

# Reliability of innovation measures

Mika Naumanen

Statistics Finland & Technical Research Centre of Finland VTT

RISIS Research Seminar #21

# Data

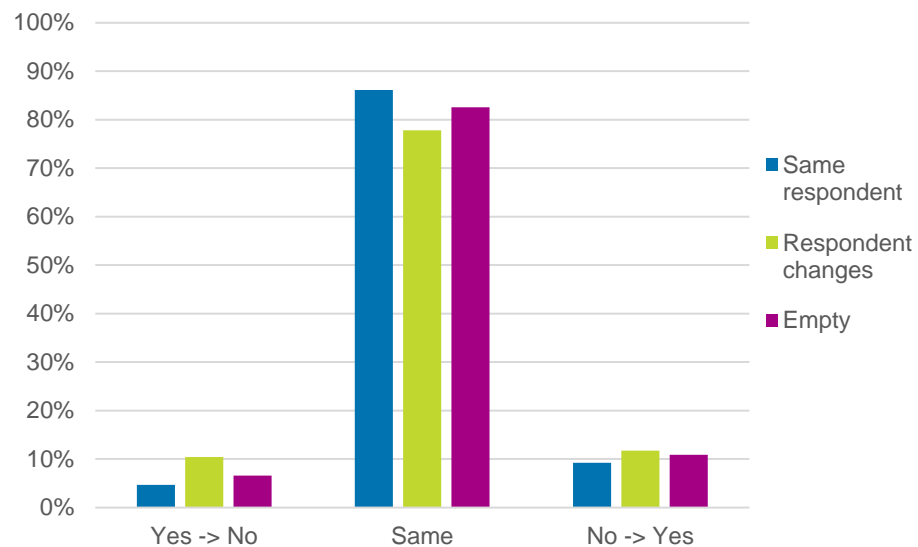
- National R&D surveys (RD)
  - Annual 2000-2019
- Community Innovation Surveys (CIS)
  - 2000, 2004, 2008, 2010, 2012, 2014, 2016, 2018
- Financial statement data panel (FSS)
- Longitudinal Employer-Employee Data
- Business subsidies
- Patenting

# Reliability

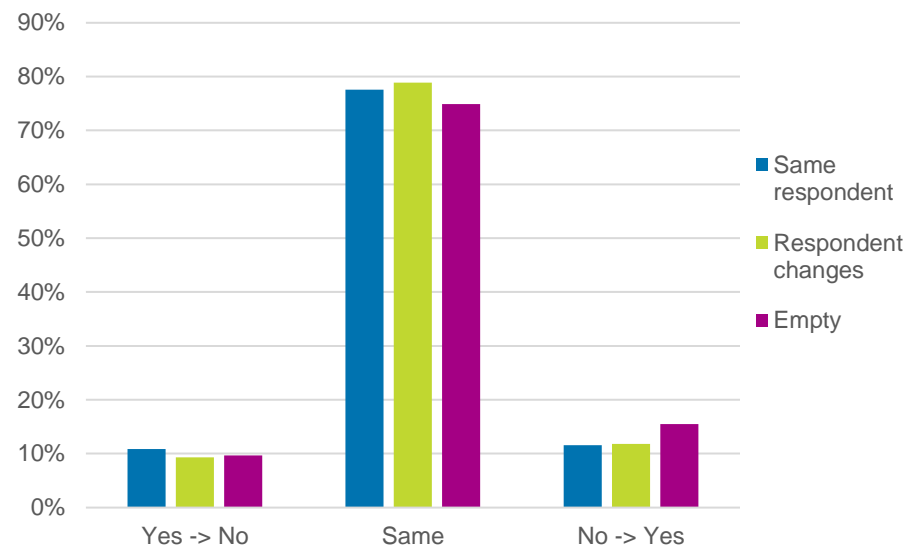
The overall consistency of a measure

- **Inter-rater reliability** assesses the degree of agreement between two or more raters in their appraisals
- **Test-retest reliability** assesses the degree to which test scores are consistent from one test administration to the next
- **Inter-method reliability** assesses the degree to which test scores are consistent when there is a variation in the methods or instruments used
- **Internal consistency reliability**, assesses the consistency of results across items within a test

# Own and commissioned R&D, RD survey, comparison between years



	Same respondent	Respondent changes	Empty	13415	3837	42218
Yes -> No	5 %	10 %	7 %	627	400	2789
Same	86 %	78 %	83 %	11552	2986	34843
No -> Yes	9 %	12 %	11 %	1236	451	4586



	Same respondent	Respondent changes	Empty	5952	1894	549
Yes -> No	11 %	9 %	10 %	647	176	53
Same	78 %	79 %	75 %	4618	1494	411
No -> Yes	12 %	12 %	15 %	687	224	85

