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Industrial Upgrading Dataset Development for the Cities of Pearl River Delta of China (1999–2018)

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Abstract: Based on the statistical yearbook data of the Pearl River Delta (PRD) region, the authors analyzed the evolution process of industrial upgrading of nine cities in the PRD region (including Guangzhou, Shenzhen, Zhuhai, Dongguan, Foshan, Zhongshan, Zhaoqing, Huizhou, and Jiangmen) from two dimensions, industrial structure upgrading and firm efficiency upgrading, and developed the dataset of the evolution process of industrial upgrading of the PRD (1999–2018). The dataset includes the following data of nine cities in the PRD: (1) the proportion of output value of high-tech industries in the PRD from 1994 to 2020; (2) the upgrading of industrial structure in the PRD from 1998 to 2020; (3) average industrial value added of firms in the PRD from 1998 to 2018; (4) the upgrading of firm efficiency in the PRD from 1999 to 2018; (5) firm efficiency and industrial structure of the PRD from 1998 to 2018; (6) the industrial upgrading in the PRD from 1999 to 2018; (7) panel data on firm efficiency of the PRD cities from 1998 to 2018; (8) panel data on industrial structure of the PRD cities from 1998 to 2018. The dataset is archived in .xlsx format, and consists of one data file with data size of 187 KB.

Keywords: industrial upgrading; Pearl River Delta; Guangzhou-Shenzhen-Zhuhai

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Dataset Availability Statement:

The dataset supporting this paper was published and is accessible through the *Digital Journal of Global Change Data Repository* at: https://doi.org/10.3974/geodb.2023.05.02.V1 or https://cstr.escience.org.cn/CSTR:20146.11.2023.05.02.V1.

1 Introduction

Since the beginning of the reform and opening-up policy, the Pearl River Delta (PRD) has

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effectively integrated into the global economic system, benefiting from the impetus provided by national market-oriented reforms and the proactive response of local authorities[1]. Consequently, it has achieved sustained and rapid economic growth. However, in recent years, the industrial upgrading in this region has faced the challenges of declining regional assets and rising costs concerning land use and human resource, as well as external shocks such as globalization setbacks, trade frictions, and the COVID-19 pandemic, resulting in a decline in its position in the global production network. Therefore, quantitatively measuring the path of industrial upgrading in the PRD is essential for a deeper understanding of the process of industrial upgrading of this region under globalization.

Currently, the research on industrial upgrading primarily draws from economics, management, and development studies based on a series of representative theories, such as the flying-geese paradigm. However, these studies have failed to comprehensively capture the geographical dimension of industrial upgrading. Furthermore, the economic geography perspective has largely ignored the industrial upgrading in latecomer regions, especially the initiatives of local actors, and associated geographical variables[2].

Therefore, this dataset focuses on the nine cities in the PRD and includes data on the evolution of industrial structure upgrading and firm upgrading from 1999 to 2018. The dataset takes into account the geographical aspects of industrial upgrading and provides quantitative measurement indicators, technical routes, and results. It has certain technical value and basic data value and can provide new references for regional industrial upgrading research.

2 Metadata of the Dataset

The metadata of the Dataset of the evolution of industrial upgrading of nine cities in the Pearl River Delta of China (1999–2018) is summarized in Table 1[3]. It includes the dataset's full name, short name, authors, year of the dataset, data format, data size, data files, data publisher, and data sharing policy, etc.

3 Methods

In terms of indicator development, the dataset measured the trajectory of industrial upgrading in the PRD through two dimensions: firm-level production efficiency (this type of upgrading will be phrased as "firm upgrading" hereafter) and industrial structure. It measured the average value added per enterprise and the proportion of high-tech industry output value in the total industrial output value, respectively. According to the Circular on the Statistical Classification Catalogue of High-tech Industries issued by the National Bureau of Statistics of China in 2002, the statistical scope of high-tech industries includes aerospace and equipment manufacturing, electronic and communication equipment manufacturing, computer and office equipment manufacturing, pharmaceutical manufacturing, and medical equipment and instrument manufacturing.

