



Innovation & Productivity of New Zealand Firms

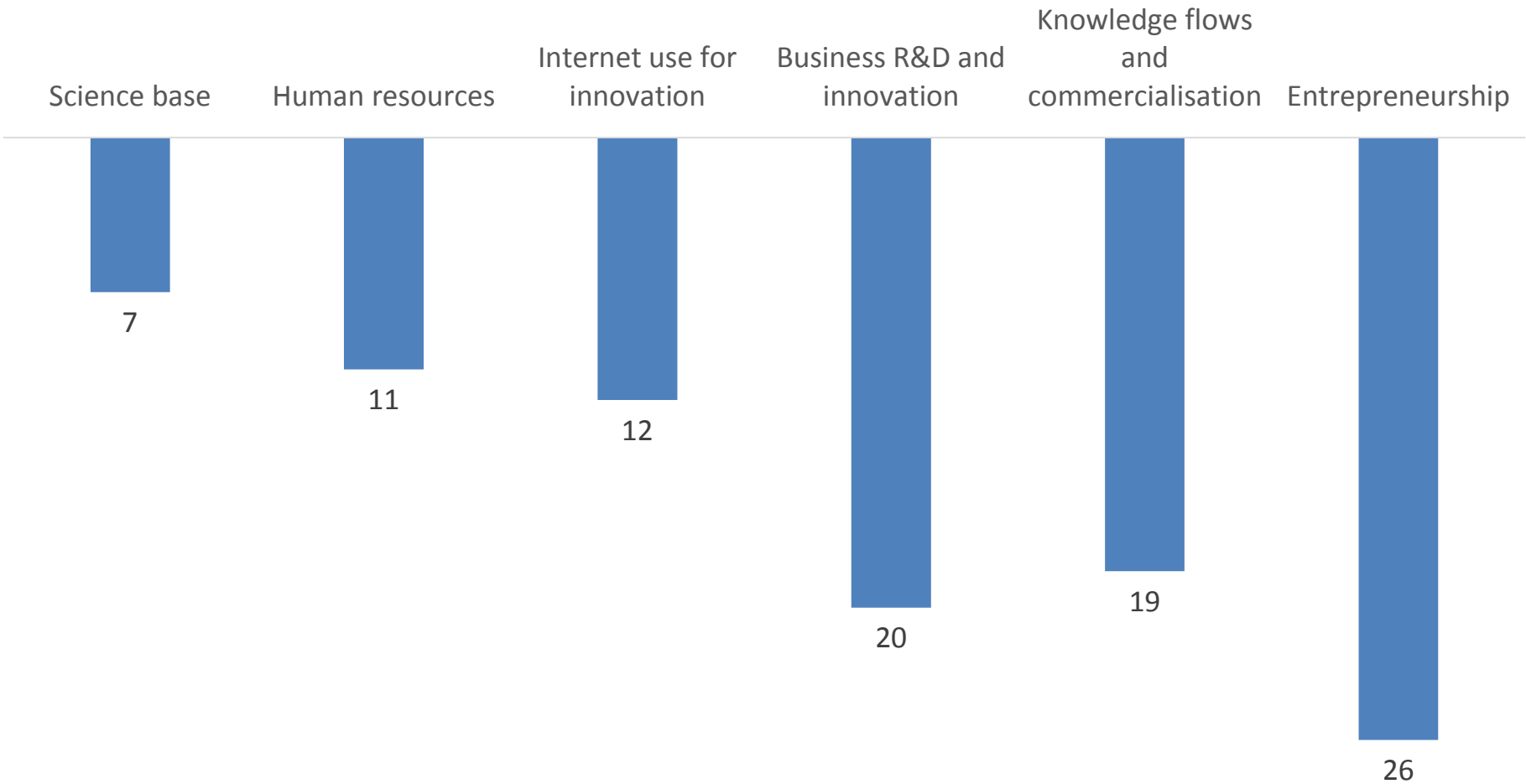
Simon Wakeman

Innovation & Productivity Symposium

1 December 2015

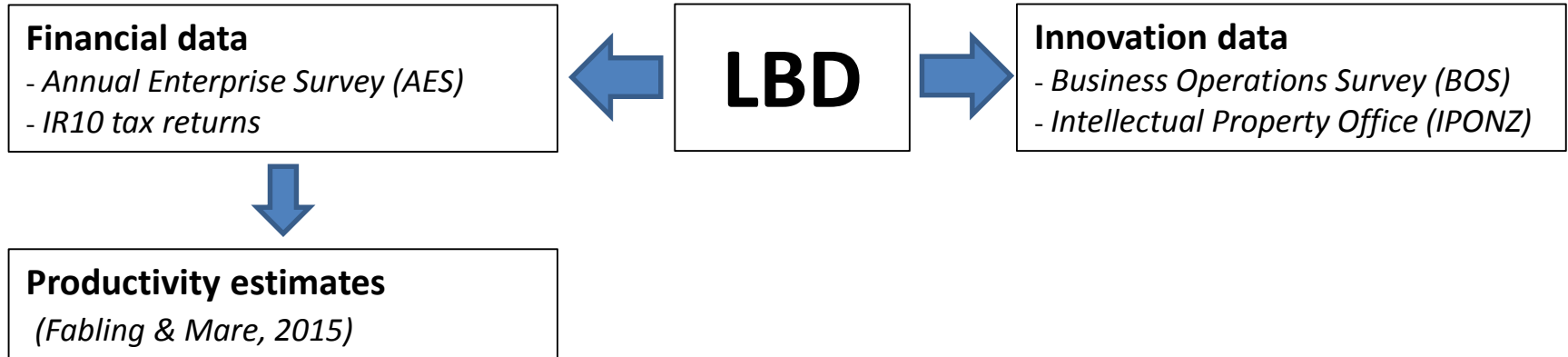
NZ near top in science but not in commercialising innovation

NZ'S AVERAGE RANKING IN TOP-LEVEL CATEGORIES OF OECD STATISTICS



Use Statistics NZ's Longitudinal Business Database to study relationship between innovation and productivity

