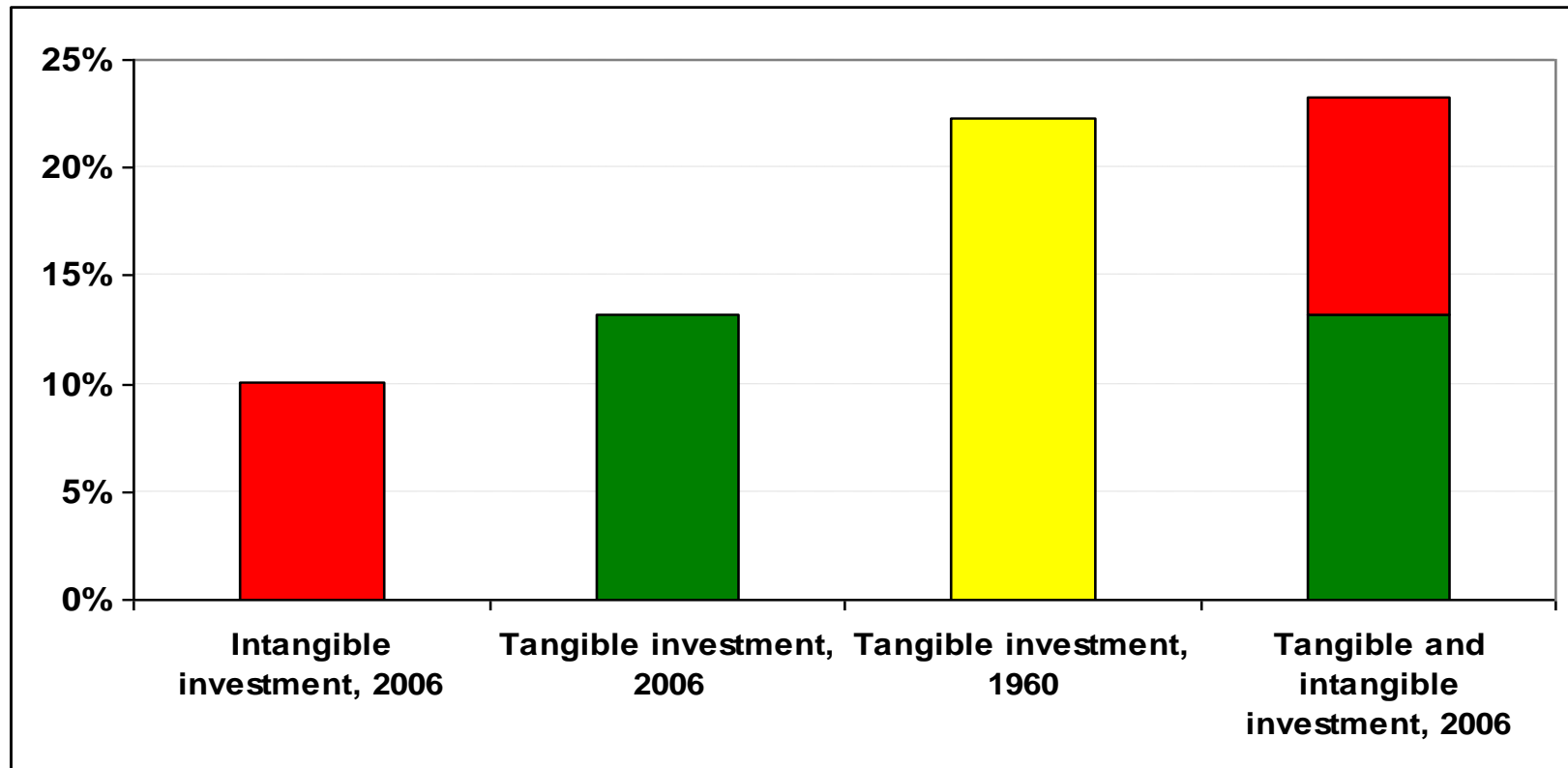
Intangible investment in the business sector in 12 different countries in 2006 (percent of GDP)



Sources: Hao et al. (2009), Corrado et al. (2009), Marrano et al. (2009) och egna beräkningar.



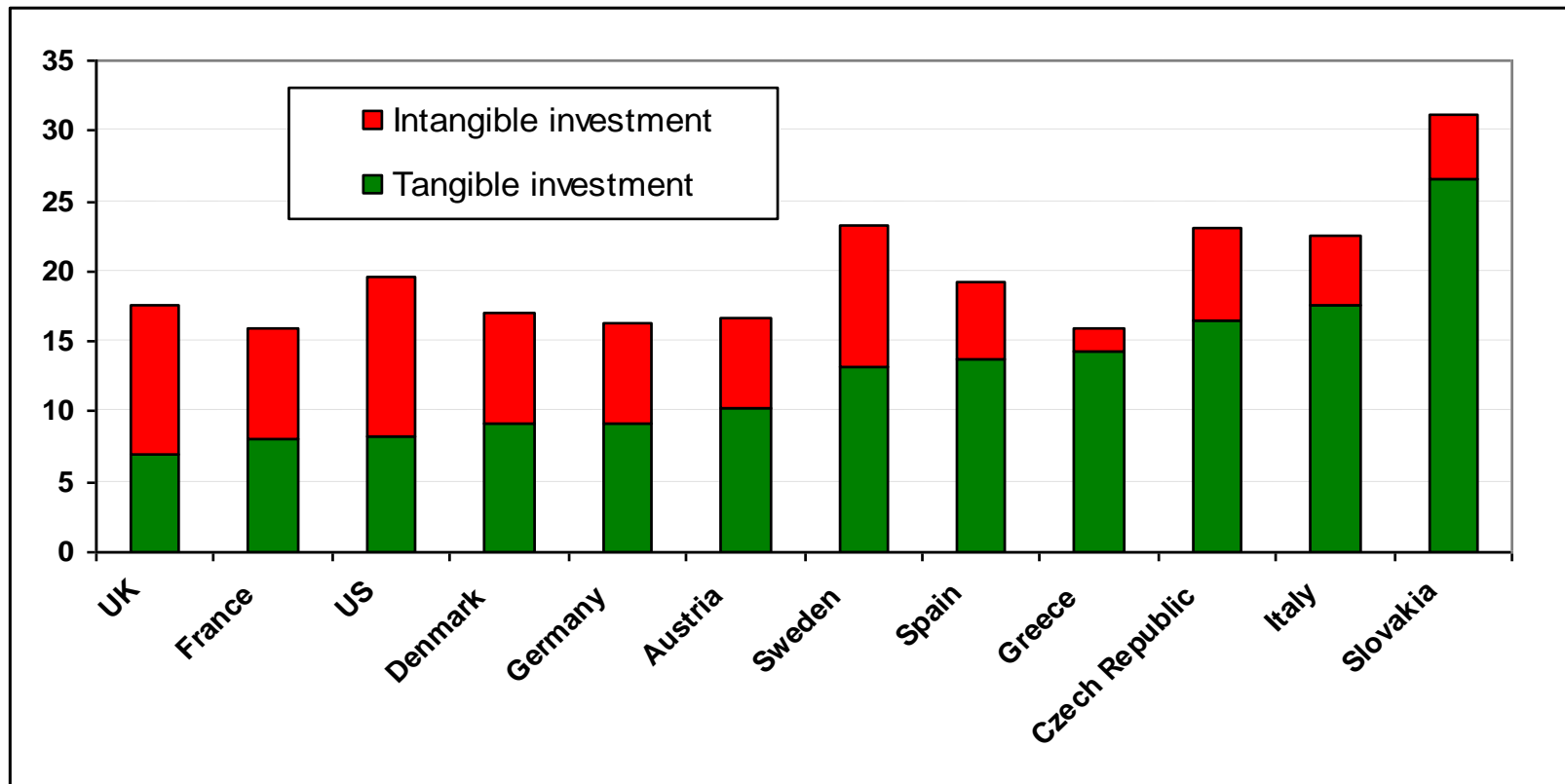
Intangible investment in the Swedish business sector in 2006 (percent of GDP)



