

# Absorptive capacity and regional patterns of innovation

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# Research questions

- Our aim is to understand the substantial regional variations in innovation rates in the UK
- Can these be partly explained by regional differences in absorptive capacity?
- What are the main determinants of absorptive capacity?
- Can we draw implications for regional and national innovation policy?

Region	% Innovative firms	% Goods innovators	% Service innovators	% Process innovators
London	33.03	14.45	22.42	16.11
Eastern	29.97	16.42	15.45	15.92
South East	33.38	15.89	19.81	16.69
South West	29.20	15.48	15.45	15.32
West Midlands	30.73	17.35	13.83	16.38
East Midlands	31.79	18.44	15.36	16.33
Yorkshire	29.34	15.81	16.37	14.78
North West	28.88	15.81	15.50	15.16
North East	29.99	16.12	17.74	16.33
Wales	26.93	15.74	13.37	15.20
Scotland	27.03	12.57	14.47	15.79
Northern Ireland	30.59	13.22	13.61	19.56
Average	30.07	15.61	16.11	16.13

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# Defining absorptive capacity

- The ability to identify, assimilate and make use of external knowledge (Cohen and Levinthal, 1989, 1990)
- Internal and external sources of knowledge are complementary
- Internal knowledge is needed to take advantage of external knowledge
- R&D plays a dual role: as a direct input into the innovation process and as an investment in absorptive capacity

# Defining absorptive capacity

- The concept was originally developed in the cognitive sciences
- It was extended by Cohen and Levinthal to the firm level:
  - Firm-level absorptive capacity is more than the sum of the absorptive capacity of individual workers
  - Better internal communication processes improve the firm's ability to absorb external knowledge
  - Networks are necessary to identify sources of relevant external knowledge

# Two complementary surveys

- Two surveys with very similar questions, but covering different populations, both carried out in 2004
- Fourth UK Community Innovation Survey (CIS4) includes firms with 10-1000+ employees
- Centre for Business Research (CBR) survey includes firms with 1-499 employees
- More detailed information in the CBR survey, while the CIS survey is larger and representative at the regional level

# Research methodology

- Multivariate probit regressions using CIS4 and CBR data
- Allow for correlation across types of innovation
- The dependent variable is the probability of introducing a goods, service or process innovation
- Follow-up in-depth case studies, based on firms that completed the CBR survey

# Absorptive capacity variables

- Absorptive capacity is a multi-dimensional concept, difficult to operationalise
- Absorptive capacity variables:
  - Fraction of employees educated to degree level or higher (R&D employees for CBR data)
  - Employee training
  - R&D expenditure per employee
  - New management and organisational techniques
  - Collaboration with firms and higher education institutions at the local, national and/or overseas level

# Control variables

- Other variables that affect innovation directly are included as controls:
  - Perceived obstacles to innovation
  - Local, national and EU government support
  - Size of the market
  - Age and size of the firm
  - Ownership structure
  - Sectoral and regional dummies

Variable	Goods innovation	Service innovation	Process Innovation
Fraction employees with science degree	0.045*	0.067**	0.015
Fraction employees with other degree	0.013	0.064**	-0.001
R&D expenditure per employee	0.002**	-0.001	0.001*
Training	0.090**	0.124**	0.168**
New management techniques	-0.023**	0.024**	0.049**
New organisational structure	0.030**	0.049**	0.040**
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Collaborations: National	0.111**	0.069**	0.117**
Collaborations: Overseas	0.095**	0.002	0.029
Obstacles: Finance	0.054**	0.065**	0.059**
Obstacles: Knowledge	0.020*	0.025**	0.018*
Obstacles: Market	0.037**	0.015	0.000
Obstacles: Other	-0.018*	-0.002	-0.010

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National public support	0.083**	0.036	0.117**
EU public support	-0.051**	0.032	-0.026
Claimed tax credit	0.134**	-0.026	-0.012
Market: national	0.060**	0.035**	0.031**
Market: overseas	0.154**	0.034**	0.067**
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# Further results based on CBR data

- Training can be disaggregated into managerial, scientist and other employee training
- New management techniques can be disaggregated into:
  - Total quality management
  - Quality circles
  - Job rotation
  - Performance related pay
- Process innovation separated into goods and service process innovation

Variable	Product innovation (goods)	Product innovation (services)	Process innovation (goods)	Process innovation (services)
Fraction R&D employees	0.181*	0.197	0.068	0.280*
R&D expenditure per employee	0.000	0.000	0.000	0.000
Managerial training	0.004	0.184**	0.015	0.104*
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Quality circles	0.125*	0.034	0.120*	0.044
Job rotation	0.087*	-0.004	0.103*	0.035
Performance-related pay	-0.009	0.038	-0.010	0.017
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- Different aspects of absorptive capacity have a different impact on goods, service and process innovation
- Regional differences in innovation rates disappear once absorptive capacity and industrial structure are taken into account
- Networks are important, but their spatial impact varies with the type of innovation

# Conclusions

- R&D tax credit is positively associated with goods innovation; service firms find it difficult to access
- Policy focus in the UK on developing local networks may be detrimental in some sectoral contexts