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## Chinese Innovation and Global Integration- Theoretical Framework of Perceived Insecurities in University Technology Transfer

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# CHINESE INNOVATION AND GLOBAL INTEGRATION - THEORETICAL FRAMEWORK OF PERCEIVED INSECURITIES IN UNIVERSITY TECHNOLOGY TRANSFER

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## ABSTRACT

University technology transfer is growing in China and is vital to China's innovation and intellectual property program. This paper provides a literature review used to create a theoretical framework for explaining conflicts between university technology transfer participants. Economic development and business competitiveness relies on innovation and intellectual property generation. Given increased investments in university research and Chinese universities, it is important to be aware of conflicts between university technology transfer office staff and faculty within academic exchanges. University technology transfer is growing in China and is vital to China's innovation and intellectual property program. Conflicts between university technology transfer participants can thwart efforts to create thriving, successful university technology innovation and commercialization programs. This paper provides a literature review which defines insecurity as perceived threats felt by both the faculty researchers and TTO staff. From this literature review, a theoretical conceptual framework and hypotheses were developed to explain this phenomenon.

*Keywords: intellectual property, job insecurity, technology commercialization, culture in research, research and development, technology development, Chinese intellectual property piracy, IP piracy*

## INTRODUCTION

This research is motivated by recent concerns over Chinese piracy of intellectual property. This research identifies conflicts between participants in university technology transfer which can harm academic exchanges between American and Chinese researchers. Universities have increased contributions to China's national innovation systems (Singh, 2015). In the late 1990s, a number of regulations were adopted by central and provincial Chinese governments to increase technological innovation and university-industry partnerships (Nezu, 2007). This is evidenced by the fact that since 2000, China has been the largest producer of science and engineering doctoral degrees; and the growth has been at a rapid rate. There were 4,000 awarded in 1996 and 31,000 by 2010 (NSF, 2014). Also, in

the early twenty-first century, there were about 2,000 scientific university ran businesses employing 238,000 employees including 78,000 researchers resulting in an increase of university technology transfer (Nezu, 2007).

Like the American universities, the details of managing intellectual property (IP) rights in collaborations are decided by the Chinese universities. Many Chinese universities have University IP Management Offices with publicly stated IP rules and require that their researchers file IP disclosure forms (Nezu, 2007). Thus, there is increasing transparency. With the increase of university managed business enterprises, there is growth in international collaborations. For example, the Japanese Kyoto University set up a technology licensing office in China. Although many Chinese universities have publicly stated their IP rules, there is a need for more consistency in IP rights management and more transparency given the increase in international collaborations (Nezu, 2007).

Academic interest in China's tech transfer has increased in both China and in America (Chen, 2016). University technology transfer offices (TTOs) have been around in America since the passage of the Bayh Dole Act in 1980. TTOs emerged in China nearly 20 years later in 1999 at the Xi'an Jiotong University and East China University of Science and Technology (Nezu, 2007). There are at least 30 TTOs in operation in China. Faculty are critical to university-industry licensing because if the research faculty did not participate in university tech commercialization, there would be a lack of university owned intellectual property (IP) to license and potential licensees to license patented inventions to (Thursby, 2004). Although the TTO staff is also critical, faculty researchers' attitudes about university tech transfer and their participation have more influence on the success of university tech licensing than the assistance provided by university TTOs (Wu, 2014). There are potential conflicts between the American faculty researchers and their university TTO staff persons. Herein, it is argued that in multicultural academic exchanges between American and Chinese researchers, there are also potential conflicts due to perceived threats. These threats are largely influenced by American's focused attention on IP piracy problems in China.

This research begins with a literature review of felt insecurities from both the faculty researchers' and TTO staff's perspectives. This is followed with a discussion of IP piracy violations and the work of cross-cultural teams. Based on these findings, a conceptual theoretical framework which explains this phenomenon is described.

