MINISTRY OF SCIENCE AND TECHNOLOGY OF THE GOVERNMENT OF THE PEOPLE'S REPUBLIC OF CHINA (MOST)

CHINESE ACADEMY OF SCIENCE AND TECHNOLOGY FOR DEVELOPMENT (CASTED)

WIPO WORLD INTELLECTUAL PROPERTY ORGANIZATION

Leveraging Public Research for Innovation and Growth - An international Comparison of Knowledge Transfer Policies and Practices

Introduction and Research Objective

Universities and public research organizations (PROs) play a key role in innovation through their contribution to the production and diffusion of knowledge.

Policies and practices at the national and institutional level have been developed to support the commercialization of publicly-funded research through formal transfer mechanisms.[1] These include regulations on the ownership of intellectual property (IP), the creation of knowledge transfer offices, incentive schemes to encourage the licensing out of inventions, the establishment of spin-offs, and institutional policies managing knowledge transfer.[2]

High-income economies have implemented relevant policies and practices for some time. More recently, low- and middle-income economies have been pursuing knowledge transfer activities. Related efforts are underway in large middle-income countries such as Brazil, China, India, Malaysia, Mexico, the Philippines and South Africa, but also in other middle- and lower-income countries such as Colombia, Kenya, Sri Lanka, Uganda, and Thailand. Yet, it is noteworthy that countries have implemented a diverse range of legal, policy and institutional approaches to knowledge transfer. No unique public-private knowledge transfer blueprint is recognized as time-tested and optimal.

Accordingly, a vital question for policy-makers today is how to improve the efficiency of these knowledge transfer practices in order to maximize innovation-driven growth, while being mindful of the fact that countries at different stages of development might require different approaches. Unfortunately, it is not straightforward for policy-makers to determine which policies and practices work and which do not. While several countries and institutions have garnered substantial experience with diverse approaches, academic research has not identified a set of policies and practices that maximize knowledge transfer and downstream economic outcomes.

Part of the problem is the fact that the sound evaluation of knowledge transfer policies is still a challenge. Three issues are at stake.

[1] See WIPO (2011), Zuñiga (2011) and OECD (2013).
[2] European Commission (2008).

First, a commonly accepted conceptual and evaluation framework for comprehensively identifying the possible costs, benefits, and impacts of knowledge transfer approaches is missing. Second, although there are some comparable knowledge transfer metrics for a few countries, such as the United States (US), the United Kingdom (UK), and Denmark, for most countries data collection is either sporadic or unavailable.[3] Valid, international comparisons over time are hardly possible. Third, it is likely that there are several *combinations* of policies that result in successful outcomes and which partly depend on national and institutional characteristics, including industry structures, the level of development and national and institutional policies and practices. This complicates the identification of effective policies and practices across countries, requiring the use of new analytical techniques.

In June 2014, the Francis Gurry, Director General, WIPO agreed with H.E. Mr. Wan Gang, Minister for Science and Technology, to pursue a joint MOST-WIPO research project on knowledge transfer policies and practices addressing these questions. This project has three objectives:

1. Developing a conceptual framework for the evaluation of knowledge transfer activities, related practices and outcomes. This framework would draw on and further develop the one conceived for the *World Intellectual Property Report 2011*.[4] It will underline that relying on single indicators such as university patents or licensing income alone is unlikely to capture the full spectrum of knowledge transfer activities and outcomes.
2. Identifying optimal survey methods and metrics which mirror the above conceptual framework and which help assess knowledge transfer activities and outcomes. A standardized set of metrics for assessing national or institutional performance relevant to both high- and middle-income countries will be developed. These metrics will be compared to data that are currently available for a selected number of countries in order to determine critical data gaps and to provide suggestions on how to fill them.
3. Applying different analytical methods to test the relationship between policies and practices on both knowledge transfer activities - for instance, the number of licenses - and downstream economic outcomes. If sufficient data are available, analytical methods will be applied to identify "what works best" under different conditions.

