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Did Industrial Centralization Strategy in Shanghai's Suburbs Lead to Economic Growth?

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Abstract: Industrial centralization is an important policy choice in the industrial economy era. The purpose of this paper is to evaluate the overall performance and the influential effects of the industrial centralization strategy in the suburbs of Shanghai. The results show that (1) the strategy of industrial concentration in the suburbs of Shanghai effectively promoted economic growth; (2) on different spatial scales, there are visible differences in the impact of industrial concentration on the performance of industrial land; (3) industrial concentration has significantly improved industrial energy utilization efficiency; and (4) industrial concentration has narrowed the gap of economic development among the suburbs, but it has not resulted in a corresponding narrowing of the urban-rural gap. The main recommendations are to pay more attention to the high-end and centralization of urban industries in the central city, promote the interactive development of manufacturing and service industries as well as the integrated development of industry and city, moderately control the scale and speed of industrial suburbanization and residential suburbanization, promote the transformation of the traditional industrial land into "industry + R&D + business and office + exhibition" and further narrow the income gap between and within regions.

Keywords: industrial concentration strategy; performance appraisal; influential effects; industrial suburbanization; Shanghai suburbs

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1. Introduction

Industrialization is not only the main driving force behind urbanization but also the only way to realize the modernization of the whole society. Therefore, industrialization plays an important strategic role in the process of modernization, and countries all over the world ascribe great importance to promoting the sustainable and healthy development of industrialization. In particular, the agglomeration and scale benefits brought by industrial concentration and regional specialization have become sources of efficiency for the prosperity of countries, regions and cities [1–7].

The first focus of research has concerned the relationship between industrial agglomeration and economic growth [8–12], and a positive relationship between spatial agglomeration and economic performance (productivity) has always been expected by the academic community and government agencies. Mucchielli and Yu [13] found that market size, production costs, agglomeration effects and geographic location impact the location choices of multinational corporations (MNCs) significantly. Du and Vanino [14] examined the economic impact of fast-growing firms on slowly growing firms operating within the same region and industry in the UK through backward and forward linkages, and found fast-growing firms to have remarkably positive spillover effects on the labour productivity of slowly growing firms in the same industry and region but to cause negative externalities in the employment growth of slowly growing firms. Zeng et al. [15] explored the relationship between urban cost performance and industrial agglomeration and revealed that the more reasonable distribution of industrial structures in cities is associated with a higher

level of cost savings in urban economic development. However, the economic performance of industrial agglomeration is not only dynamic over time but also spatially varied. Okubo and Tomiura [16] examined regional disparities in plant productivity distributions based on Japan's manufacturing census and found that the productivity distribution tends to be significantly left skewed, especially in cores, regions with diversified industrial compositions, regions with weak market potential and agglomerated industries.

The second focus of research concerns the impacts of industrial agglomeration [17,18]. Lee et al. [19] examined the impacts of industrial agglomeration and outward foreign direct investment (OFDI) on the total factor productivity (TFP) of Taiwanese firms and argued that local industrial agglomerations make a positive contribution to firm productivity, but that FDI in Chinese Mainland has no significant effects on Taiwanese firms' TFP. Yang et al. [20] investigated the effect of global value chain (GVC) participation and positioning on innovation performance in China's manufacturing industries and the interaction effects of GVC involvement and industrial agglomeration on innovation performance. The authors found that GVC participation has an inverted U-shaped effect on innovation performance, whereas the effect of GVC positioning on innovation performance is positive. The interaction effect of GVC positioning and industrial agglomeration positively influences innovation performance, while the interaction effect of GVC participation and industrial agglomeration is negative. Ke et al. [21] constructed a simultaneous equation model of the coagglomeration of producer services and manufacturing to analyse the synergistic effects of the two sectors in the same cities or in neighbouring cities. Grodach and Martin [22] showed that urban manufacturing revival in post-industrial cities cannot overlook low-tech and high-touch manufacturing, which are more likely to concentrate in central industrial zones, while manufacturing overall is predominately found in the outer suburbs. The authors argued that a key feature of industrial agglomeration is the presence of zoning and that industrial decline is not solely due to outsourcing but also due to land use policies geared towards maximizing land values over other benefits.

A third research focus concerns the relationship between regional specialization and geographic concentration. He et al. [23] found significant temporal and sectoral variations in concentration. The least-protected industries have become increasingly concentrated, and the most-globalized industries are clustered in coastal regions. The authors' analysis indicates that globalization and internal scale economies have contributed to geographical concentration, while protectionism has hindered industrial specialization. Yu [24] used China's provincial panel data and the generalized moment method to test the role of regional specialization and geographic concentration in necessity- and/or opportunity-driven entrepreneurship and found that entrepreneurial activities are motivated by opportunity rather than necessity.

