

The Evolution of Technological Innovation Ecosystem Among Industry-University-Research Cooperation in the Guangdong-Hong Kong-Macao Greater Bay Area: A Patent-based Approach

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Abstract: This paper using the patent analysis method, the Great Bay Area of Guangdong 15 universities and enterprises for mutual cooperation between the patent information time dimension analysis, clear large bay area of ecological situation, analyze the development trend of Industry-University-Research cooperation, summarizes the large bay area of Guangdong innovation ecosystem evolution process.

Keywords: Technology Innovation Ecosystem; Industry-University-Research Environment; Patent Analysis.

1. Introduction

Industry-University-Research cooperation is a key department in China's innovation-driven development. Strengthening Industry-University-Research cooperation is a vital choice for innovation and development among countries in the world. Based on the perspective of patent metrology analysis, this paper analyzes the evolution and development of the Industry-University-Research collaborative innovation ecosystem of the Guangdong-Hong Kong-Macao Greater Bay Area, a typical Industry-University-Research development region in China, and provides a new perspective for the evolution of Industry-University-Research cooperation collaborative innovation system.

The Guangdong-Hong Kong-Macao Greater Bay Area is a representative gathering place of universities in Guangdong Province and even in China. It has a relatively mature Industry-University-Research model and a large number of University-Enterprise cooperation, which is of great reference value. This paper will study the situation of industry, university and research of 15 universities in the Guangdong-Hong Kong-Macao Greater Bay Area from the perspective of patent measurement analysis, and explore the evolution process of innovative ecological environment of Industry-University-Research cooperation in the Greater Bay Area based on patentometrics tools.

2. Theoretical background

This paper uses patentometrics analysis. Due to the security and interest of patents, patents have become a landmark achievement proof material in Industry-University-Research cooperation. patentometrics analysis is also one of the important methods of competitive information research. Through the patent measurement analysis of a technology or field, it can grasp the latest trends in this field and clarify its development trend. This paper in the Patyee data information base as the data base, through the time dimension of Guangdong 15 universities and enterprises between the patent information analysis finally get intuitive conclusion, forming this summary of Guangdong cooperation innovation environment evolution, for the rest of the world cooperation innovation mode development to provide certain value and reference.

3. Patent Analysis

This study adopts "applicant (original) = (company) AND applicant (original) = (Sun Yat-sen University or South China University of Technology or Jinan University or Guangdong University

of Foreign Studies or Guangdong University of Technology or Shenzhen University or Wuyi University or Shantou University or Guangdong Ocean University or South China Agricultural University or South China Normal University or Guangzhou university or Guangdong Pharmaceutical University or Guangzhou University of Chinese Medicine) AND application day <= (2021.12. 31) " And to merge and screen the patent application numbers, Finally, 9,915 invention patents and utility model patents were obtained.

From a rigorous point of view, since the data in 2022 is not perfect enough before the completion of this paper, this paper will first conduct the time dimension measurement analysis of the data in the last 20 years (excluding 2022).

Analysis On The Trend Of The Number Of IUR Cooperation Patents In GBA
In Recent 20 Years

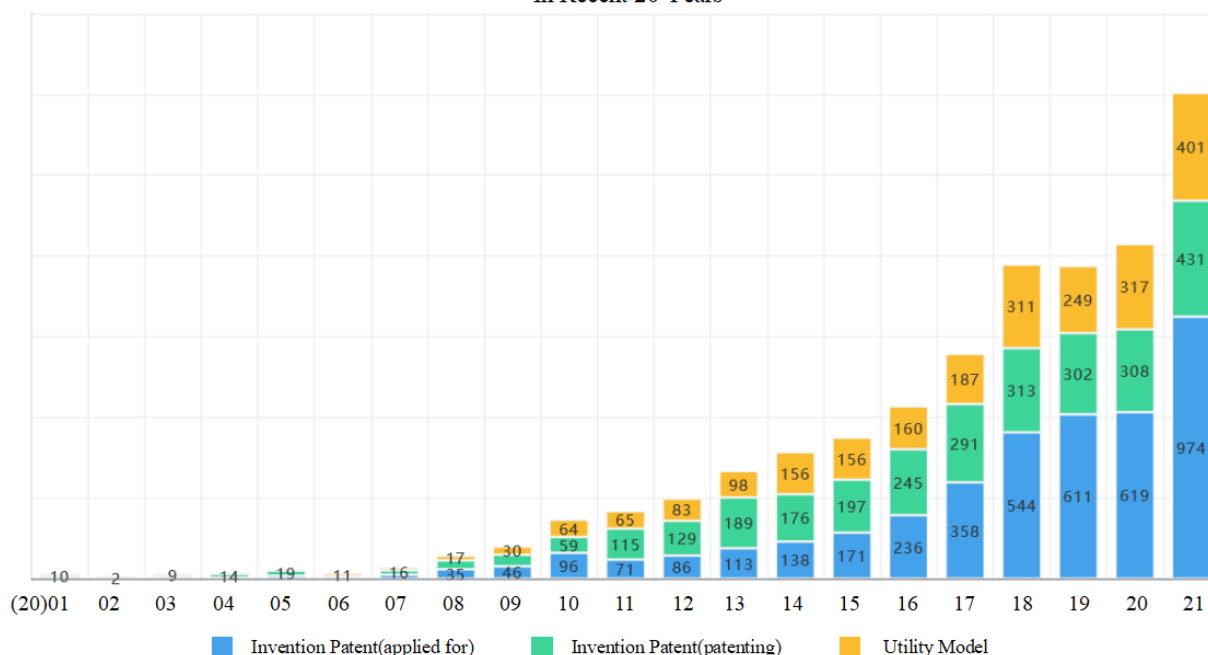


Fig. 1 Chart of Number of Patents About IUR In the GBA (2011-2021)