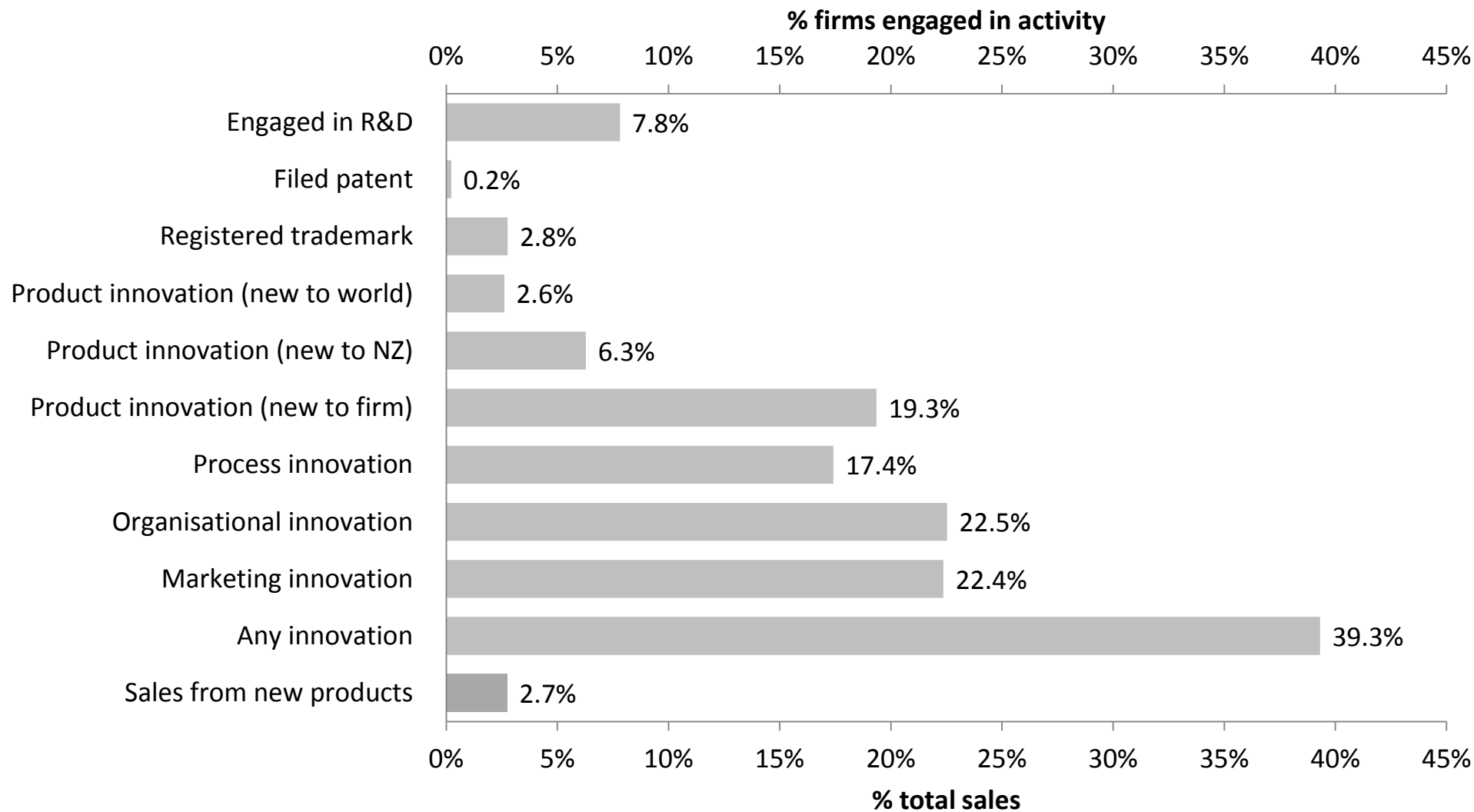
DATA SOURCES



Access to the data presented was managed by Statistics New Zealand under strict micro-data access protocols and in accordance with the security and confidentiality provisions of the Statistic Act 1975. These findings are not Official Statistics. The opinions, findings, recommendations, and conclusions expressed are those of the author/researcher, not Statistics NZ or the New Zealand Productivity Commission.

LBD contains various measures of innovation

MEASURES OF INNOVATIVE ACTIVITY



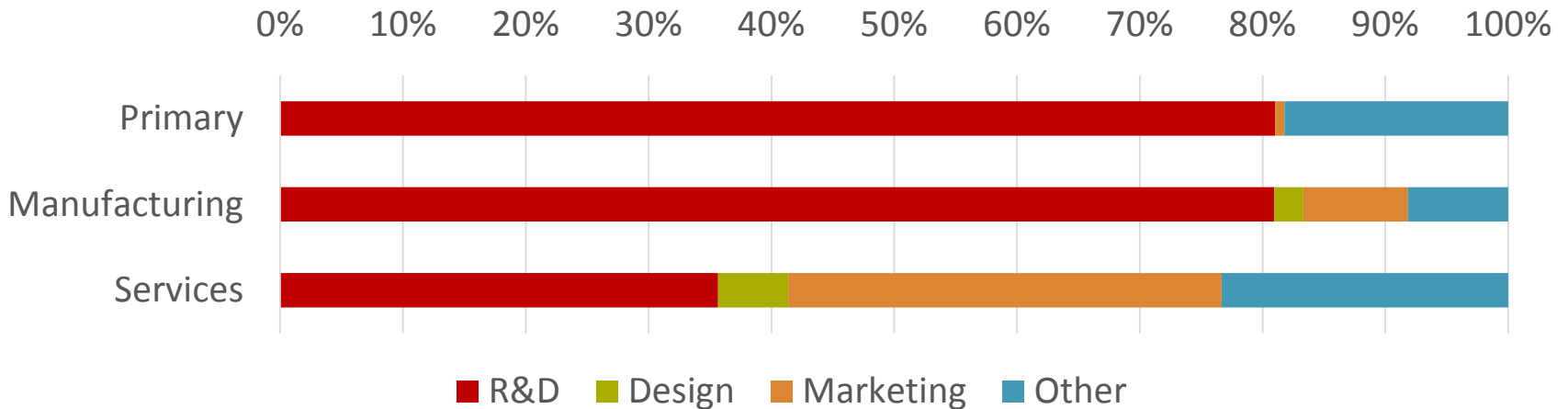
There is more to innovation than R&D

R&D ACTIVITY VS INNOVATION ACTIVITY

		Engaged in innovation	
		No	Yes
Engaged in R&D	No	52.7%	34.5%
	Yes	3.2%	9.6%

Sample contains firms responding to Business Operations Survey (2005-2013).