# Own and commissioned R&D, comparison between RD and CIS surveys

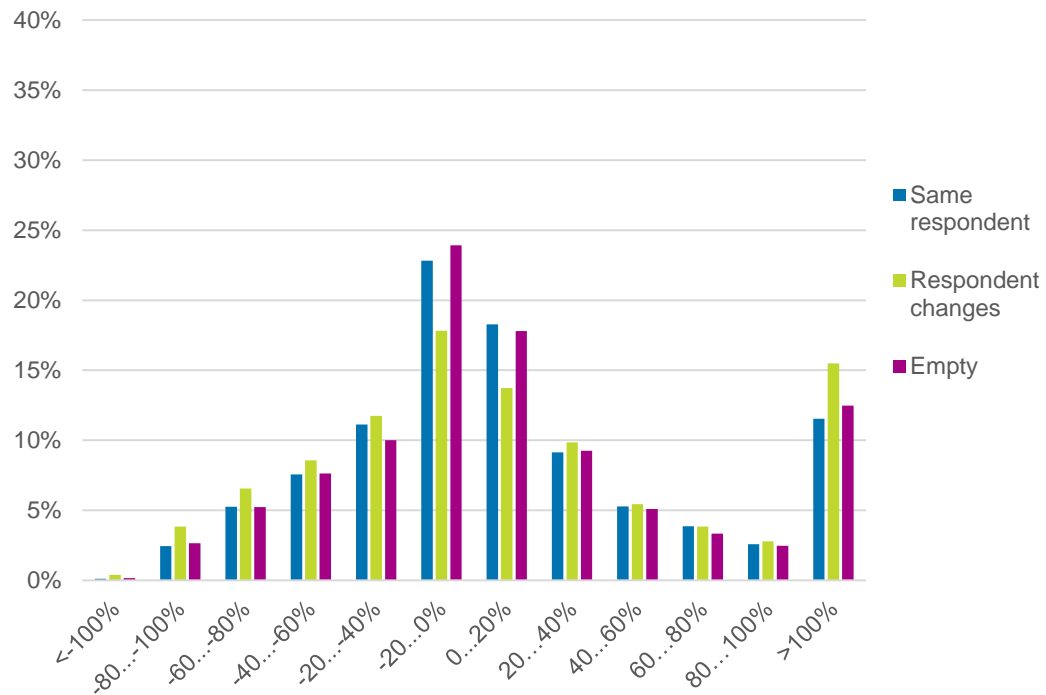
## Own R&D

CIS				
RD	Yes	No		
Yes	4357	218	65 %	3 %
No	923	1159	14 %	17 %

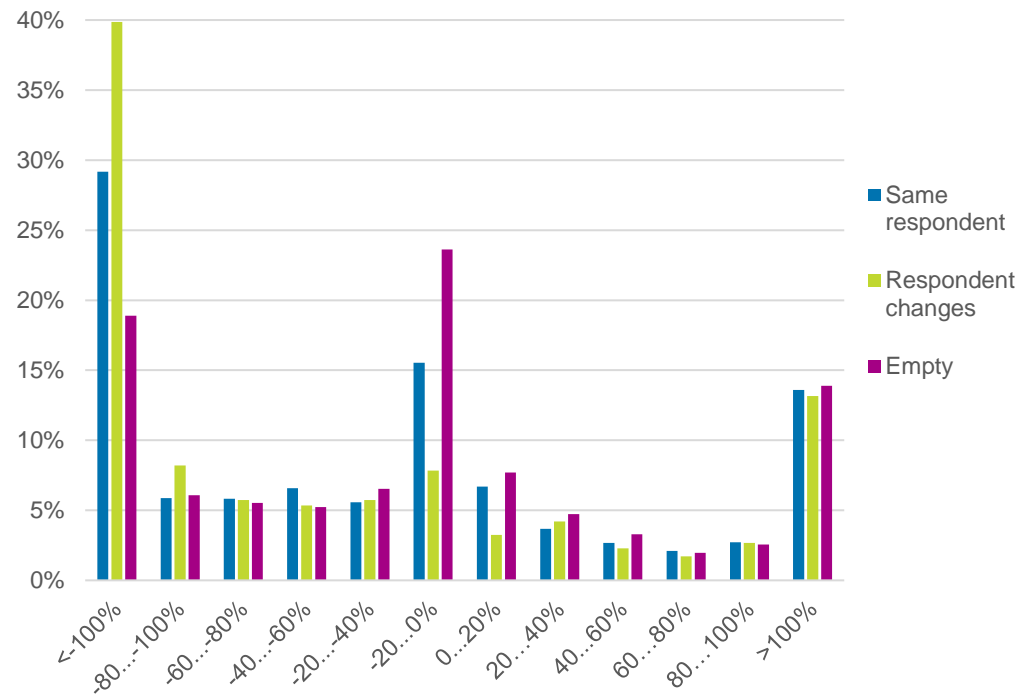