Industrial land is the basic resource and spatial carrier of industrialization development, and its scale, quality and location have become central in restricting the development of industrialization. With the scarcity of resources and an increase in land prices, the intensive utilization of industrial land has received increasing attention. Even after entering post-industrial society, the rise of the network economy may lead to a reduction in the total demand for industrial land, but the adjustment of land structures and the optimization of spatial distribution are still important. Therefore, industrial land has also become a focus of attention for government departments, entrepreneurs and academics [25,26]. Relevant studies have been carried out in the following areas:

(1) The change in industrial land prices and corresponding effects on industrial diffusion. Chen et al. [27] examined the spatial effects of industrial land prices on the scale of industrial diffusion and its determinants using the geographical weighted regression (GWR) model and found the industrial land price to have a remarkably negative effect on the industrial diffusion scale, while market potential and trade freedom have positive impacts.
(2) The effect of industrial agglomeration. Jiang et al. [28] investigated rural industrial land use patterns and their impacts on rural areas, based on a combined method of

landscape indices and geospatial analysis. The authors found that rural industrial land and non-rural industrial land involve different formation and development mechanisms. The effects of industrial agglomeration on green development efficiency, energy efficiency and regional pollution are also concerned [29–31].

(3) Industrial land efficiency and its influencing factors. Over the past 20 years, the evaluation of the intensive use of industrial land has drawn extensive attention [32–35]. Ye et al. [36] discussed the effects of China's dual land ownership and land lease terms on rural town industrial land use efficiency and concluded that collective land results in lower land use inefficiency and that different land lease terms are negatively correlated with the efficiency of rural industrial land use. Based on the sequential generalized directional distance function and metafrontier nonradial Malmquist index, Xie et al. [37] analysed the dynamic changes, saving potential, efficiency decompositions, and influencing factors of industrial land use efficiency. The authors found that the relationship between per capita GDP and industrial land use efficiency follows an "N" shape, while industrial labour surplus and the governance of "land finance" have the opposite effect.

Over the past four decades, China's industrialization has progressed rapidly, especially with the influx of industrial enterprises with foreign investment, the economic power of Chinese cities in the world has grown dramatically, playing a major role in the global economy [38,39]. Chinese cities are developing not only traditional industry but also advanced producer services since end of the 20th century [40]. As the modern industrial and economic center of China, Shanghai is taking the lead in China's industrialization. Shanghai has made a huge jump in the last decades in international scope, and is strongly increasing its international connectivities and economic power by hosting foreign companies [41,42]. Shanghai is not only one of the rising global cities, but also still one of the most important manufacturing centers in China, and its process and experience of industrialization development are representative.

To date, it has been more than 30 years since the implementation of the "Three Concentrations" strategy in the suburbs of Shanghai. "Industrial concentration in the parks" is at the core of the "Three Concentrations" policy. The purpose of this paper is to analyse the characteristics of spatiotemporal processes and pattern changes since the implementation of the industrial centralization strategy in the suburbs of Shanghai and to quantitatively evaluate implementation effects of the industrial centralization strategy. In addition, the following two theoretical questions are addressed: (1) does industrial concentration promote regional specialization and (2) does industrial concentration improve land use performance?

2. Data and Methods

2.1. Study Area

Shanghai has been a leader in China's reform and opening up, innovation and development. Since the end of the 1980s, the traditional manufacturing industry has accelerated its migration to the suburbs, and the relative and absolute quantity of suburban industrial enterprises have increased significantly with the stock adjustment and rational increment distribution of the urban industry. The suburbs have gradually formed the industrial layout of three dimensions. (1) Core industries supported by high-tech and pillar industries mainly include four industrial bases of "East, South, West and North" (the Eastern Microelectronics Industrial Base, Southern Petrochemical Industrial Base, Western Automobile Industrial Base and Northern Iron and Steel Industrial Base), three pilot industrial parks (i.e., the Shanghai Minhang Economic and Technological Development Zone, Shanghai Hongqiao Economic and Technological Development Zone and Shanghai Caohejing Emerging Technological Development Zone) and four export processing zones (i.e., the Shanghai Caohejing Export Processing Zone, Shanghai Jinqiao Export Processing Zone, Shanghai Songjiang Export Processing Zone and Shanghai Minhang Export Processing Zone). (2) Key industrial parks wherein "one industry is particularly strong while multiple industries are developing" mainly include municipal and supporting industrial parks. (3) A number of