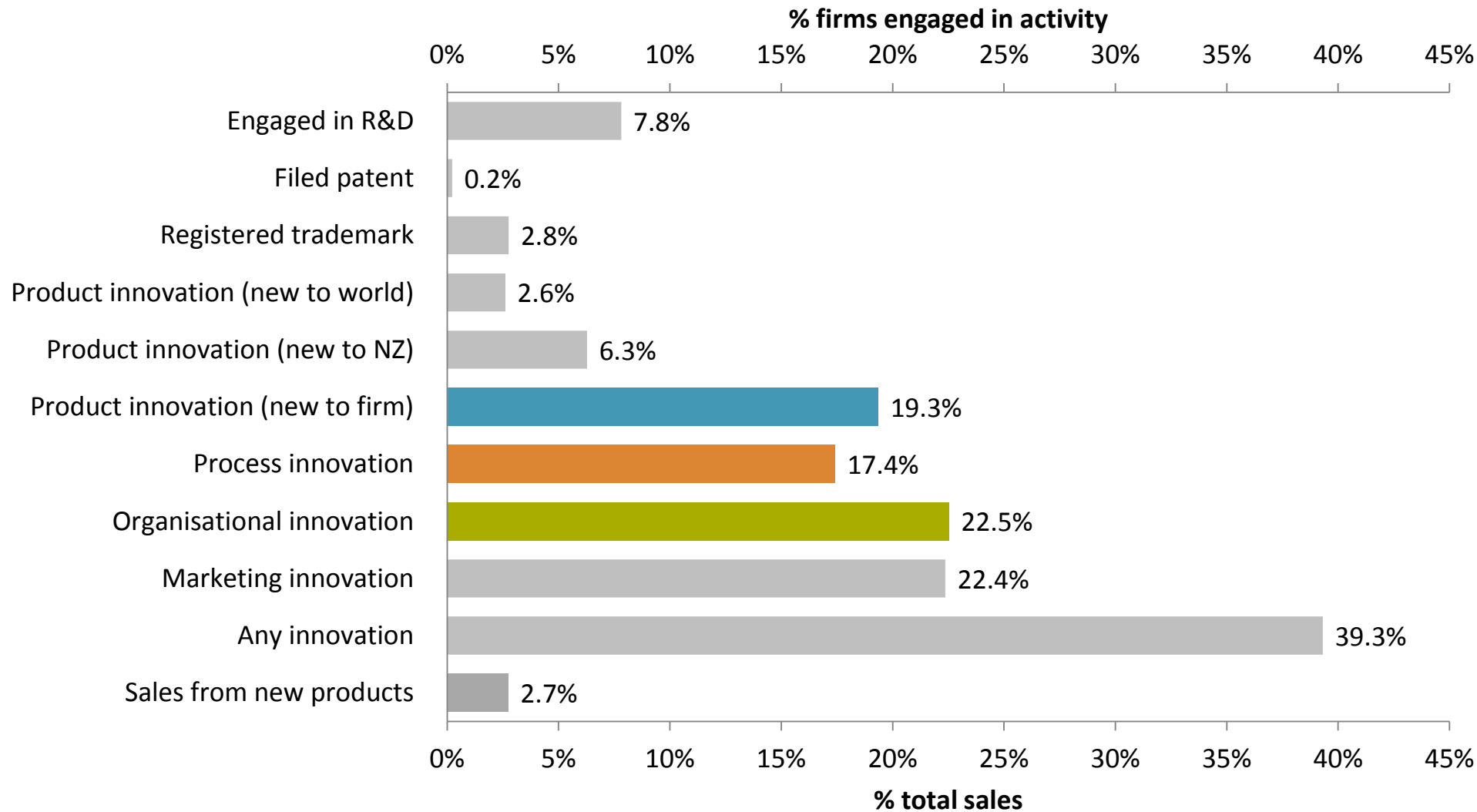
INNOVATION SPENDING BY TYPE



Sample contains firms responding to Business Operations Survey (2007-2013).

Focus on three measures of innovation output

MEASURES OF INNOVATIVE ACTIVITY



Innovating firms are larger and generating more output but not clearly more productive

