

The background of the slide features a photograph of a brick wall with a concrete pillar. A white sign with black text and arrows is mounted on the pillar. The sign reads "← 82 - 125" on the left and "82 - 125 →" on the right.

← 82 - 125

82 - 125 →

# The Role of Employee-Driven Relations and Persistence in University-Industry Collaboration on Regional Innovation

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# Previous research has documented an 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).



# Firms collaborating with universities

- Are often located in relative close proximity with the university (Broström, 2010; Laursen et al., 2011; D'Este et al., 2013).
- Tend to invest in R&D (e.g. Laursen and Salter, 2004).
- Tend to have university graduates among their employees (e.g. Bruneel et al., 2010; Laursen et al., 2011).
- Recent research has shown that this finding may to a large extent be the result of **employee-driven relations** where firms with employees who are graduates from a specific university are more likely to collaborate with this university (Drejer & Østergaard, 2017).

**However**, there are still many unanswered questions on the role of employee-driven relations and learning in university-industry collaborations



# Research question and hypotheses

**RQ: What is the role of employee-driven relations and persistence for firms' collaboration on innovation with specific universities?**

Main hypotheses:

**Hypothesis 1a.** The existence in a firm of an employee with a degree from a specific university increases the firm's likelihood of engaging in a collaboration on innovation with the specific university ('the alumni effect').

**Hypothesis 1b.** The existence in a firm of an employee with a degree from a specific university increases the firm's likelihood of a persistent collaboration on innovation with the specific university.

**Hypothesis 2.** If a firm has previously collaborated on innovation with a specific university, this increases the likelihood of the firm collaborating with this university in the subsequent period.



## Additional hypotheses

**Hypothesis 3.** If a firm invests in R&D then it is more likely to collaborate on innovation with a university.

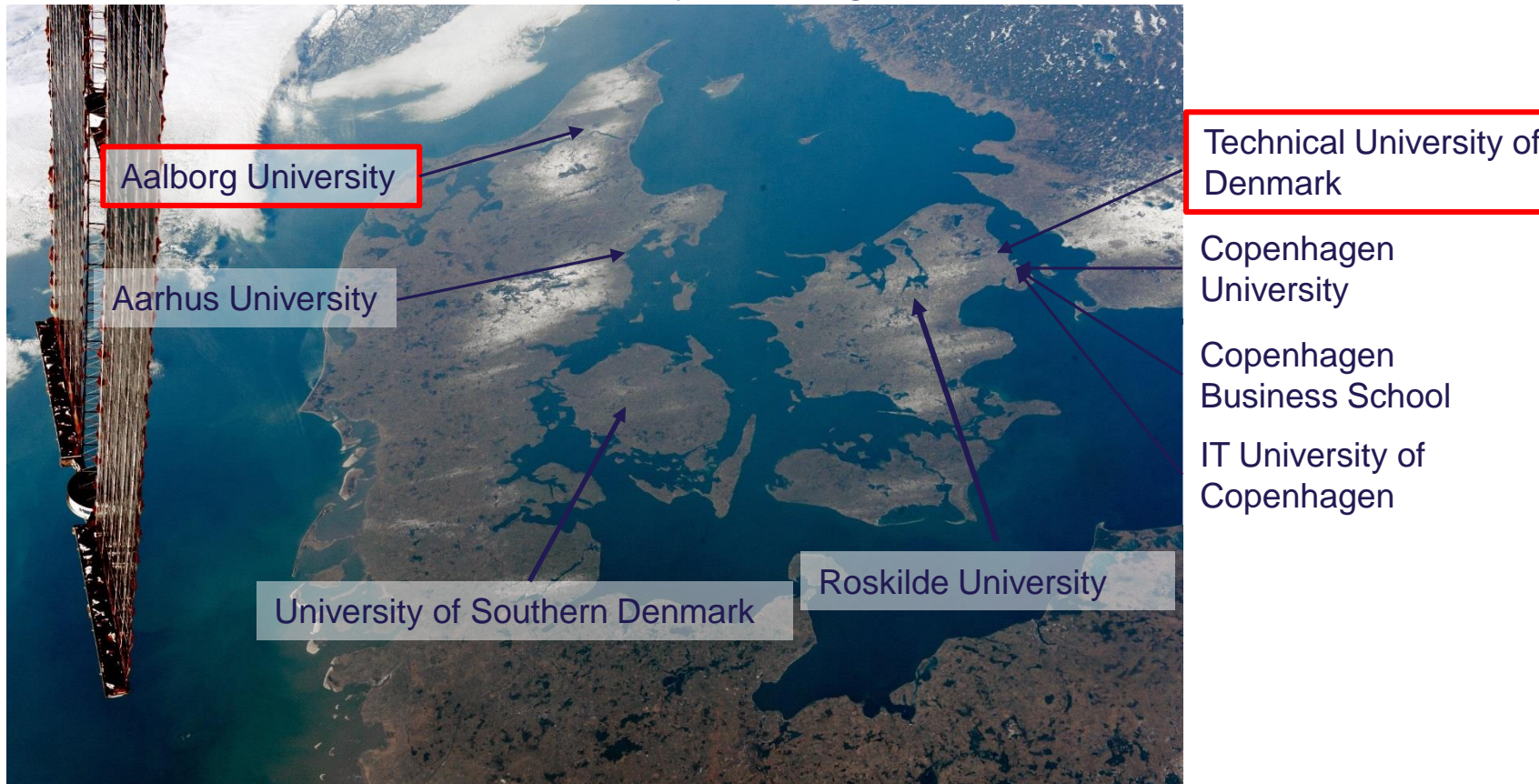
**Hypothesis 4.** If a firm is using multiple collaboration partners on innovation (openness) then it is more likely to collaborate on innovation with a university.

