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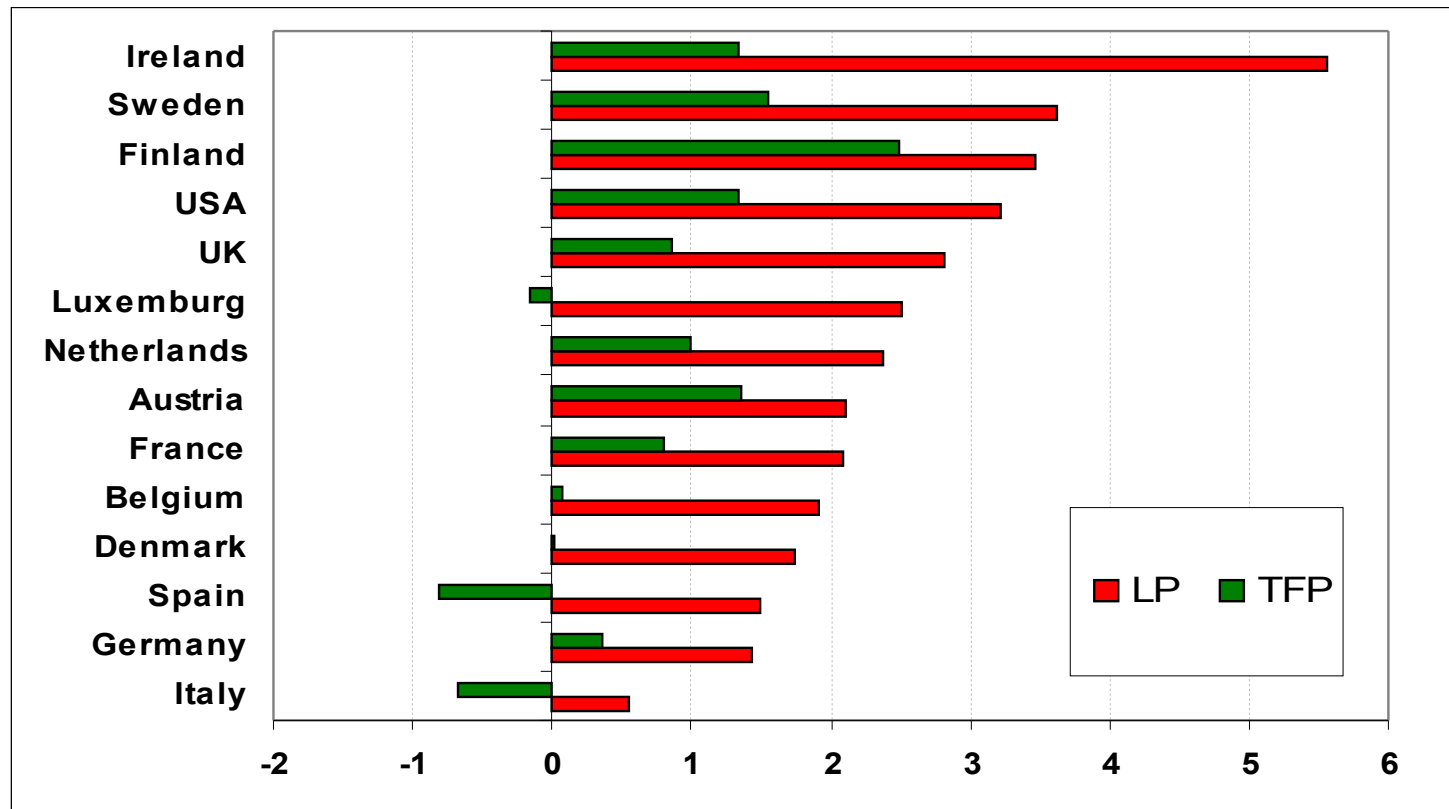
# Can Investment in Intangibles Explain the Swedish Productivity Boom in the 1990s?

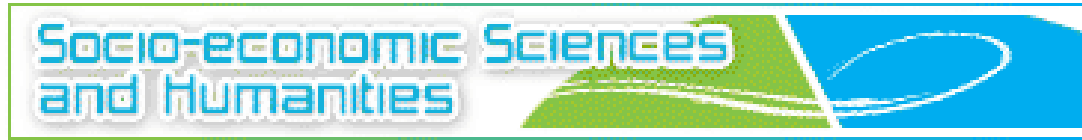
**Harald Edquist**

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## Labor- and total factor productivity growth in the business sector in 13 EU-countries and the US in 1995–2005





# Background

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



# Questions

- How large were the spending and investment in intangible assets in Sweden in 2004?
- How important were investment in intangibles for productivity growth in the Swedish business sector?