Source: Own calculations



Tangible and intangible investment in the business sector in 12 different countries 2006



Sources: Hao et al. (2009), Corrado et al. (2009), Marrano et al. (2009) och egna beräkningar.



Growth accounting

Excluding intangibles:

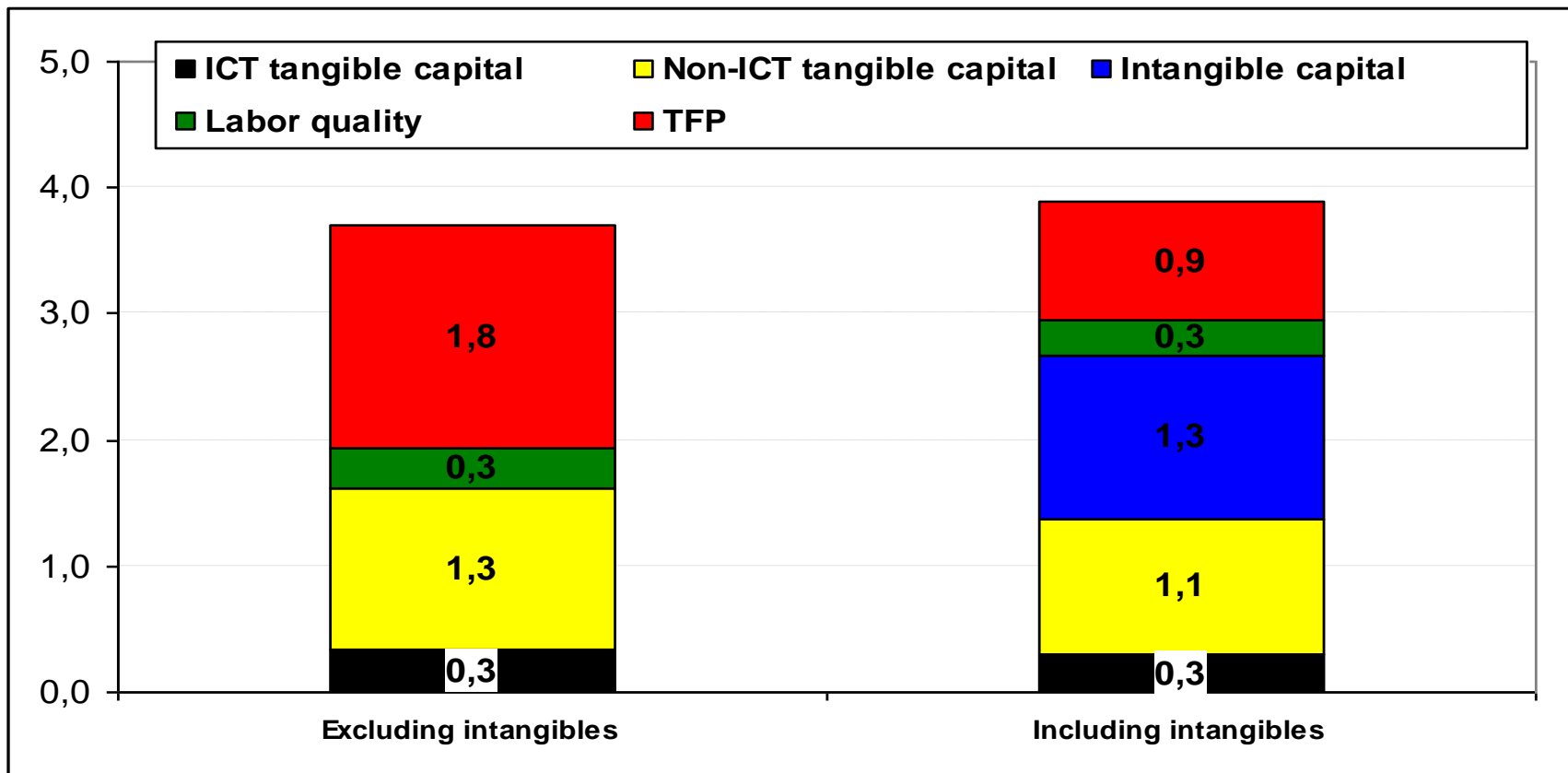
$$\Delta LP = S_K \Delta \text{Capital labor ratio} + S_L \Delta \text{Labor quality} + \Delta TFP$$

Including intangibles:

$$\Delta LP = S_R \Delta \text{Intangible capital labor ratio} + S_K \Delta \text{Other capital labor ratio} + S_L \Delta \text{Labor quality} + \Delta TFP$$