**Hypothesis 5.** If a firm is located geographically proximate to a specific university then is more likely to collaborate persistently on innovation with this university.



# Empirical setting

- 8 universities in Denmark – 5 multi-faculty and 3 specialised.
- The analysis focuses on the two **technically-oriented universities**:
  - The Technical University of Denmark (11,000 students in tech. sciences, ranked 153 in THE University Ranking 2018)
  - Aalborg University (8,000 students in tech. sciences + 12,500 other, ranked 201-250 in THE University Ranking 2018)



# Data and method

Logistic regression models on a combined sample (balanced panel) of innovation survey and register data

1,796 observations covering the periods 2009-11 and 2012-14

Dependent variable:

- Firms' collaboration on innovation with the specific university (single period and two consecutive periods respectively)

Independent variables:

- Employees who are graduates from specific university 2014 only (dummy)
- Employees from specific university 2011 only (dummy)
- Employees from specific university 2011 and 2014 (dummy)
- Employees from specific university 2011 (dummy)
- Share of employees from other universities 2014
- Collaboration with specific university 2009-11 (dummy)
- Travel distance firm-university
- Collaboration with other DK universities 2012-14 (dummy)
- Openness 2012-14
- R&D 2014
- Industry (9 groups)
- Firm size (5 groups)



# Collaboration with universities in CIS

**6.2 During the three years 2010 to 2012, did your enterprise co-operate on any of your innovation activities with other enterprises or institutions?** Innovation co-operation is active participation with other enterprises or institutions on innovation activities. Both partners do not need to commercially benefit. Exclude pure contracting out of work with no active co-operation.

Yes   
 No  **(Please go to question 7.1)** CO

## 6.3 Please indicate the type of innovation co-operation partner by location

*(Tick all that apply)*

Type of co-operation partner	[Your country]	Other Europe**	United States	China or India	All other countries
A. Other enterprises within your enterprise group	<input type="checkbox"/> Co11	<input type="checkbox"/> Co12	<input type="checkbox"/> Co13	<input type="checkbox"/> Co14	<input type="checkbox"/> Co15
B. Suppliers of equipment, materials, components, or software	<input type="checkbox"/> Co21	<input type="checkbox"/> Co22	<input type="checkbox"/> Co23	<input type="checkbox"/> Co24	<input type="checkbox"/> Co25
C. Clients or customers from the private sector	<input checked="" type="checkbox"/> Co311	<input checked="" type="checkbox"/> Co312	<input checked="" type="checkbox"/> Co313	<input checked="" type="checkbox"/> Co314	<input checked="" type="checkbox"/> Co315
D. Clients or customers from the public sector*	<input checked="" type="checkbox"/> Co321	<input checked="" type="checkbox"/> Co322	<input checked="" type="checkbox"/> Co323	<input checked="" type="checkbox"/> Co324	<input checked="" type="checkbox"/> Co325
E. Competitors or other enterprises in your sector	<input type="checkbox"/> Co41	<input type="checkbox"/> Co42	<input type="checkbox"/> Co43	<input type="checkbox"/> Co44	<input type="checkbox"/> Co45
F. Consultants and commercial labs	<input type="checkbox"/> Co51	<input type="checkbox"/> Co52	<input type="checkbox"/> Co53	<input type="checkbox"/> Co54	<input type="checkbox"/> Co55
G. Universities or other higher education institutions	<input type="checkbox"/> Co61	<input type="checkbox"/> Co62	<input type="checkbox"/> Co63	<input type="checkbox"/> Co64	<input type="checkbox"/> Co65
H. Government, public or private research institutes	<input type="checkbox"/> Co71	<input type="checkbox"/> Co72	<input type="checkbox"/> Co73	<input type="checkbox"/> Co74	<input type="checkbox"/> Co75