# Corrado, Hulten and Sichel (2006) framework

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



# Sources

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



# Copyright and license cost

- Assumed to be equal to development costs of motion pictures (Source: Screen Digest)
- Turnover is available of video production and sound recording
- The same investment/turnover ratio



# Design

## Purchased

$$\text{Design (purchased)} = \text{Turnover AED sector} \times \frac{\text{Employees with AED occupations}}{\text{Total employees in AED sector}}$$

## Own Account

$$\text{Design (own account)} = \frac{\text{Design (purchased)}}{\text{Wage bill of employees with AED occupations in the AED sector}} \times \text{Wage bill for employees with design occupations in the rest of the business sector}$$

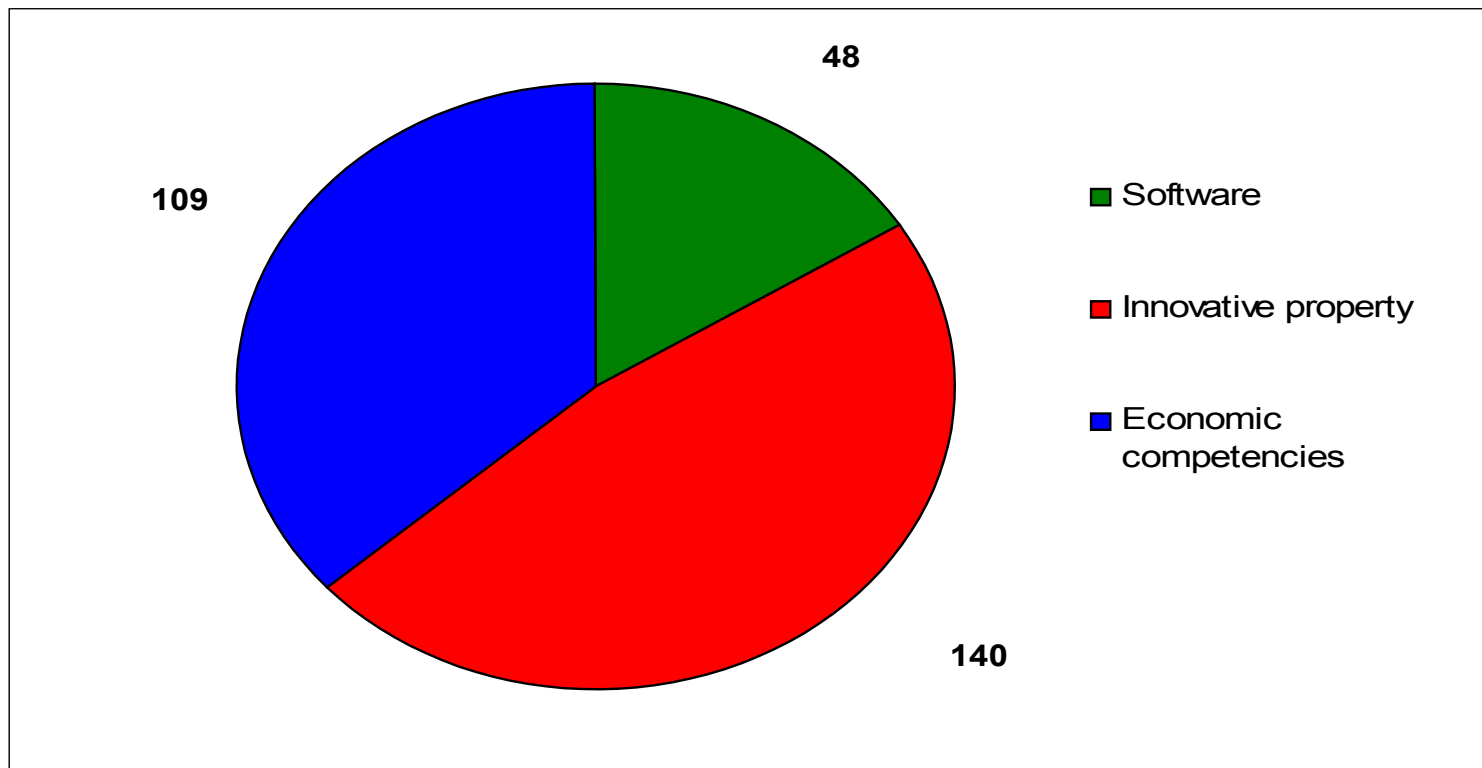


# AED-occupations based on the Swedish Standard Classification of Occupations (SSYK)

Architects and town planners	(SSYK 2141)
Civil engineers	(SSYK 2142)
Electrical engineers	(SSYK 2143)
Electronics and telecommunication engineers	(SSYK 2144)
Mechanical engineers	(SSYK 2145)
Chemical engineers	(SSYK 2146)
Designers	(SSYK 2456)
Decorators and commercial designers	(SSYK 3471)