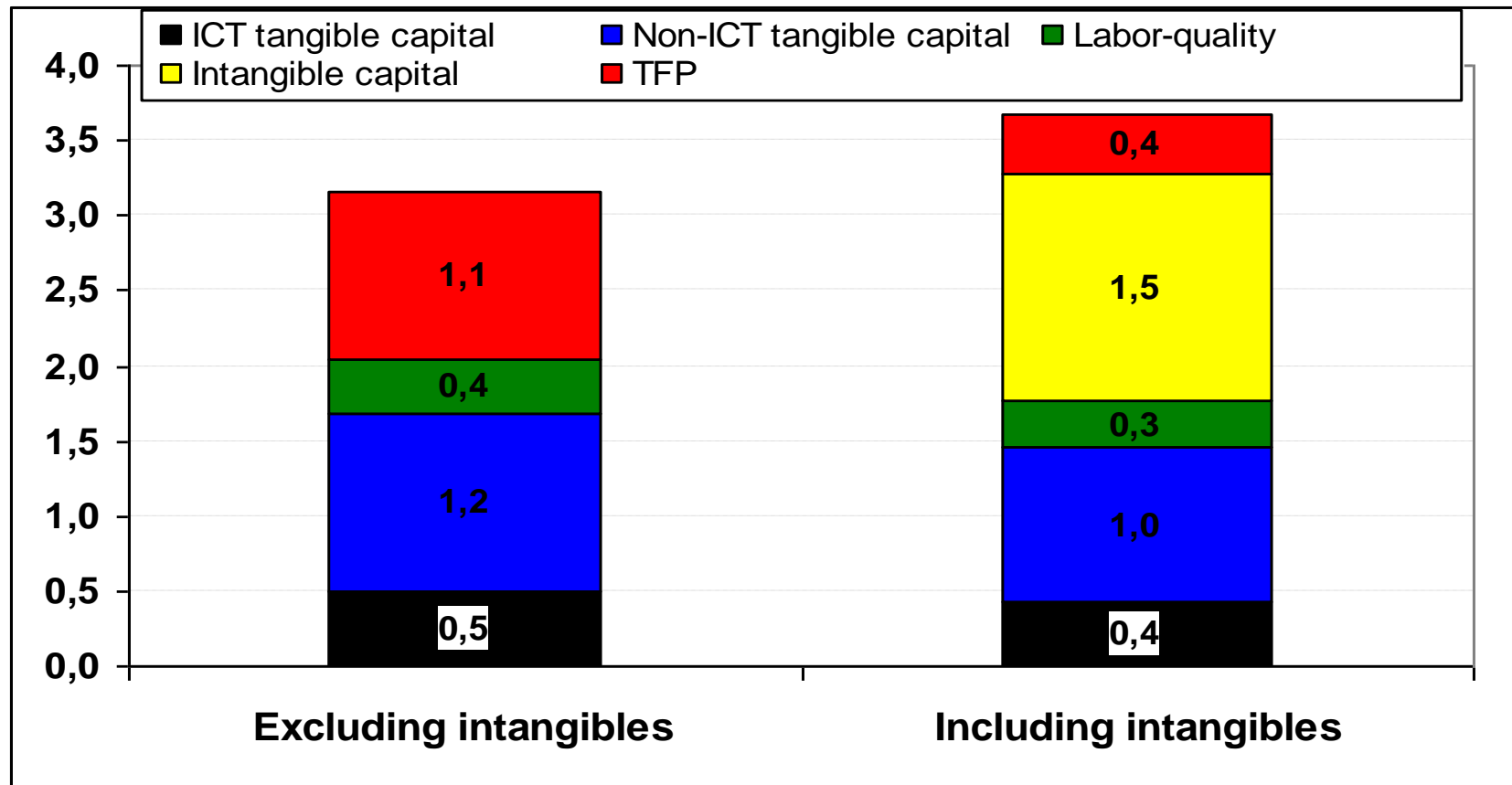
Decomposition of LP growth 1995–2004



Source: Edquist (2009)



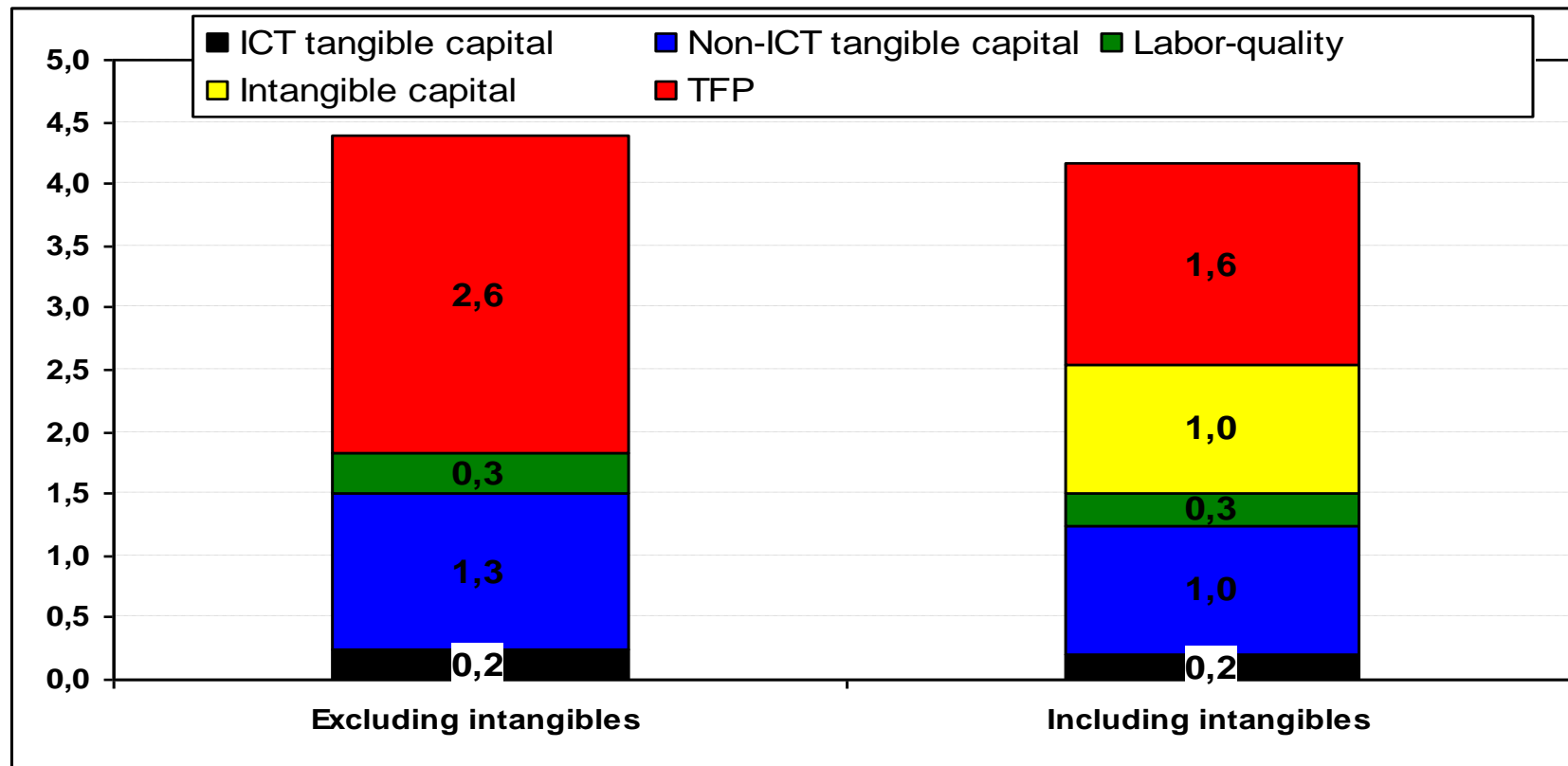
Decomposition of LP growth 1995–2000



Source: Edquist (2009)



