From Physics to Daily Life

Universities and Corporations: The Case of Switzerland

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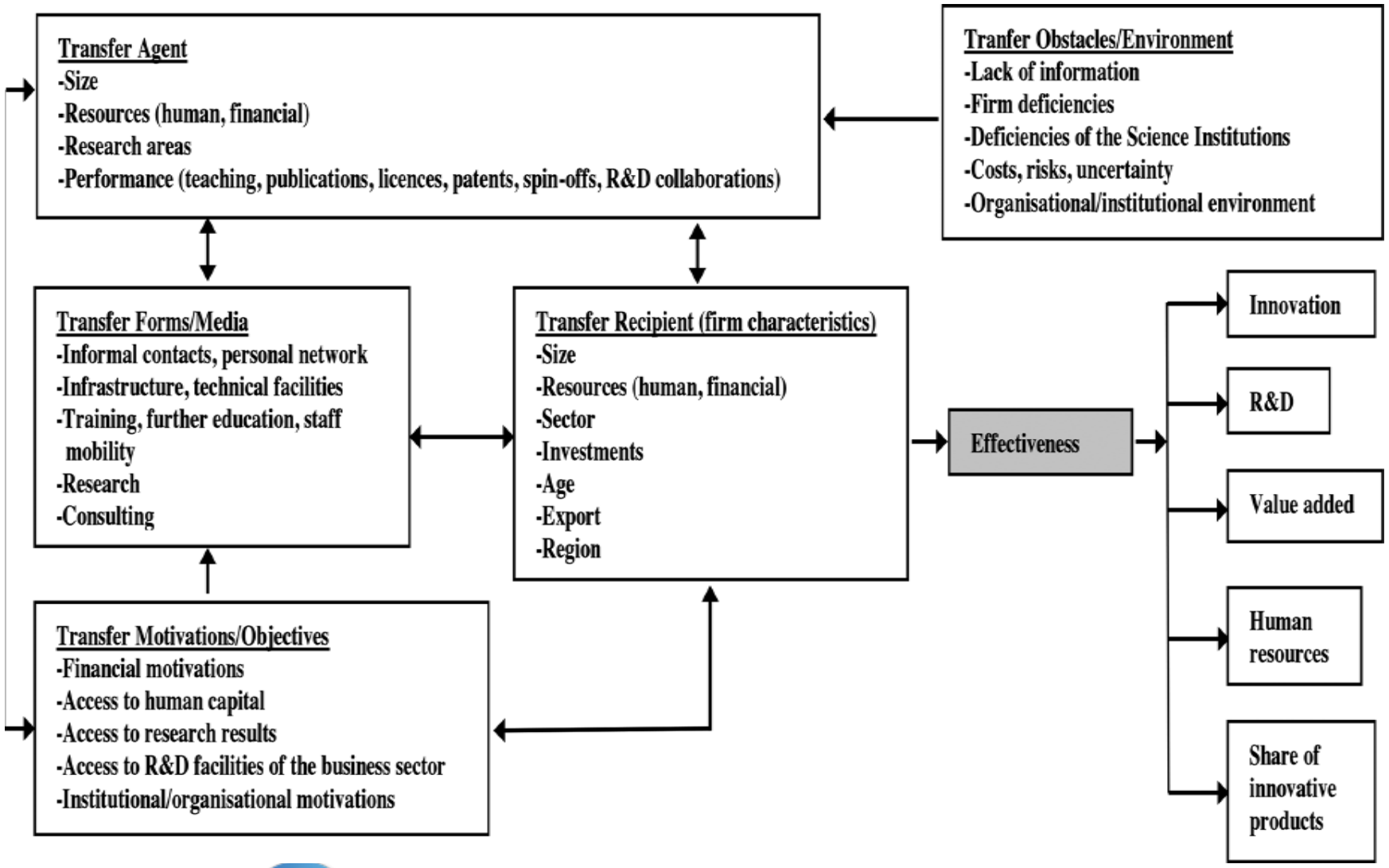
Stylized model for Knowledge and Technology Transfer



The View of the Firm

Incidence

How frequently KTT activities are taking place?

