Firms' Innovation-Oriented Collaboration with Specific Universities: Does Geographical Distance Matter?

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A positive effect of university-industry collaboration on firm innovation

Firms that collaborate with universities tend to:

- Have more patents and lower internal R&D costs (high-tech firms) (George et al., 2002).
- Have higher revenues from new or improved products (Lööf and Broström, 2008).
- Be more productive and introduce innovations of great novelty (Hanel and St-Pierre, 2006).

But the majority of innovative firms do not collaborate with universities on innovation (Laursen and Salter, 2004; Drejer et al., 2014).

Universities may thus be under-utilized actors in the innovation system (Huggins and Kitagawa, 2012)

University-industry collaboration and geographical distance

When firms do collaborate with university, they tend to do it with their local university – indicating the importance of geographical proximity (Arundel and Geuna, 2004; Broström, 2010; Ponds et al. 2010).

….**but** we also know:

- that geographical proximity is neither a precondition nor a sufficient factor for fostering collaboration (Boschma, 2005),
- that collaboration is often based on social (employee driven) ties (Breschi and Lissoni, 2001; 2009),
- that absorptive capacity matters (Cohen and Levinthal, 1990);
- that firms often collaborate with more than one university (although this is often overlooked),
- that prior collaborations may influence current search processes for collaboration partners on innovation (Johnston and Huggins, 2015)

Research question

The purpose of the present paper is to analyse which factors influence firms' innovation oriented collaboration with specific universities.

Research question:

Does geographical distance maintain to be an important factor explaining firms' collaboration with specific universities when other factors, such as employee-driven relations, human capital and general experience from collaborating with universities are included.

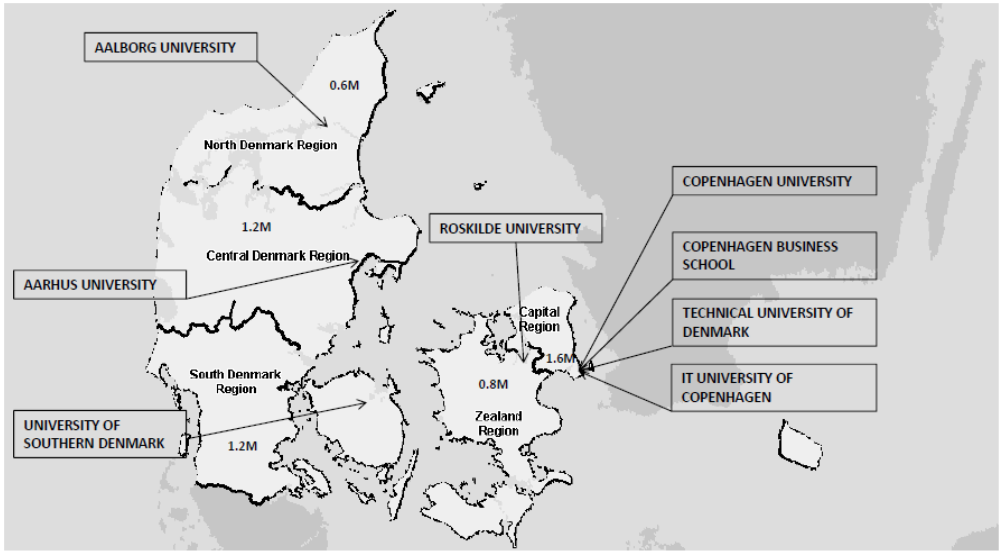
The analysis is based on a combination of detailed register micro data matched with recent innovation survey data for 2,183 innovative Danish firms.

It takes two to tango..

- Firms that want to collaborate with a university on innovation face several challenges
  - they need the relevant absorptive capacity to collaborate successfully with a university,
  - they need to find a relevant university to collaborate with and also to identify the specific research groups and researchers.

- However, universities are also active in the search for collaboration projects.
  - third mission activities,
  - partners in research projects,
  - partners in applications to various funding bodies that often require industrial participation.
- Ideally, university researchers should search for the most appropriate firms, but they are also influenced by bounded rationality, maintaining networks, and responsibilities related to keeping a strong regional identity.
- Therefore, researchers at the universities might use their social network to recruit former collaboration partners or former students.