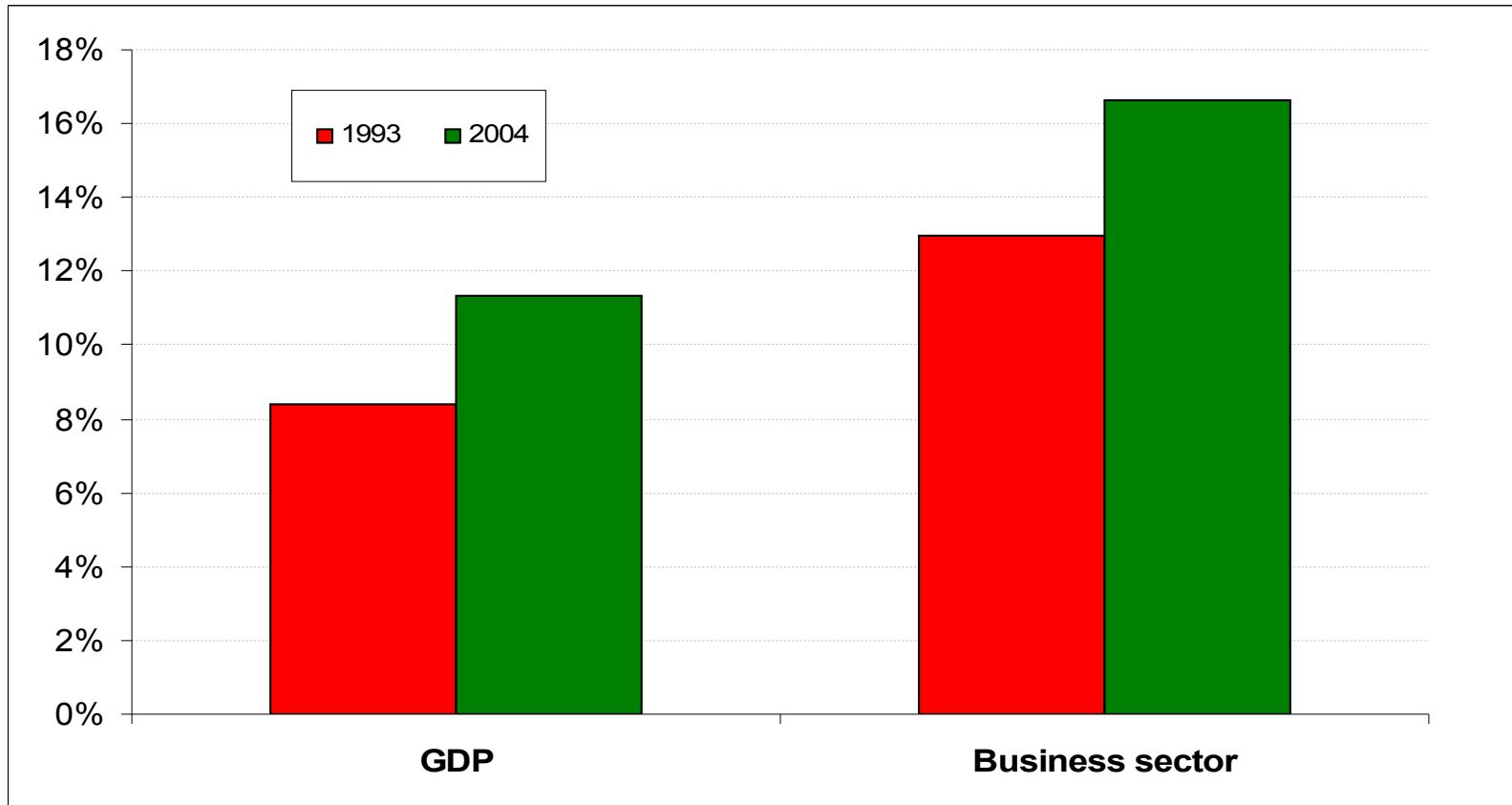
# Total spending on intangibles in the business sector in 2004 was 297 billion SEK



Source: Edquist (2009)



