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論文の内容の要旨

Knowledge has become a strategic resource for economic development in a knowledge-based economy. The globalization, networking, and informational society have accelerated the arrival of the era of open cooperative innovation further. University and enterprises have gradually become the main R&D subjects in the national innovation system and play a crucial role in economic development. However, the imbalance of regional university-industry (U-I) collaboration in China restricts this type of effect. How to shorten the "distance" between university and enterprises enhancing the efficiency knowledge flow from university to enterprises for innovation? A proximity approach gives us a new view to understanding U-I linkages. Therefore, this research aims to explore the spatial trend, different influential factors from proximity perspective on knowledge flow from university to enterprises and proposes two types of strategies through entrepreneurship education and region-industry linkage to foster the U-I knowledge flow drawing on the national innovation system, the new knowledge production mode, and triple helix theory. The thesis is organized as following:

Chapter 1, the research background, research meanings, main research questions and research framework were introduced.

Chapter 2, the literature on U-I collaboration, knowledge flow and proximity were reviewed.

Chapter 3 and chapter 4, to find the rule of spatial trend from university to enterprises, we should understand how the knowledge flow. Therefore, this research construct a framework of knowledge flow on U-I collaboration and explore the flow mechanism on two stages of knowledge outflow and inflow from proximity perspective. Then, the trend of inter-regional U-I knowledge flow with 7,994 co-invent patents by university-industry over the period 2013 to 2018 in China were illustrated.

Chapter 5 and chapter 6, this research will discuss what types of proximity impact on knowledge flow by cross-level perspective with embedding absorptive capacity into outflow and inflow stages to cross regional and organizational boundary. Firstly, we used 484 pairs of patents to test the proximity effects on the regional U-I innovation performance. We further verify the catch-up moderating role of regional internal and external absorptive capacity, focusing on the U-I collaboration from non-local universities to local regions that significantly impact lagging regional U-I collaborative innovation performance.

Following this analysis, paying attention to the organizational boundary, the research tests the mediating role of knowledge embeddedness and moderating role of enterprises absorptive capacity. The

findings rich triple helix theory from the subjects side which considers the integrated resource endowments in the triple helix research framework and fosters the knowledge flow activities between university and enterprises.

Finally, in chapter 7, we emerge two types of strategies: one is from entrepreneurship education as a means for fostering U-I knowledge flow and the other is region-industry linkages development pathway. These expand in-depth analysis of the impact of proximity, innovation performance, and regional resource endowments on U-I knowledge flow.

Then, we got the results from the following three aspects:

As for flow "spatial trend", the gaps between regions in China are obvious, showing a spatial pattern of "strong in eastern and weak in the other areas". The inter-regional U-I collaboration makes an increasing trend, however, most of the new co-patents flow into prosperous provinces. There is a ladder shape of imbalances development on U-I collaboration in prosperous and lagging regions.

For "influential factors" of flow from universities to enterprises, (1) The long geographic distance is not a hamper for improving regional and enterprises innovation performance. The economic development level has no significantly different effects on such role. (2) Technological proximity plays a negative role in increasing inter-region U-I innovative performance, eastern region has the most noticeable results. However, it can foster the enterprises innovation performance. (3) The better relationship and social trust of subjects can get more innovation performance in eastern and western, but the central area negatively affects. Simultaneously, social proximity also can improve enterprises innovation performance. (4) The U-I collaboration for innovation performance-enhancing advantages are not equal for all regions but are moderating by specific regional absorptive capacity dimensions. The areas with a higher level of internal human capital can get more catch-up effects, the knowledge embeddedness helps enterprises shape innovation performance.

For fostering U-I collaboration "strategies", entrepreneurship education integrated with professional education contribute to U-I knowledge flow through fostering students' creative thinking and problem-solving capability. The universities and enterprises located in lagging regions should increase entrepreneurship education, as a means for U-I knowledge flow. And then the regions cultivate the innovation atmosphere to absorb talents fostering cross-regional cooperation for catching up. Region-industry linkages promote the clustering growth, then push the U-I collaboration development. The conclusion section highlights the most relevant findings of this paper and formulates a set of recommendations. These findings can provide theoretical and practical guidance for innovation by real-world university-industry collaboration.

Keywords: Knowledge flow; University-Industry(U-I) collaboration; spatial trend; proximity; innovation performance

論文審査の結果の要旨

中国では、大学と産業の連携（UI 連携）は活性化しているが、地域間格差という課題が存在している。その中、本研究は、中国を4地域（中国東部、中央部、西部、東北部）に分けて、異なる近接性（地域的近接性、技術的近接性、社会的近接性）を用いて、UI 連携のための知識フロー（UI 知識フロー）についての状況を明らかにしたものである。論文構成は、1）知識フローについての空間的傾向、2）異なる

る近接性が知識フローに与える効果、3) 地域の UI 連携を進めるための戦略、について、まとめたものとなっている。

1) 知識フローについての空間的傾向：最初に、UI 知識フローを出力・入力に分けたモデルや複数の地域を意識した知識フローの機構モデルを提示している。次に、UI 連携による 7,994 件の共同発明特許を対象として UI 知識フローのネットワーク分析を行い、東部の UI 連携は豊かであるが、他の地域は弱いという不均衡を明らかにしている。

2) 異なる近接性が知識フローに与える効果：484 組の特許分析や企業アンケートをデータとして、地域のイノベーション・パフォーマンス(IP)に対する異なる近接性の効果について分析している。その結果、地域的近接性の遠さは地域や企業の IP 向上を妨げるものではないこと、一方、技術的近接性は産学連携の IP を高める上でマイナスであること（東部地域で顕著）、また UI 連携における社会的近接性は東部、西部では肯定的であるが、中央部では逆であるという結果を得ている。なお企業のみに限ると、技術的近接性、社会的近接性は企業の IP を高めることも確認している。そして、UI 連携における IP 向上の特徴は地域間で異なり、知識の吸収能力によって調整されうるという結果を明らかにし、人材に注目した知識の埋め込み戦略の重要性を支持する成果となっている。

3) 地域の UI 連携を進めるための戦略：UI 知識フローを促進する手段としての企業家教育と地域経済の特徴を理解した取り組みを提案している。前者の企業家教育については、専門教育と統合された企業家教育をオンライン環境下で実践し、それが創造的思考と問題解決能力の育成に及ぼす効果を確認している。後者については、水産産業が盛んな遼寧省の消費構造の変化を示し、その変化を考慮した UI 連携の基礎を提示している。

以上、本論文は、イノベーション活動を理解するための知識フローについて幅広く知見を得ており、知識経営で重視される知識移転の観点から学術的に貢献するところが大きい。よって博士（知識科学）の学位論文として十分価値あるものと認めた。