## LITERATURE REVIEW

### Defining Insecurity as a Perceived Threat

#### *Faculty Researchers' Insecurities*

**Counterfeits and IP piracy.** When Chinese university researchers seek to work collaboratively with American university researchers, there are likely to be perceived insecurities. Legal researchers have noted that as America's legal regime is aimed to protect American intellectual property, it thwarts the optimal foster of innovation (Dreyfuss, 2016). The lack of clarity over IP ownership rights can make American universities unattractive to Chinese students, visiting faculty and other collaborators given the litigious nature of the 1996 Economic Espionage Act (EEA) involving harm to academic exchanges (Dreyfuss, 2016). Academic exchanges between American and Chinese faculty can also be harmed by perceived insecurities about IP piracy and current concerns about counterfeit product markets. It is estimated that 5 to 10% of world trade is counterfeit goods valued at an estimated \$500 billion in lost sales to companies with legal rights to those products (Amine, 2007). There is evidence that IP owners have to raise their prices and quality; and reduce sales in order to attract product demand and compete against Chinese counterfeit products. This evidence may lead to insecurities and distrust at the R&D phase of product innovation and academic exchanges between American and Chinese researchers. At the production phase of tech commercialization, there is evidence that when Chinese multinationals fear losing tech advantages to counterfeits, they fragment their production among multiple local plants to diminish information flow and deter IP infringement; or they may limit the range of technologies that they offer (Sun, 2010, Maskus, 2000, Fink, 2016). This leads to inefficiencies and a reduction in the ultimate technology transfer into the commercial marketplace.

The high incidents of counterfeiting and IP Piracy in the East (China and India) in comparison to the West (America) is likely the result of cultural differences. Owning and protecting IP rights is a Western concept and infringing on IP rights is not viewed as morally wrong in China (Chaudhry, 2009). In fact, although the World Intellectual Property Organization (WIPO) was created in 1967 (WIPO, 2017), IP laws were not adopted in China until the late 1970s and China was not admitted into WIPO until 1980 (Amine, 2007). China did not have patent laws until 1984. Whereas, the American patent protection is included in the US Constitution legislative powers given to Congress signed in 1787 to promote science and the arts (History.com, 2009). Thus, there is nearly 200-year time span between the birth of the American and Chinese IP legal systems.

This cultural difference has presented conflicts between American university researchers and Chinese national researchers in the United States. It has also resulted in race- based hate and discrimination directed toward Chinese students and faculty on university campuses. For example, the racists flyers were posted at the University of Texas at Austin School of Engineering accusing

Chinese students of plagiarizing and in need of special ethics lessons (Herreria, 2017). Yet, the reality is that there is a widespread global problem with consumer complicity to purchase counterfeits, to ignore IP owner legal rights and protections, and to support counterfeit sellers in order to express anti-big business sentiments (Chaudhry, 2009, Tom, 1998). Yet, there are serious concerns in China. The Office of the US Trade Representative (USTR) has China on Section 306 monitoring due to its serious problems with regard to IP rights protection in trade (Piquero, 2005). This does not help American Chinese research relationships. For example, in the software industry, by the year 2001, China had piracy rates of over 90 percent (Ronkainen, 2001). Using cultural value dimensions (Hofstede, 1980), Ronkainen (2001) found that countries with high power distance displayed higher levels of piracy than more equalitarian societies. These types of countries display concerns of interpersonal distrust and feelings of unfair deals. Further, the higher the avoidance of uncertain and ambiguous situations, the higher the rate of piracy (Ronkainen, 2001).

Forty-nine (49) American firms formed an anti-counterfeiting coalition in China. The coalition's purpose was to implement resistance strategies against deceptive product designs, labeling and packaging. However, they are losing the battle (Amine, 2007). Arguably, the American/China IP piracy war increases perceptions of perceived threats to IP rights and in turn to job security for research faculty who rely on the creation and protection of the results of their R&D. It can lead to distrust.

Besides IP rights issues, other problem areas with cultural differences in multicultural research teams include communication issues with accents, fluency, differing attitudes toward authority and hierarchy, indirect versus direct communication, and conflicting decision-making norms. The key to rectifying these communication problems is to acknowledge and discuss the cultural gaps and establish norms (Brett, 2006). Trust is essential to high functioning multi-cultural teams. Having team leaders that understand cultural and language differences and multi-cultural perspectives; and the ability to establish clear norms is essential to building trust in cross-cultural teams (Molinsky, 2016).

**American faculty researchers' conflicts with their university TTO staff.** To further fuel insecurities, there are issues among the American university technology transfer players. In America, non-tenured faculty have less independence than tenured faculty and considerable voice in influencing university choices (McPherson, 1999). In addition, what is produced in the academy is highly specialized and advances the need for long-term job security (McPherson, 1999). In research universities that offer tenure, non-tenured faculty researchers strive to earn tenure and guard themselves in the process of achieving this goal. A fundamental question that arises is whether the American faculty researcher's participation in university tech commercialization will count toward tenure.