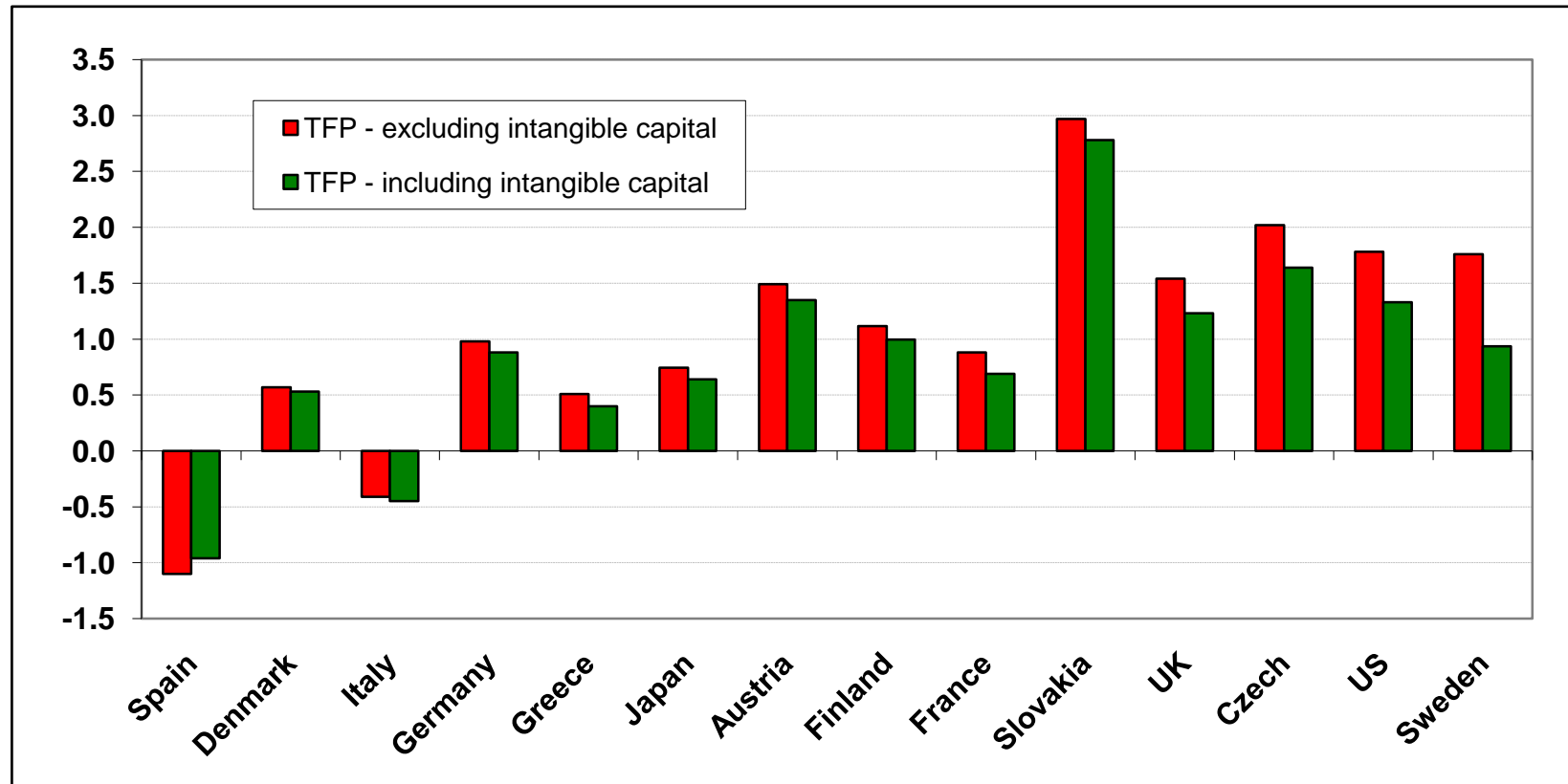
Decomposition of LP growth 2000–2004



Source: Edquist (2009)

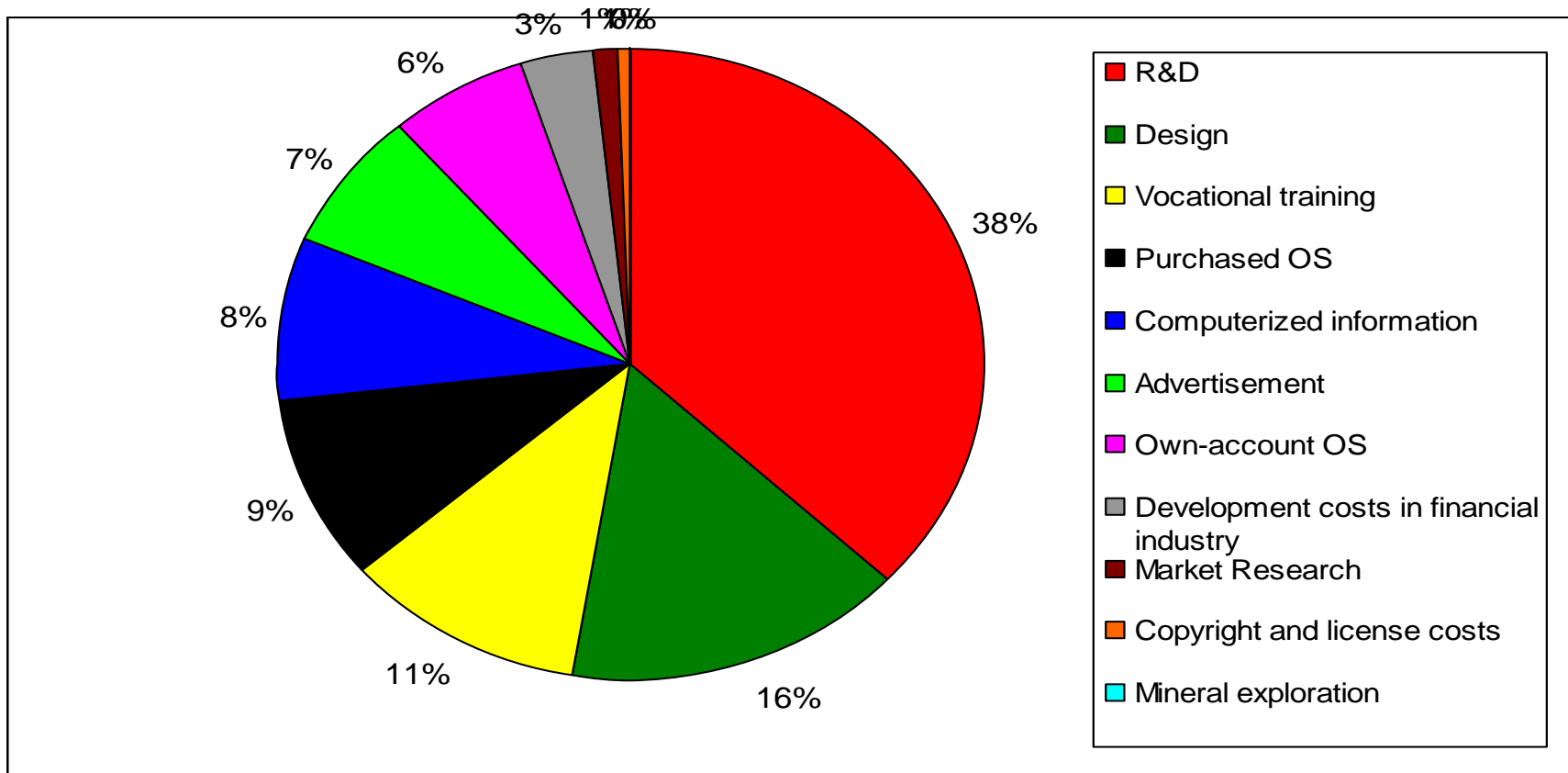


TFP in different countries excluding and including intangible capital in 1995–2004