The data source comes from the statistical yearbooks of various cities in the PRD, including Guangzhou, Shenzhen, Zhuhai, Dongguan, Foshan, Zhongshan, Zhaoqing, Huizhou, and Jiangmen, from the years of 1999 to 2018[5–14]. It should be noted that data from Hong Kong and Macau is currently unavailable.

Based on the statistical yearbooks of the cities aforementioned above, the data is further processed to achieve a quantitative measure of industrial upgrading. Taking the n^{th} year as an

Table 1 Metadata summary of the Dataset of the evolution of industrial upgrading of nine cities in the Pearl River Delta of China (1999–2018)

Items	Description
Dataset full name	Dataset of the evolution of industrial upgrading of nine cities in the Pearl River Delta of China (1999–2018)
Dataset short name	EvolutionIndustrialPRD1999-2018
Authors	Huang, K. X. HOF-0893-2023, Department of Geography, National University of Singapore, h.kaixuan@u.nus.edu Liu, Y. GMY-4030-2022, School of Tourism Management, Sun Yat-Sen University and Key Laboratory of Intelligent Assessment Technology for Sustainable Tourism, liuyi89@mail.sysu.edu.cn Zhang, Y. F. HKO-3368-2023, College of Urban and Environmental Sciences, Peking University, zhangyifan2022@stu.pku.edu.cn Liu, Y. T. HOA-5542-2023, School of Tourism Management, Sun Yat-Sen University, liuyt95@mail2.sysu.edu.cn
Geographical region	The Pearl River Delta, China
Year	1999–2018
Data format	.xlsx
Data size	187 KB
Data files	This dataset includes 8 tables: (1) data on the proportion of high-tech industry output value in the PRD from 1994 to 2020; (2) data on the level of industrial structure upgrading in the PRD from 1998 to 2020; (3) data on the average industrial value added by firms in the PRD from 1998 to 2018; (4) data on the level of firm-level efficiency upgrading in the PRD from 1999 to 2018; (5) data on the efficiency and industrial structure of firms in the PRD from 1998 to 2018; (6) data on industrial upgrading in the PRD from 1999 to 2018; (7) and (8) panel data on firm-level efficiency and industrial structure in the cities of the PRD from 1998 to 2018. These panel datasets are mainly used to calculate the aforementioned indicators
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Data publisher	Global Change Research Data Publishing & Repository, http://www.geodoi.ac.cn
Address	No. 11A, Datun Road, Chaoyang District, Beijing 100101, China
Data sharing policy	***Data*** from the Global Change Research Data Publishing & Repository includes metadata, datasets (in the *Digital Journal of Global Change Data Repository*), and publications (in the *Journal of Global Change Data & Discovery*). ***Data*** sharing policy includes: (1) ***Data*** are openly available and can be free downloaded via the Internet; (2) End users are encouraged to use ***Data*** subject to citation; (3) Users, who are by definition also value-added service providers, are welcome to redistribute ***Data*** subject to written permission from the GCdataPR Editorial Office and the issuance of a ***Data*** redistribution license; and (4) If ***Data*** are used to compile new datasets, the 'ten per cent principal' should be followed such that ***Data*** records utilized should not surpass 10% of the new dataset contents, while sources should be clearly noted in suitable places in the new dataset[4]
Communication and searchable system	DOI, CSTR, Crossref, DCI, CSCD, CNKI, SciEngine, WDS/ISC, GEOSS

example, the measurement of industrial structure upgrading is divided into three steps: (1) calculating the ratio of high-tech industry output value to total industrial output value, i.e., the proportion of high-tech industry; (2) the increase in the proportion of high-tech industries in a city in the n^{th} year can be used to measure the level of industrial structural upgrading in that city for the n^{th} year; and (3) then summing the industrial structure upgrading levels of all cities year by year to obtain the industrial structure upgrading level of the PRD from 1999 to 2018.

The measurement of firm upgrading also includes three steps: (1) calculating the ratio of industrial value added to the total number of industrial firms year by year, i.e., the average industrial value added per firm; (2) calculating the annual increase in the average industrial value added per firm in a city for the n^{th} year; and (3) summing the firm upgrading of all cities year by year to obtain the level of the region from 1999 to 2018. The technical route is shown as follows.