American faculty researchers are evaluated on the basis of their research, teaching and service. Faculty members may choose not to participate in technology commercialization and not to work with their TTO because scholarly work is advocated more so in university policies than commercialization activity which is typically ranked as a service and does not weigh as much in TNP decisions (Markman, 2005, Link, 2008). Since, in research universities, faculty research findings count the most toward tenure, faculty members are very guarded and protective about their research. Getting involved with TTO staff has been deemed an act of delegation on the part of faculty (Jain, 2009). This occurs only after the faculty researcher perceives the TTO staff as trustworthy.

When it comes to TTO staff's insecurity, there are perceived threats to positive performance evaluation outcomes. TTO staff competency is evidenced by their actual educational backgrounds, prior work experience and years of work experience in the TTO. As aforementioned, the faculty researchers have concerns about the TTO staff's competence and their ability to manage the disclosed inventions, gain patent protection, and communicate effectively with industry representations regarding licensing opportunities. Tech transfer is a social knowledge-making action for which professional communication is central to the transfer of the technology transfer (Perkins, 1993). Well, the TTO staff may be equally insecure about these responsibilities. They will gain more confidence and feel less perceived insecurity as they gain more experience and education.

Technology transfer is typically a research administration service located in the research offices of universities. In America, the TTO directors often report to the Vice Presidents of Research. TTO performance is measured by the number of startups and licenses formed. With respect to research administration, some of the challenges include faculty fear of the unknown in that they do not know how their engagement in research and tech transfer will turn. More importantly, they question what is in it for them (Miner, 2003). Problems include not understanding why any new focus on tech commercialization is needed, lack of confidence in leaders and general mistrust. Faculty researchers question why leaders want them to do more when their workload may already be too heavy (Miner, 2003).

One issue is the TTO staff's perception of faculty researchers' motivation to engage in university tech commercialization. TTO directors have listed faculty indifference and ideological resistance as impediments to securing discoveries from faculty inventors (Markman, 2005). While applied researchers care little about increases in university patenting, there is fear among some basic researchers that patenting might get in the way of their research choices (Davis, 2011).

In addition, the time demanded by faculty researchers and university administrators can be problematic. At many researcher universities, TTOs are very demanding, high stress work

environments (Abrams, 2009). These offices operate in crisis mode with deadlines, mounds of paperwork, pressure, budget restrictions and bureaucracy (Hesselton-Mangan, 2003). This is particularly true of universities with larger research volumes. In general, with respect to time management, research administrators like the TTO staff are responsible for inspiring faculty to submit invention disclosures, bolstering the university's research culture, and gaining buy-in to research activities, and training faculty and other personnel about research policies and procedures (Miner, 2003). The time demanded of the TTO staff by their customers depend on their customers' ever changing expectations which need to be managed (Weeks, 2006).

Potential conflicts in American-Chinese research exchanges

## PROPOSED THEORETICAL FRAMEWORK

Based on the literature review, a theoretical framework for Chinese American academic tech transfer exchanges was developed. The study of perceived insecurity is complicated. Figure 1 depicts conceptually independent variables that can be and in fact, have been measured to assess individual insecurity distress and how that distress correlates to TTO staff performance, the dependent variable. TTO performance is a measure of licensing revenues and start-up companies formed by the TTOs.

### Propositions

#### *Faculty researchers' job insecurity*

As per the findings in the literature review, faculty researchers' perceived threats to tenure and promotion are impacted by the following six (6) measures:

1. Whether the research university has policies that allow participation in the university technology commercialization process to count toward tenure and promotion

**Proposition 1.1** – The presence of university policies that allow participation in the university technology commercialization process reduce affected distress caused by faculty researcher job insecurity.

2. How the faculty researchers perceive the TTO staff's reputation

Perceptions of TTO staff's reputation are influenced by the faculty researcher's and their peers' previous experience with the TTO staff. Perceptions of TTO staff lack of competence to successfully carry out technology commercialization functions also influences perceptions of TTO staff reputation. These perceptions may be related to evidence about the TTO staff's educational background, size of the organization measured by full time equivalent staff hires



(FTEs), and TTO staff years and quality of prior work experience in technology intellectual property protection, marketing, and licensing negotiations.

