University-Industry Interaction and Scientific Productivity: Evidence from China

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Research Objective

Over the last decades, university–industry relations have attracted a lot of attention for promoting the "Third Mission" of universities by fostering links with knowledge users and facilitating technology transfer (Bercovitz, and Feldman, 2008; Jenson et al., 2010; Aguiar-Diaz et al., 2015). There is, however, widespread concern that heavy involvement with firms or entrepreneurial activities may "corrupt" the academic research agenda, distracting attention from the fundamental research, and concentrating it on the application-oriented needs of the industry. *This project* addresses the long-standing question of the effect of university-industry proximity on academic output and performance *by utilizing a unique dataset which covers four types of university-industry (UI) interactions (contract research, licensing, trade secrets and university spin-off) of 61 Chinese research-intensive universities from 2009 to 2015, focusing how different types UI interactions impact on academic research output.*

This project contributes to the extant literature in two ways. First, we will deploy a qualitative and quantitative research approach to understand the effects of industry involvement in different circumstances (e.g. contract research, licensing and spin-off), considering the effects of industry engagement on academic publishing. Second, previous studies have mostly focused on OECD countries, whereas emerging economies like China – the focus of this paper – India or Brazil have been less studied. To the best of our knowledge, only Zhang and Wang (2017) have used individual data and Cheng et al. (2018) have used province data to study relationship between UI interaction and research output in China. This project aims to fill this gap by offering empirical evidence about Chinese university-industry interaction and research output at institutional level.

Theoretical Background and Hypothesis

The relationship between university–industry linkage and the academic research output and performance has been controversial. On the one hand, studies have shown that the number of university–industry relations has a positive effect on researchers' productivity (Perkmann et al., 2013; Banal-Estanol et al., 2015; Muscio et al., 2017; Tseng et al., 2018), since it can enable researchers to actively seek ideas and resources from industry and shape their research agendas accordingly. On the other, closer relationship with the industry can generate time pressure, thereby reducing the ability to concentrate on academically relevant outputs (Calderini et al., 2007). As several authors have pointed out, university–industry interactions embrace a much broader spectrum of activities than commercialization of intellectual property.

Production of scientific research involves multiple inputs, including **knowledge, time** and **resources** (Griliches, 1979). Other **constraints** in university-industry interactions such as information confidentiality proposed by companies will also affect the dissemination of research results and have impact on university scientific productivity (Stephan, 2012). This project is premised on the idea that university-industry interactions affect the four main determinants of university scientific output (Stephan, 1996; Lee, 2000; Banal-Estanol et al., 2015).

Accordingly, we hypothesize:

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1) Contract research commissioned by industry have an inverted U-shaped effect on research output;
2) Licensing has a positive effect on research output;
3) Trade secrets have a negative effect on research output;
4) university spin-offs have a negative effect on research output.

Empirical Context and Data

Before the reform of the higher education system in 1984, there was very little technology transfer in Chinese universities (Chen and Kenney, 2007). As part of the transition to market economy, the Chinese government implemented a series of policies aimed at encouraging research collaboration between university and industry and technology transfer (Chen at al., 2016). The developing closer relationship between university and industry and the growth of university commercialization give us a great opportunity to investigate how university-industry interactions affect academic research output. Three major datasets will be utilized to construct the dataset:

- Higher Education Statistical Survey (HESS): The surveys conducted by Ministry of Education contains the R&D information about public universities in China. The information includes university publications, number of technology transfer contracts, funding resources, revenue from patent licensing and other 23 indicators relevant to university R&D
- Web of Science (WoS): WoS database for university annually publications and citations
- University-run Enterprise Statistical Survey: The surveys conducted by Ministry of Education contains operating and finance information about Chinese university-run enterprise.

Expected Results and Policy Implication

Preliminary empirical results seem to go in the direction of the four hypotheses listed above. In particular, contract research and technology transfer (e.g. licensing, trade secrets) have different impact on university scientific productivity. Contract research commissioned by industry have an inverted U-shaped effect on research output; and licensing has positive effect on research but trade secrets has negative effect on research output. Support from NBER will allow us to acquire additional data of university-run enterprise in China which leads to deeper investigation about the impact of university spin-off on university scientific productivity.

The theoretical framework and the empirical results of this research shed light on policy making at the institutional level to build an entrepreneurial university with less “corruption” of the academic research agenda. To create an institutional environment that attracts industry resources, interaction with industry not only promotes university absorptive capacity and facilitates scientific production, but also allows easier access to more resource which enhance the research production. Maintaining a balanced relationship with industry is, however, also necessary for a sustainable entrepreneurial university. Excessive proximity with industry might generate extra pressures such as time limitation or research constraint, thereby reducing the ability to concentrate on academically relevant outputs.

We believe our results will have broader appeal than for a single country. Support from NBER will allow us to expand our theoretical and empirical research with additional case studies of different regions in China and other emerging countries. We will conduct interviews with university faculty members and build case studies from five different regions of China. The case studies will allow us to understand whether what we examine is a particular Chinese phenomenon unfurling under a certain cultural and policy background or one could learn lessons for other countries and future studies could be replicated in other emerging economies.

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Budget Estimate

	Description	Cost ($)	Cost in total ($)
Data	University-run Enterprise Statistical Survey	1000	1000
	Transfer the data into electronic data (RA)		
	University-run enterprise statistical Survey	1250	1250
	Higher Education Statistical Survey	1250	1250
	Web of Science	500	500
Field Work	Interviews in China		4000
Conference	Two conferences in United States		
	Innovation Policy and the Economy NBER	1800 per person	3600
	Atlanta Conference on Science and Innovation Policy	1800 per person	3600
	International Conference	2500 per person	5000
Sum Cost			19200