

Regional technology demand and the transfer strategies and performance of universities and public research institutes

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Covariates of KTT success

Characteristics of the knowledge transfer office (KTO)

- Size and age of the KTO,
- The industry background and experience of KTO staff
- Other KTO characteristics such as level of autonomy from its affiliated university, the degree of centralization of services and transfer strategies

Characteristics of the affiliated institution

- Ownership (public or private),
- Size,
- Existence of engineering and natural sciences departments, hospitals,
- Research excellence and business orientation
- Institutional policies and practices

Contextual influences

- Laws and regulations on IP ownership
- Economic context

Regional covariates of KT success

Dependent variables (KTO level)	Independent concepts (regional level)			
	Technology intensity	Research in the private sector	Overall output	Venture capital
# invention disclosures	/ Germany (Hülsbeck, et al., 2013)		/ Germany (Hülsbeck et al., 2013)	
#patent applications		/ Europe (Van Looy et al., 2011)		
# R&D agreements		/ Europe (Van Looy et al., 2011)	/ Germany (Dornbusch, et al., 2012) ^a	
# start-ups	+ US (Friedman & Silberman, 2003) – US (O'Shea, et al., 2005)	+ Europe (Van Looy et al., 2011) + Italy (Algieri, et al., 2013) / Spain (González-Pernía, et al., 2013)		/ US (Di Gregorio & Shane, 2003) / Spain (González-Pernía et al., 2013) + Italy (Fini, et al., 2011)

Regional covariates of KT success contd.

Dependent variables (KTO level)

Independent concepts (regional level)	Technology intensity	Research in the private sector	Overall output	Venture capital
# licences	+ US (Friedman & Silberman, 2003) – US (Sine, et al. 2003) / Europe & US (Conti & Gaule, 2011)	+ US (Link & Siegel, 2005; Siegel, Waldman, & Link, 2003) + UK (Chapple, et al., 2005)	/ UK (Chapple et al., 2005) / US (Link & Siegel, 2005; Siegel et al., 2003) ^b	/ Spain (González-Pernía et al., 2013)
licensing income	+ US (Belenzon & Schankerman, 2009; Friedman & Silberman, 2003; Lach & Schankerman, 2008) + Europe & US (Conti & Gaule, 2011)	/ US (Siegel et al., 2003) + US (Link & Siegel, 2005) / UK (Chapple et al., 2005) / Spain (González-Pernía et al., 2013)	+ UK (Chapple et al., 2005) / US (Link & Siegel, 2005; Siegel et al., 2003) ^b	+ US (Warren, Hanke, & Trotzer, 2008)

Our objectives

- 1. Investigation of the relationship between regional characteristics and the KTT performance of universities and public research institutes**

- 2. Exploration of the mediating role of transfer strategies**
 - a) Do institutions tailor their transfer strategies to the economic characteristics of their regional environment?
 - b) Does this have an impact on their transfer performance?