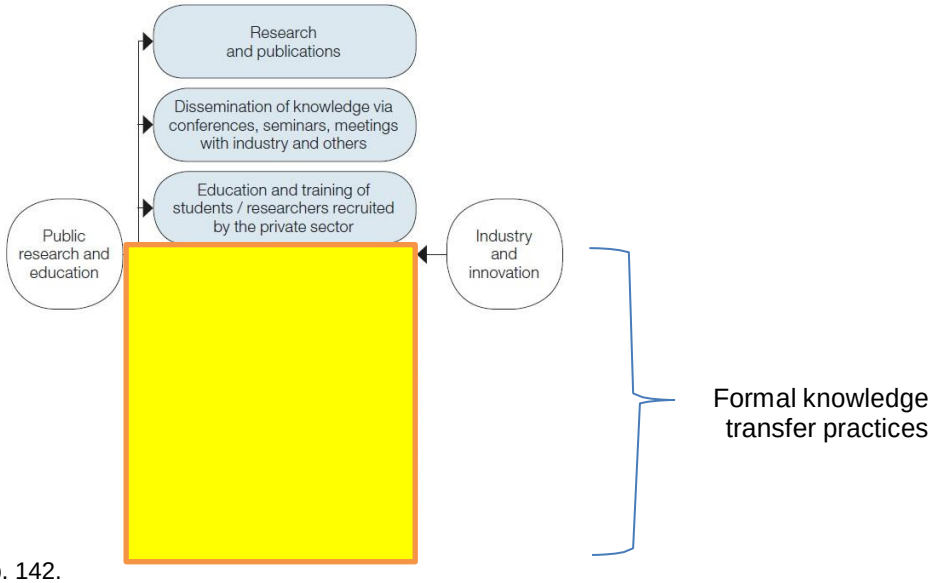
Fulfilling these objectives will result in policy advice on how to evaluate and support effective policies and practices. Ideally, the survey and evaluation framework can also be deployed by WIPO or other organizations to other countries to yield comparable data over time.

Focus of the Project

Public-private knowledge transfer occurs through a large number of formal and informal channels (see Figure 1). Informal channels include the transfer of knowledge through publications, conferences and informal exchanges between scientists. Formal channels include contracting technology services, research collaboration, creating university spin-offs or joint-ventures, and IP-related channels. This project will focus on formal knowledge transfer channels as highlighted in Figure 1. However, where possible, metrics and interrelationships between formal and informal transfer channels will be assessed.

[3] Arundel and Bordoy (2008) and Arundel *et al* (2013).
[4] See tables 4.5, 4.6 and 4.13 in WIPO (2011).

Figure 1. The multiple vectors of knowledge transfer from universities and PROs to industry



Source: WIPO (2011), p. 142.

Main Components of the Project

Two distinct but interrelated strands of research will be pursued to address the project's objectives. The first focuses on identifying the necessary metrics for an evaluation framework while the second applies the framework through country studies.

1. Improved conceptual framework and corresponding metrics for knowledge transfer, relevant policies, practices, and outcomes

Building on existing approaches, three questions stand out:

1) Which conceptual framework provides good guidance on how to evaluate knowledge transfer policies, practices, and outcomes?
2) Which corresponding metrics are required to produce internationally comparable data on formal knowledge transfer practices and their impacts?
3) Which processes need to be put in place to collect these data?

Experts will provide a conceptual framework to evaluate knowledge transfer practices and outcomes, and review existing related statistical approaches. The research will go beyond related approaches in high-income countries to also cover the burgeoning activities in middle-income countries. On this basis, suggestions will be made for how to improve relevant metrics – including the production of a standardized international survey instrument – and to identify the minimum number of metrics for determining 'what works' best. This component of the study will also produce a replicable statistical assessment of global and country-specific university and PRO patenting, including the identification of such patents in high-technology areas.[5]

The methodology for this section of the study will entail (i) in-depth desk research and a literature review, including an assessment of available metrics by a leading expert, in conjunction with countries and the WIPO Secretariat, and (ii) work on producing internationally comparable patent statistics for universities and PROs.