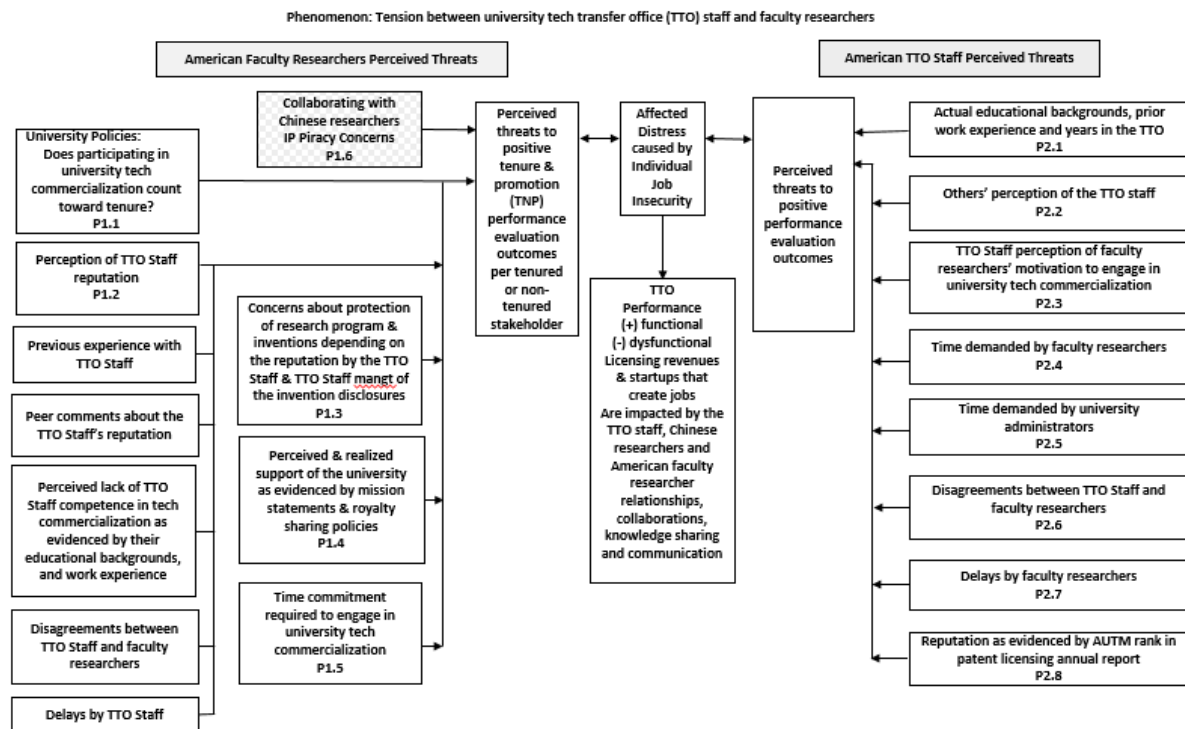


Figure 5: Concept Model for University Tech Transfer Insecurities in Chinese American Academic research exchanges

**Proposition 1.2** – Positive faculty researcher perceptions of TTO staff reputation reduce affected distress caused by faculty researcher job insecurity.

- How concerned the faculty researchers are about protecting their research programs and inventions from potential mismanagement by TTO staff

**Proposition 1.3** – Positive faculty researcher perceptions of TTO management of faculty researcher inventions and established industry social network relationships reduce affected distress caused by faculty researcher job insecurity.

- Perceived and realized support from the university as evidenced by university mission statements and policies related to funding, royalty sharing, and other incentives and rewards for participating in technology commercialization

**Proposition 1.4** – Positive perceptions and realizations of support from the university as evidenced by university mission statements and policies related to funding, royalty sharing, and other incentives and rewards for participating in technology commercialization, reduce affected distress caused by faculty researcher job insecurity.

- Time commitment required to engage in university technology commercialization

**Proposition 1.5** – Perceived and realized high amounts of time commitment required to engage in university technology commercialization will reduce affected distress caused by faculty researcher job insecurity.

6. The added layer of complexity with perceived threats of Chinese IP piracy which looms as a concern when American faculty researchers collaborate with Chinese researchers

**Proposition 1.6** – Perceived threat of Chinese IP piracy will increase affected distress caused by faculty researcher job insecurity.

### *TTO Staff's Job Insecurity*

TTO staff perceived threats to job security, evidenced by performance evaluations, are impacted by the following eight (8) measures:

1. Actual educational backgrounds, technology commercialization work experience, and years in the TTO

**Proposition 2.1** – The presence of actual technology commercialization educational backgrounds, technology commercialization work experience, and years of work in the TTO reduce affected distress caused by TTO staff job insecurity.