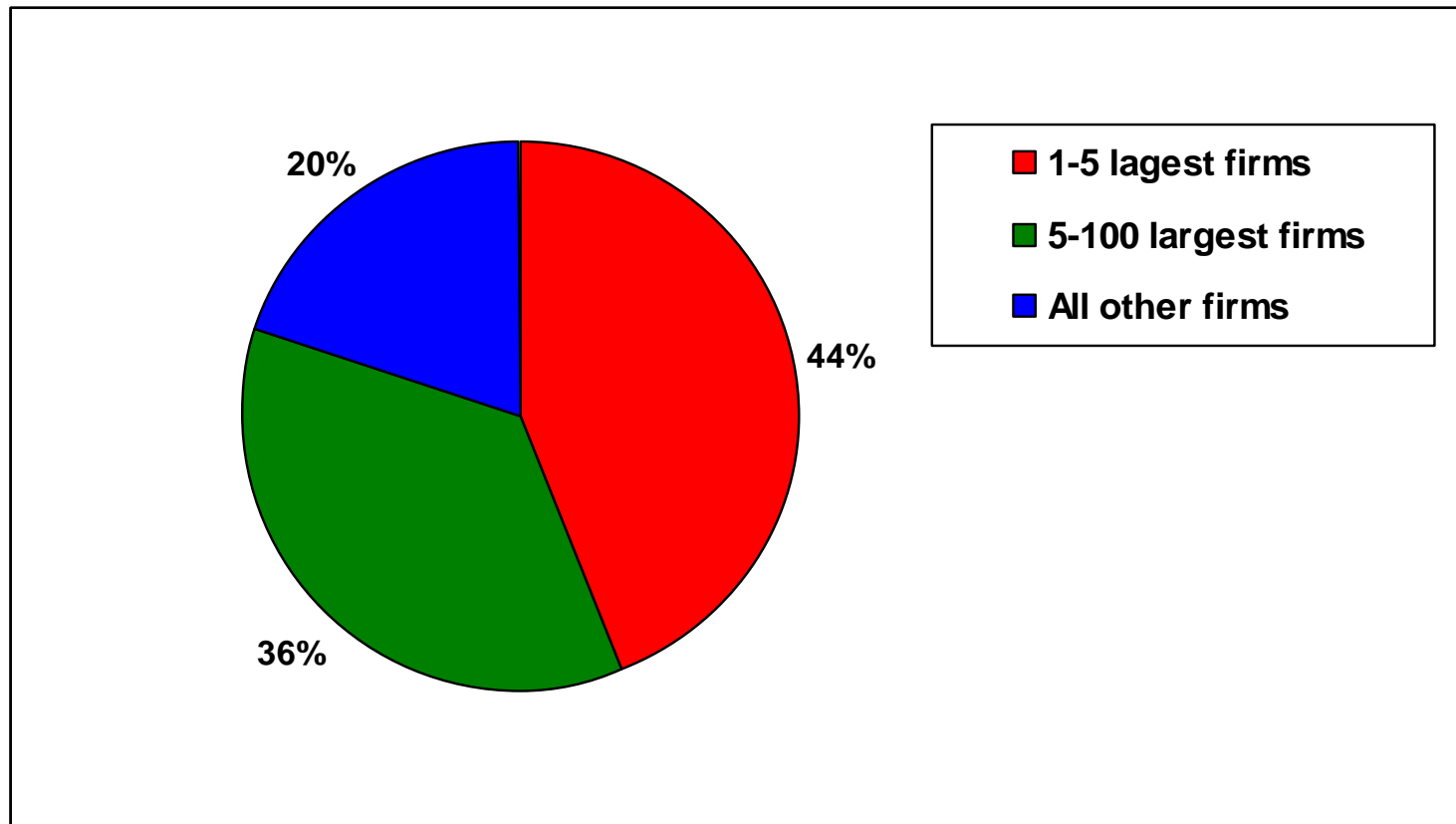
Contribution of intangible capital deepening to LP growth 1995–2004



Source: Edquist (2009)



R&D-investment by firms in 2007 (percent)