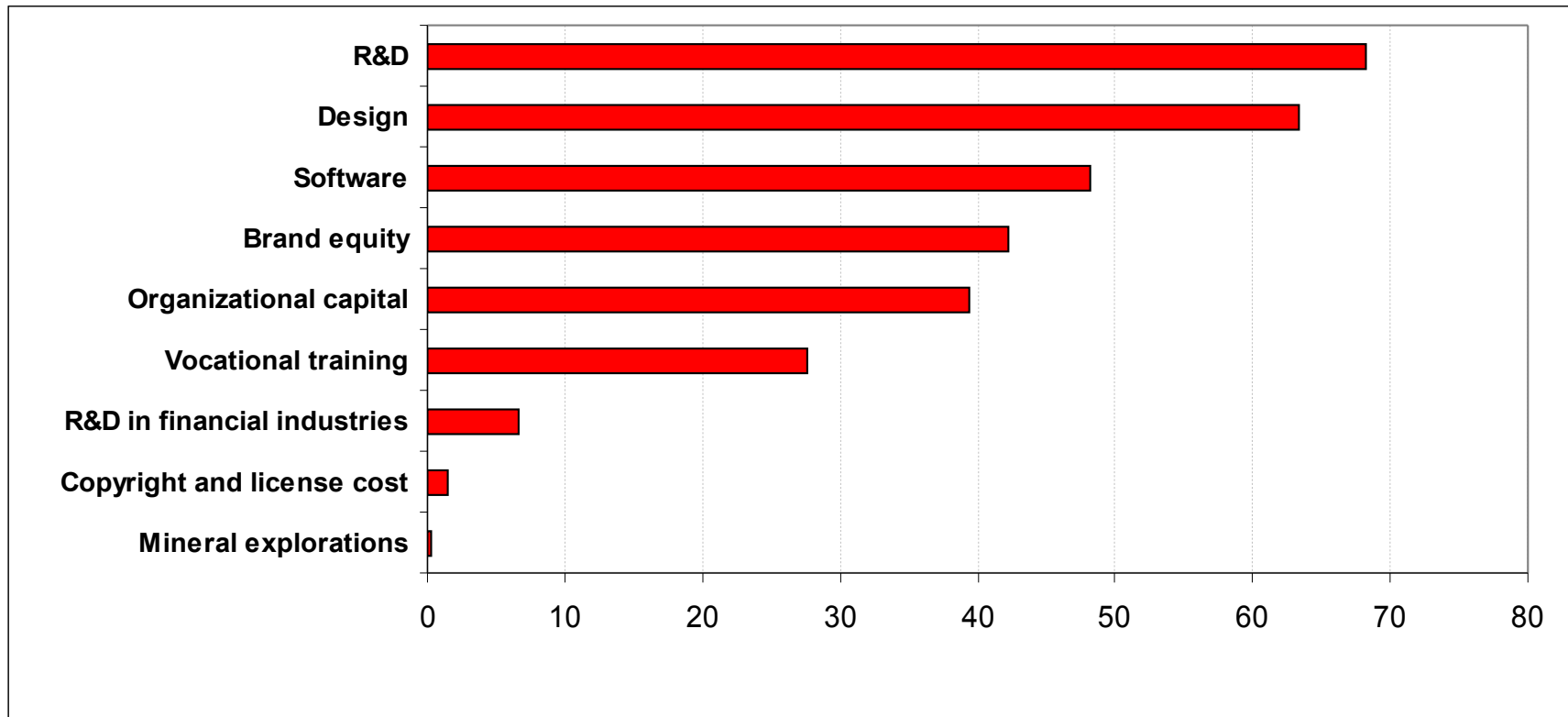
# Spending on intangibles 1993 and 2004



Source: Edquist (2009)



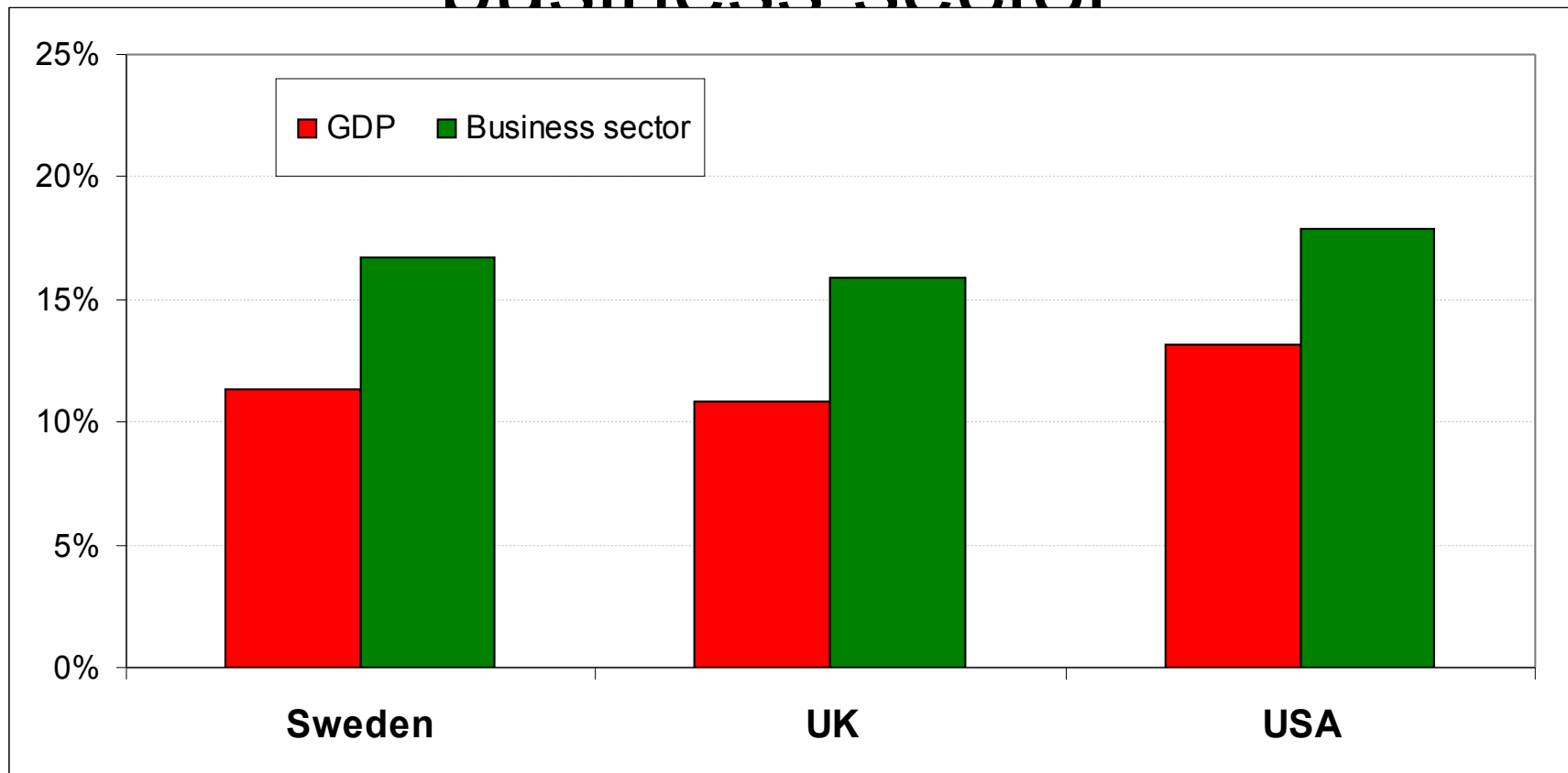
# Spending on intangibles (billion SEK)



Source: Edquist (2009)



