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[Panel 4] Maximizing Global Innovation: Why IP Protections and Open Data Flows Matter

# **Corporate Technological Diversification and National Innovation System: U.S. and Korean Manufacturing Industries**

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# Introduction

## Overview

- IP protection is a traditional institutional method to promote technological innovation
  - Intellectual property rights provide tools for appropriating innovative output, thereby promoting innovation
  - Although (too strong) IP protection may hinder follow-up innovation(ex. patent trolls, entry barriers, etc.), there would be little disagreement on the necessity of a certain level of IP protection
- This presentation introduces two studies on corporate innovation in the U.S. and Korea, respectively, and draws implications on the importance of IP protection
  - Specifically, the two studies investigate the relationship between technological diversification and R&D productivity in the U.S. and Korea and show that the overall level of corporate technological diversification is relatively low in Korea
- The differences in the two countries imply the importance of IP protection

# Theoretical Framework

## Technological Diversification and R&D Productivity

- Corporate technological diversification is a strategy for firms to expand their technological capabilities by accumulating technological knowledge across multiple, diverse technological fields.
  - Firms can diversify their technological knowledge by engaging in R&D in a new technological field, R&D cooperation, and technology transfer.
  - Corporate technological diversification is becoming a prevailing phenomenon(Leten *et al.*, 2007; Kim *et al.*, 2016)
- Corporate technological diversification has been regarded as a key to managing the productivity of R&D
  - **(Diminishing returns to R&D)** Firms can offset the diminishing returns to R&D investment by deploying their R&D resources into diverse technological fields (Henderson and Cockburn, 1996; Klette, 1996; Klette and Kortum, 2004)
  - **(Economies of scope)** Firms can use their technological resources efficiently and lead to synergy among diverse knowledge with complementarities (Besanko *et al.*, 2010; Granstrand, 1998 ; Grant, 1996; Miller, 2006; Teece, 1982)
  - **(Learning effect)** Engaging in technological diversification enhance firm-specific capability to assimilate external knowledge (Cohen and Levinthal, 1989 ; Garcia-Vega, 2006 ; Quintana-García and Benavides-Velasco, 2008)
  - **(Risk management)** By spreading their resources across different technological fields, firms can lower the overall risk involved in R&D investment (Garcia-Vega, 2006)

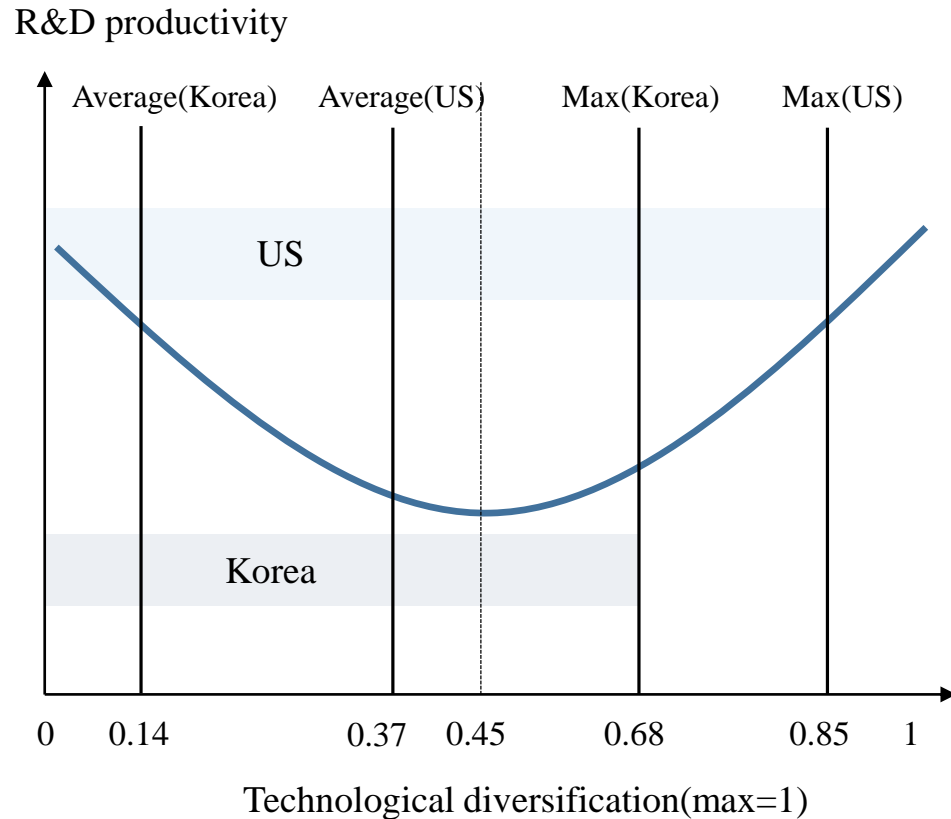
# Empirical Evidence(1)

## U-shaped Relationship

- There are some disadvantages of Corporate technological diversification in managing the productivity of R&D
  - Difficulties in communication, coordination and integration of diverse technologies (Granstrand, 1998; Leten *et al.*, 2007)
  - Risk involved in exploring unrelated technological fields (Zook and Allen, 2003)
  - Low productivity of R&D in unfamiliar or inexperienced technological fields
- The relationship between technological diversification and R&D productivity is U-shaped(Choi and Lee, 2021)
  - The technological-competence-enhancing effect of technological diversification tends to be relatively weak or negligible at an early state of a limited level of technological diversification (Matusik and Fitza, 2012; Yang *et al.*, 2014)
  - Exploration into new, unfamiliar technological fields particularly at its early stage can be competence-destroying (Abernathy and Clark, 1985; Tushman and Anderson, 1986)

# Empirical Evidence(2)

## Corporate Technological Diversification in U.S. and Korea



- The relationship between technological diversification and R&D productivity is U-shaped in the U.S. manufacturing industry
- Technological diversification has a negative effect on the R&D productivity of the Korean manufacturing firms
  - This is primarily because the level of technological diversification is low
- Why is the level of technological diversification low in Korea?
  - There is no clear-cut answer to this question yet, but we can draw some implications from the NIS(National Innovation System) framework

# Implications

## National Innovation System: U.S. and Korea

- Korean industrial R&D policy is characterized by strategic focusing on some specific technological fields
  - The specific technological fields include smart manufacturing, future mobility, smart healthcare, and green energy
  - Intensive R&D investment in strategic technological fields can lead to efficient R&D, but on the other hand, may hamper technological diversification
- IP protection is relatively weak in Korea compared to the U.S.



- The U.S. ranked first in the national intellectual property environment, while Korea ranked 12<sup>th</sup>(GIPC, 2021)
- The GIPC index consists of five key sets of indicators: (1) patents (2) copyrights (3) trademarks (4) enforcement (5) membership and ratification of international treaties

# Concluding Remarks

## NIS and Corporate Technological Diversification

- The Korean government needs to increase the overall level of corporate technological diversification
  - In Korea, disadvantages of technological diversification are more pronounced than benefits, thereby discouraging firms' spontaneous technological diversification
- In order to increase the incentive for firms to engage in R&D in new, unfamiliar, diverse technological fields, stronger IP protection is necessary
  - Along with IP protection, direct support(ex. subsidy, tax credit, etc.) to increase the incentive is also crucial
- Policy tools for promoting R&D cooperation and technology transfer are also necessary

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Thank you for your attention!

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