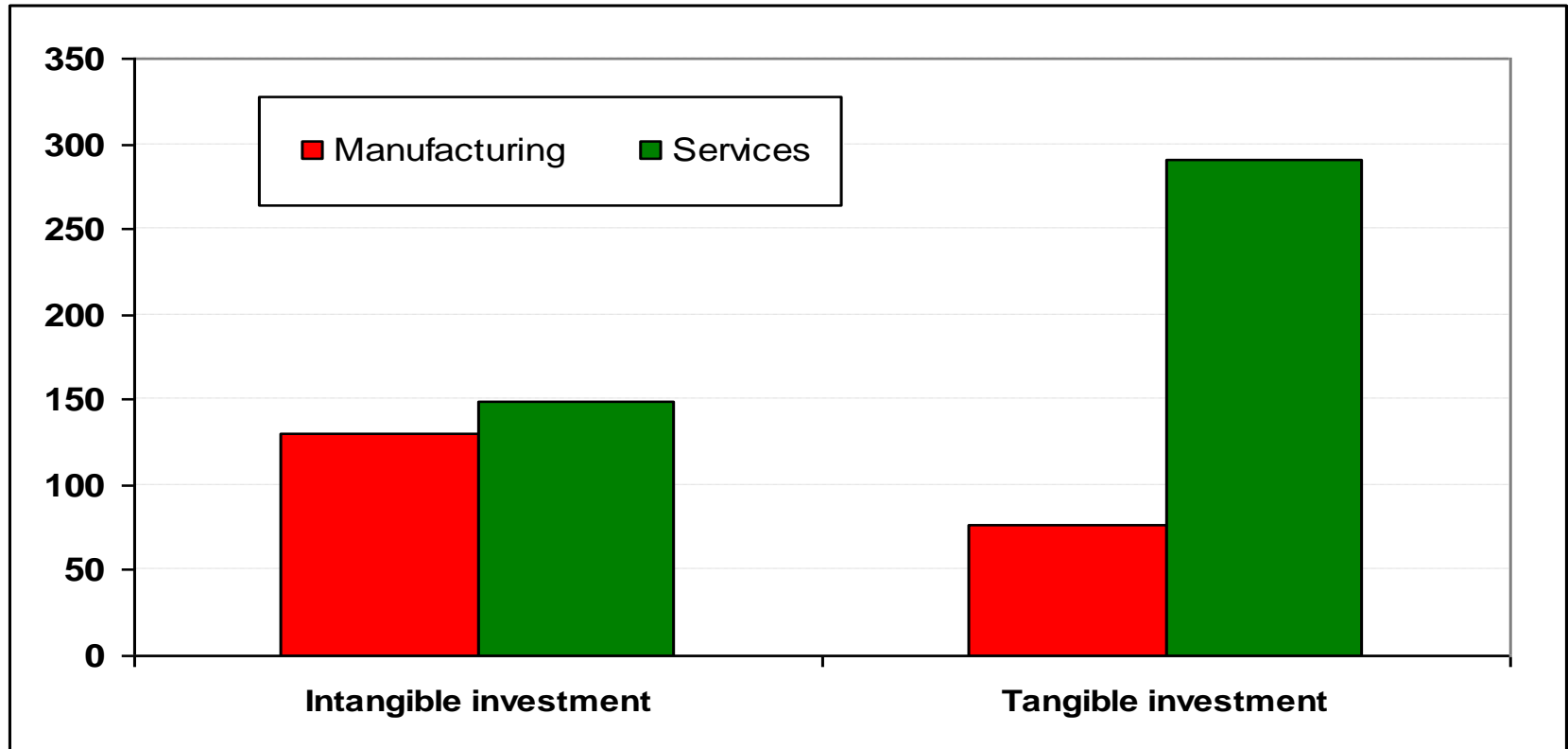


Industry level method

| <i>Intangible assets</i> | <i>Sources</i> |
|---------------------------------|---|
| Software | Sector data available in EU-KLEMS |
| Research and development | Sector data available in ANBERD |
| Mineral exploration | Only investment in mining and quarrying |
| Copyright and license cost | Turnover of industries producing entertainment, literacy and artistic originals |
| Financial innovation | Only investment in financial industry |
| Design | Use tables for purchased design and wage sums in different sectors for own-account design |
| Brand equity | Use tables for advertising and market research |
| Vocational training | Sector data provided by Statistics Sweden |
| Organizational capital | Use tables for purchased OS and wages for managers at the industry level for own-account OS |

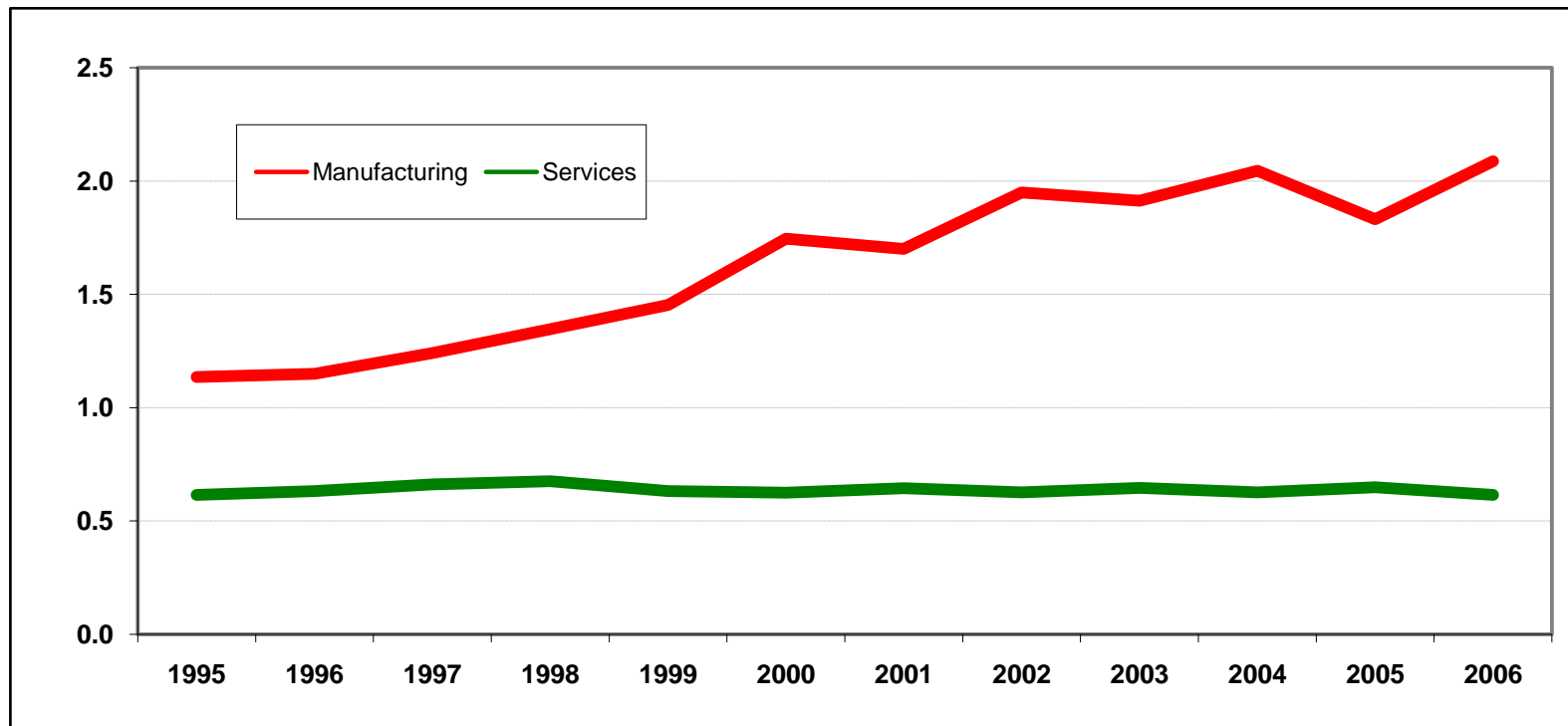


Investment in intangibles for manufacturing and services in Sweden 2006 (bn SEK)





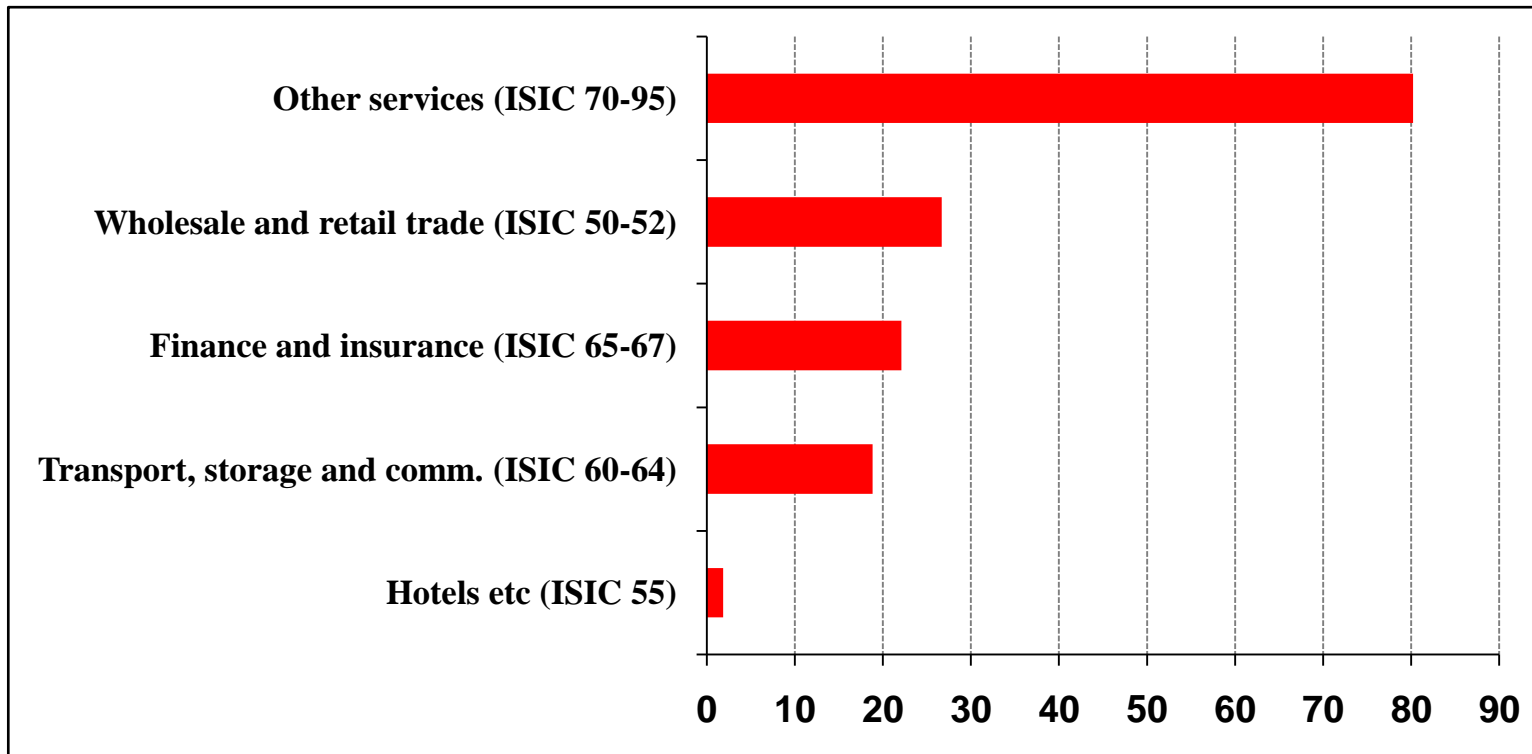
Ratio of intangible to tangible investments in Swedish manufacturing and services 1995–2006