# The Danish version of the CIS survey

- If yes to "universities or other higher education institutions in Denmark" answer B:
- B: which Danish universities has the firm collaborated with on R&D or innovation?
  1. Copenhagen University
  2. Aarhus University
  3. University of Southern Denmark
  4. Roskilde University
  5. Aalborg University
  6. Technical University of Denmark
  7. IT University of Copenhagen
  8. Copenhagen Business School

# Descriptives

**Table 1. Innovation and university collaboration 2009-11 and 2012-14, respectively (weighted data)**

	Collaboration with any Danish university	Collaboration with Aalborg University	Collaboration with Technical University of Denmark	N
Innovative 2009-11	7%	2%	3%	2,307
Innovative 2012-14	10%	3%	4%	2,515

**Table 2. Distribution of participating firms according to innovation activity 2009-11 and 2012-14, respectively (weighted data)**

	Not innovative 2012-14	Innovative 2012-14
Not innovative 2009-11	0%	22%
Innovative 2009-11	30%	56%

**Table 3. Distribution of participating firms according to their employment of graduates from Aalborg University and Technical University of Denmark, 2011 and/or 2014 (weighted data).**

	Employees from Aalborg University	Employees from Technical University of Denmark
Not in either period	72.3%	76.8%
In 2011 but not in 2014	3.1%	2.2%
In 2014 but not in 2011	5.0%	3.2%
In 2011 and 2014	19.6%	17.8%
N	4,411	

# From employees to collaboration... but still a rare event

**Table 4. Frequency of occurrences of different combinations of presence/no presence of firms' collaboration with and employment of graduates from a specific university (weighted, N=4,411)**

	2011	2014	Aalborg University	Technical University of Denmark
1	No collaboration - No employees	No collaboration - No employees	70.72%	74.65%
2	No collaboration - Employees	No collaboration - Employees	16.71%	13.95%
3	No collaboration - No employees	No collaboration - Employees	4.76%	2.95%
4	No collaboration - Employees	No collaboration - No employees	2.94%	1.82%
5	<b>No collaboration - Employees</b>	<b>Collaboration - Employees</b>	<b>1.29%</b>	<b>1.36%</b>
6	Collaboration - Employees	No collaboration - Employees	1.04%	0.99%
7	No collaboration - No employees	Collaboration - No employees	0.70%	1.45%
8	Collaboration - No employees	No collaboration - No employees	0.65%	0.39%
9	Collaboration - Employees	Collaboration - Employees	0.59%	1.51%
10	Collaboration - No employees	Collaboration - No employees	0.17%	0.35%
11	Collaboration - Employees	No collaboration - No employees	0.14%	0.18%
12	<b>Collaboration - No employees</b>	<b>Collaboration - Employees</b>	<b>0.09%</b>	<b>0.02%</b>
13	No collaboration - No employees	Collaboration - Employees	0.09%	0.13%
14	No collaboration - Employees	Collaboration - No employees	0.05%	0.15%
15	Collaboration - No employees	No collaboration - Employees	0.05%	0.07%
16	Collaboration - Employees	Collaboration - No employees	0.00%	0.02%
			100%	100%

# Firm collaboration with Aalborg University 2012-14

Collaboration 2012-14	Effect (max-rescaled R <sup>2</sup> 0.64)	Effect (max-rescaled R <sup>2</sup> 0.64)
a. Empl. from specific university 2014 (dummy)	-	
b. Empl. from specific university 2011 (dummy)	-	
c. Empl. from specific university 2011 <u>and</u> 2014 (dummy)	-	
b+c. Employees from specific university 2011 (dummy)		Positive*
Share of empl. from other universities 2014	-	-
Collaboration with specific uni. 2009-11 (dummy)	Positive ***	Positive ***
Travel distance firm-university	Positive ***	Positive ***
Collaboration with other DK universities 2012-14 (dummy)	Positive ***	Positive ***
Openness 2012-14	Positive ***	Positive ***
R&D 2014	Positive ***	Positive ***
Size and industry controls	yes	yes