## Commissioned R&D

CIS				
RD	Yes	No		
Yes	389	53	24 %	3 %
No	569	590	36 %	37 %

# Own R&D spending & Spending on innovation activities, change

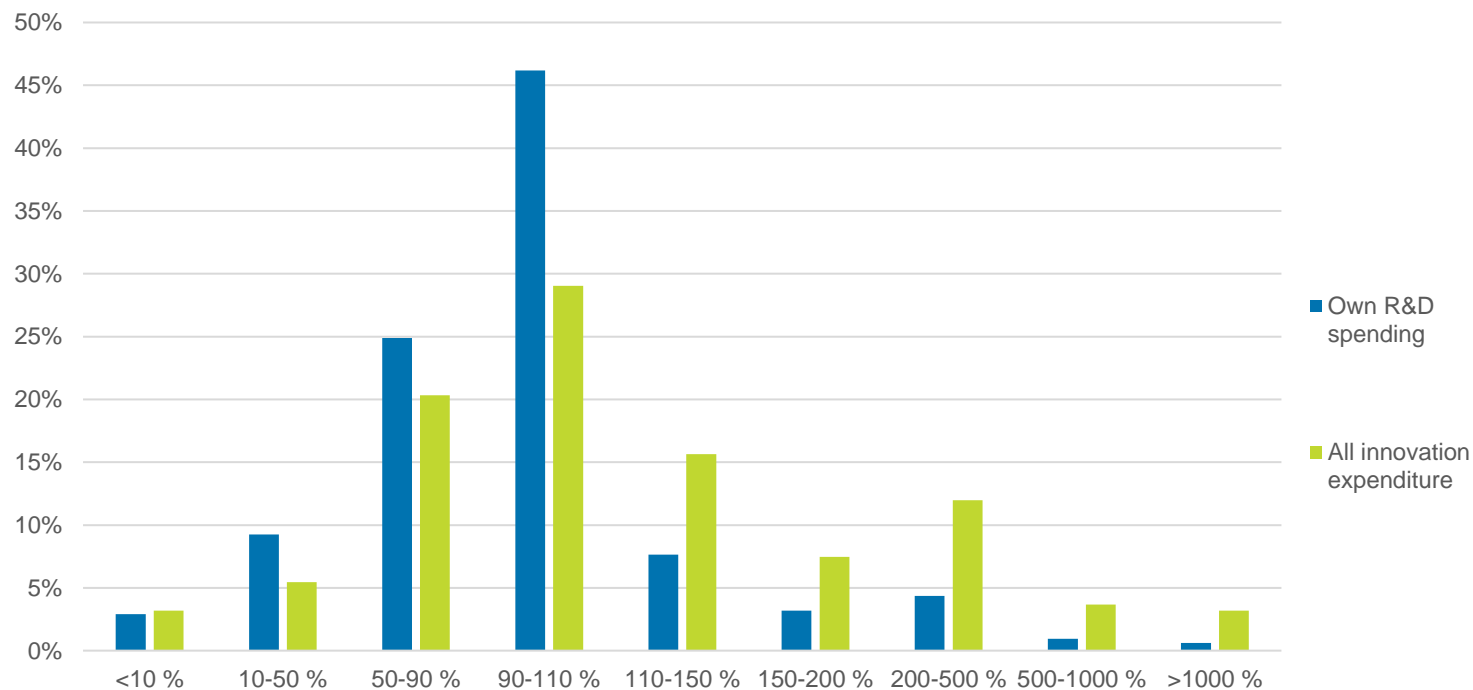


2389 524 4854