characteristic industrial parks are supported by central suburban towns [43]. By the mid-1990s, the layout of Shanghai's suburban development zones had basically taken shape. Industrial concentration with development zones as the main body has formed the core premise of Shanghai's "three concentrations" strategy. With the start of the 21st century, national and municipal development zones developed rapidly, and, by 2004, the number of Shanghai development zones had shrunk to 41. By 2009, with the implementation of the "integration of two plans" policy, 104 industrial blocks were included in Shanghai's industrial concentrated construction area (Figure 1, Table 1). "Integration of two plans" is the combination of land use overall planning and urban overall planning. In the past, the general plan of land use was prepared and approved by the land resources administration departments, while the general plan of city was prepared and approved by the urban construction administration departments. "Integration of the two plans" means that the same content involved in the two plans is unified and implemented on a common spatial planning platform, and the other content of each plan is supplemented according to the requirements of relevant majors. On the whole, the spatial distribution of industrial blocks has two basic characteristics. First, industrial plots are closely connected to major transportation networks. Second, the industrial blocks are characterized by a high degree of spatial aggregation. Since 2010, Shanghai development zones have entered a new stage of industrial transformation and upgrading and innovative development (Table 2). In 2017, the industrial map of Shanghai was published, further putting forward a new general industrial layout with "one core, one ring, two belts and multiple areas" [44].

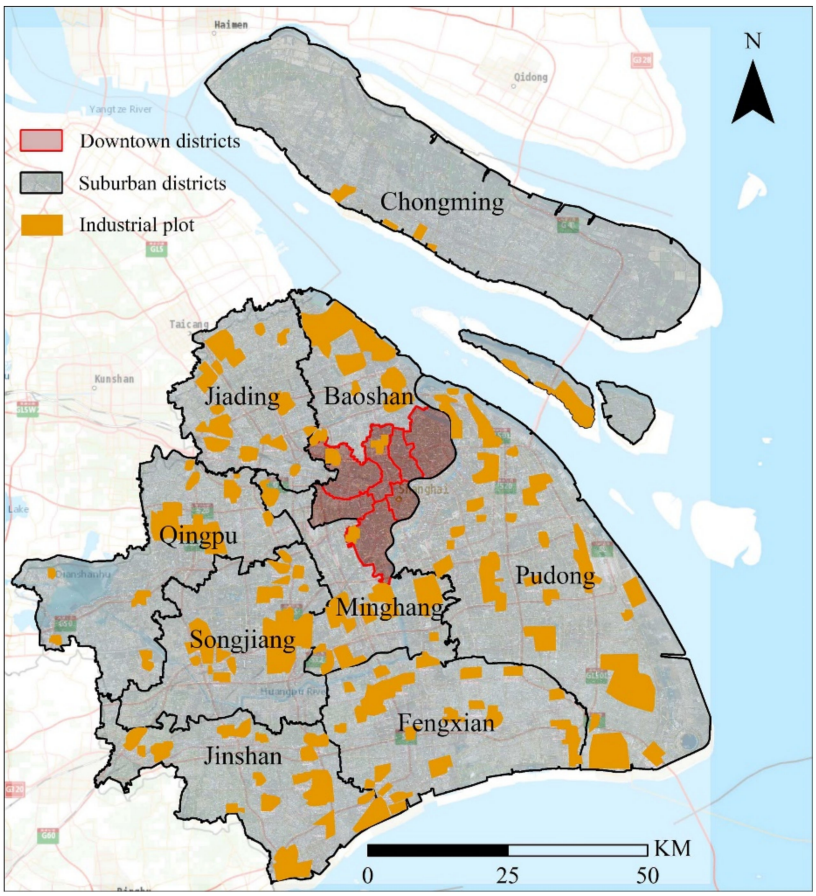

Figure 1. Spatial distribution of industrial blocks in Shanghai. Source: Tou Deng Cang big data platform. https://www.toodc.cn/tools/104 (accessed on 1 November 2021).

Table 1. Distribution of 104 industrial blocks in Shanghai.

District	Downtown	Pudong	Fengxian	Jinshan	Jiading	Minhang	Songjiang	Qingpu	Baoshan	Chongming	Total
Quantity	3	21	17	13	11	10	9	8	7	5	104

Data source: Shanghai Institute of Geological Surveys.

Table 2. Changes in industrial concentration policies adopted in Shanghai since the 1980s.

Period	Policy Priorities
Early 1980s	The rapid development of township enterprises in the suburbs of Shanghai was promoted.
Late 1980s	Stock adjustment and rational incremental distribution: enterprise transformation involved closing down, merging and transforming activities; the industry was dispersed to the periphery of the central urban area, and development zone construction began.
1990s	Suburban industrial layout planning was largely developed; industrial clusters such as industrial bases, industrial parks, and characteristic industrial zones were constructed.
2000s	National and municipal development zones rapidly developed.
Early 2010s	Development zones were administered and rectified, concentrated construction areas were designated, and industrial transformation and upgrading were promoted.
Late 2010s	An overall industrial layout including "one core, one ring, two belts and multiple areas" was set in place.