Methodological approach

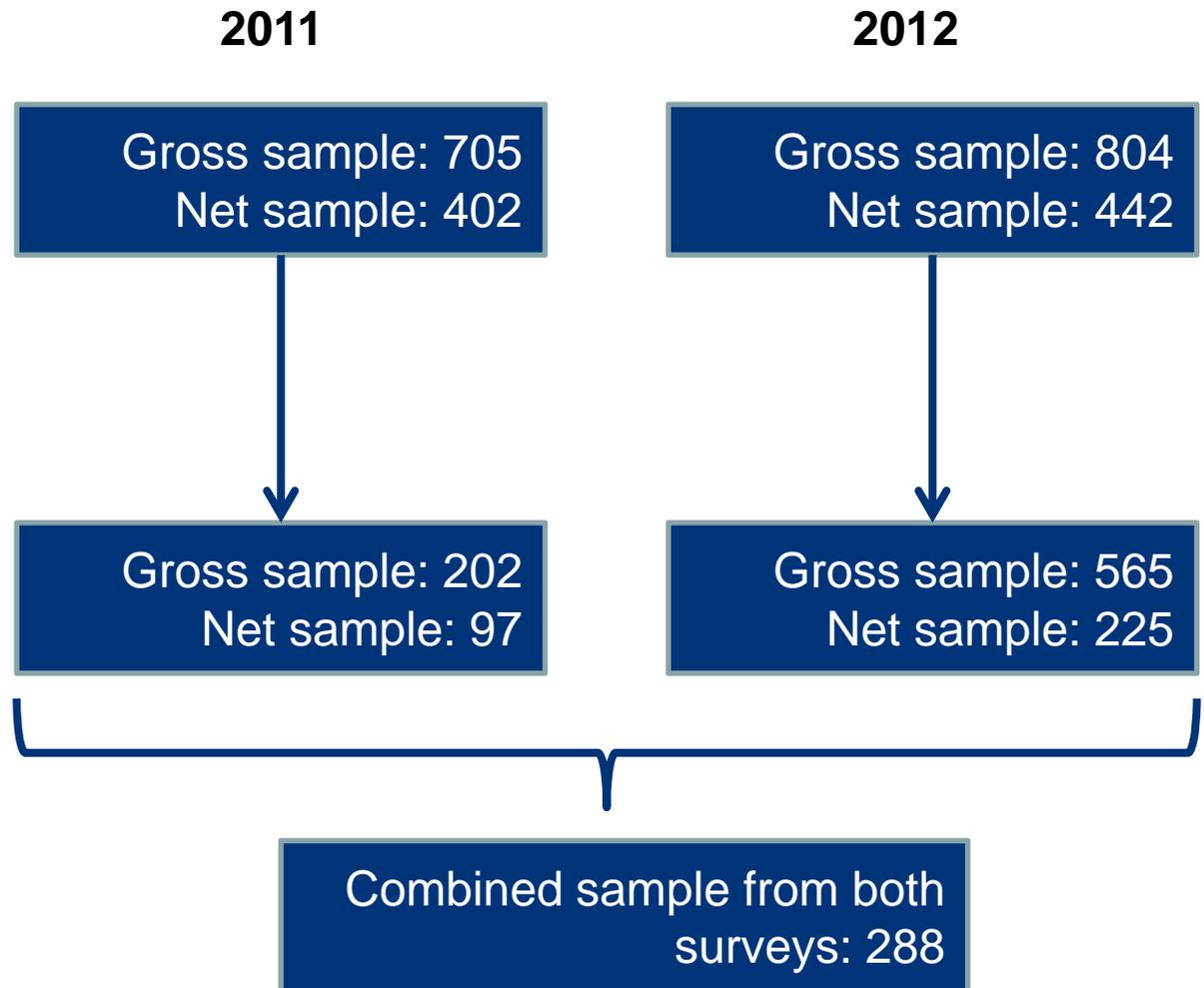
- **Nested surveys of KTOs at HEI and research institutes**
- **Population**
 - 39 countries with (estimated) 3'000 higher education institutions and 500 public/governmental research institutes
- **Sampling criteria**
 - Leading research institutes in the countries
 - PRO must have a KTO or dedicated personnel who provide support for knowledge transfer activities
 - Coverage of all 39 countries
- **Sample**
 - Inclusion of top institution in regard to research expenditures or research personnel per country (N=39)
 - Included institutions per country proportional to the share in the 39-country GOVERD+HERD total (averaged 2005-10) (N=461)