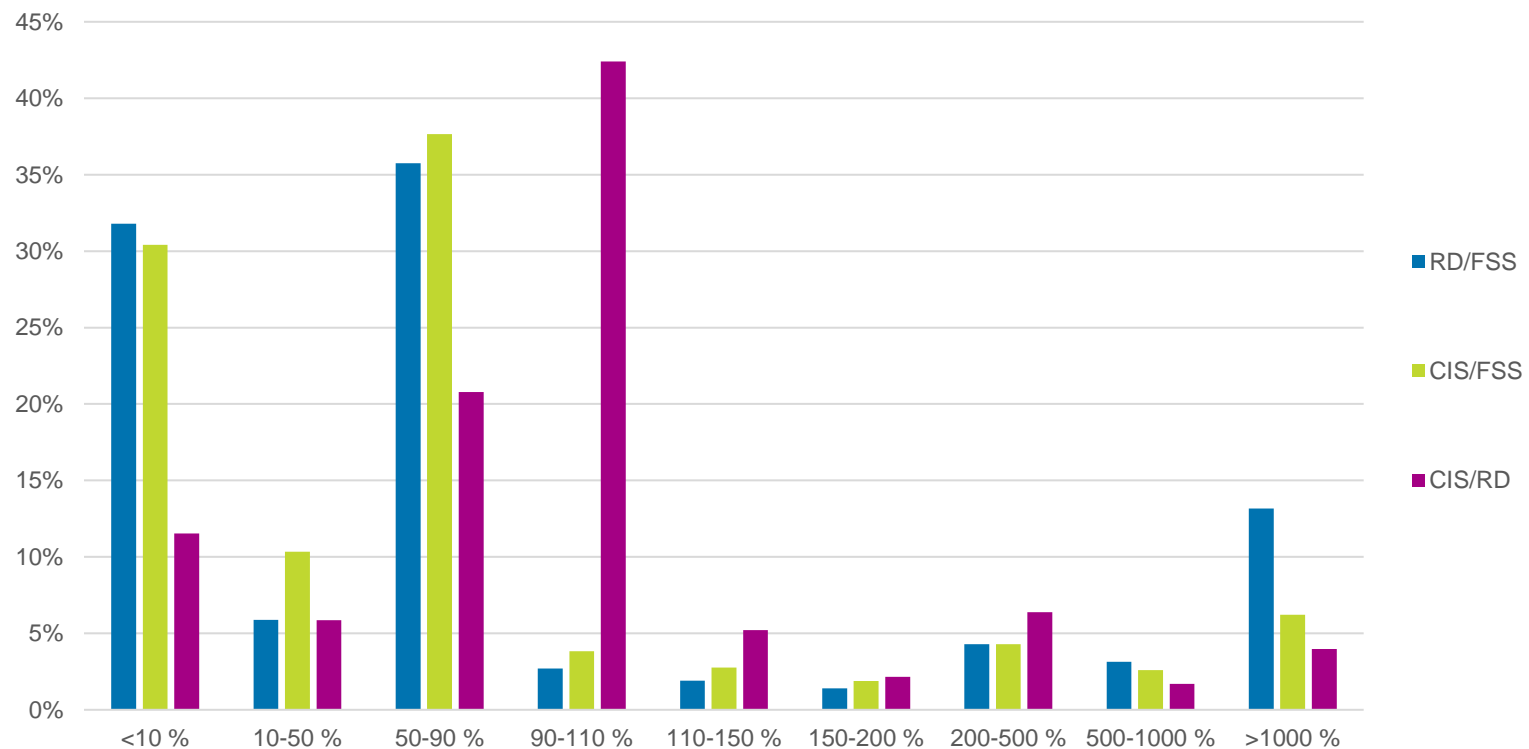


1084 174 976

# Own R&D and all RDI expenses, comparison of values CIS/RD

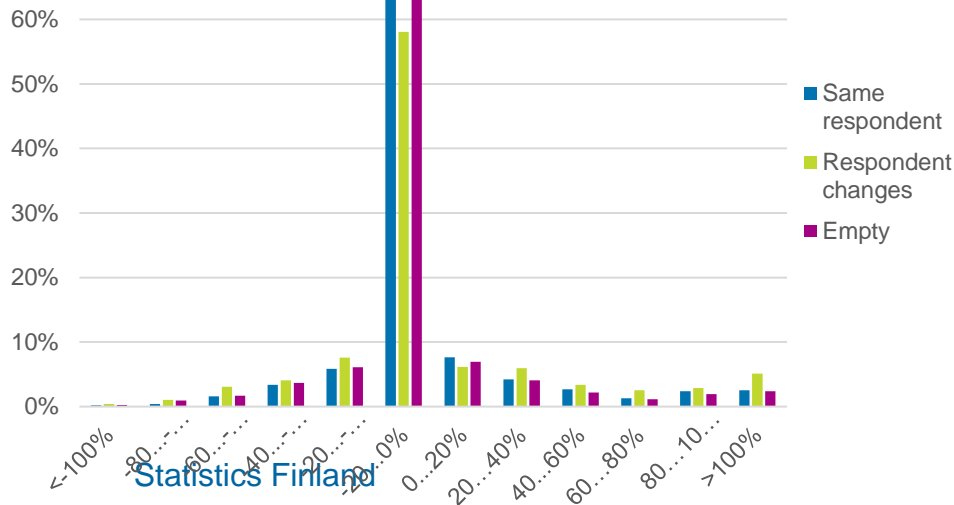
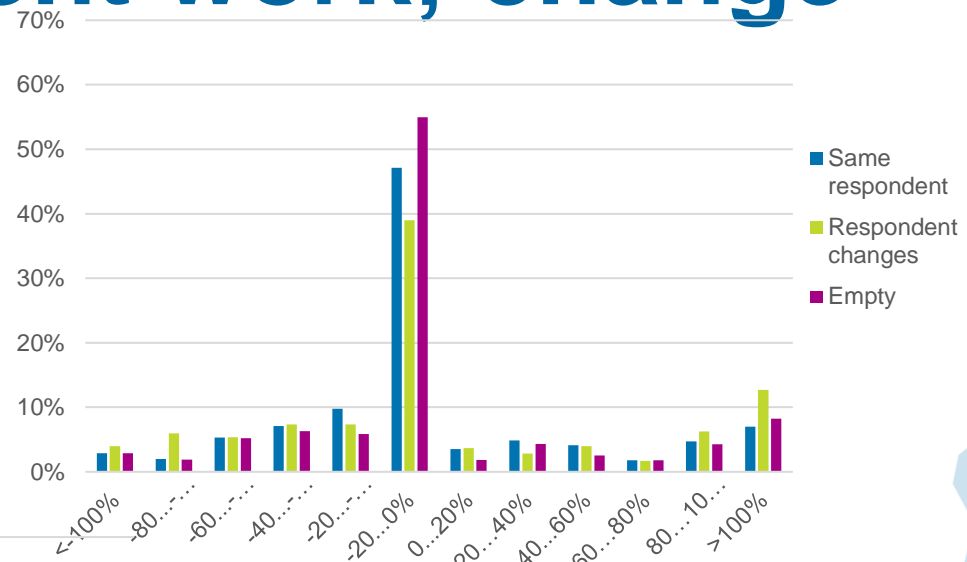
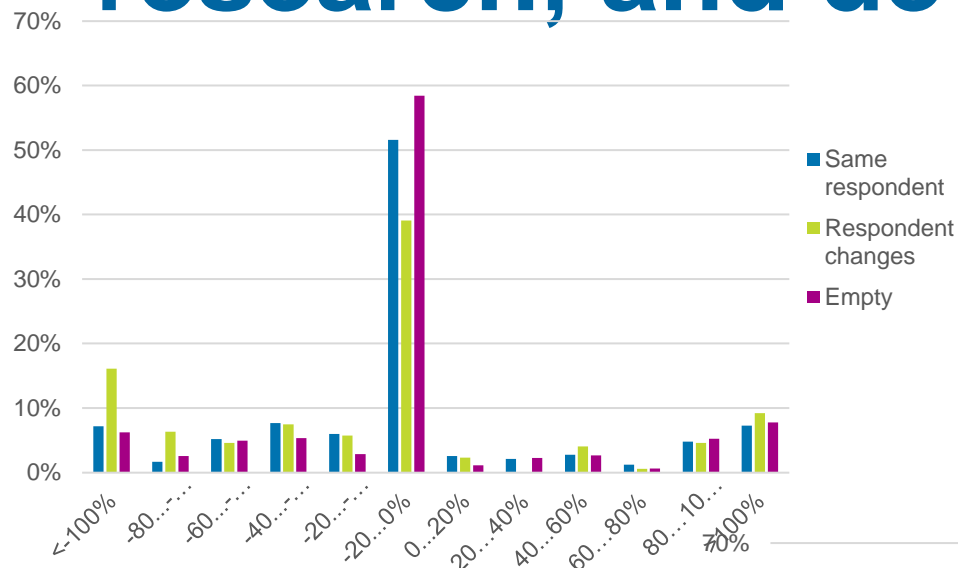