Source: According to references [43,44].

2.2. Data Sources

The data used in this paper are mainly drawn from the Statistical Manual of Shanghai Development Zones, Development Report of Shanghai Development Zones, Statistical Yearbooks of Shanghai Suburbs, Statistical Yearbooks of Shanghai and statistical bulletin of Shanghai and districts and counties. Based on the availability and completeness of data, the present work focused on the period of 2004 to 2018 or 2019. This period was also the most important stage of industrialization and urbanization in Shanghai.

2.3. Methods

2.3.1. Calculation of the Sectoral Concentration Index

At the core of industrial concentration development in the suburbs of Shanghai is a shift in industrial concentration towards development zones, industrial bases and industrial blocks. First, the classic sectoral concentration index (CR_n index) is selected to calculate the concentration and dynamic change in industrial zones (development zones). The sectoral concentration ratio refers to the sum of market shares (output value, output, sales, sales volume, employees, total assets, etc.) occupied by the N largest enterprises in the relevant market of the sector. Given the output value, output, sales, sales volume, number of employees and total assets of enterprises in the sector, the calculation formula is as follows:

$$CR_n = \frac{\sum_{i=1}^{n} X_i}{\sum_{i=1}^{N} X_i}, \; N > n \tag{1}$$

where CR_n represents the sectoral concentration of the largest companies; X_i is the output value, output, sales, sales volume, employees and total assets of the ith enterprise; n is the number of the largest enterprises in the sector; and N is the total number of enterprises in the sector.

2.3.2. Comprehensive Evaluation of Practical Effects of the Industrial Concentration Strategy

First, from the three aspects of industrial development, economic benefits and capital investment, nine indicators, including the industrial production concentration, employee concentration, concentration of industrial enterprises, degree of aggregation of leading industries, industrial main business income concentration, concentration of total profits of industrial enterprises, concentration of industrial enterprise total assets, concentration of fixed asset investment and concentration of actual foreign capital utilization, were chosen to build a comprehensive evaluation index system (Figure 2). The main bases for selecting these indicators are as follows. (1) Industrial development is usually measured in terms of the number of enterprises, output value, the number of employees and investment in capital. In addition, in industrial development, the evolution of the regional leading industry determines the success or failure of regional development. Therefore, the agglomeration level of the leading industry is included in the evaluation index system. (2) In terms of economic benefits, we mainly cover main business income, profits, total assets and other indicators. (3) Capital investment mainly covers fixed asset investment and foreign direct investment.

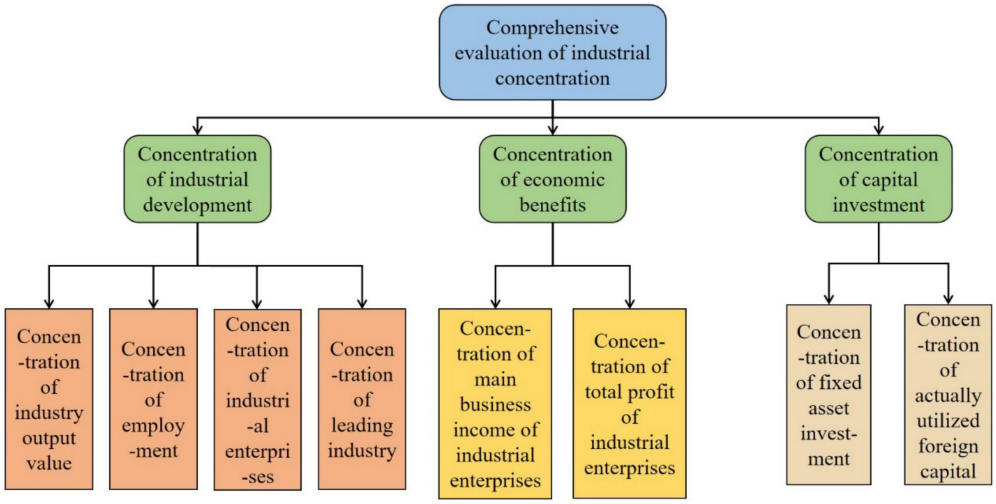

Figure 2. A comprehensive evaluation index system for the implementation performance of Shanghai's industrial concentration strategy.

Second, we determine the weight of the evaluation index. The entropy method is used to determine the weight of the evaluation index. The specific steps are as follows:

① Normalization processing of indicators: In this paper, the "range transformation method" is used for the standardized processing of indicators. To eliminate the influence of 0, the standardized processing of indicators is structured as follows:

$$d_{ij} = \frac{x_{ij} - Min(x_{ij})}{Max(x_{ij}) - Min(x_{ij})} * 0.9 + 0.1 \quad (2)$$

where x_{ij} is the status quo value of the index and d_{ij} is the standardized value of the index. The obtained index decision matrix is shown in Table 3.