	2002-2004	Abroad 2002-2004	2008-2010	Abroad 2008-2010
Sectors				
Manufacturing	25.1	13.2	28.0	8.7
Construction	10.1	4.1	4.3	1.1
Services	26.7	8.3	24.6	4.7
Subsectors				
High-tech	28.3	18.9	44.6	15.9
Low-tech	23.4	10.1	16.7	3.8
Modern services	27.2	9.2	35.2	6.1
Traditional services	26.2	7.4	10.6	2.9
Size				
Small (5-49 empl.)	19.4	7.7	16.2	2.5
Medium (50-249 empl.)	33.7	11.9	34.7	11.6
Large (> 250 empl.)	44.9	18.3	57.3	27.8
Total	**22.2**	**8.6**	**21.1**	**5.0**

Forms of Knowledge and Technology Transfer and Technology Fields

Which forms are used to transfer knowledge and technologies?

Main categories of single forms of KTT; firms' percentage with KTT activities 2011

INFORMATION	**62.9**
Informal contacts	29.3
Attending conferences	37.0
Reading of, reference to publications	34.6
INFRASTRUCTURE	**13.9**
Joint laboratories	5.2
Use of university technical infrastructure	12.7
EDUCATION	**59.3**
Employing graduates in R&D	25.3
Contact of graduates with university	12.1
Students' participation in firm R&D	16.0
Diploma thesis	24.4
PhD	6.0
University researchers' participation in firm R&D	6.3
Joint courses	7.6
Teaching of firm researchers at university	17.0
Attending university training courses	41.0
RESEARCH	**17.1**
Joint R&D projects	15.8
Long-term research contracts	4.5
Research consortium	4.3
CONSULTING	**14.8**
Expertise	9.3
Consulting	13.0

Technology fields

In which technological fields transfer firms are active?

	% of firms with KTT
Nanotechnology	2.9
New materials	22.7
Microelectronics / semiconductor technology	5.3
Laser technology /optoelectronics / displays	7.8
Software / simulation / artificial intelligence	38.4
Telecommunication / information technology	15.9
Biotechnology / gene technology	3.6
Medical technology / sanitary engineering	13.9
Flexible computer-integrated manufacturing technology	11.7
Transport technology / traffic engineering / logistics	19.4
Energy technologies	22.6
Environmental technologies	33.1
Geological technologies	4.7
Mathematical models of finance	1.7

Motives for Transfer Activities

Motives

Why firms are active in KTT with universities? (% of Firms with KTT activities)

Access to human capital ("tacit knowledge")	**65.1**
Access to specific skills in addition to internal know-how	40.3
New research ideas	16.9
Further education, training possibilities	44.8
Recruitment of graduates	36.0
Access to basic research	16.4
Access to research results ("codified knowledge")	**28.9**
Access to patents/licences	2.3
Access to research results for subsequent internal use	11.2
Access to research results for developing new products	16.1
Access to research results for developing new processes	17.7
Access to R&D infrastructure	8.3
Financial motives	**33.0**
Cost-saving in R&D	9.9
Reduction of technical R&D risks	10.8
Time-saving in R&D	15.7
Insufficient firm R&D resources	11.3
Project characteristics require cooperation with scientific institutions	21.7
Institutional/organisational motives	**28.1**
Building up a new research field	2.2
R&D outsourcing as a strategic measure	6.1
R&D cooperation as a condition for public funding	15.1
Improvement of firm image through co-operation with scientific institutions	12.6
Indirect access to competitors' knowledge	5.1

Transfer Obstacles

Obstacles

Which factors hinder KTT activities?