RELATIVE OUTPUT LEVEL VS. NON-INNOVATORS BY INNOVATION TYPE

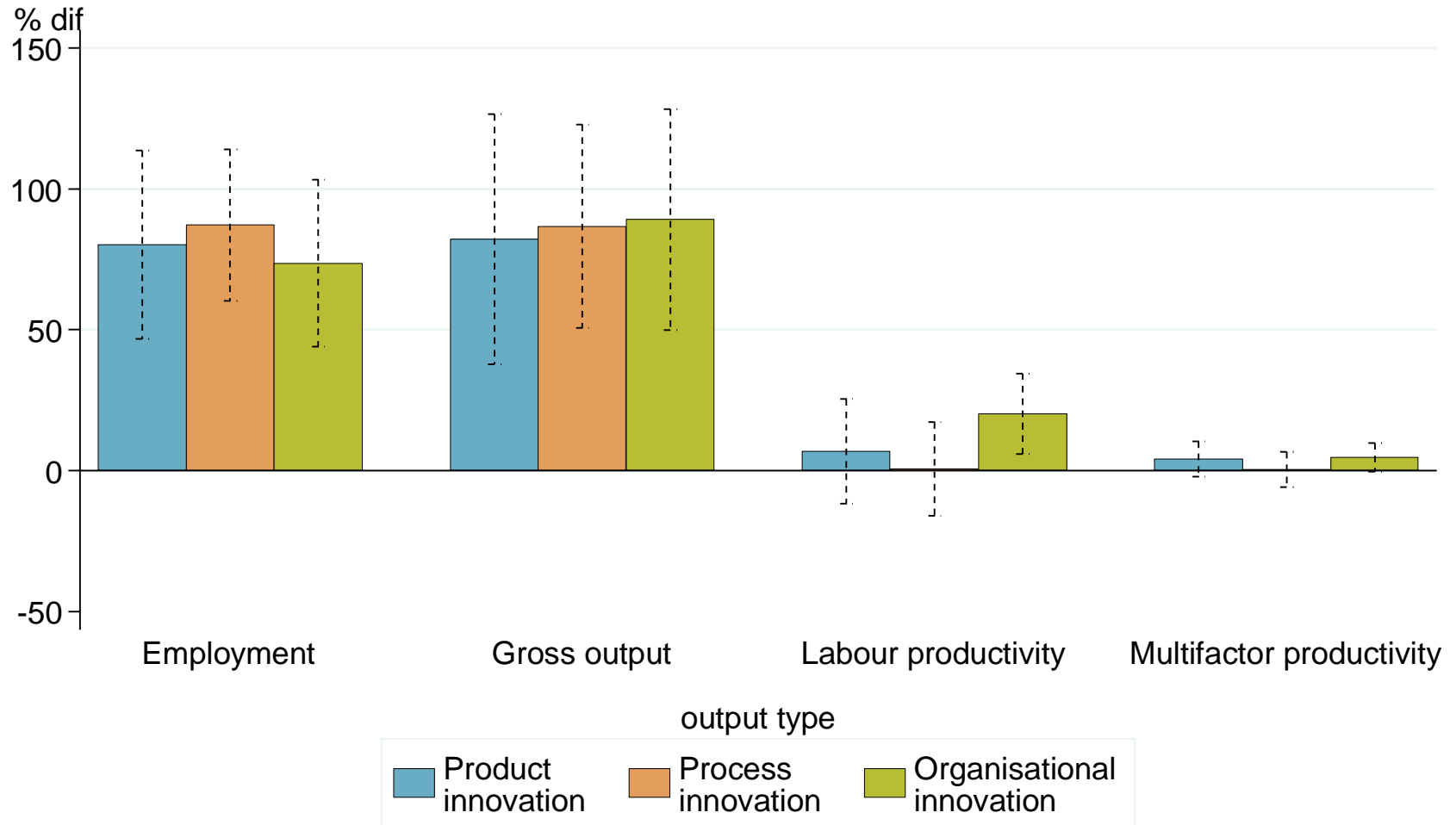


Chart show coefficients from series of OLS regressions of output level in year 0 on innovation in year 0 with controls for base year and firm characteristics. Bars show 95% confidence intervals. Sample contains firms in BOS 2005-2011. Observations weighted by BOS sampling weights multiplied by firm inputs.

Measuring relationship between innovation and productivity not simple

EMPIRICAL APPROACH

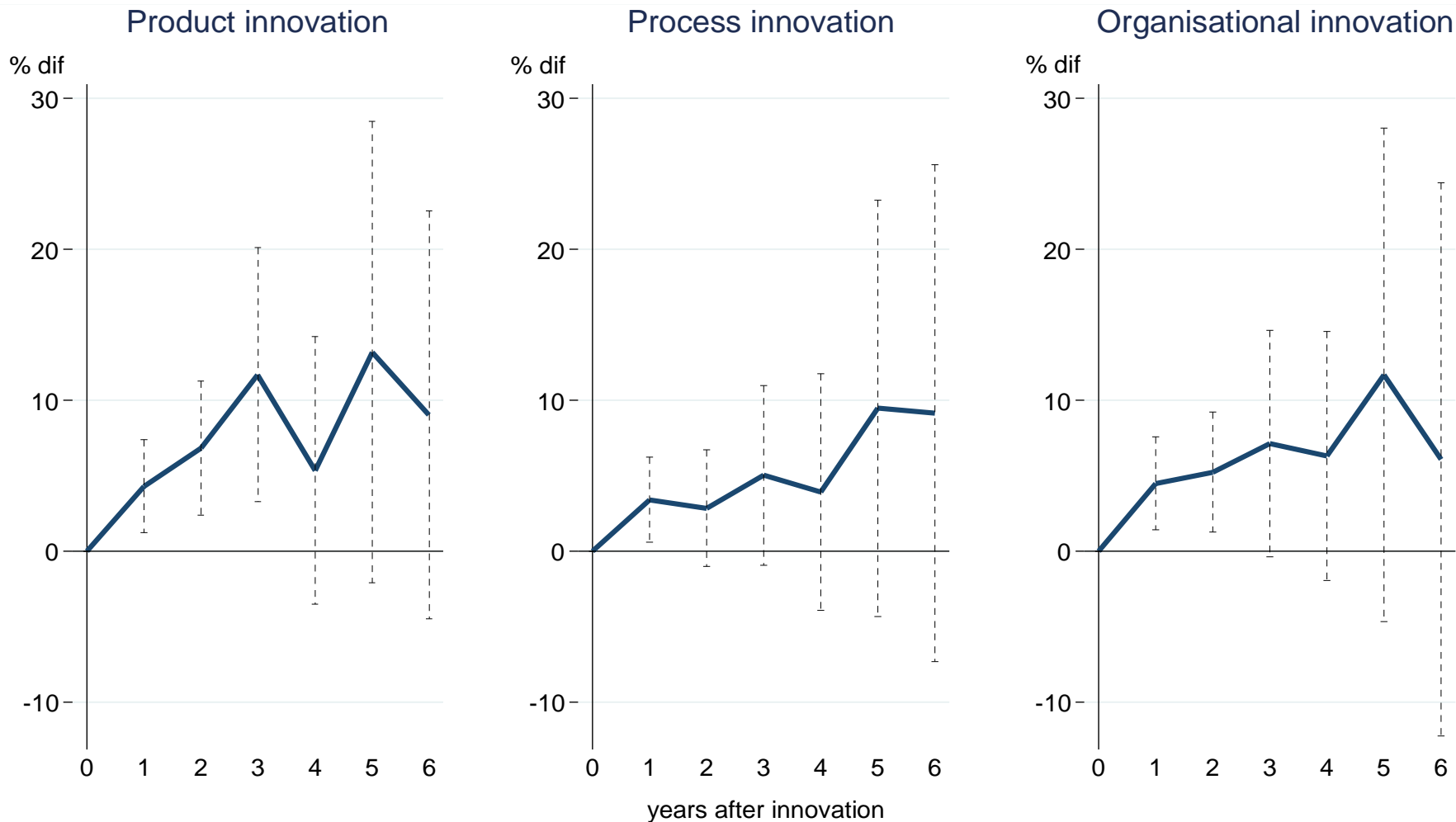
- OLS regression: Change in firm output/productivity ($Y_{in}-Y_{i0}$) on innovation in year 0 (I_0)

$$Y_{in} - Y_{i0} = \alpha + \beta_I I_{i0} + \beta_X X_{i0} + t + \varepsilon$$

- MFP is residual from $Y=f(L,K,M,\gamma)$
- Not instrumenting for innovation (cf Crepon, Duguet & Mairesse, 1998)
- Examining differences: accounts for unobserved firm characteristics
- Control for observed firm characteristics (age, size, industry, etc.)
- Using 2-year MA of MFP: accounts for measurement error
- Weight observations by firm's level of input

Firms introducing all types of innovation grow 5-10% faster over following 3 years