According to the figure 1, the number of patents for Industry-University-Research cooperation in the Guangdong-Hong Kong-Macao Greater Bay Area is increasing. In the past two decades, it has grown from only 2 patents in a single year to 1,806 a year now. As can be seen from the figure, the patents of Industry-University-Research cooperation in the Guangdong-Hong Kong-Macao Greater Bay Area have been increasing year by year since 2008, stabilizing in 2018-2020, and ushered in a small outbreak in 2021. Under the background of The Times, from 2018 to 2020, the Guangdong-Hong Kong-Macao Greater Bay Area was affected by local saturation and the epidemic. In 2021, due to 20 years of project accumulation and the rise of the concept of "Industry-University-Research", the boom of Industry-University-Research cooperation surged again.

Analysis On Patent Growth Trend Of IUR Cooperation In GBA In Recent 20 Years

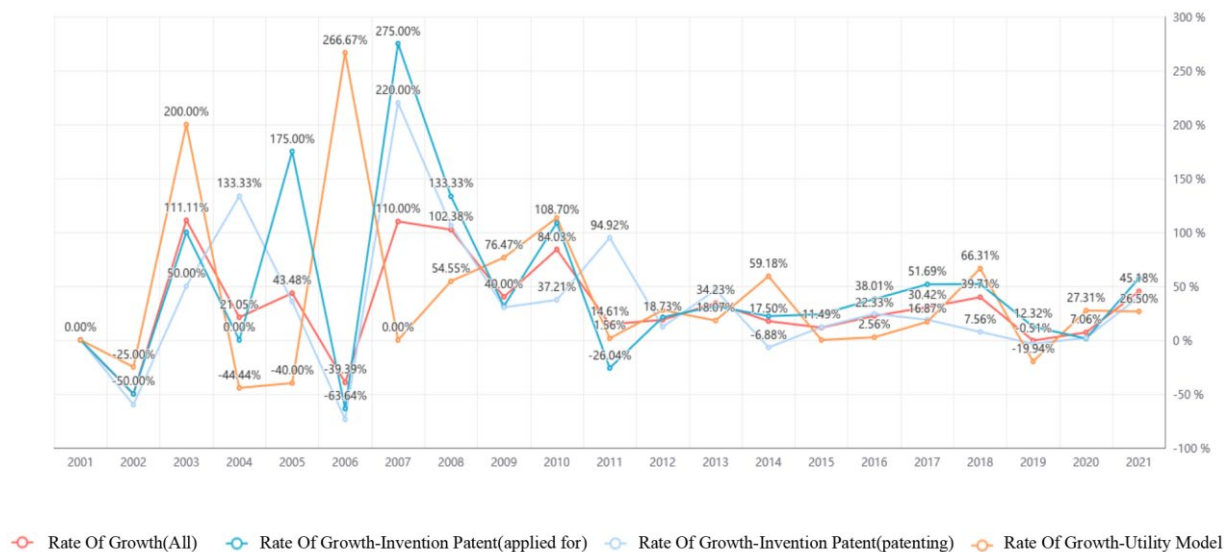


Fig. 2 Trend of Patents About IUR In the GBA (2011-2021)

From Figure 2, before 2008, due to the small number, the growth rate changed more extreme, while after 2009, the overall growth rate tended to stabilize. Although the number trend of each type of patents fluctuated slightly, it generally showed a stable and positive trend.

4. Conclusion

4.1 The ecological environment for innovation in the Guangdong-Hong Kong-Macao Greater Bay Area is stable and improving.

As can be seen from the above data analysis, the development of ecological environment in the Guangdong-Hong Kong-Macao Greater Bay Area has reached a small scale since 2008. Since 2009, the total number of patents in the Guangdong-Hong Kong-Macao Greater Bay Area has grown relatively stable, ushering in a small outbreak in from time to time like 2021. From the data, this paper can infer that the ecological environment of Industry-University-Research innovation in the Guangdong-Hong Kong-Macao Greater Bay Area is stable and improving.

4.2 The innovation of the Guangdong-Hong Kong-Macao Greater Bay Area is still not saturated

From the above data, we can know that the number of Industry.

University-Research innovation patents only achieved a small growth from 2018 to 2020. It seems the Guangdong -Hong Kong-Macao Greater Bay area encounters a bottleneck and the innovation environment is saturated. But in the context of the global economic recession at that time, the Industry-University-Research patents in the Guangdong, Hong Kong and Macao Greater Bay area can still stand in the torrent, and realize the accumulation and thin development in 2021. Therefore, this paper believes that there is still unsaturated space for Industry-University-Research innovation in Guangdong, Hong Kong and Macao Greater Bay area.

4.3 The innovation and ecological evolution of the Guangdong-Hong Kong-Macao Greater Bay Area is worth learning

According to the data, the Guangdong-Hong Kong-Macao Greater Bay Area has used 20 years to actively develop, improve the Industry-University-Research innovation environment, and quickly

achieved a leap from small to large, and still maintains a good growth trend, which is other underdeveloped Industry-University-Research regions worth learning from.

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