Does it make any sense to talk about geographical distance in a small country?



- In a UK analysis, the average minimum distance between a sampled firm and the nearest university was 11.1 miles (Laursen et al., 2011).
- Faggian & McCann (2009) define labour mobility as a movement between two locations with a distance greater than 15 km between each other (almost all individual UK urban labour markets have a radius of less than 15 km)

A tendency towards within-region collaboration

Share of innovative firms in each region which have collaborated with each of the Danish universities on innovation

	Aalborg University (North Denmark Region)	Aarhus University (Central Denmark Region)	University of Southern Denmark	Roskilde University (Zealand Region)	Copenhagen University (Capital)	Copenhagen Business School (Capital Region)	Technical University of Denmark (Capital Region)	IT University of Denmark (Capital Region)	Any Danish university
Capital Region	4.8%	4.0%	4.4%	1.9%	7.9%	5.0%	10.4%	1.3%	15.9%
Zealand Region	1.5%	2.6%	1.5%	1.0%	4.6%	0.0%	5.6%	0.0%	11.2%
Southern Denmark Region	4.8%	3.4%	7.5%	0.0%	2.2%	0.2%	5.8%	0.0%	13.7%
Central Denmark Region	4.5%	6.9%	2.8%	0.4%	3.2%	0.9%	4.7%	0.2%	11.8%
North Denmark Region	12.3%	2.5%	1.0%	0.0%	0.5%	0.5%	2.9%	0.0%	14.7%
Any Danish region	5.2%	4.6%	4.0%	1.0%	4.8%	2.3%	7.7%	0.6%	

A tendency towards within-region hiring

Share of innovative firms in each region with employees that are graduates from each of the Danish universities

	Aalborg University (North Denmark Region)	Aarhus University (Central Denmark Region)	University of Southern Denmark	Roskilde University (Zealand Region)	Copenhagen University (Capital)	Copenhagen Business School (Capital Region)	Technical University of Denmark (Capital Region)	IT University of Denmark (Capital Region)	Any Danish university
Capital Region	33.6%	43.7%	34.1%	33.6%	55.2%	63.8%	41.4%	12.7%	83.9%
Zealand Region	11.2%	19.9%	16.3%	13.8%	29.1%	38.3%	32.1%	1.5%	62.2%
Southern Denmark Region	26.9%	36.5%	56.7%	2.4%	17.3%	14.4%	17.8%	1.2%	70.4%
Central Denmark Region	36.6%	58.7%	27.7%	4.1%	17.4%	10.5%	14.0%	1.3%	71.0%
North Denmark Region	62.3%	34.3%	10.3%	0.0%	5.9%	6.4%	12.8%	0.5%	71.6%
Any Danish region	33.7%	42.5%	33.2%	16.4%	32.9%	35.3%	27.5%	5.9%	75.5%

Method

Logistic regression models – one for each of the eight Danish universities.

2,183 innovative firms

Register data on firm location, size, industry and employees' educational level (and – if graduates - which institution they have graduated from).

Dependent variable:

- Firms' collaboration with the specific university (CIS data) 2010-2012

Explanatory variables:

- Geographical distance: travel distance (logarithm to the road travel time between the firm's and the university's postal code and then we subtract this value from the highest value in the data set (Boschma et al. 2014))
- Human capital/absorptive capacity: share of employees with higher education, 2009
- Collaboration with other universities (Danish or international), 2010-2012
- Employee-driven relations: at least one employee who has graduated from collaborating university prior to the period of innovation (social ties), 2009

Control variables:

- Firm size (# employees, five size groups)
- Industry affiliation (nine industry groups)
- Collaboration with suppliers, 2010-2012