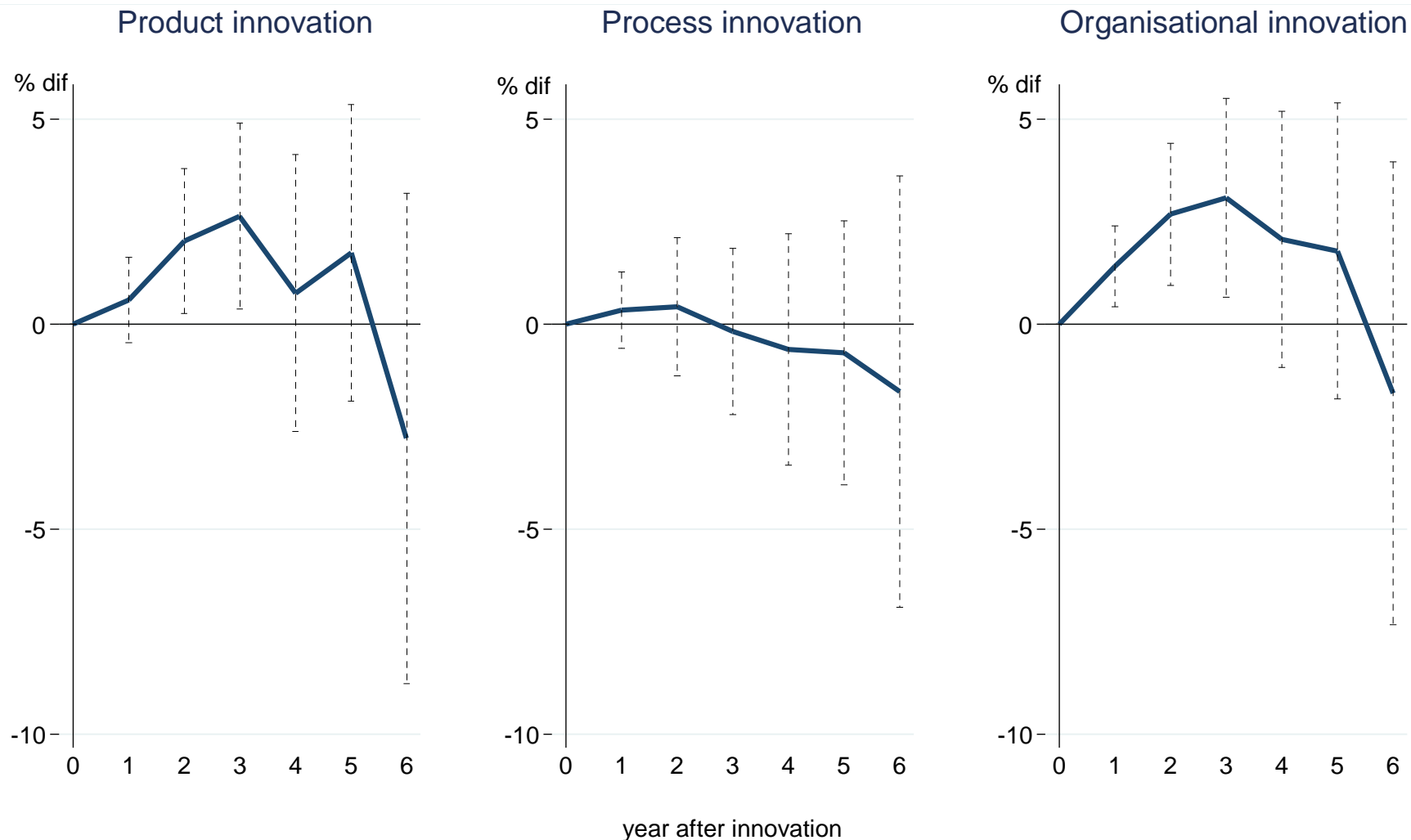
RELATIVE OUTPUT GROWTH VS NON-INNOVATORS BY INNOVATION TYPE



Charts show coefficients from series of OLS regressions of change in output from year 0 to year t on innovation in year 0 with controls for base year and firm characteristics. Bars show 95% confidence intervals. Sample contains firms in BOS 2005-2011 without output measures until 2012. Observations weighted by BOS sampling weights multiplied by input.

Firms introducing product and organisational innovation have 3-5% higher MFP growth