# Purchased R&D, comparison of values



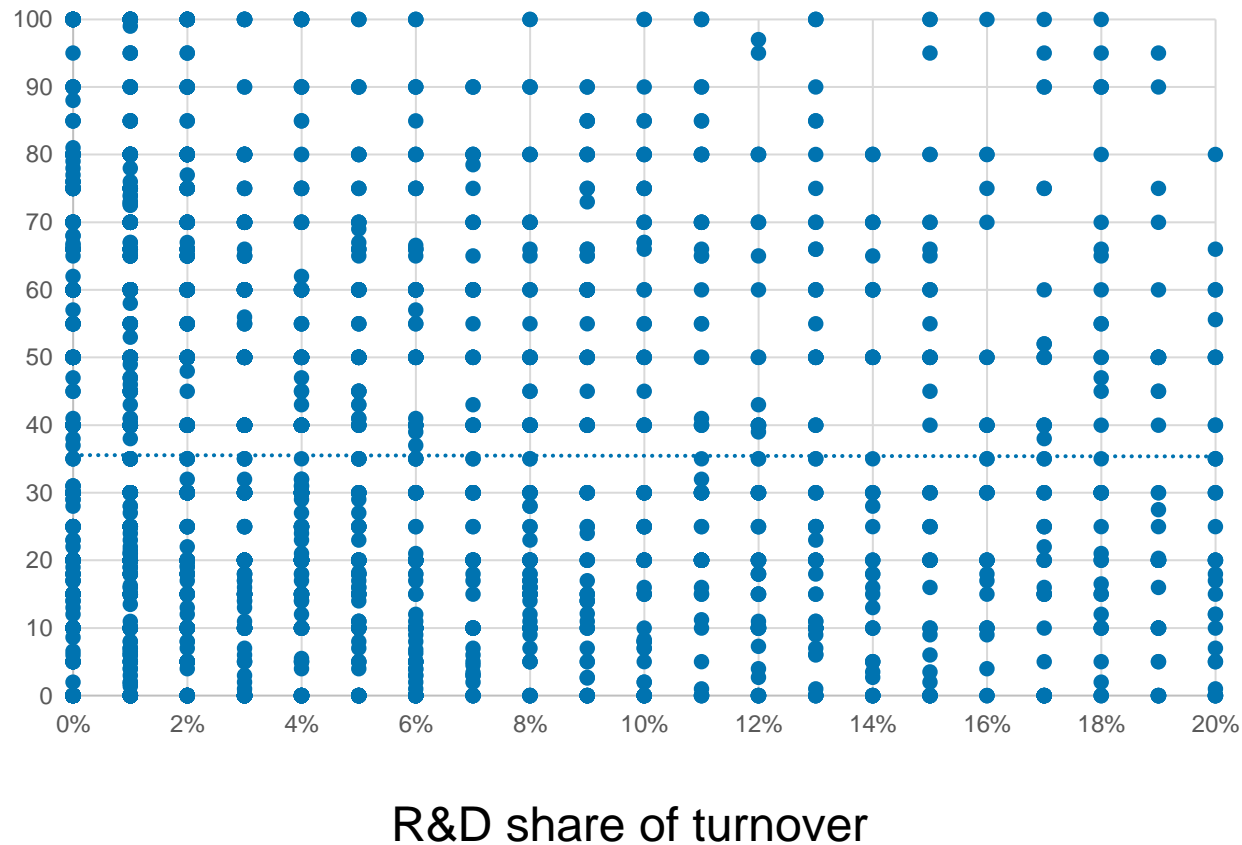


# Shares of basic research, applied research, and development work; change

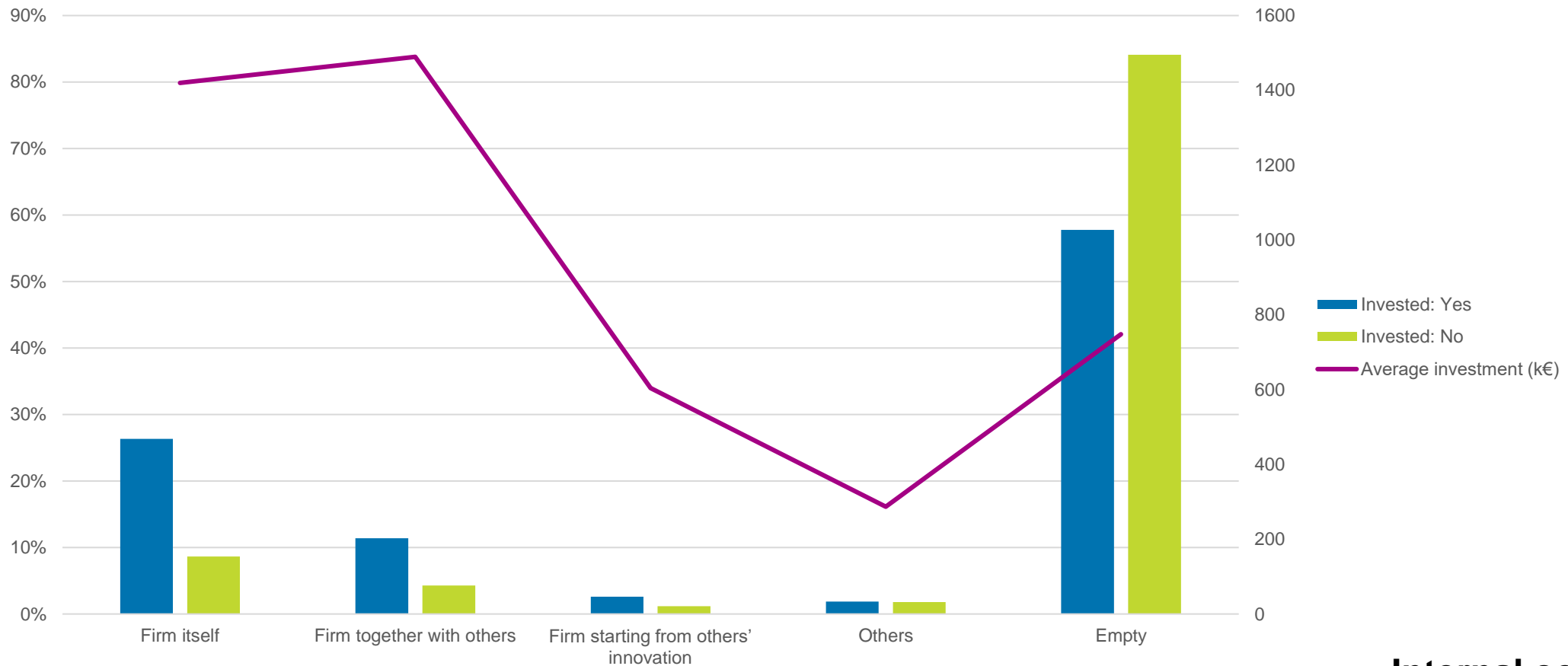


# Share of basic and applied research wrt R&D share of turnover

Share of basic and applied research