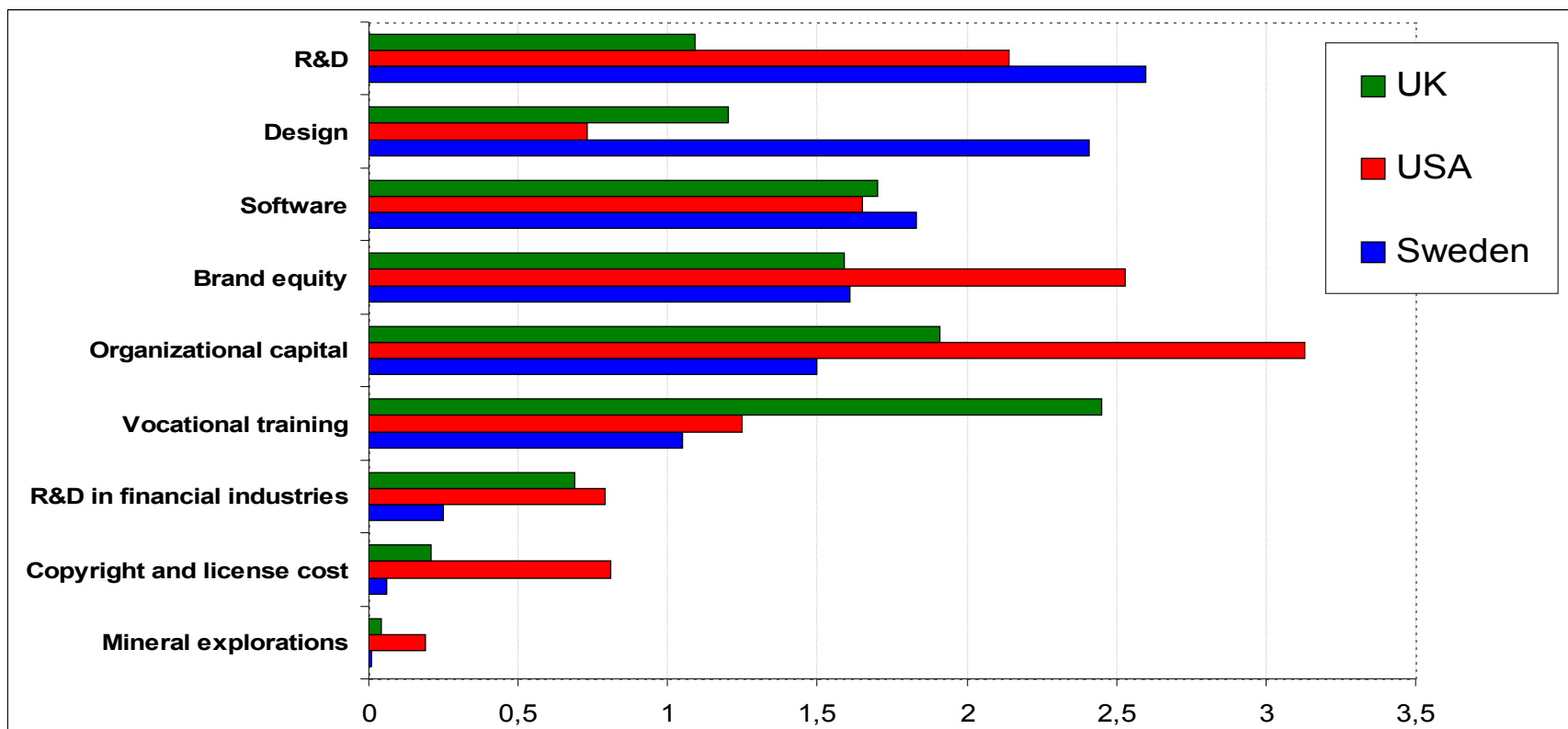
# Spending on intangibles in the business sector



Sources: Edquist (2009); Corrado, Hulten och Sichel (2006); Marrano och Haskel (2006)