Survey approach

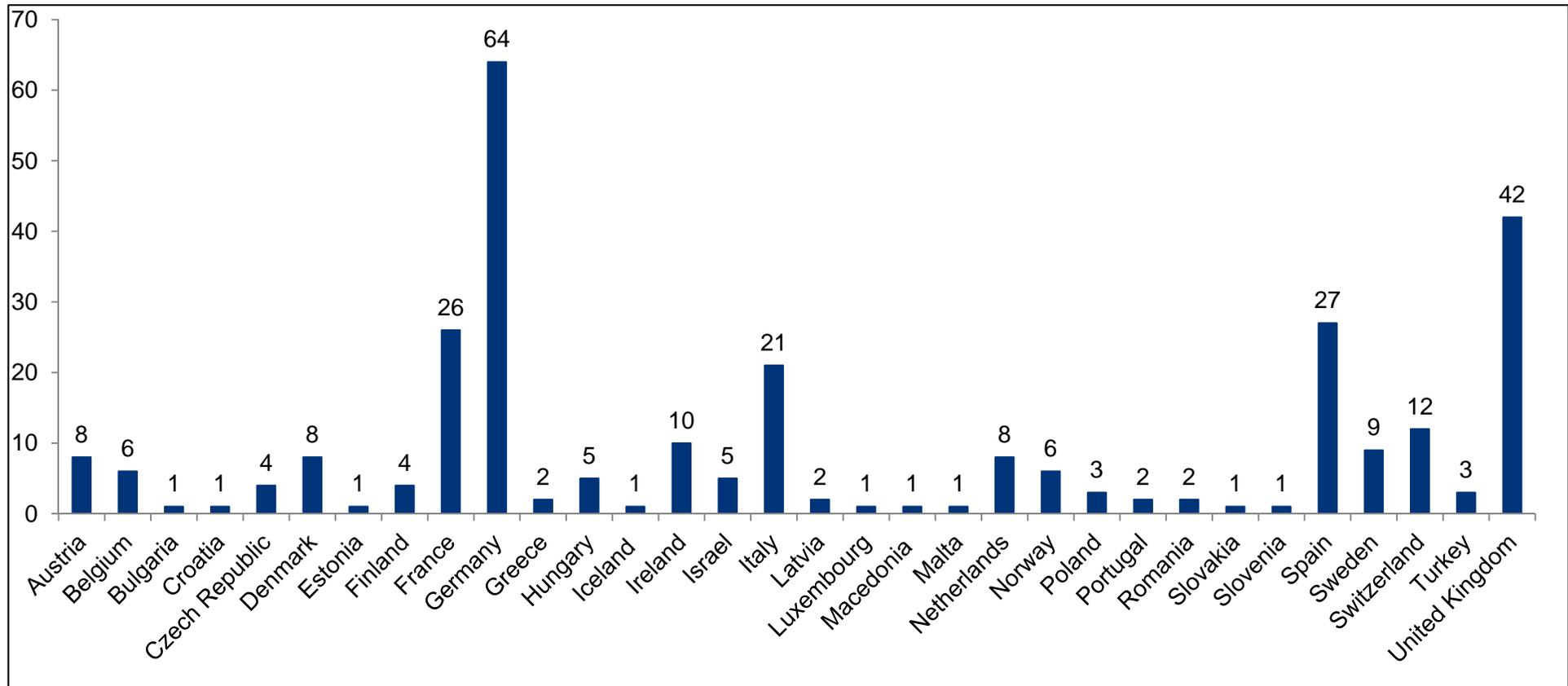
Postal European Knowledge Transfer Indicator Survey (UNU-MERIT)
plus data from national surveys

Online European Knowledge and Technology Transfer Practice Survey (FHNW)

Data basis of this analysis



Country distribution of the responses



Regional data

- **NUTS 2 level**
- **Eurostat data with 3 year averages (2008 – 2010)**
- **Control variables for region size and structure**
 - Employees (in 1'000)
 - GDP in mEUR PPP
 - Employment share in manufacturing (2011)
 - Employment share in services (2011)
- **Research in the private sector**
 - Business enterprise R&D expenditure (BERD) to GDP
 - Business Enterprise R&D Expenditure (BERD) to Gross Domestic R&D Expenditure (GERD)
- **Technology intensity**
 - Patent applications per million population
- **Regional output**
 - GDP per capita

Key performance indicators

	N ¹	Mean	Median	Standard deviation	Percent zero ²
Universities					
R&D agreements with companies	161	170.5	68	259.9	4.3
Patent applications	228	14.3	6	24.1	18.4
Licenses executed	200	11.3	3.5	21.5	24.5
Start-ups formed	214	5.2	2	14.6	33.2
Research institutes					
R&D agreements with companies	31	249	30	892.3	0.0
Patent applications	38	14.6	6.5	22.3	10.5
Licenses executed	37	13.7	3	28.2	24.3
Start-ups formed	38	1.3	1	1.3	34.2

Source: MERIT, European Knowledge Transfer Indicator Survey 2011 and 2012.