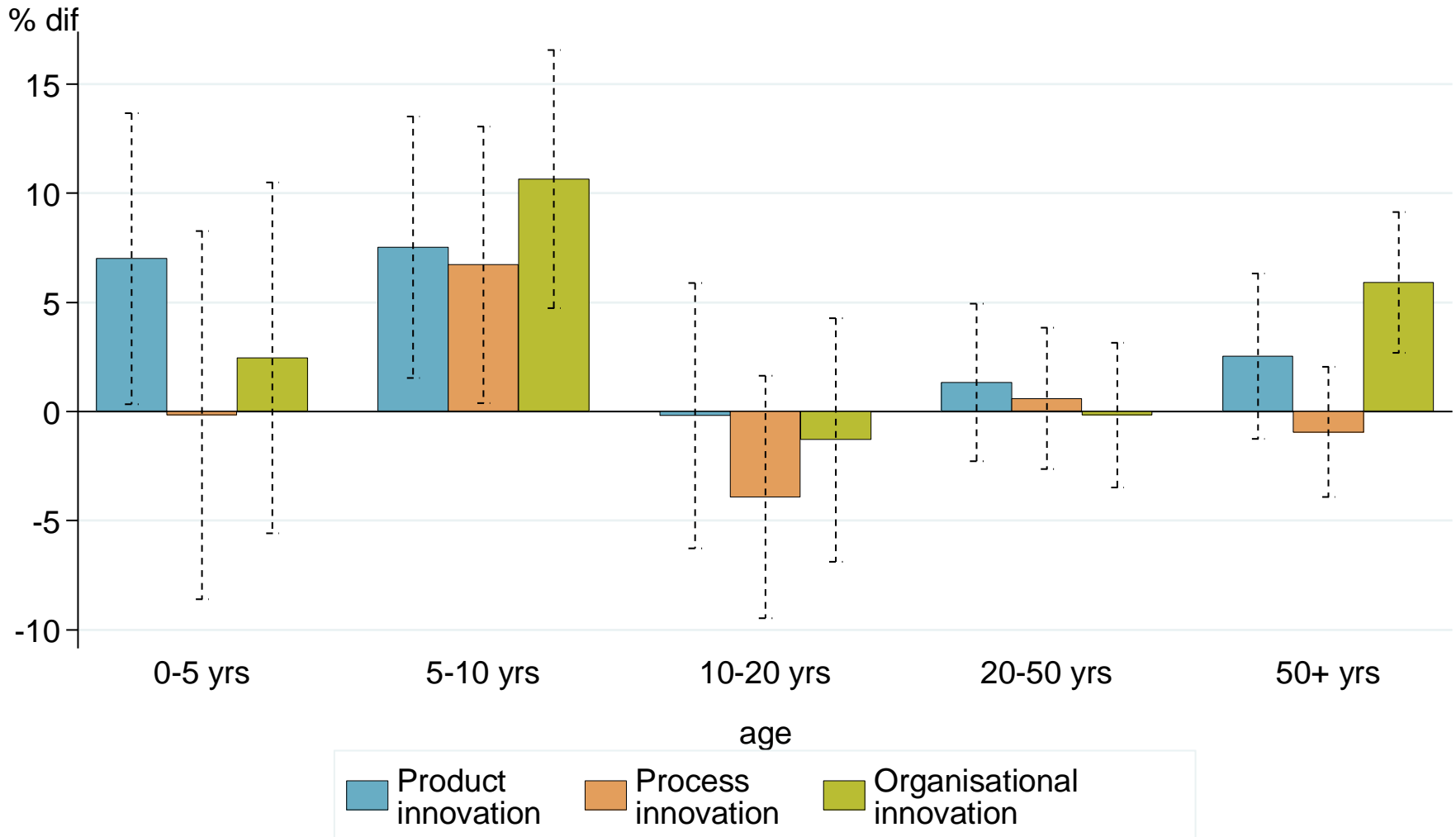
RELATIVE MFP GROWTH VS NON-INNOVATORS BY INNOVATION TYPE



Charts show coefficients from OLS regressions of change in 2-yr-MA of MFP from year 0 to t on innovation in year 0 with controls for base year and firm characteristics. Bars show 95% confidence intervals with controls for firm characteristics. Sample contains firms in BOS 2005-2011 without output measures until 2012. Observations weighted by BOS sampling weights multiplied by input.

Younger firms show higher productivity improvements following innovation

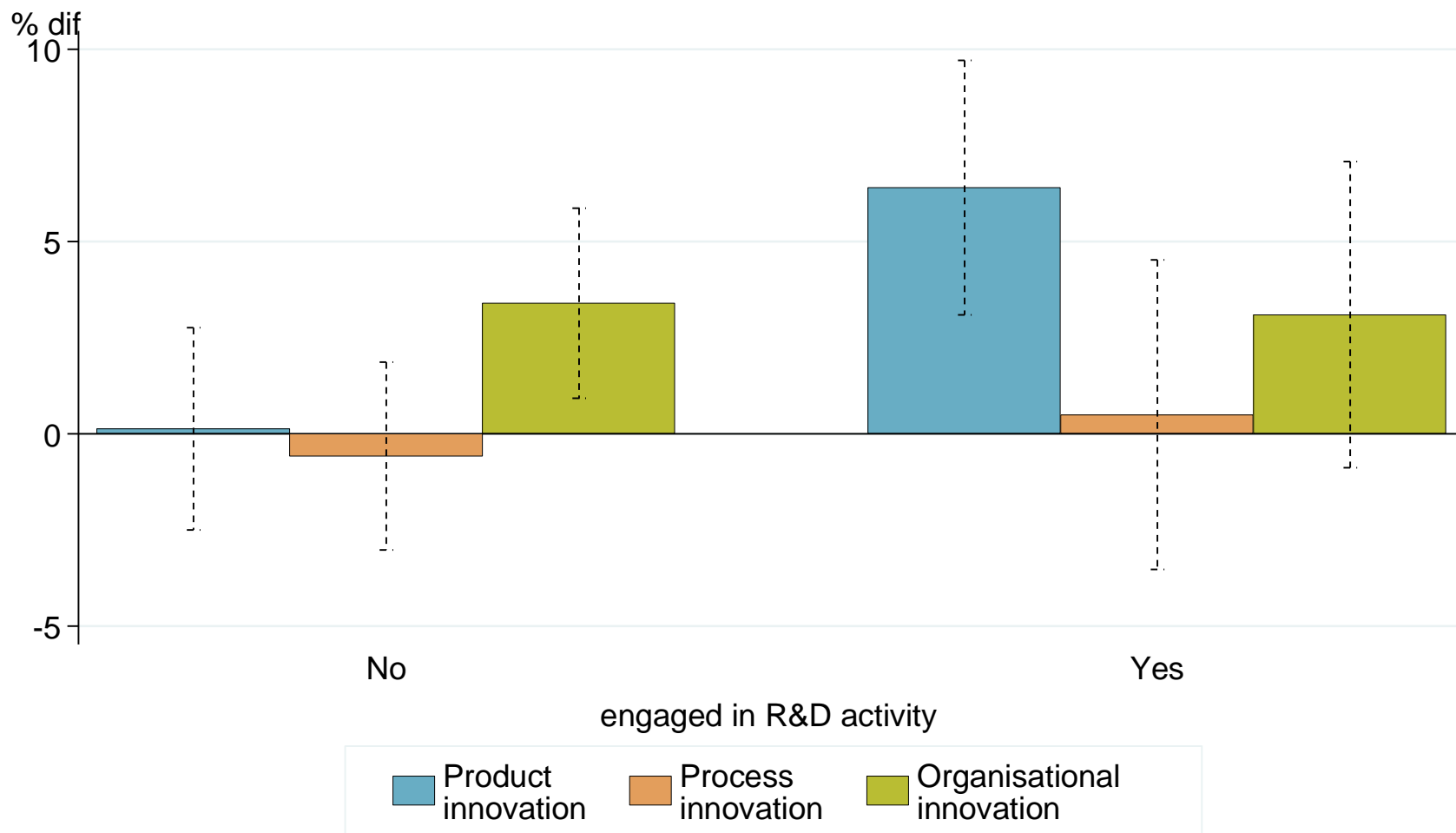
RELATIVE CHANGE IN MFP OVER 3 YEARS BY AGE



Charts show coefficients from series of OLS regressions of change in 2-yr MA of MFP from year 0 to year t on innovation in year 0 interacted with firm characteristics and controls for base year. Bars show 95% confidence intervals. Sample contains firms in BOS 2005-2011 without output measures until 2012. Observations weighted by BOS sampling weights multiplied by input.