Table 3. Evaluation index weights derived from the entropy method.

Index	1	2	3	4	5	6	7	8	9
Entropy	0.9950	0.9888	0.9502	0.9998	0.9835	0.9763	0.9751	0.9848	0.9884
Coefficient of difference	0.0050	0.0112	0.0498	0.0002	0.0165	0.0237	0.0249	0.0152	0.0116
Weights	0.0318	0.0710	0.3150	0.0015	0.1041	0.1497	0.1574	0.0963	0.0732

② Building the raw data matrix:

$$R = \begin{pmatrix} x_{11} & \cdots & x_{1n} \\ \vdots & \ddots & \vdots \\ x_{m1} & \cdots & x_{mn} \end{pmatrix} \quad (3)$$

③ Data processing:

$$p_{ij} = \frac{x_{ij}}{\sum_{i=1}^{m} x_{ij}} \ (j = 1, 2, \ldots, n) \quad (4)$$

④ Calculating the entropy of each index:

$$e_j = -k \sum_{i=1}^{m} p_{ij} * \ln(p_{ij}) \quad (j = 1, 2, \ldots, n) \quad (5)$$

$$k = \frac{1}{ln(m)} \quad (6)$$

⑤ The degree of disorder is calculated according to the entropy value:

$$d_j = 1 - e_j \quad (7)$$

⑥ The weight of the index is obtained by normalization:

$$W_j = \frac{d_j}{\sum_{j=1}^{n} d_{ij}} \quad (8)$$

The calculation results are shown in Table 3.

⑦ Calculating the comprehensive evaluation score: the comprehensive evaluation score of industrial concentration is calculated according to the following formula:

$$F = \sum_{j=1}^{n} (d_{ij} * W_j) \quad (9)$$

where F is the comprehensive evaluation score of industrial concentration, d_{ij} is the current value of index j and W_j is the weight value of the jth index.

2.3.3. Gini Coefficient Calculation Method

There are many indicators to measure regional differences, among which the Gini coefficient is a widely used macroeconomic index to measure the degree of equality of social income distribution [45–48]. It is mainly used to evaluate the evolution of inequality in a country or region, or to evaluate the relative degree of inequality among various countries or regions. This method can be applied to both developed countries with unitary social structure and developing countries with pluralistic social structure. Its limitation lies in that it does not fully and adequately reflect the severity of the gap between the rich and the poor. In this paper, Gini coefficient is used to measure the difference between urban and rural disposable income in Shanghai, which proves that industrial concentration can narrow the difference between urban and rural disposable income to some extent.

In order to directly reflect the degree of differences between different regions in the suburbs of Shanghai, this paper uses the Gini coefficient to measure on the basis of per capita GDP (Gross Domestic Product) of each district. Generally, the Gini coefficient is between 0 and 1. The closer the value is to 0, the smaller the regional differences. On the contrary, the closer the value is to 1, the greater the degree of regional differences. The Gini coefficient calculation formula adopted in this paper is as follows:

$$G = \frac{1}{2n^2\mu} \sum_{j=1}^{n} \sum_{i=1}^{n} |Y_j - Y_i| \quad (10)$$

where G represents the Gini coefficient, n is the number of regions, μ represents the average per capita GDP of Shanghai suburban areas and $\left|Y_j - Y_i\right|$ represents the absolute value of sample difference of per capita GDP of any two regions.

3. Relationship between Industrial Concentration and Economic Growth

3.1. Change in the Industrial Concentrationin the Suburbs of Shanghai

Table 4 shows the calculated comprehensive scores for industrial concentration in Shanghai. Overall, from 2004 to 2018, the comprehensive scores of the industrial concentration in Shanghai exhibited an obvious upward trend, indicating that Shanghai's industrial centralization strategy has achieved good results. From 2004 to 2013, after the governance and rectification of the development zones, Shanghai's industrial activity as a whole concentrated in each development zone. After 2013, industrial concentration tended to level off. In addition, the comprehensive score decreased from 2008 to 2009, indicating that the output level and investment intensity of Shanghai development zones were affected by the global financial crisis and that temporary fluctuations occurred.

Table 4. Comprehensive scores of the industrial concentration in Shanghai.