1: Number of KTOs reporting results for each performance measure (including zero outcomes).

2: Percent of respondents reporting 'zero' for each outcome. For example, 33.2% of 208 universities reported zero start-ups in 2010 or 2011.

Baseline NEGBIN regressions with control variables

Independent variable	R&D agreements	Patent applications	Licence agreements	Start-ups
Cases	151	202	188	198
Size (# of faculty)	+++	+++	++	+++
KTO size (in FTE)		+++		+++
With Hospital			++	
University			--	+++
IP owned by institution or companies			+++	
KTO age	+++		++	
KTO age squared	---	--		--

Source: MERIT, European Knowledge Transfer Indicator Survey 2011 and 2012.

Note: + = positive effect and $p < .1$; ++ = positive effect and $p < .05$; +++ = positive effect and $p < .01$; - = negative effect and $p < .1$; -- = negative effect and $p < .05$; --- = negative effect and $p < .01$.

Country dummies

Independent variable	R&D agreements	Patent applications	Licence agreements	Start-ups
Austria			-	
Germany	---			++
Denmark			---	
France				
Ireland			+++	+
Italy	---	--		
The Netherlands	++			
Spain				
Sweden	---		---	++
Switzerland				++
United Kingdom			+++	

Source: MERIT, European Knowledge Transfer Indicator Survey 2011 and 2012.

Note: + = positive effect and $p < .1$; ++ = positive effect and $p < .05$; +++ = positive effect and $p < .01$; - = negative effect and $p < .1$; -- = negative effect and $p < .05$; --- = negative effect and $p < .01$.