# Developer of product/process innovation wrt innovation related investments in machinery



# R&D subsidies, comparison between Business Finland data and RD & CIS surveys

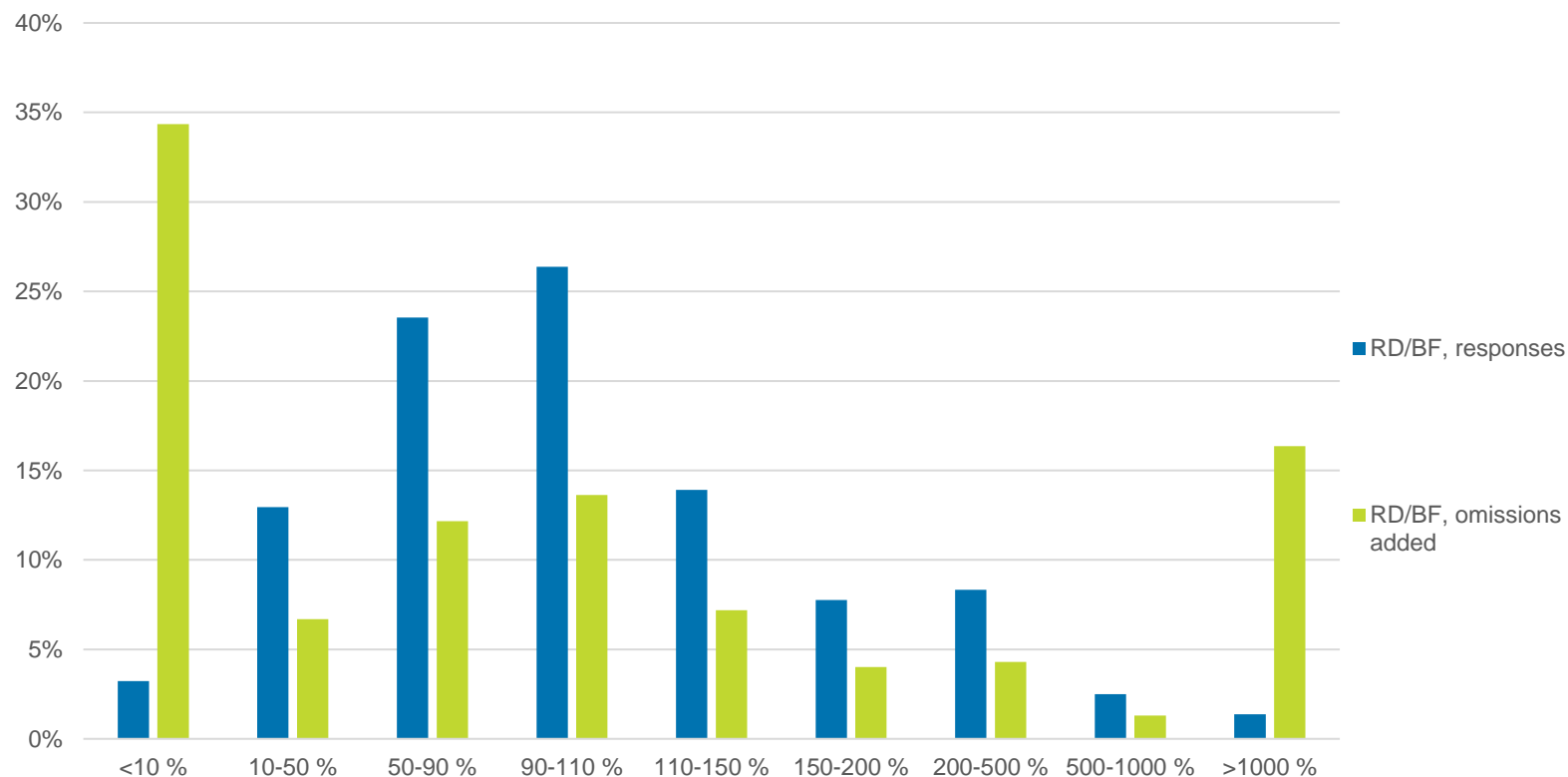
## RD survey

		Yes	No	Yes	No	True	False
BF data	<b>Yes</b>	1164	781	18 %	12 %	76 %	24 %
	<b>No</b>	374	4135	6 %	64 %	84 %	16 %