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Score	0.2326	0.2454	0.2614	0.2786	0.2694	0.2710	0.3329	0.3756	0.3501	0.3850	0.3736	0.3736	0.3712	0.3742	0.3738

3.2. Relationship between the Industrial Concentration and Economic Growth

3.2.1. Relationship between the Industrial Concentration and Industrial Output Value

In the early stages of the construction of the development zones, "expanding incrementally and continuously" was the development approach. During the Eleventh Five-Year Plan period (2006–2010), the industrial concentration of Shanghai increased from 0.2614 in 2006 to 0.3329 in 2010, and the average annual growth rate of Shanghai's industrial output value reached 12.6%. Both have better growth coordination. By 2010, the gross industrial output value of Shanghai development zones had reached 2.5 trillion yuan, accounting for 72.91% of Shanghai's total industrial output value. After 2011, "optimizing stock" became the main focus of development zones. The integration and upgrading of industrial parks accelerated. During the Twelfth Five-Year Plan period (2011–2015), the industrial concentration degree of Shanghai increased first and then decreased, the total industrial output values of Shanghai and the development zones also showed the same change trend (Figure 3). After 2015, the degree of industrial agglomeration changed little, and the scale and speed of industrial output growth also decreased significantly. It can be concluded that industrial concentration can promote the growth of industrial output value.

3.2.2. Relationship between the Industrial Concentration and Industrial Employees

With the promotion of the industrial concentration strategy, the number of industrial employees in the development zones increased from 1.02 million in 2004 to 3.04 million in 2014, reflecting an increase of 198%. In the same period, the industrial employees in Shanghai rose from 3.16 million to 4.77 million, showing an obvious growth trend (Figure 4). Since 2014, the industrial concentration degree of Shanghai has increased significantly, the number of industrial employees in Shanghai and Shanghai development zones has also decreased year by year. Therefore, it can be concluded that industrial concentration can increase employment capacity.

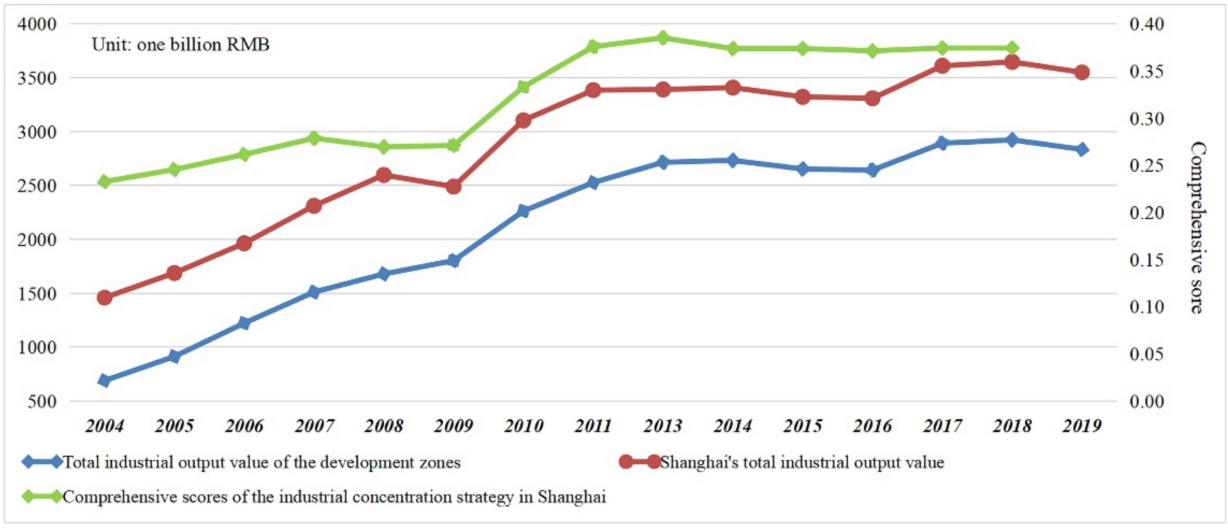

Figure 3. Changes in the industrial concentration and gross industrial output value in Shanghai and Shanghai development zones. Data source: Calculated by Shanghai Statistical Yearbooks (2005–2020) and Statistical Manual of Shanghai Development Zones (2005–2020).