Firms engaged in R&D activity show higher MFP growth after product innovation

RELATIVE CHANGE IN MFP OVER 3 YEARS BY WHETHER ENGAGED IN R&D

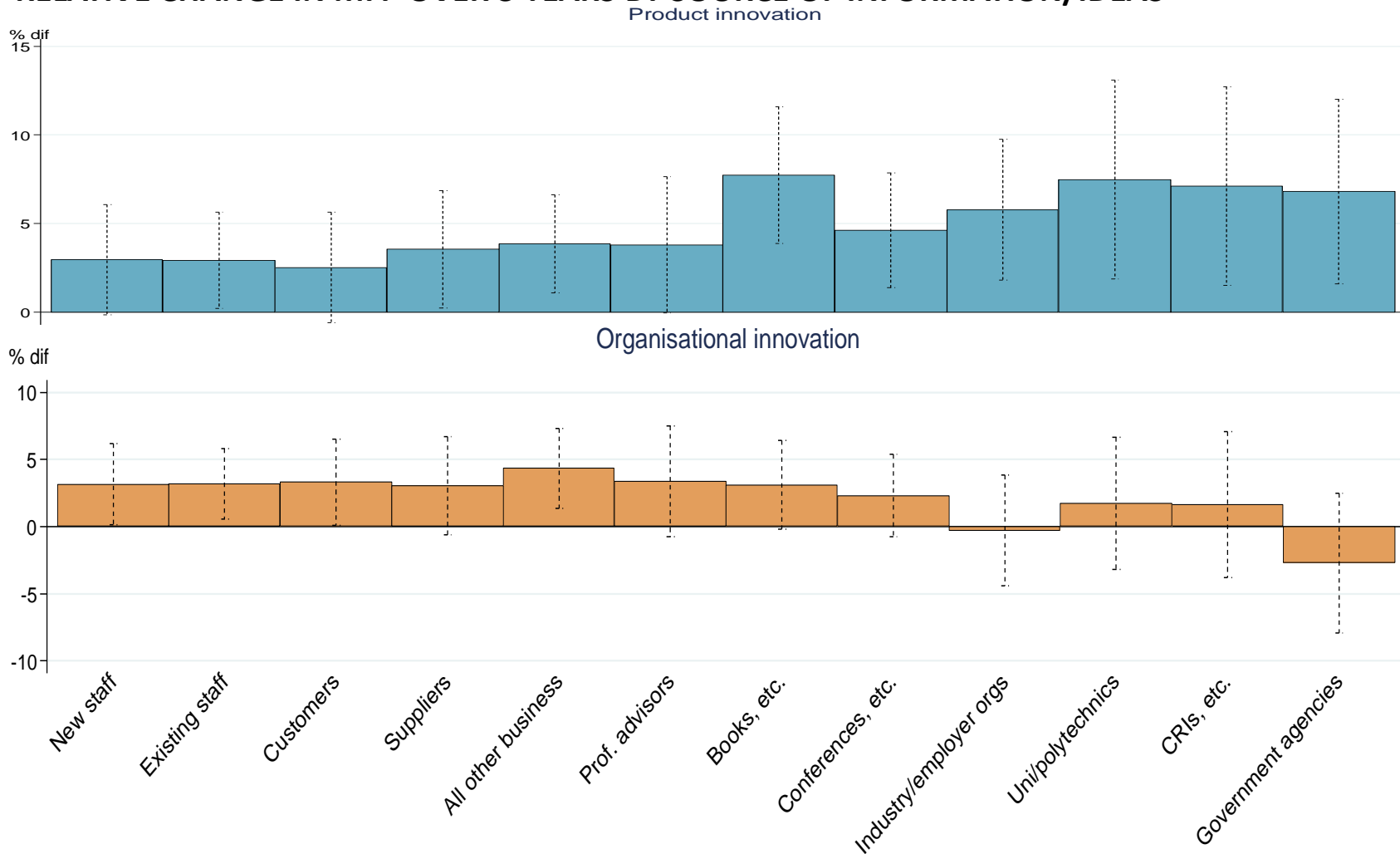


Charts show coefficients from series of OLS regressions of change in 2-yr MA of MFP from year 0 to year t on innovation in year 0 interacted with firm characteristics and controls for base year. Bars show 95% confidence intervals. Sample contains firms in BOS 2005-2011 without output measures until 2012. Observations weighted by BOS sampling weights multiplied by input.

More formal sources of ideas associated with MFP growth after product innovation

Ideas from business environment with higher growth after organisational innovation