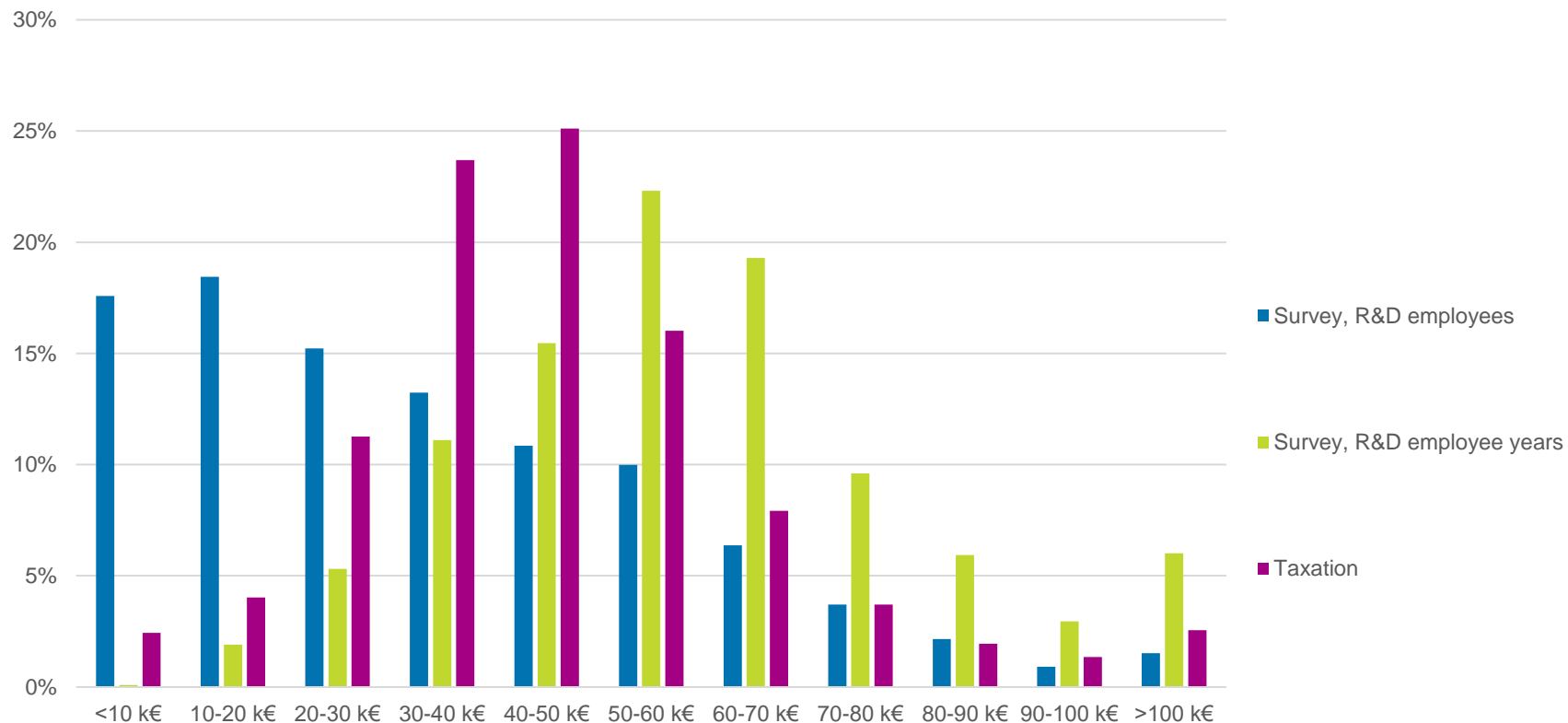
## CIS

		Yes	No	Yes	No	True	False
BF data	<b>Yes</b>	419	203	26 %	13 %	65 %	35 %
	<b>No</b>	224	742	14 %	47 %	79 %	21 %

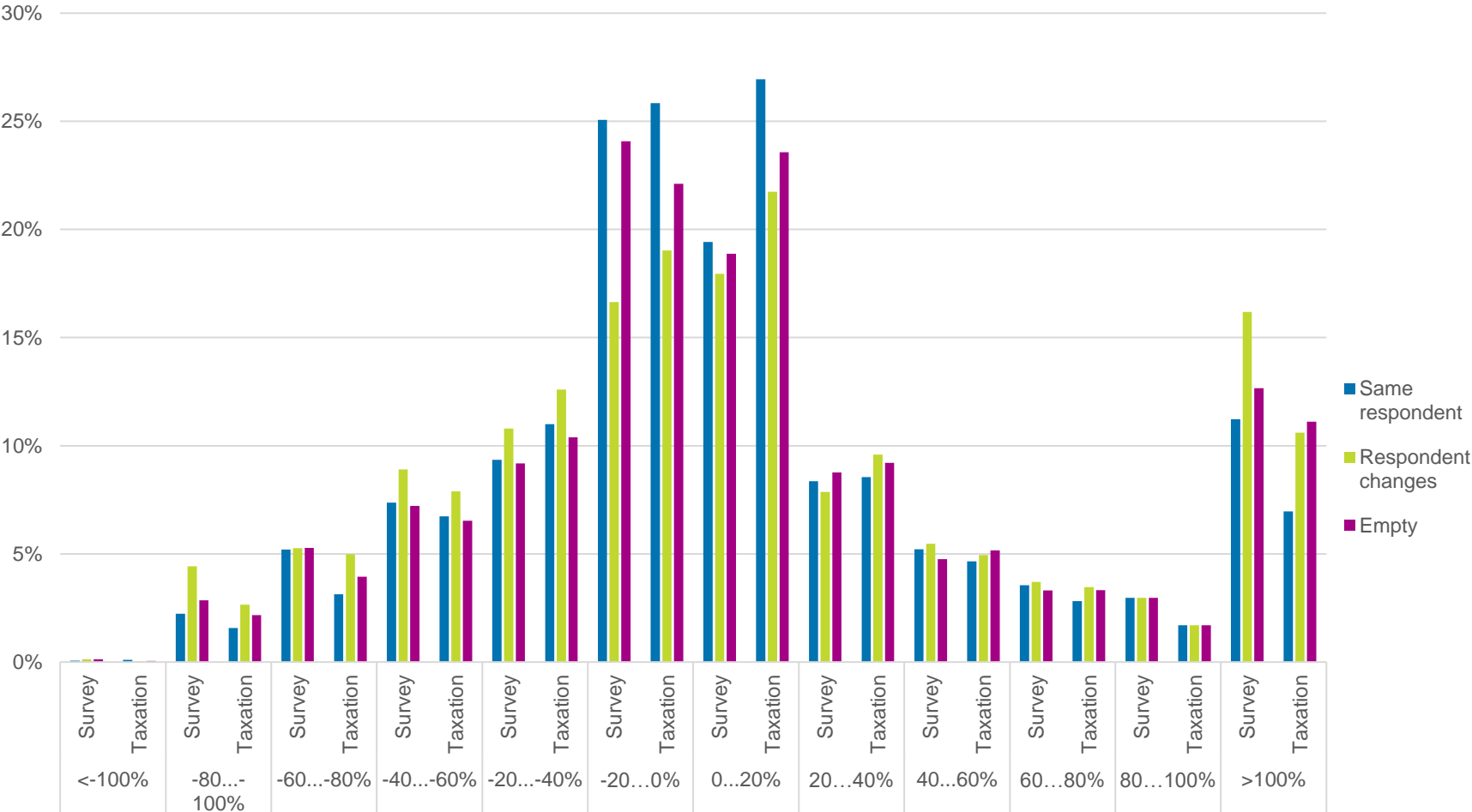
# R&D subsidies, comparison between Business Finland data and RD & CIS surveys