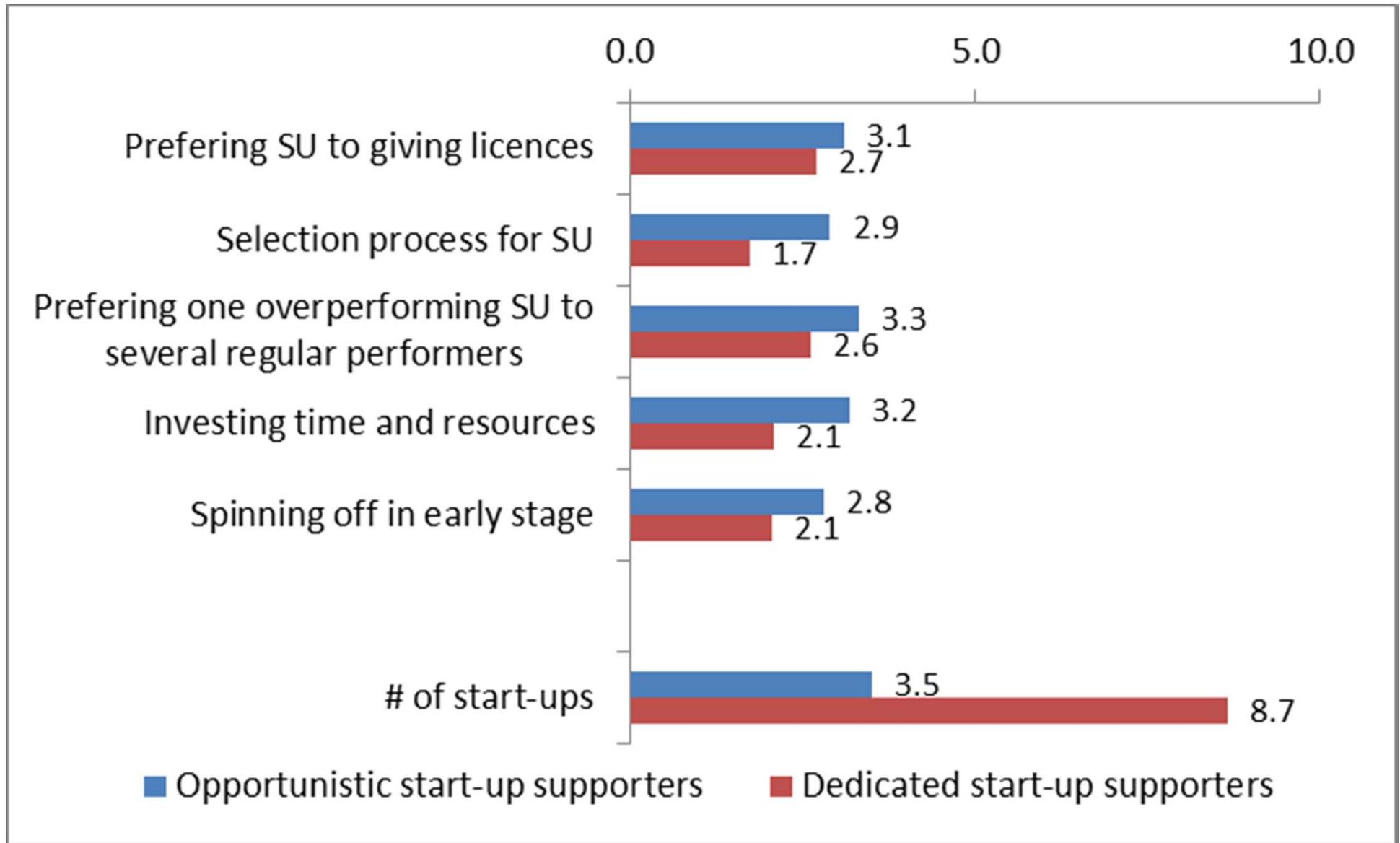
Regional level variables

Independent variable	R&D agreements	Patent applications	Licence agreements	Start-ups
GDP in mill. EUR PPP				
Employment in manufactg.	+++	++		
Employment in services				
GDP per capita	+++		++	++
GDP per capita squared	---		--	--
BERD/GERD ratio	---		--	--
BERD/GDP ratio				
Patent applications per mill. inhabitants	-		+++	

Source: MERIT, European Knowledge Transfer Indicator Survey 2011 and 2012.

Note: + = positive effect and $p < .1$; ++ = positive effect and $p < .05$; +++ = positive effect and $p < .01$; - = negative effect and $p < .1$; -- = negative effect and $p < .05$; --- = negative effect and $p < .01$.