2. Other's perceptions of TTO staff competence

**Proposition 2.2** –Positive perceptions by others of TTO staff competence reduce affected distress caused by TTO staff job insecurity.

3. TTO staff perception of faculty researchers' motivation to engage in university technology commercialization

**Proposition 2.3** – Positive perceptions by TTO staff of faculty researchers' motivation to engage in university technology commercialization reduce affected distress caused by TTO staff job insecurity.

4. Time demanded of the TTO staff by faculty researchers

**Proposition 2.4** - Perceived and realized low amounts of time commitment required to work with faculty researchers engaged in university technology commercialization reduce affected distress caused by TTO staff job insecurity.

5. Time demanded of the TTO staff by university administrators

**Proposition 2.5** - Perceived and realized low amounts of time commitment required to work with university administrators engaged in university technology commercialization reduce affected distress caused by TTO staff job insecurity.

6. Disagreement between TTO staff and faculty researchers

**Proposition 2.6** – Low amounts of disagreements between TTO staff and faculty researchers reduce affected distress caused by TTO staff job insecurity.

7. Delays by faculty researchers

**Proposition 2.7** – Low instances of delays by faculty researchers reduce affected distress caused by TTO staff job insecurity.

8. Reputation as evidenced by the Association of University Technology Managers' (AUTM) rank in patent licensing annual report

**Proposition 2.8** – Working for a research university that is highly ranked by AUTM's annual licensing survey reduces affected distress caused by TTO staff job insecurity.

Any added threats of intellectual property piracy exacerbates an already tenuous area of conflict.

## CONCLUSION

This research is motivated by recent concerns over Chinese piracy of intellectual property. The goal of this research is to provide a conceptual theoretical framework for researching conflicts in academic exchanges between faculty researchers and university TTO staff. In particular, this framework includes the added complexity of potential conflicts due to cultural differences between American and Chinese faculty researchers. Ultimately, with use of this theoretical framework for research, this body of research can reveal guidelines to alleviate conflicts for use by technology managers and academic researchers who are responsible for engaging in university technology commercialization. Tech transfer can be viewed as a process that draws out stressors and result in felt job insecurity. Job insecurity is proposed to be felt by both the TTO staff and the faculty inventors. This research aims to provide a better understanding of what can reduce affected distress and result in subsequent improved university tech transfer performance.

The significance of the university tech transfer process for intellectual property managers is the emphasis tech transfer paces on collaboration and knowledge sharing. It is proposed that any lack of communication, social exchanges, motivation, engagement, streamlined processes, supportive organizational cultures, or competencies on the part of the TTO staff or faculty researchers can result in felt job insecurity and distress. Also, people who lack personality characteristics that give them an aversion to job insecurity can experience the stress. It is advocated that all of these factors need to be examined further in a holistic way.

This study will help universities hone in on the causes of faculty researcher and TTO staff perceived job insecurity. This paper provides a review of the top perceived impediments to faculty researcher participation in the university technology transfer process. It is theorized that job insecurity may cause both the faculty researchers and TTO staff to experience perceived distress that hinders their

ability to build stronger working relationships in the technology commercialization arena. Job insecurity is a perceptual phenomenon (Sverke, 2002, Greenhalgh, 1984) and is defined as an affected distress in alignment with stress theory which teaches that the anticipation of a fundamental and unwanted event leads to strain (Sverke, 2002). This study is very important to the field of university technology transfer because job insecurity can lead to reduced work effort, propensity to leave, and resistance to change (Greenhalgh, 1984). This research focuses on job insecurity among university faculty researchers and technology transfer office (TTO) staff. Many research universities have TTOs to support technology commercialization activities. These activities include soliciting invention disclosures from academic inventors, evaluating the disclosures for marketability, patenting inventions, and licensing intellectual property (IP). IP might be licensed to start-up businesses or established firms big and small.

This paper examines the top impediment to faculty researchers engagement in the process: faculty indifference, ideological resistance, poor discoveries, limited TTO budget, bad TTO reputation, and university bureaucracy (Markman, 2005). Other impediments examined are lack of trust in the process, delays, building and guarding research collaboration funding relationships, and non-tenured faculty researcher concerns. In addition, this paper also examines the theoretical framework for the study of job insecurity related to university technology transfer. Personality, motivation, social exchange, social network, power dominance, worker resistance, and communication theories are discussed. A theoretical conceptual model of the phenomenon is also provided and discussed. Fourteen (14) related propositions are presented as groundwork for a future empirical study to test this theoretical concept.

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