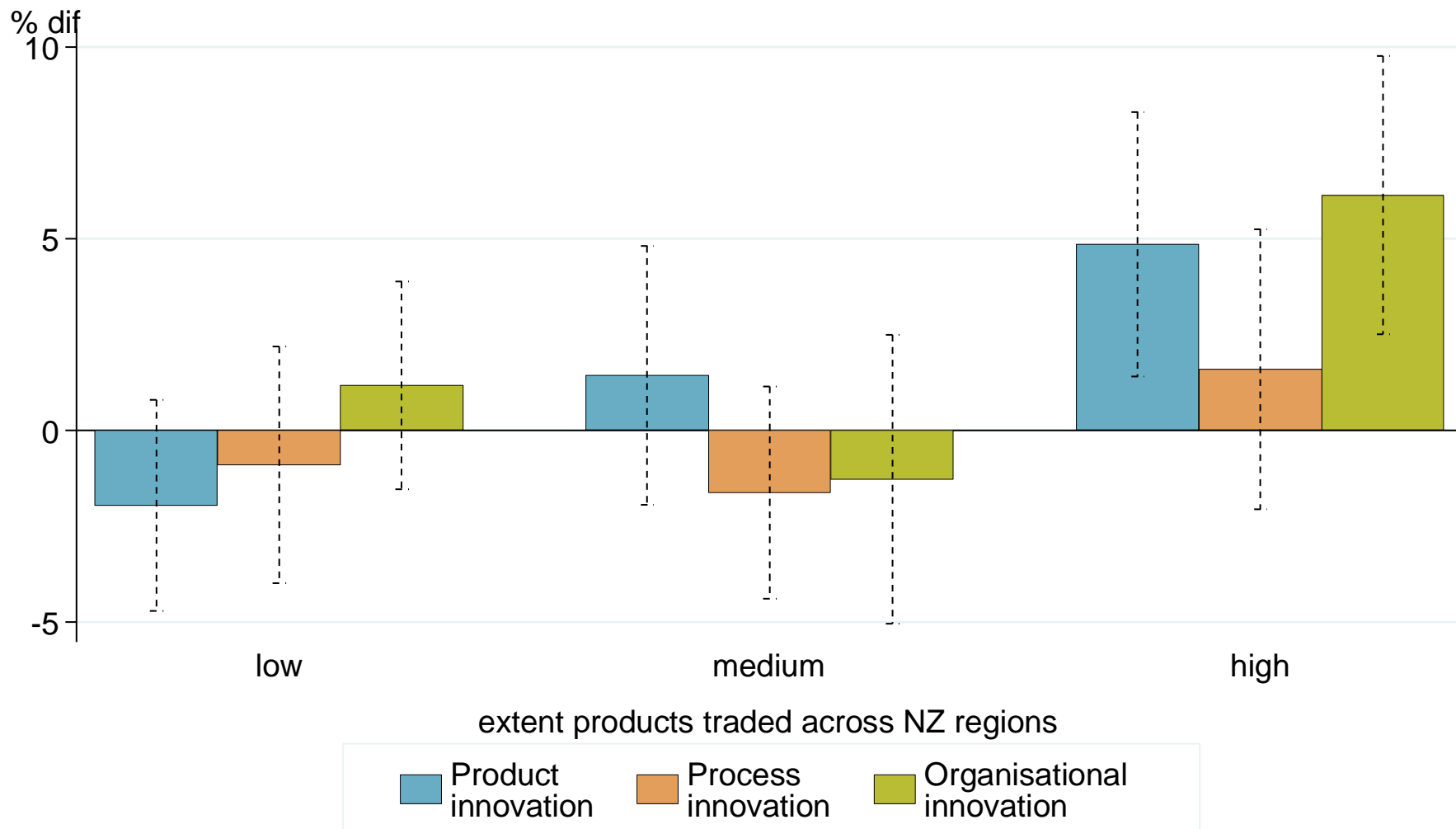
RELATIVE CHANGE IN MFP OVER 3 YEARS BY SOURCE OF INFORMATION/IDEAS



Charts show coefficients from series of OLS regressions of change in 2-yr MA of MFP from year 0 to year t on innovation in year 0 interacted with firm characteristics and controls for base year. Bars show 95% confidence intervals. Sample contains firms in BOS 2005-2011 without output measures until 2012. Observations weighted by BOS sampling weights multiplied by input.

Firms selling more tradable products show higher MFP growth after product and organisational innovation

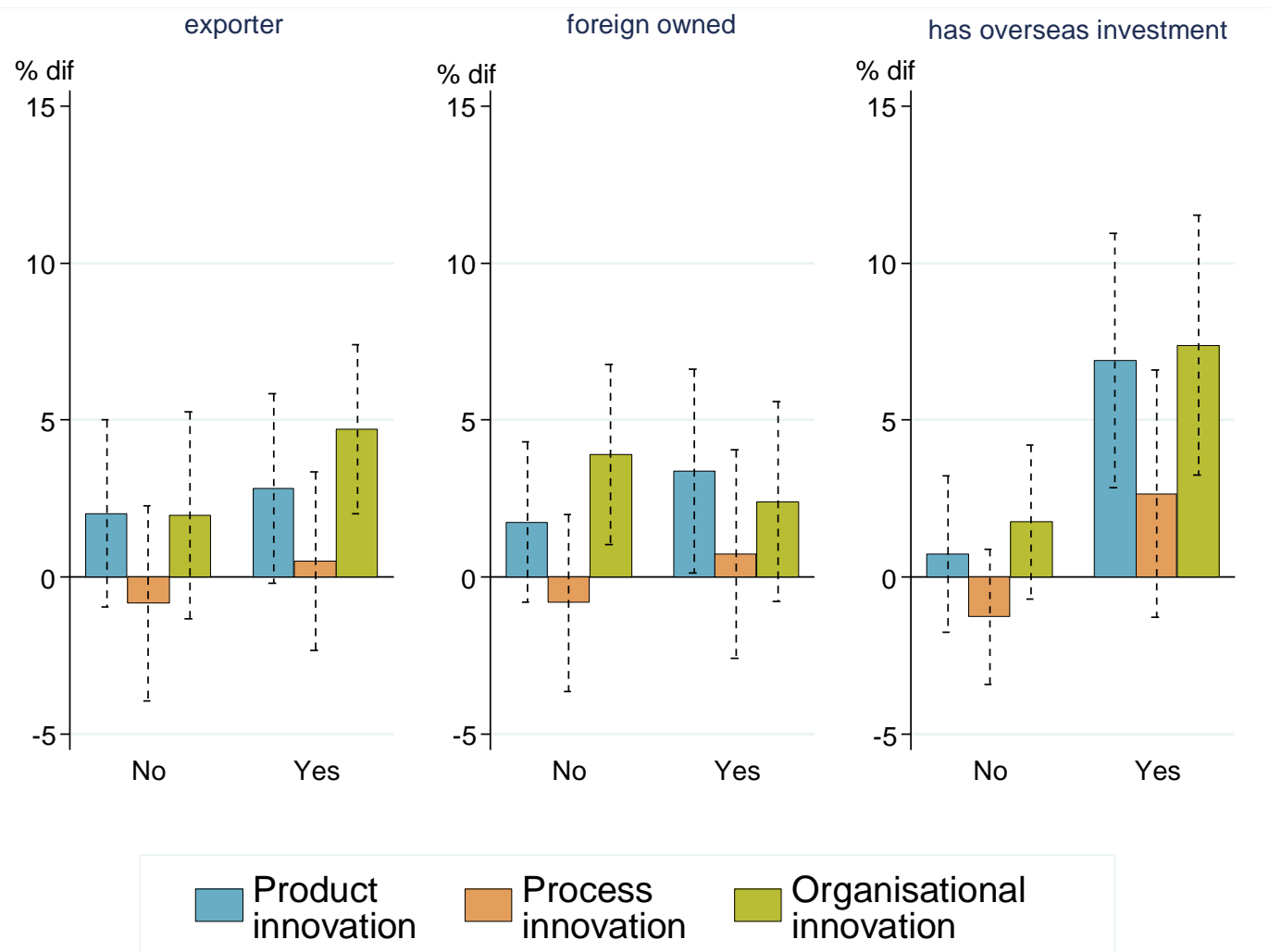
RELATIVE CHANGE IN MFP OVER 3 YEARS BY PRODUCT TRADABILITY



Charts show coefficients from series of OLS regressions of change in 2-yr MA of MFP from year 0 to year t on innovation in year 0 interacted with firm characteristics and controls for base year. Bars show 95% confidence intervals. Sample contains firms in BOS 2005-2011 without output measures until 2012. Observations weighted by BOS sampling weights multiplied by input.

Internationally connected firms more likely to show MFP growth after product or organisational innovation

RELATIVE CHANGE IN MFP OVER 3 YEARS BY INTERNATIONAL CONNECTIVITY



Charts show coefficients from series of OLS regressions of change in 2-yr MA of MFP from year 0 to year t on innovation in year 0 interacted with firm characteristics and controls for base year. Bars show 95% confidence intervals. Sample contains firms in BOS 2005-2011 without output measures until 2012. Observations weighted by BOS sampling weights multiplied by input.

Innovation matters for productivity, but more for some firms than others

CONCLUSION

- Product innovators and organisational innovators do better but improvements small
- Matters most for young firms
- R&D and other formal sources matter for product innovation; business environment matters for organisational innovation
- Firms with larger markets improve more after innovation