4 Data Results and Validation

4.1 Data Composition

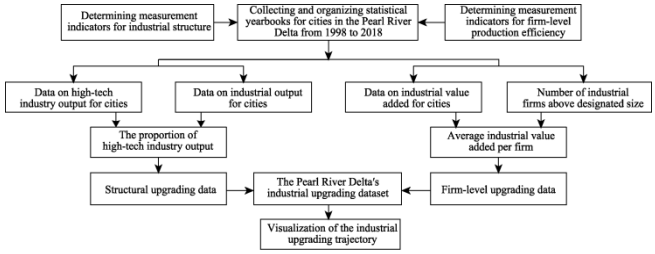

Figure 1 Technical route of dataset development

The dataset of the evolution of industrial upgrading of nine cities in the Pearl River Delta of China (1999–2018) is archived in a .xlsx format and consists of one data file with a size of 187 KB. The data mainly includes the industrial structure upgrading and firm-level efficiency upgrading data of the PRD as a whole as well as each city from 1999 to 2018 and the panel data used to calculate the aforementioned indicators.

4.2 Data Products

Figure 2 reports the annual data of structural upgrading and firm upgrading of each city in the PRD from 2004 to 2018. From 2004 to 2008, most cities in the PRD experienced a round of structural upgrading, followed by three years of firm-level efficiency upgrading. From 2009 to 2011, the region entered a phase of continuous enterprise upgrading. Through the dual effect of government capacity elimination policies and voluntary relocation of firms, a number of backward industries in the region were phased out. After 2013, most cities entered a phase of regional upgrading, where both firm efficiency and industrial structure were upgraded simultaneously.

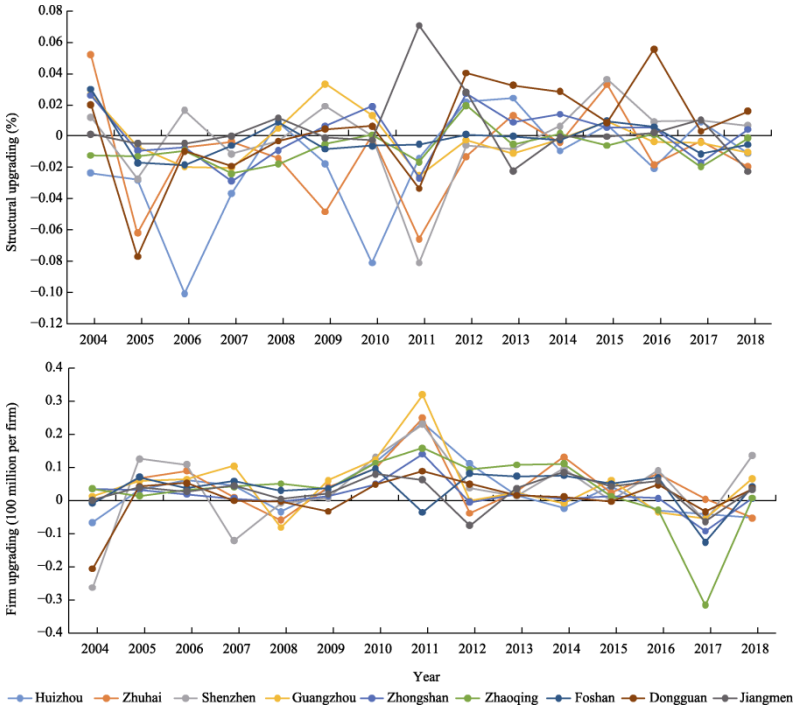

Figure 2 Structural and firm upgrading of each of nine cities in the PRD (2004–2018)