Source: Own calculations



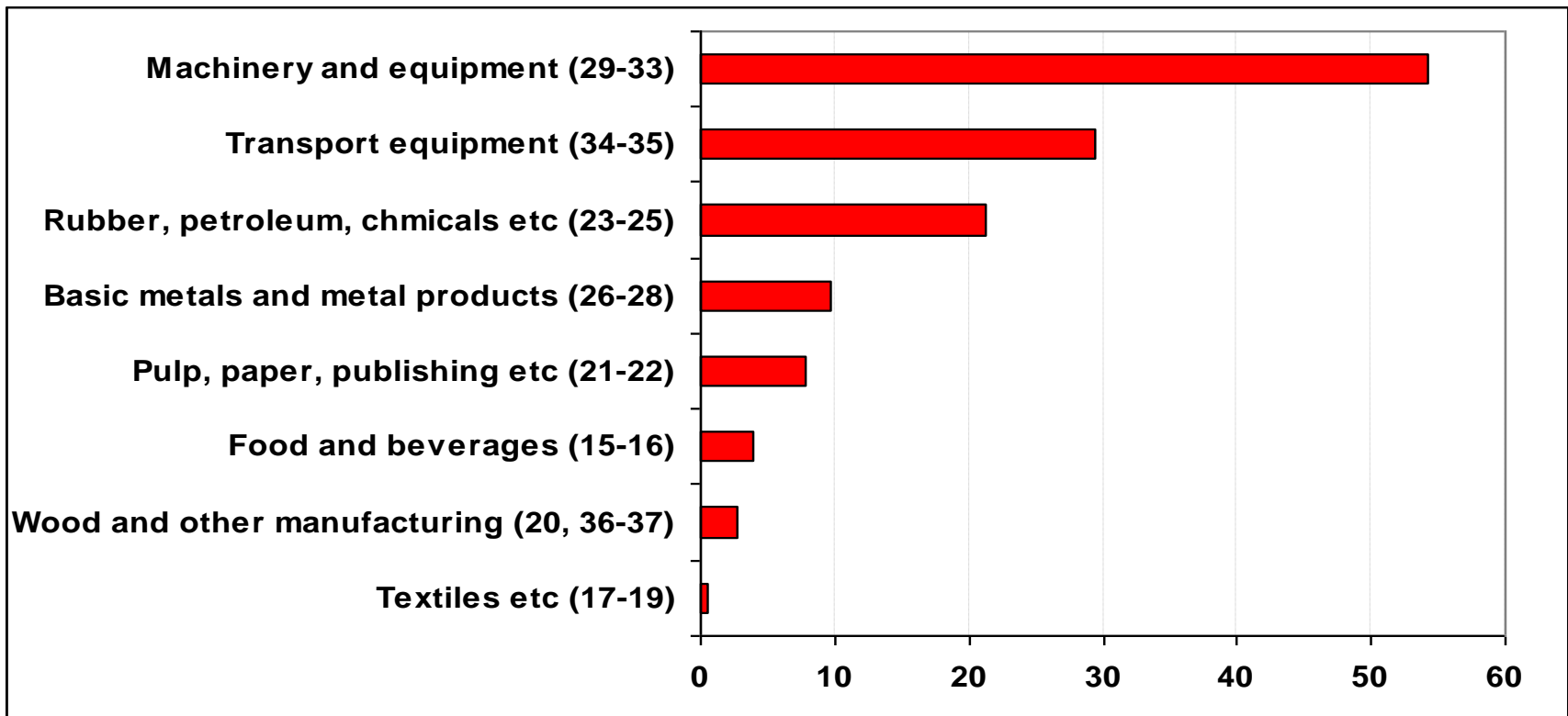
Investment in intangibles by the Swedish services in 2006 (bn SEK)