	KTT	No KTT	All firms
LACK OF INFORMATION	**21.6**	**26.1**	**25.2**
Difficulty getting information about R&D in science institutions	11.3	20.0	18.2
Difficulty finding contact persons	15.3	20.6	19.5
Lack of resources for “interface” (e.g. transfer office)	7.3	18.7	16.3
FIRM DEFICIENCIES	**43.3**	**55.2**	**52.7**
Lack of qualified staff	21.8	21.8	21.8
Lack of technical equipment	10.2	20.3	18.2
Lack of interest in scientific projects	10.2	34.5	29.4
Firms’ R&D questions are not interesting for science institutions	25.4	43.6	39.8
DEFICIENCIES OF SCIENCE INSTITUTIONS	**36.7**	**42.7**	**41.4**
Lack of scientific staff for transfer activities	4.6	19.1	16.1
Lack of entrepreneurial spirit	13.9	17.7	16.9
R&D orientation of science institutions is uninteresting for firms	18.4	33.9	30.7
Possible R&D results cannot be commercialised	19.9	30.4	28.2
COST, RISKS, UNCERTAINTY	**44.3**	**42.1**	**42.6**
Secrecy with respect to firms’ know-how is not guaranteed	14.7	17.8	17.1
Need for comprehensive additional follow-up work in order to implement public R&D results	19.3	19.9	19.8
Lack of firm financial resources for transfer activities	25.9	33.9	32.2
Science institutions’ lack of financial resources for cooperation on an equal basis with firms	13.0	21.8	19.9
Insufficient efficiency of university staff compared to firms’ staff	10.5	17.9	16.3
Technological dependency on external institutions	8.2	15.9	14.3
Uncertainty about outcomes of cooperation	13.1	20.7	19.1

Obstacles

Which factors hinder KTT activities?

	KTT	No KTT	All firms
INSTITUTIONAL/ORGANISATIONAL OBSTACLES	**31.1**	**30.4**	**30.5**
Costly administrative and approval procedure	18.3	24.4	23.1
Lack of administrative support for joint R&D projects on the university's part	10.2	17.2	15.7
Lack of administrative support for the commercialisation of R&D outcomes on the university's part	7.6	17.2	15.1
Problems with property rights	9.6	17.4	15.8
Problems with project management at universities (e.g. communication problems)	7.0	18.0	15.7
Different understanding of priorities	14.4	19.3	18.3
Lack of trust on the firm's part	4.6	15.9	13.5
Risk of losing reputation on the firm's part	1.1	15.3	12.3

Analytical Part (econometrical evidence)

Propensity to KTT activities

Drivers of KTT activities from the firms' point of view

Determinants	Effect on KTT
Gross investment per employee	Positive / no effect
Share of employees with tertiary-level education	Positive
R&D activities yes/no	Positive
Export intensity	Positive / no effect
Firm size	Positive (non-linear)
Firm age	Positive
Domestic ownership	Positive / no effect
Technological field:	
Nanotechnology; New Materials; Software/Simulation/Artificial Intelligence; Biotechnology; Environmental Technologies	Positive
Obstacles to KTT activities:	
Lack of information	Positive
Firm deficiencies	Negative
Deficiencies of universities	Negative
Cost, risks	Positive
Organizational/institutional problems	No effect

Impact of KTT on Firm Performance

	R&D expenditures / sales	Sales share of modified products	Sales share of new products	Labour productivity
Overall KTT activities	Positive	Positive	Positive	Positive
Forms of KTT activities				
Research	-	Positive	Positive	-
Education	-	Positive	Positive	-
Technical infrastructure	-	No effect	Positive	-
Consulting	-	No effect	No effect	-

Summary of the presented results

Summary

- About 1/5 of Swiss firms have KTT
- Important forms:
  - Information/education related contacts
- Important motives:
  - access to human capital/specific skill
- Important obstacles:
  - firms' research questions are not interesting for research institutions
  - lack of financial means for transfer
- Transfer propensity:
  - older, R&D active firms, with a higher share of tertiary-level educated employees
- Transfer Impact:
  - positive on innovation and labour productivity