Start-up strategies

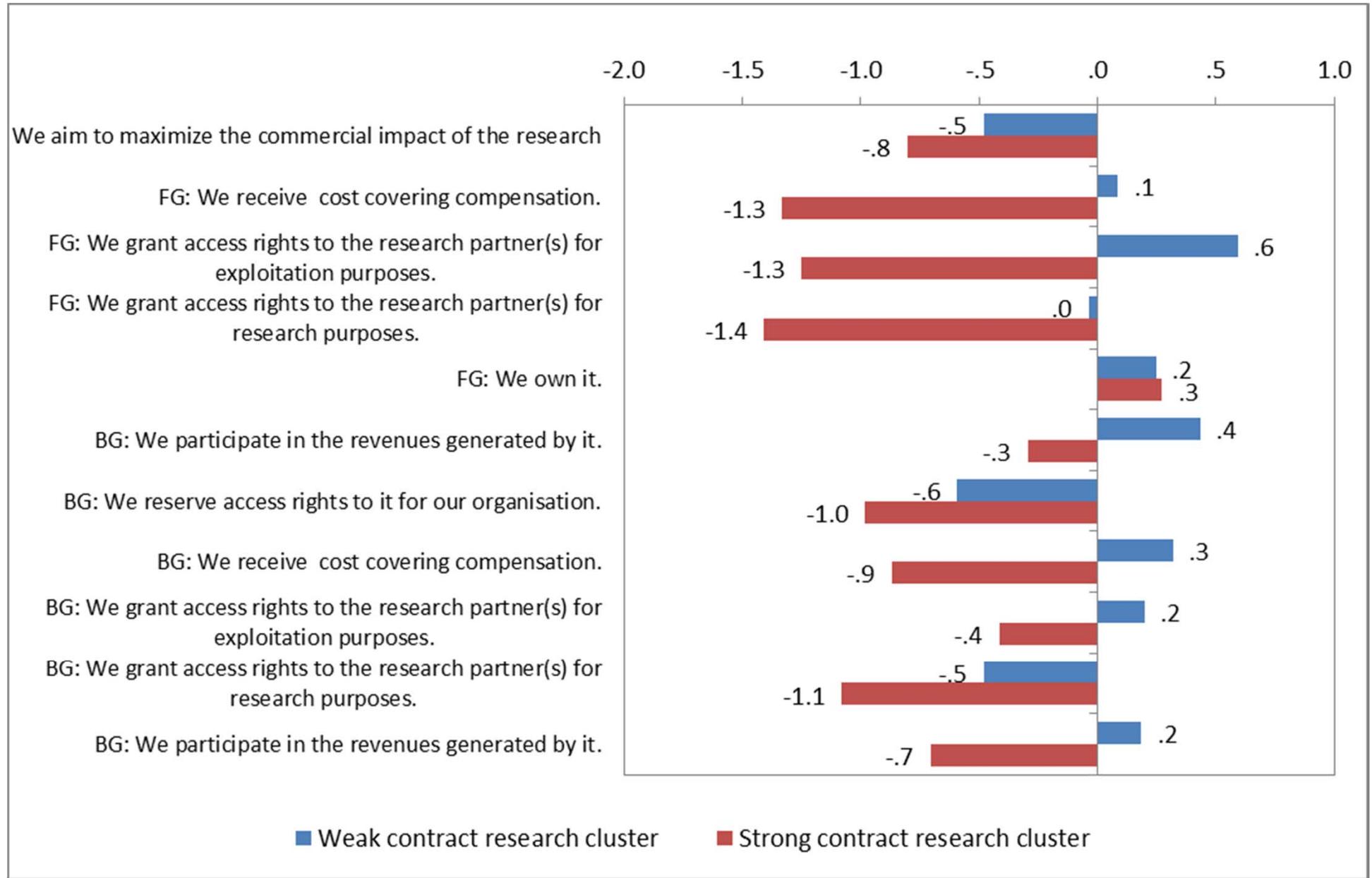


Covariates of dedicated start-up supporters

Independent variable	Dedicated start-up supporters
Constant	
Size (# of faculty)	++
KTO age	-
KTO age squared	+
IP owned by institution or companies	
Austria	+
Germany	+
Ireland	+
Italy	+
Sweden	
Employment in manufacturing	+
BERD/GERD ratio	:-

Source: MERIT, European Knowledge Transfer Indicator Survey 2011 and 2012.
 Note: + = positive effect and $p < .1$; ++ = positive effect and $p < .05$; +++ = positive effect and $p < .01$; - = negative effect and $p < .1$; -- = negative effect and $p < .05$; --- = negative effect and $p < .01$.

Contract research clusters



Covariates of strong contract research cluster

Independent variable	Strong contract research cluster
Constant	
Size (# of faculty)	++
With hospital	+
France	-
UK	++
GDP per capita	
GDP per capita squared	-
Employment in manufacturing	--
Employment in services	--
Patent app. per mill. inhabitants	+

Source: MERIT, European Knowledge Transfer Indicator Survey 2011 and 2012.

Note: + = positive effect and $p < .1$; ++ = positive effect and $p < .05$; +++ = positive effect and $p < .01$; - = negative effect and $p < .1$; -- = negative effect and $p < .05$; --- = negative effect and $p < .01$.

Summary

Our objectives

1. Relationship between regional characteristics and KTT performance
2. Exploration of the mediating role of transfer strategies

- 1. Institutions in high income regions perform better, but the effect is non-linear**
- 2. Institutions in regions with a strong public research sector perform better than institutions in regions with a strong private research sector.**
- 3. Institutions in technology-intensive regions close more license agreements but fewer R&D agreements.**
- 4. Dedicated start-up strategy correlates with**
 - higher start-up numbers
 - younger KTOs
 - a strong public research sector