[5] See the approach taken in WIPO (2015), Chapters 2 and 3.

Outputs: a conceptual framework, one study reviewing available data for knowledge transfer, and a set of agreed metrics and suggested survey templates and instruments.

2. Analyzing knowledge transfer practices and outcomes so far

As to policy, the following questions stand out:

1) What knowledge transfer laws and practices have been put in place in high- and middle-income countries? Can they be grouped into distinct approaches?
2) What are the specifics of these approaches ranging from the legal and institutional approaches, the incentive and evaluation structures, and other transfer components?
3) Which overall economic and other impacts have been measured?
    a. Which approaches have a demonstrated positive impact over others? How have new policies affected previous knowledge transfer channels?
    b. Have potential negative effects on the science and innovation system been measured? What is their extent and what are containment strategies?
    c. Do approaches exist that are particularly relevant to developing countries?

To address these questions, a study will review the prevailing national policy and academic studies on these matters in order to generate lessons on approaches and outcomes.
In addition, a series of country studies will be carried out. This component of the study will involve the following tasks:

2a. Analysis drawing on the existing literature and available data

Part 2a. of the study involves three tasks, covering:

Task 1) Description of the evolving role of public research institutions in modern innovation systems

Task 2) Stock-taking of specific knowledge transfer policies and practices in detail, including the identification of distinct approaches in both high- and middle-income economies

Task 3) Reviewing the academic literature of the various approaches taken, including the identification of good practices and failures

2b. Selected comparative country studies to assess approaches and impacts

A set of detailed country studies will be conducted. These will follow a uniform research approach, drawing on and implementing the recommendations of the aforementioned statistical research component, including, if possible, the production of a common set of metrics and the deployment of a common survey instrument.

The suggested countries are the following:

2-3 high-income countries:	**2-3 middle-income countries:**
UK, Germany, Republic of Korea	Brazil, China, South Africa

Where possible, the collected data will be studied to identify combinations of policies and practices that improve knowledge transfer and economic outcomes.[6]

Outputs: report on the results of Part 2a, a country study template, six country studies, and, where possible, analytical work on the basis of national data.

If possible, all country reports and studies will be published in English, Chinese and other requested languages.

Currently the plan is that the results of this project will lead to a future book proposal under our book agreement with Cambridge University Press.

Timelines

In the 2016/2017 biennium, the project will proceed in the following stages.

	Time-frame	Content
Stage 1	February 2016	- Hiring of all international and national experts
Stage 2	Now to mid-March	- Production of draft outline for the metrics paper and draft structure for country studies (Arundel)
Stage 3	Project kick-off call mid-March 2016	- Discussion of draft country study template to align with inputs from country experts - Discussion of draft outline for the metrics paper
Stage 4	End April 2016	- Draft country study template (Arundel) and start of country studies
Stage 5	July 2016	- Draft study on metrics (Arundel) for team discussion and further input to country studies
Stage 6	July 18 or 19, 2016	- Intermediate workshop at MOST on July 18/19 with international expert, WIPO and China team - Final study on metrics - Agreed approach for country studies
Stage 7	by mid-November 2016	- First draft of country studies for team discussion (feedback until end-November 2016) and first draft of overview study covering the elements of above section 2a (Arundel and Wunsch-Vincent).
Stage 8	March, 27-29 2017	- International workshop, UNU-MERIT/MOST/WIPO, Maastricht • Presentation of revised country studies • Presentation of final metrics paper
Stage 10	July 2017 October 2017	- Finalization of all study inputs, including sections 2a. and 2b., and data analyses - Launch of the full report

[6] Effective policies and practices can be identified using multivariate regression methods, but identifying combinations of effective policies and practices, or 'what works' under different conditions, would benefit from the use of qualitative comparative analysis (QCA), an emerging statistical method for identifying multiple combinations of factors that are correlated with outcomes.

Teams

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