	Aalborg University (North Denmark Region)	Aarhus University (Central Denmark Region)	University of Southern Denmark	Roskilde University (Zealand Region)	Copenhagen University (Capital Region)	Copenhagen Business School (Capital Region)	Technical University of Denmark (Capital Region)	IT University of Copenhagen (Capital Region)
Model 1 (max rescaled R^2)	(0.35)	(0.32)	(0.29)	(0.26)	(0.37)	(0.44)	(0.39)	(0.39)
Distance, inverse log	**0.51**		**0.43**	*0.46*			**0.32**	
Share of employees with higher education	**3.31**	**3.21**	**2.69**	**3.18**	**3.41**	**4.81**	**3.25**	**3.05**
Collaboration with suppliers	**1.26**	**1.11**	**1.19**	**0.77**	**1.19**	**1.44**	**1.29**	**1.33**
Industry and firm size controls	Yes							
Model 2 (max rescaled R^2)	(0.37)	(0.32)	(0.32)	(0.29)	(0.43)	(0.47)	(0.44)	(0.46)
Distance (inverse log)	**0.34**			0.34			*0.22*	
Share of employees with higher education	**2.73**	**3.17**	**2.16**	**2.62**	**2.23**	**4.26**	**2.52**	*3.06*
Collaboration with suppliers	**1.27**	**1.11**	**1.18**	**0.79**	**1.16**	**1.44**	**1.30**	**1.44**
Employees from same university	**0.60**		**0.67**	**0.72**	**1.06**	**0.80**	**0.90**	**0.99**
Industry and firm size controls	Yes							

Bold indicates significance at 1% level. *italics* at 5 % level -normal font indicate significance at 10% level.

	Aalborg University (North Denmark Region)	Aarhus University (Central Denmark Region)	University of Southern Denmark	Roskilde University (Zealand Region)	Copenhagen University (Capital Region)	Copenhagen Business School (Capital Region)	Technical University of Denmark (Capital Region)	IT University of Copenhagen (Capital Region)
Model 3 (max rescaled R^2)	(0.46)	(0.45)	(0.41)	(0.43)	(0.56)	(0.56)	(0.52)	(0.56)
Distance (inverse log)	**0.65**	*0.27*	**0.49**	*0.45*	0.15		**0.56**	
Share of employees with higher education	*1.54*	*1.44*			1.20	**3.16**	*1.47*	
Collaboration with suppliers	**0.75**	**0.53**	**0.65**		*0.41*	**0.75**	**0.82**	
Collaboration with other Danish Universities	**1.17**	**1.11**	**1.21**	**1.68**	**1.54**	**1.45**	**1.21**	**2.11**
Collaboration with foreign universities	**0.43**	**0.52**			**0.50**		**0.56**	
Industry and firm size controls	Yes							
Model 4 (max rescaled R^2)	(0.48)	(0.45)	(0.44)	(0.46)	(0.61)	(0.59)	(0.55)	(0.62)
Distance (inverse log)	**0.49**	*0.26*					**0.29**	
Share of employees with higher education		*1.42*				**2.64**		
Employees from same university	**0.67**		**0.64**	**0.79**	**1.09**	**1.00**	**0.72**	**1.14**
Coll. with other DK Universities	**1.19**	**1.11**	**1.22**	**1.64**	**1.56**	**1.52**	**1.14**	**2.21**
Coll. with foreign universities	**0.45**	**0.52**		0.42	**0.48**		**0.47**	
Collaboration with suppliers	**0.76**	**0.53**	**0.65**		*0.38*	**0.72**	**0.86**	
Industry and firm size controls	Yes							

Conclusions

- Geographical distance looses importance as an explanatory factor for firms' collaboration with universities when other factors are included (distance is important for three out of eight universities)
- Collaboration with other universities is an important explanatory factor behind firms' collaboration with specific universities.
- Having employees who are graduates from a specific university (employee-driven relations) influences firms' likelihood to collaborate with that university (for seven of the eight universities)

Therefore, previous findings of distance being a very important factor driving university-industry collaborations appears to a large extent to be a proxy for employee-driven relations to the collaborating university

Future work – refining the analyses

- More advanced measures of employee-driven links than just using a dummy
  - Number/percentage of employees who are graduates from a specific university
  - Management level employees who are graduates from a specific university
  - Distinguishing between recent and older graduates
  - Distinguishing between different types of graduates (are engineers e.g. more important as drivers of collaboration than other types of graduates?)
- Introduce a more general measure of general collaboration competences
- Exploring whether type of research matters (to the extent that this is possible)

THANK YOU FOR YOUR ATTENTION!

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