## Expenditure of intangibles in the business sector in three countries (percent of GDP)



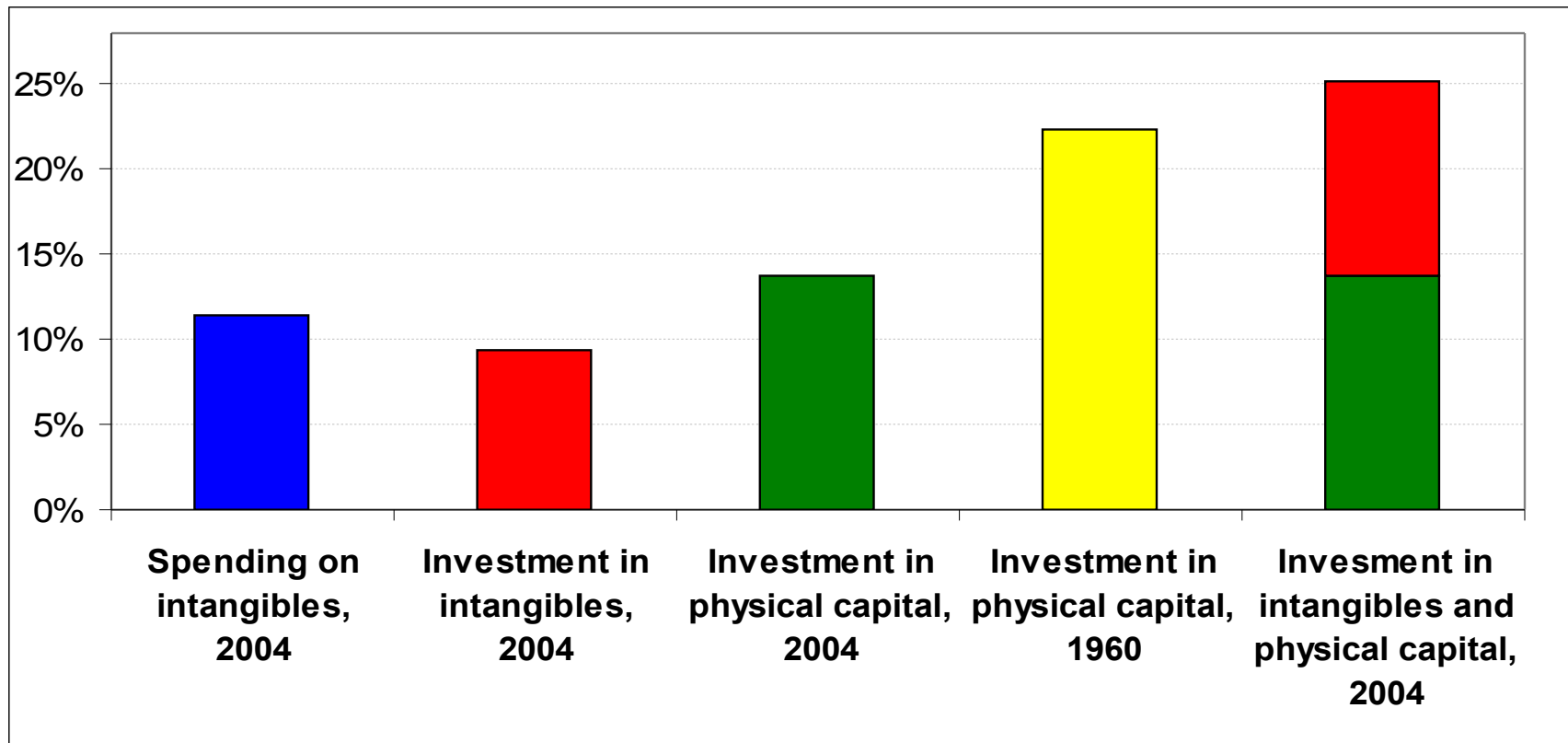


# Investment/Spending

- Investment is expenditure by businesses that are intended to boost output in the future and has a service life of 1–3 years
- Most of the investment in intangibles is believed to have an effect on future production of at least one year:
  - Design (50 percent)
  - Brand equity (60 percent)
  - Purchased organizational structure (80 percent)



## Investment in the business sector (percent of GDP)



Källa: Edquist (2009)