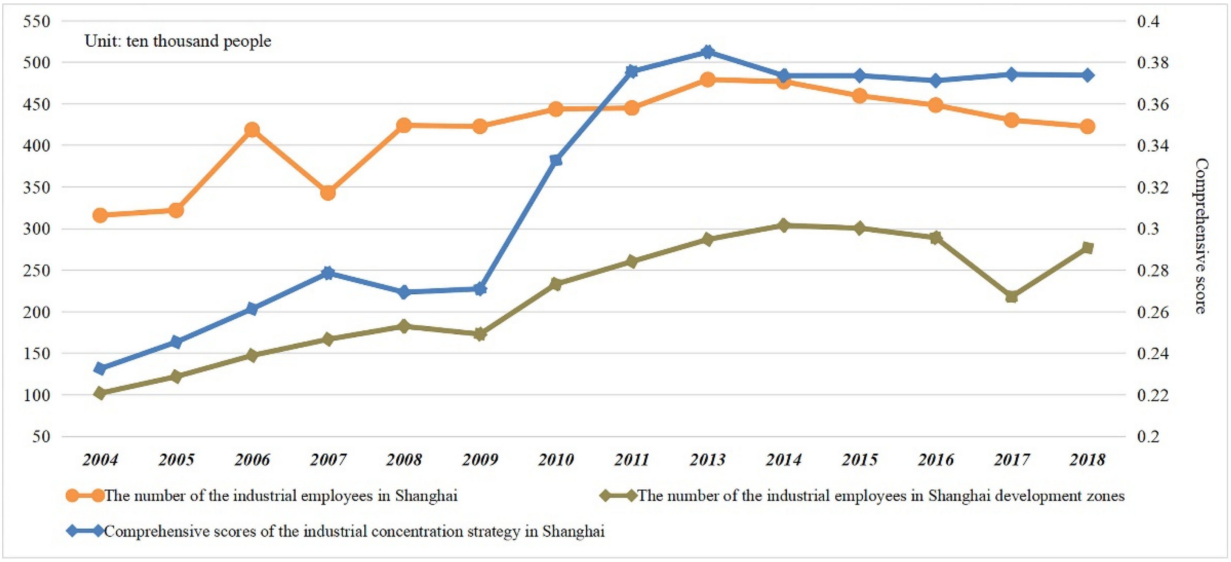

Figure 4. Changes in the industrial concentration and employees in Shanghai and Shanghai development zones. Data source: Calculated by Shanghai Statistical Yearbooks (2005–2019) and Statistical Manual of Shanghai Development Zones (2005–2019).

3.2.3. Relationship between the Concentration of Leading Industries and Economic Growth

The proportion of the output value of leading industries of the total industrial output value of development zones is the degree of leading industry aggregation. From 2004–2006, the concentration of leading industries in Shanghai development zones increased rapidly, Shanghai's GDP grew at an average annual rate of 12.9%. During the Eleventh Five-Year Plan period (2006–2010), the concentration of leading industries in Shanghai development zones Kept it at the maximum, Shanghai's GDP grew at an average annual rate of 11.2%. During the Twelfth Five-Year Plan period (2011–2015), the concentration of leading industries in Shanghai development zones decreased year by year; Shanghai's annual GDP growth slowed to 7.6%. From 2016–2018, the concentration of leading industries in Shanghai development zones has increased year by year again; Shanghai's GDP grew at an average

annual rate of 9.3% (Table 5). The results show that the concentration of leading industry in Shanghai development zones is closely related to GDP growth.

Table 5. Change in the concentration of leading industries in Shanghai development zones (unit: %).

Year	2004	2005	2006	2007	2008	2009	2010	2011	2013	2014	2015	2016	2017	2018
National development zones	86	89	94	94	94	95	95	92	93	90	87	89	88	89
Municipal development zones	73	78	84	84	83	82	83	85	81	76	74	76	78	80
Total	81	84	87	88	88	86	87	87	85	81	80	82	83	84

Data source: Shanghai Statistical Yearbooks. 2005–2019.

3.2.4. Relationship between the Industrial Concentration and Economic Benefits

In addition to being affected by the global financial crisis in 2008, the changes in the main business income, total profits and total assets of industrial enterprises in Shanghai development zones show an obvious and consistent rising trend (Figure 5). Between 2004 and 2009, the growth rate of these three indicators was much lower than that of 2009–2018. With the implementation of the "integration of the two plans" policy in Shanghai in 2009, the spatial scope of the development zones has increased, and the total economic benefits have further improved. However, from 2014 to 2016, the main business income of industrial enterprises in Shanghai development zones declined again.