Figure 3 presents the trajectory of industrial upgrading patterns in the PRD from 1999 to 2018 Due to statistical reasons, the results of the industrial structural upgrading in 2003 were anomalous and have been excluded from the analysis. Before 2000, the PRD went through the involutional stage of the industrialization process during the reform and opening up period. In 2003, due to flaws in statistical data, there was a deviation in the result of structural upgrading, which greatly interfered with the characterization of the annual track of industrial upgrading pattern in the PRD, so the track result presented in this year was excluded. Since the early 21st century, the PRD has embarked on a new round of regional upgrading. From 2001 to 2007, the PRD successively experienced firm-level and structural upgrading. In 2008, it suffered from the impact of the financial crisis and exhibited mild involutional tendencies. Subsequently, from 2009 to 2011, it entered a sustained firm upgrading phase. From 2012 to 2016, the PRD underwent regional upgrading with a significant improvement in industry structure and firm-level efficiency. In 2017, the efficiency of firms and the upgrading of industrial structures in the PRD experienced a setback, showing a short-lived period of regional industrial involution. In early 2018, with another round of technological transformation of industrial firms, the PRD emerged from the involutional phase and started a new phase of firm upgrading.

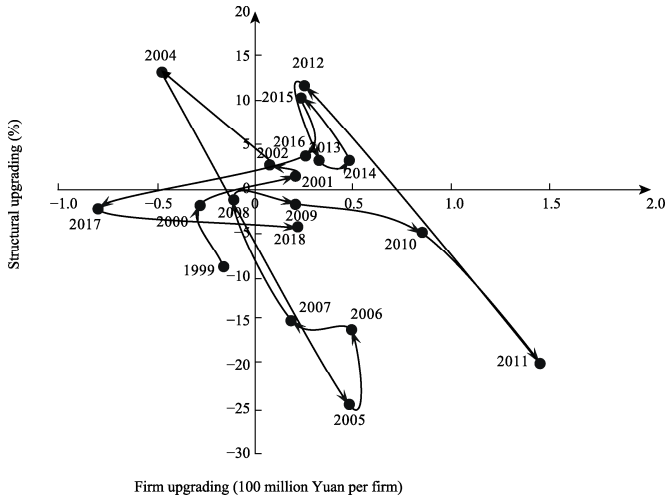

Figure 3 Map of industrial upgrading pattern of the PRD (1999–2018)

Based on the trajectory of industrial upgrading in the PRD, this research proposes a "Dragon-shape Paradigm" for capturing the trajectory of regional industrial upgrading, which means that the pathway of industrial upgrading is not a linear or gradual trajectory, but a circuitous or roundabout development process, like a crawling snake. According to the framework of the four quadrants of industrial upgrading analysis, the dynamic of the regional industrial curve shows a certain degree of oscillation, which oscillates between firm upgrading, structural upgrading, regional upgrading, and regional industrial involution.

5 Discussion and Conclusion

This study measures the industrial upgrading trajectory of the PRD based on two dimensions: firm upgrading and industrial structure upgrading, and proposes the Dragon-shape Paradigm to term the regional pathway of industrial upgrading. Following the end of involutional stage under the process of industrialization in the early 21st century, the industrial upgrading path in the PRD can be divided into three stages. Stage 1 (2001–2007) witnessed sequential upgrades in both firm efficiency and industrial structure. Stage 2 (2009–2011) experienced sustained firm upgrading. Stage 3 (2012–2016) saw rapid regional upgrading. However, in 2008 and 2017, the region faced external shocks, leading to temporary involutional stage. However, in 2018, a new round of technological transformation in industrial firms brought the region back to the stage of firm upgrading.

The core contribution of this dataset lies in its active promotion of the theoretical and empirical research progress of industrial upgrading under globalization. The evolution process of industrial upgrading in the PRD has been empirically demonstrated, including four types of industrial upgrading patterns: firm upgrading, structural upgrading, regional upgrading, and regional involution. This breakthrough has overcome the limitations of the firm-centric or space-centric analysis, which helps to better understand the geographical and multi-scale nature of industrial upgrading. Furthermore, this study has innovatively discovered the "Dragon-shape Paradigm" for capturing the niche of the unstable process of upgrading, which differs from the "flying-geese paradigm" that describes industrial upgrading as a continuously incremental process. This new concept offers a better explanation for the dynamics of industrial upgrading under globalization.

Author Contributions

Huang, K. X. and Liu, Y. designed the algorithms of the dataset. Zhang, Y. F. and Liu, Y. T. contributed to the data processing and analysis. Zhang, Y. F. and Liu, Y. T. wrote the data paper.

Conflicts of Interest

The authors declare no conflicts of interest.

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