# Growth Accounting

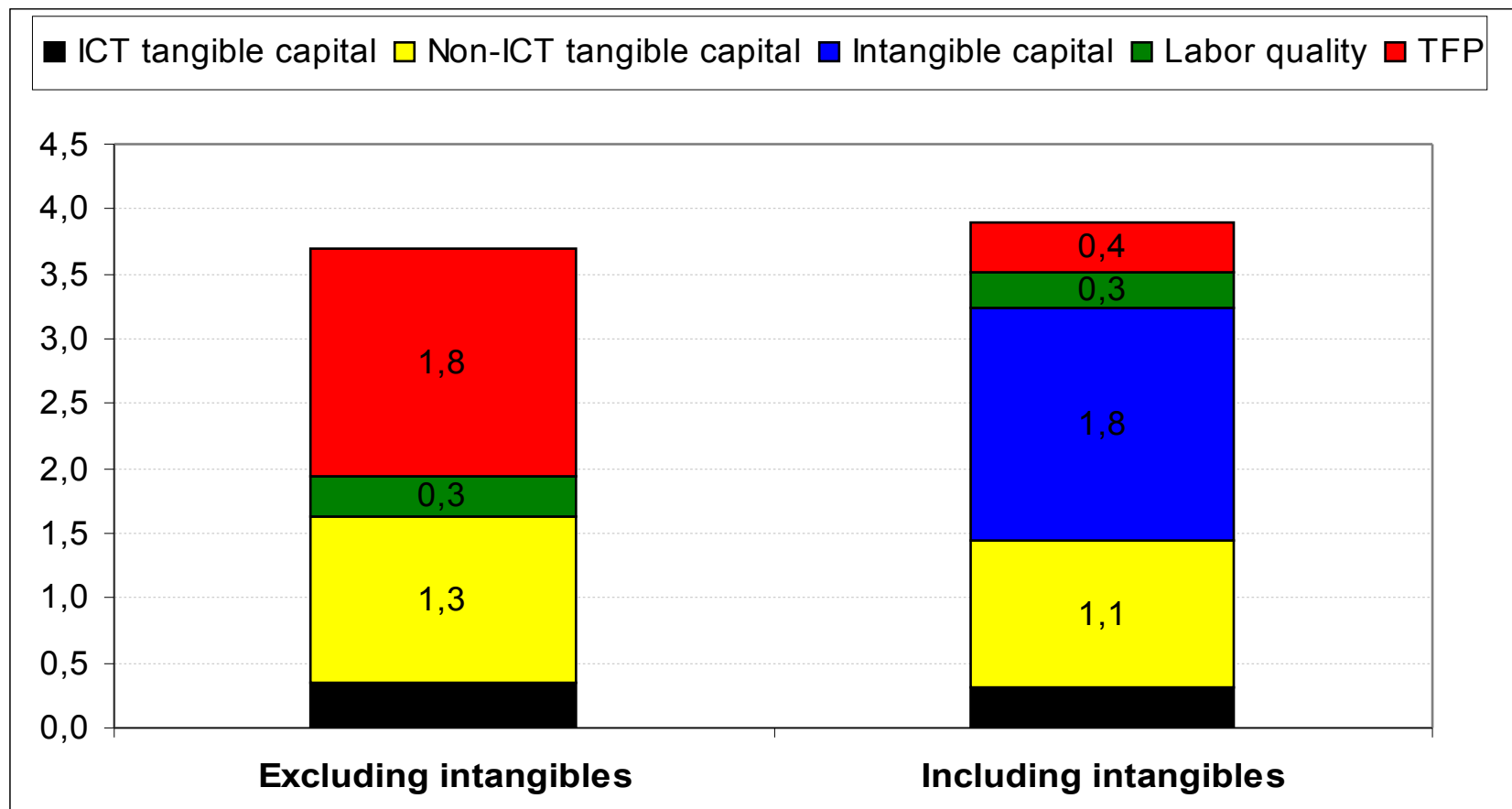
- Growth accounting framework

$$\Delta \ln(Q'/L)_t = s^L \Delta \ln(L^{QA}/L)_t + s^K \Delta \ln(K/L) + \Delta \ln TFP_t'$$

$$\Delta \ln(Q/L)_t = s^L \Delta \ln(L^{QA}/L)_t + s^K \Delta \ln(K/L) + s^R(t) \Delta \ln(R/L) + \Delta \ln TFP_t$$