\*\*\* significant at 1% level  
 \*\* significant at 5% level  
 \* significant at 10 % level

# Firm collaboration with the Technical University of DK 2012-14

Collaboration 2012-14	Effect (max-rescaled R <sup>2</sup> 0.65)	Effect (max-rescaled R <sup>2</sup> 0.64)
a. Empl. from specific university 2014 (dummy)	-	
b. Empl. from specific university 2011 (dummy)	-	
c. Empl. from specific university 2011 <u>and</u> 2014 (dummy)	Positive***	
b+c. Employees from specific university 2011 (dummy)		Positive**
Share of empl. from other universities 2014	Negative***	Negative***
Collaboration with specific uni. 2009-11 (dummy)	Positive ***	Positive ***
Travel distance firm-university	Positive ***	Positive ***
Collaboration with other DK universities 2012-14 (dummy)	Positive ***	Positive ***
Openness 2012-14	Positive ***	Positive ***
R&D 2014	Positive ***	Positive ***
Size and industry controls	yes	yes

\*\*\* significant at 1% level  
 \*\* significant at 5% level  
 \* significant at 10 % level

# Persistence in firm collaboration with university

Collaboration 2009-2011 and 2012-14	Aalborg University (R <sup>2</sup> 0.51)	Technical University of Denmark (R <sup>2</sup> 0.61)
a. Empl. from specific university 2014 (dummy)	Positive*	-
b. Empl. from specific university 2011 (dummy)	-	-
c. Empl. from specific university 2011 <u>and</u> 2014 (dummy)	-	Positive***
Share of empl. from other universities 2014	-	Negative*
Travel distance firm-university	Positive ***	Positive ***
Collaboration with other DK universities 2012-14 (dummy)	Positive *	Positive ***
Openness 2012-14	Positive ***	Positive ***
R&D 2014	Positive *	Positive ***
Size and industry controls	yes	yes

- \*\*\* significant at 1% level
- \*\* significant at 5% level
- \* significant at 10 % level



# Conclusions

- The analysis supports the existence of an ‘alumni effect’: hiring of graduates from a specific university precedes engagement in collaboration (Hypothesis 1a)
- The ‘alumni effect’ appears to be relevant, not only for engaging in collaboration but also for maintaining a persistent collaboration with a specific university (Hypothesis 1b).
- Persistence in collaboration exist (Hypothesis 2).
  - Firms that previously have collaborated with a specific university are four to six times more likely to collaborate with that university in a subsequent period compared to similar non-collaborating firms.
- The analysis confirms the findings of previous studies that firms’ investment in R&D as well as their general openness in terms of different types of collaboration partners is positively associated also with collaboration with specific universities (Hypotheses 3 and 4).
- Geographical proximity matters for persistent collaboration: the likelihood of firms collaborating with a specific university increases as travel distance decreases (Hypothesis 5).



# Regional innovation policy implications

- Once a firm has started collaborating with a specific university it is much more likely to continue doing so: establishing collaboration between firms and universities can have long lasting effects.
    - firms learn valuable lessons that facilitate engaging in collaboration with additional universities, thereby broadening the access to relevant scientific knowledge less contingent on geographical proximity and social relations.
  - However, it is not sufficient to bring firms and universities together in the hope that connections will develop and collaboration flourish.
    - firms' collaboration with universities is a rare event, which is contingent on a set of firm specific factors some of which are difficult to influence through policies in the short term.
  - Programs facilitating firms hiring of university graduates appear to be an important step towards overcoming collaboration barriers.
    - However, this is not a sufficient condition, as most firms with university graduates among their employees do not collaborate with a university.
    - Investments in R&D is still a decisive factor in enhancing the firms' absorptive capacity for acquiring university knowledge.
    - Building up general collaborative competences through collaborating with multiple types of partners also reduces barriers for engaging in collaborations with universities.
- This knowledge can be used as a tool for regional innovation policy makers' screening of which firms are most likely to benefit from targeted programs aiming at enhancing university-industry collaboration on innovation.