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Knowledge without borders? A re-investigation from the spatial and temporal perspective

Jue WANG

Liwei ZHANG

Nanyang Technological University, Singapore

Introduction

- Knowledge diffusion and spatial constraints
 - Tacit knowledge
 - Codified knowledge
- Empirical studies
 - Patent and citations
 - Localization of knowledge diffusion
 - Publication and citations
 - Less localized?
 - No strong evidence

Research questions

- Whether the spatial boundary in the dissemination of publications is indeed less visible?
- If not, how it matters?

Theoretical framework

- Heterogeneous diffusion model (Strang & Tuma, 1993)
 - Spatial heterogeneity: variation in the chance for members in the population affecting and being affected by each other
 - Temporal heterogeneity: the potential adoption varies with the length of time since their occurrence
- Space effect
 - Physical proximity and social network
 - Country used as the geographic unit
 - Languages, history, culture, and political institutions
- Time effect
 - Space effect is more evident for newly produced publications

Hypotheses

- H1: Knowledge diffuses faster in the domestic research community in the early years of publication. *Confirmed*
- H2: The proximal advantage in knowledge diffusion diminishes after the early years of publication. *Confirmed*

Data

- Seed articles

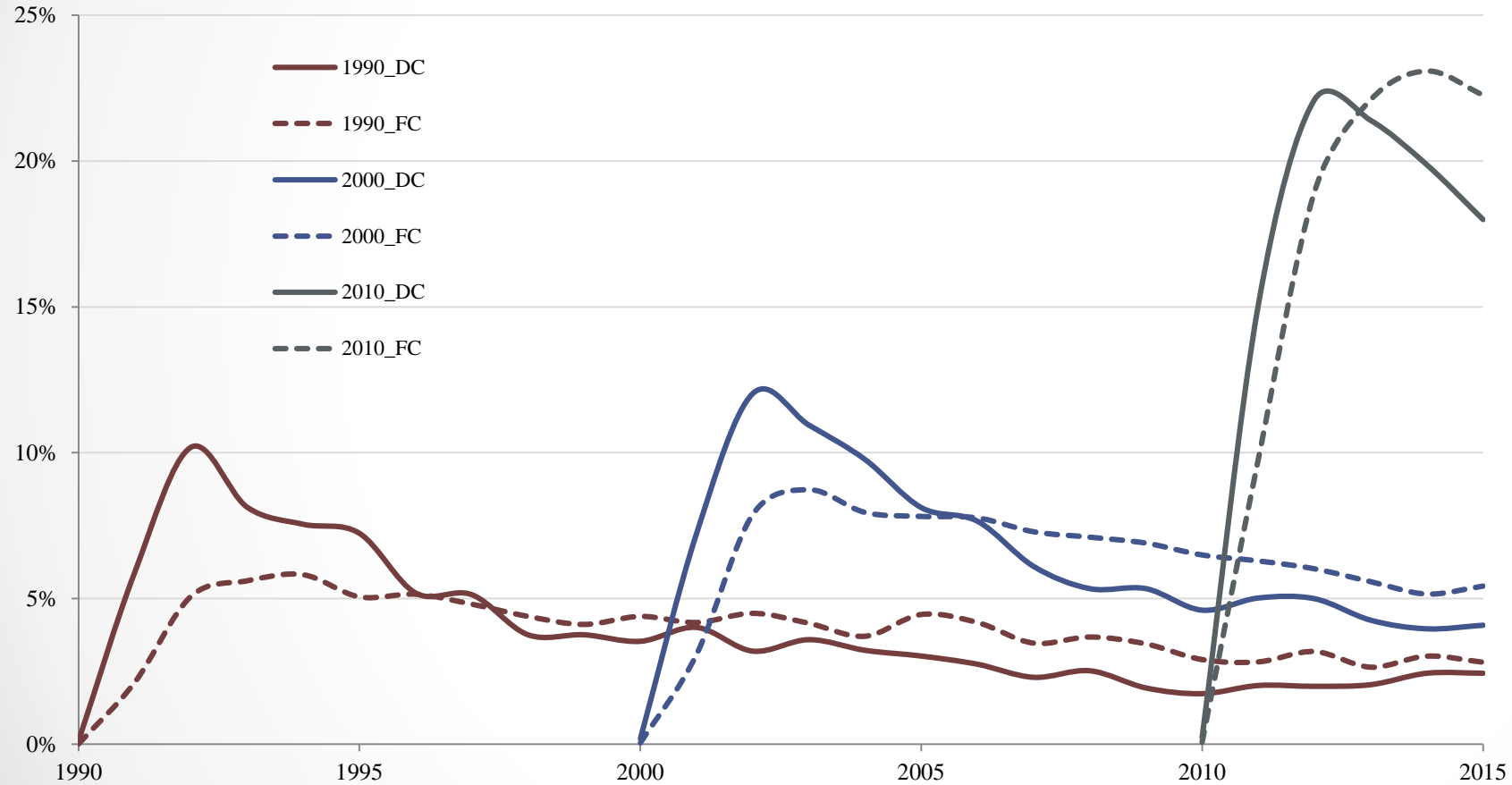
- SCI publications from WoS
- Research articles
- WC=Physics, Multidisciplinary
- Published during Dec 16–31th for three years: 1990, 2000 and 2010

- Citing articles

- All citations by year 2015 for each seed article
- All types of publications

Year	Seed Articles	Citing Articles
1990	225	11,200
2000	238	9,970
2010	342	10,005
Total	805	31,175

Speed of diffusion



- Country location
 - Domestic citation (DC)
 - Foreign citation (FC)
- Share of DC and FC
- DC accumulated faster and reached the peak earlier than FC

Summary statistics of variables

VARIABLES	N	mean	sd	min	max
TC _{it}	11,694	2.628	6.864	0	129
DC _{it}	11,694	1.023	2.835	0	51
FC _{it}	11,694	1.605	4.721	0	102
DIFF_FC_DC _{it}	11,694	0.581	3.678	-25	81
Time _{it}	11,694	9.124	7.057	0	25
Time ² _{it}	11,694	133.0	165.5	0	625
Country_num _i	11,694	1.328	1.064	1	37
IF _i	11,694	4.572	3.138	1.359	17.49
US _i	11,694	0.302	0.459	0	1
PY1990 _i	11,694	0.500	0.500	0	1
PY2000 _i	11,694	0.324	0.468	0	1
Number of ID	805	805	805	805	805

Regression result

VARIABLES	(1) TC	(2) DC	(3) FC	(4) DIFF_FC_DC
Time	0.189***	0.014*	0.174***	0.029***
Time ²	-0.009***	-0.002***	-0.008***	
Country_num	0.130	0.202***	-0.072	-0.275***
IF	0.677***	0.271***	0.406***	0.136***
US	0.731	0.713***	0.019	-0.688***
PY1990	-1.570***	-0.766***	-0.804**	0.104
PY2000	-1.351***	-0.552***	-0.799**	0.017
Constant	-0.094	-0.016	-0.076	0.207
Observations	11,694	11,694	11,694	11,694
Number of ID	805	805	805	805

Findings and discussions

- Knowledge diffusion is indeed affected by spatial boundaries
- Domestic citations accumulated faster in the early years of publications than foreign citations
 - Social network and geographic distance
 - Similar research agenda due to national policy or funding
- Foreign citations pick up a few years after of publication and last longer
 - When publication is visible to the field
 - International research community is much more wider