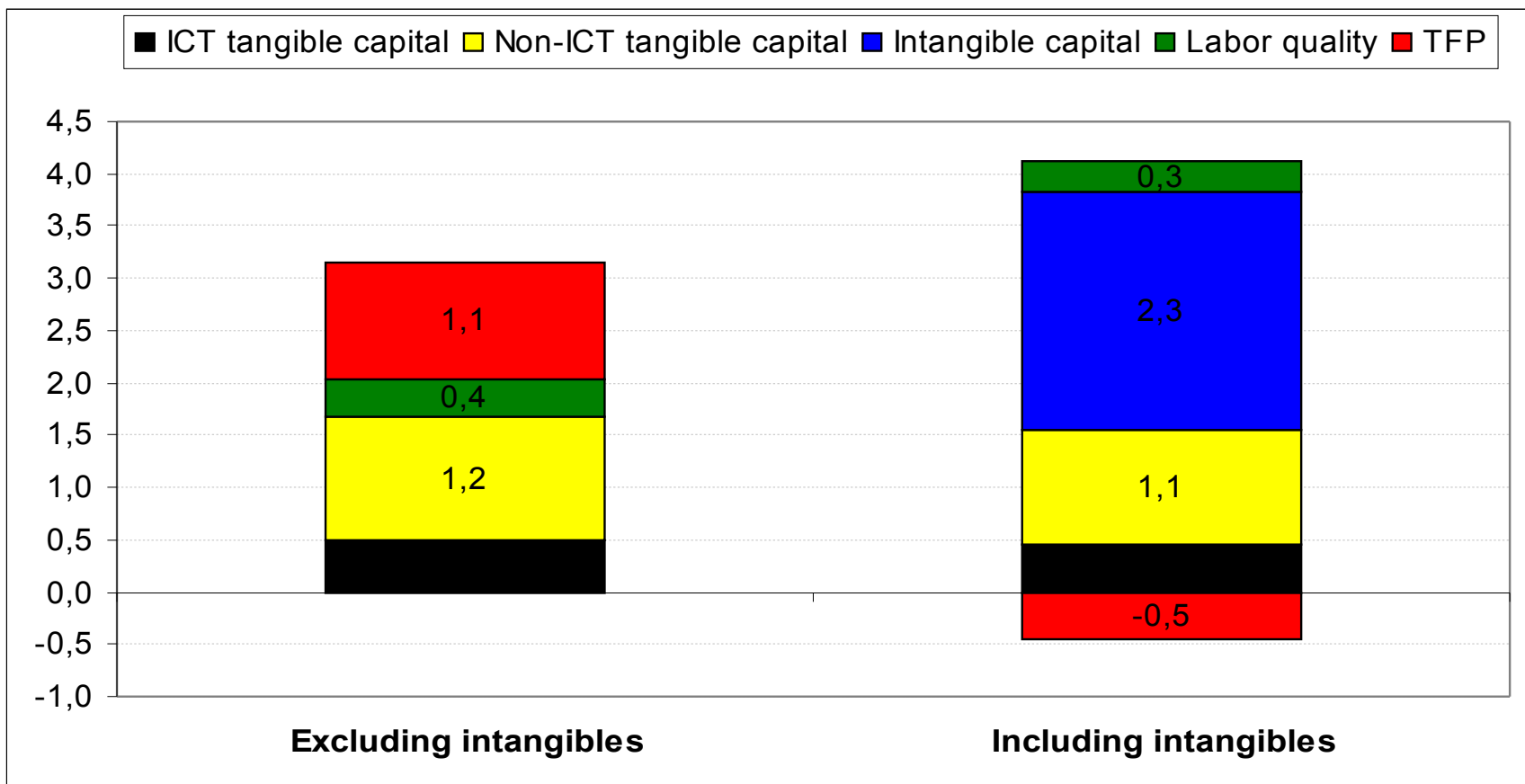


# Decomposition of LP growth 1995–2004 (preliminary results)



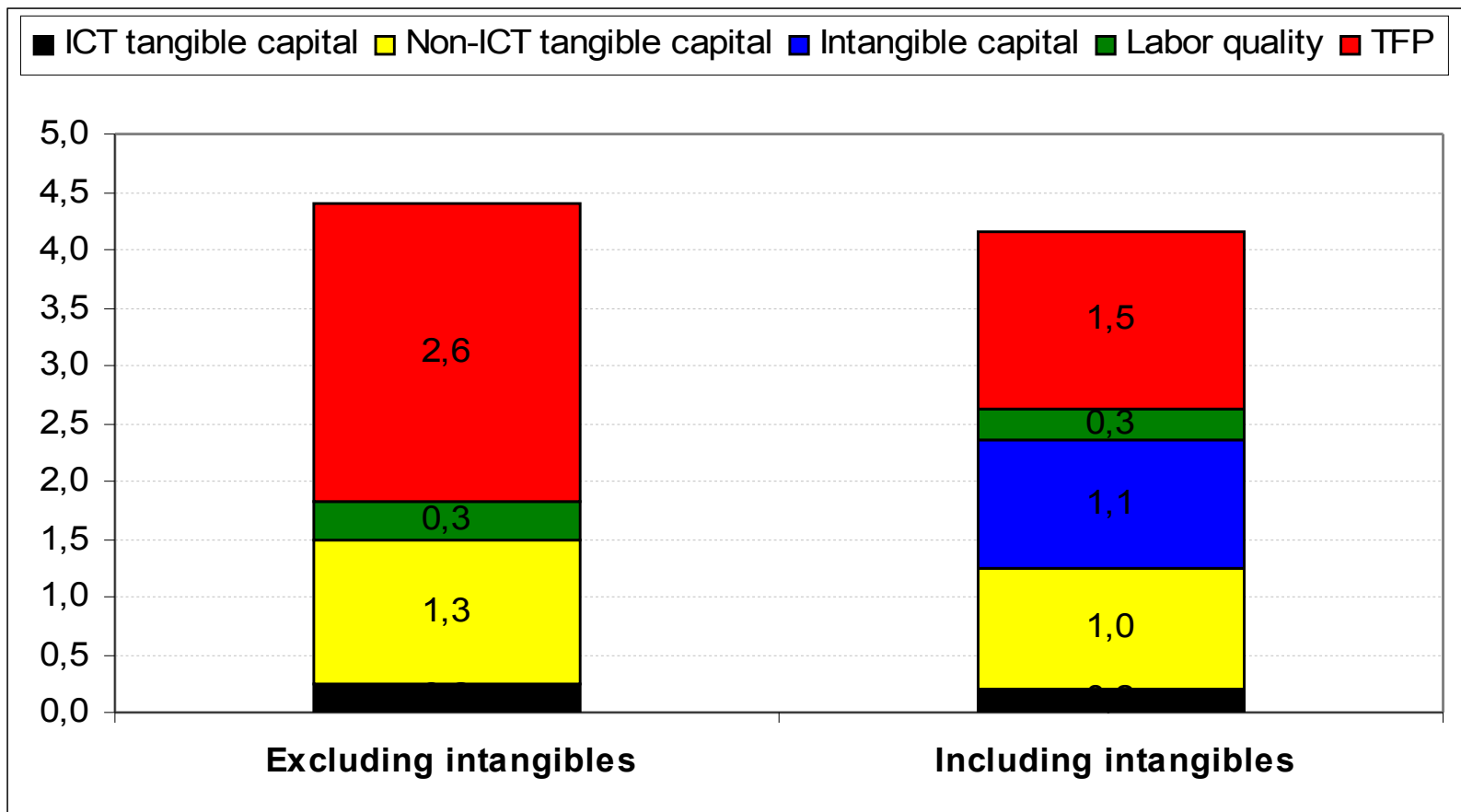


# Decomposition of LP growth 1995–2000 (preliminary results)





# Decomposition of LP growth 2000–2004 (preliminary results)





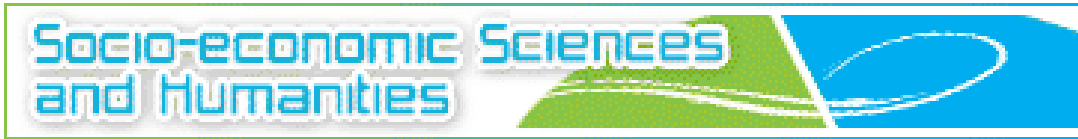
# Conclusions (I)

- Total spending on intangibles in Sweden in 2004 was 297 bn SEK (11 percent of GDP and 17 percent of business sector output)
- Total investment was 243 bn SEK or 67 percent of total investment in physical capital in 2004



# Conclusions (II)

- Sweden was very intensive on R&D spending, while very little resources were spent on own account organizational structure
- Intangibles accounted for 45 percent of the labor productivity growth in the Swedish business sector in 1995–2004
- Intangibles have been important for the high productivity growth in Sweden since the mid 1990s



# Growth Accounting



# Growth Accounting

- Three goods produced
  - Consumption good ( $C_t$ ) with price ( $P^C_t$ )
  - Tangible investment good ( $I_t$ ) with price ( $P^I_t$ )
  - Intangible investment good ( $N_t$ ) with price ( $P^N_t$ )