Source: Own calculations



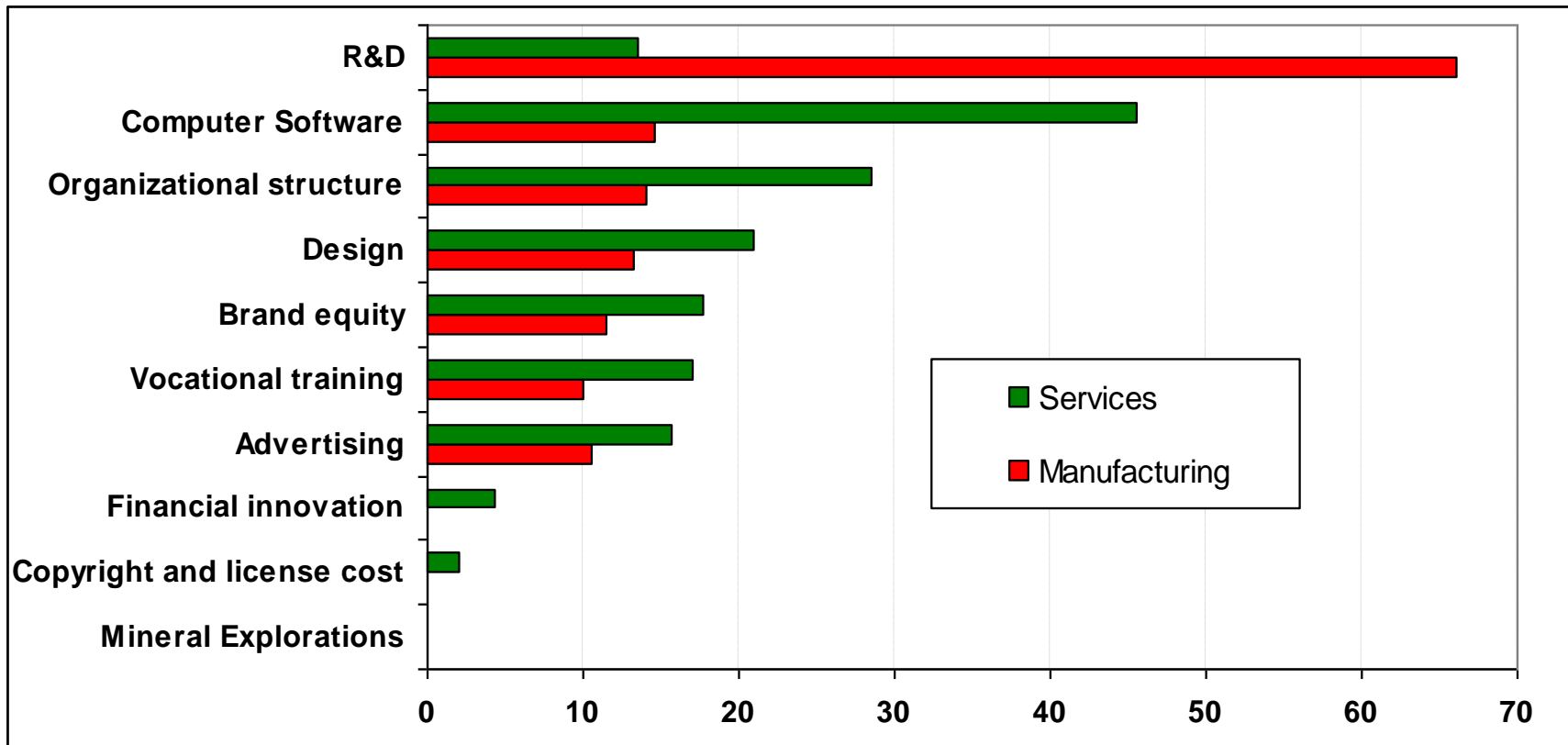
Intangible investment by Swedish manufacturing (bn SEK)



Source: Own calculations



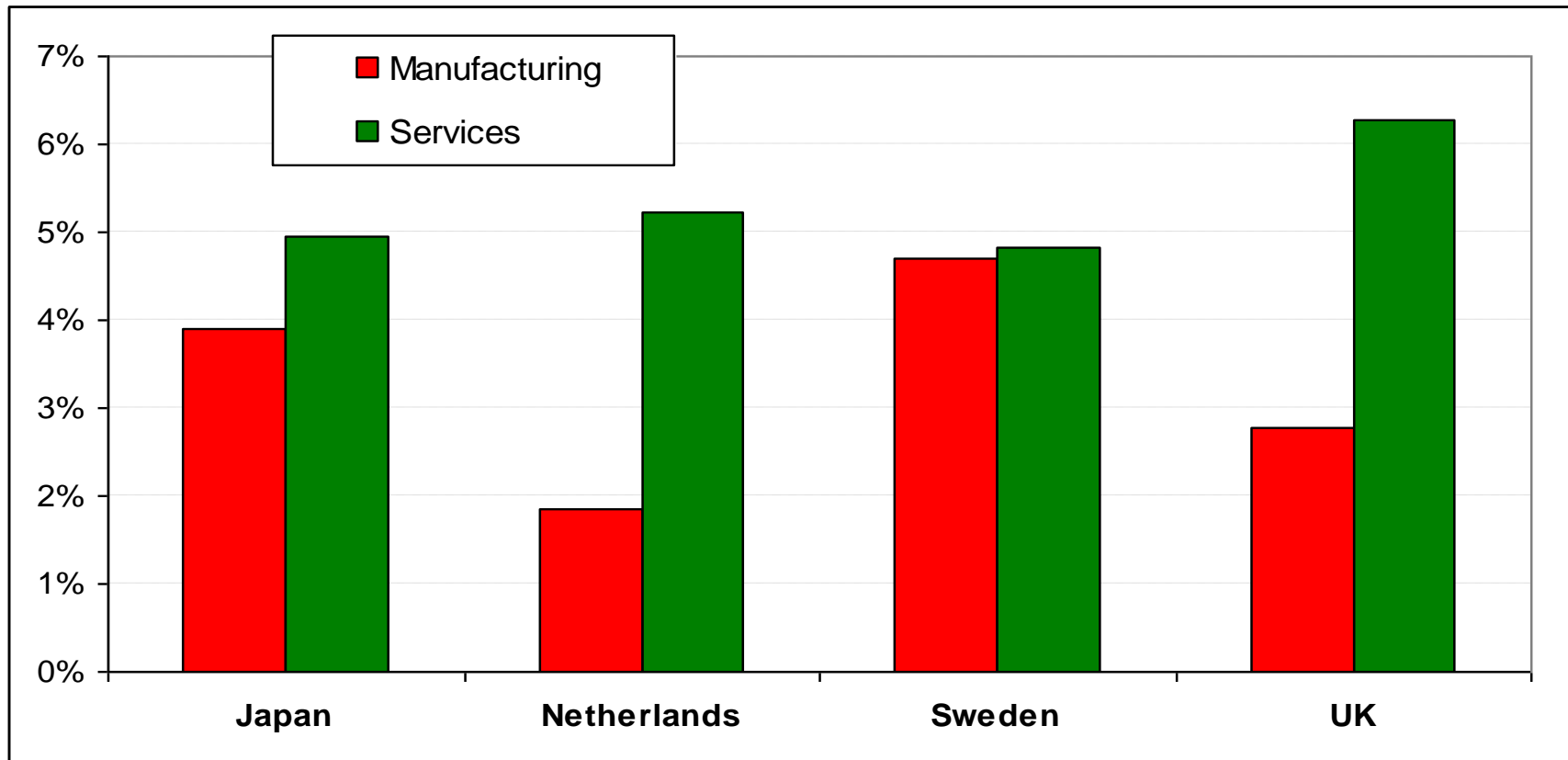
Investment in intangibles for manufacturing and the service sector in the Swedish business sector (bn SEK)



Source: Own calculations



Investment in intangibles in four different countries 2000–2005 (percent of GDP)



Source: Clayton et al. (2009); Fukao (2009); van Rooijen-Horsten et al. (2008) and own calculations.



Conclusions (I)

- Total investment in intangibles was 292 bn SEK or 10 percent of GDP in 2006
- Intangible investment was large in Sweden compared to many other OECD-countries
- Intangibles accounted for 35 percent of the labor productivity growth in the Swedish business sector in 1995–2004
- Sweden was very intensive on R&D investment



Conclusions (II)

Manufacturing – 44 percent of intangibles

Services – 51 percent of intangibles

- Manufacturing accounted for 82 percent of private sector investment in R&D, while the service sector invested more in all other categories of intangibles
- Intangible investment was large in Swedish manufacturing compared to other countries, while it was small in the service sector in relative terms