# R&D salaries, per person

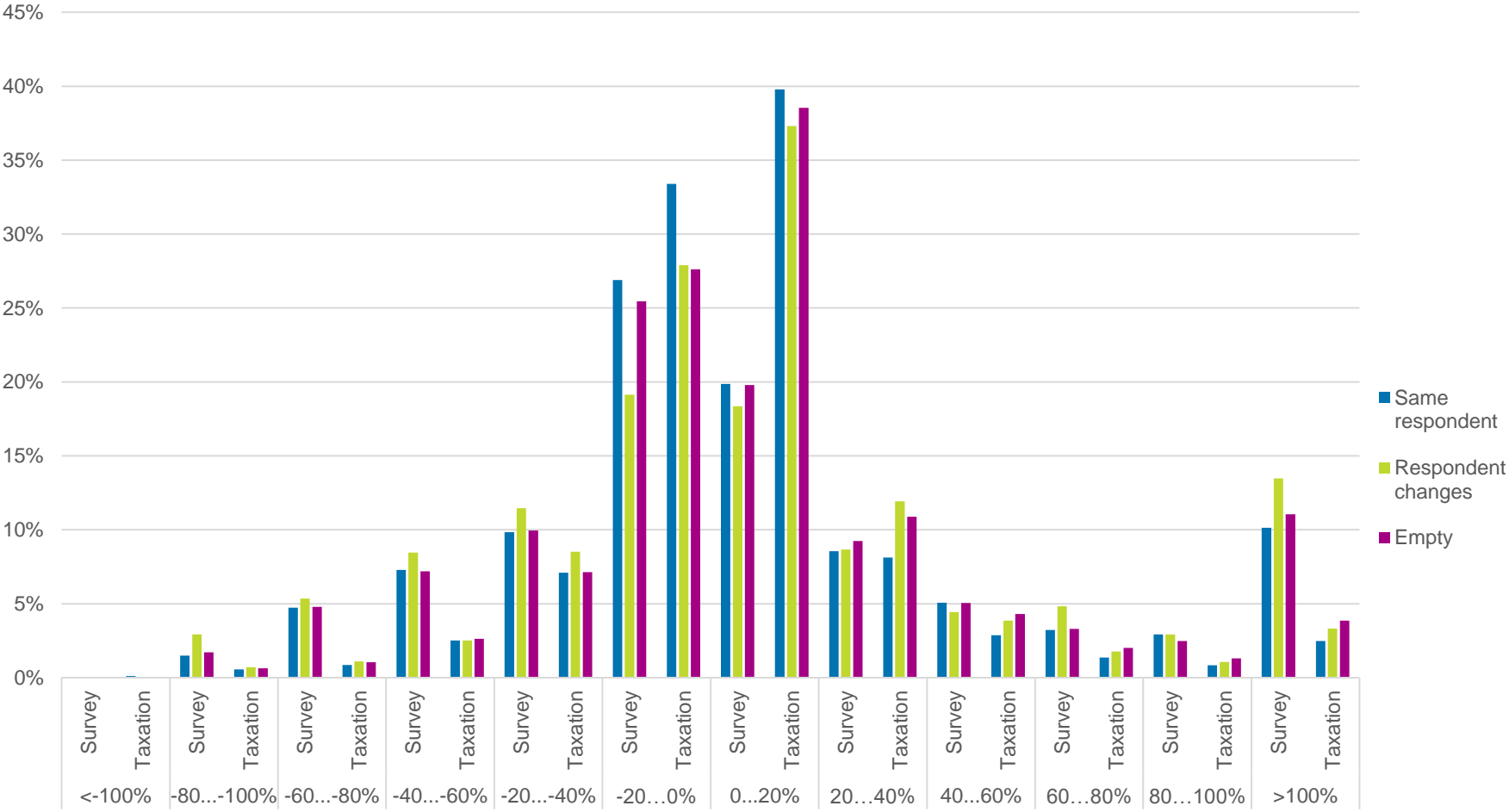


# R&D salaries, sum; change



Inter-rater  
Test-retest  
Inter-method

# R&D salaries, per person; change



Inter-rater  
Test-retest  
Inter-method





# Firm's markets and patenting, CIS

	N	Share	Sales FI	Sales EU
<b>Only Finland</b>	497	24 %	97 %	3 %
<b>Both Finland and EU</b>	1520	74 %	70 %	30 %
<b>Only EU</b>	38	2 %	37 %	63 %

## CIS

Patent data

	Yes	No	Yes	No	True	False
<b>Yes</b>	401	181	19 %	9 %	73 %	27 %
<b>No</b>	151	1393	7 %	66 %	89 %	11 %

Internal consistency

Inter-method

# Notes

The overall consistency of a measure

- **Test-retest reliability:** measures seem to be occasionally quite good, sometimes really poor
- **Inter-rater reliability:** measures seem to follow the test-retest reliability but magnify the effect
- **Inter-method reliability:** measures seem to be reasonably similar at the general level but can be pretty deviated at a detailed level
- **Internal consistency reliability:** measures seem to be occasionally quite good, sometimes really poor

# Thank you

Mika Naumanen

mika.naumanen@vtt.fi, mika.naumanen@stat.fi