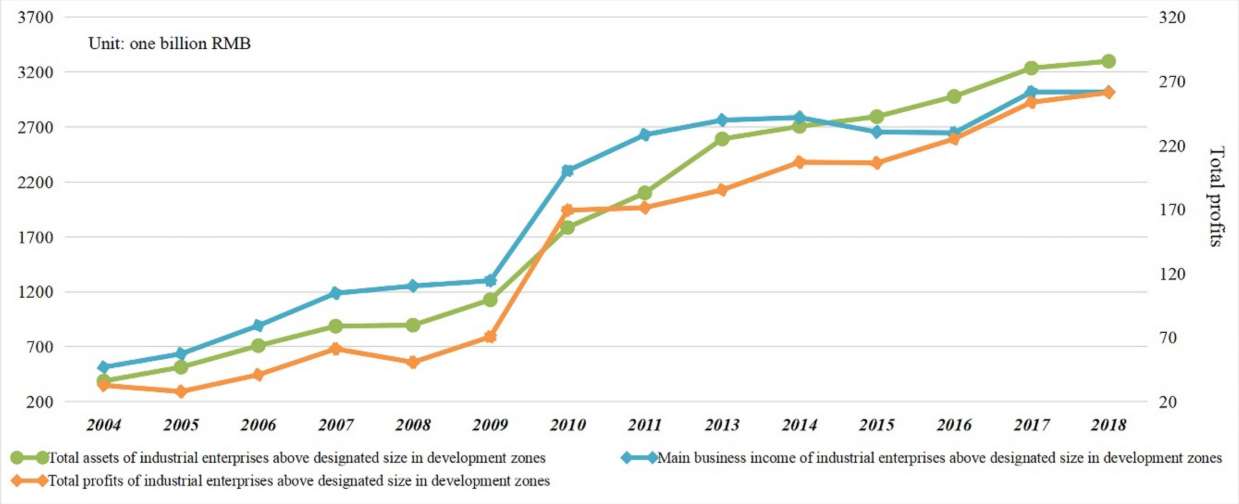

Figure 5. Change in the economic benefits of industrial enterprises in Shanghai development zones. Data source: Shanghai Development Zone Association. Statistical Manual of Shanghai Development Zones (2005–2019).

4. The Influence Effect Analysis of the Industrial Centralization Strategy

4.1. Does Industrial Concentration Improve Land Use Performance?

Has industrial concentration in the suburbs of Shanghai improved land use performance? We address this issue from the following three dimensions: the district, development zone and industrial sector levels.

4.1.1. Changes in Industrial Land Use Performance at the District Level

Table 6 shows that (1) in terms of space, industrial output value, industrial profit and the number of employees per unit of industrial area in the inner suburbs (Pudong, Minhang, Jiading and Baoshan) are generally higher than those in the outer suburbs (Fengxian, Jinshan, Qingpu and Chongming). It is worth noting that Songjiang, a district located in the outer suburbs of Shanghai, has more convenient transportation services than other outer suburbs due to its rail transit system being constructed earlier. Therefore, its industrial

land performance indicators are also higher than those of other outer suburbs. (2) In terms of time, all performance indicators of industrial land undergo obvious fluctuations and changing characteristics but do not show a clear linear rising trend. This shows that industrial centralization does not necessarily bring about a continuous improvement in industrial land performance in different regions. Previous results show that, in addition to transportation and location factors, industrial land performance may also be affected by other meso-level factors (such as economic development level, industrial structure, fixed asset investment, science and technology level, staff size, etc.) [35–37].

Table 6. Changes in the performance of industrial land in the suburbs of Shanghai.

Year	Output Indicators	Baoshan	Minhang	Pudong	Jiading	Songjiang	Fengxian	Jinshan	Qingpu	Chongming
2004	Industrial output (10^8 yuan/km^2)	17.57	24.09	29.31	17.34	23.35	7.37	14.01	9.82	3.17
	Industrial profit (10^8 yuan/km^2)	2.67	1.67	2.25	1.28	0.79	0.23	1.29	0.6	0.15
	Number of employees (person/km^2)	2050.51	4744.22	4410.18	3638.05	3707.04	2415.29	2483.92	3137.12	1655.26
2010	Industrial output (10^8 yuan/km^2)	26.59	44.12	50.19	34.48	48.83	14.54	21.25	18.72	10.41
	Industrial profit (10^8 yuan/km^2)	2.27	3.05	4.64	3.21	1.75	0.95	1.18	1.11	0.24
	Number of employees (person/km^2)	1728.73	4880.27	4046.15	3871.4	4791	2352.41	2232.32	3488.54	1627.34
2015	Industrial output (10^8 yuan/km^2)	21.88	40.1	52.75	54.33	40.5	15.44	21.91	21.27	8.13
	Industrial profit (10^8 yuan/km^2)	0.87	3.19	5.16	6.22	1.53	0.99	1.13	1.37	−0.12
	Number of employees (person/km^2)	1266.67	3384.81	3397.13	3286.81	3523.6	1759.18	1802.67	2516.9	842.86
2019	Industrial output (10^8 yuan/km^2)	22.32	41.22	52.38	55.12	39.68	16.24	22.1	22.36	8.05
	Industrial profit (10^8 yuan/km^2)	0.92	3.18	5.48	6.33	1.56	1.02	1.15	1.42	0.23
	Number of employees (person/km^2)	1255.12	3482.06	3492.22	3412.43	3616.23	1632.48	1736.58	2632.49	788.68

Note: Industrial output per km^2 of land = industrial output/industrial land area; Industrial profit per km^2 of land = total profits of industrial enterprises/industrial land area; Number of employees per km^2 of land = employees in industrial enterprises/industrial land area. Sources: ① Shanghai Statistical Yearbooks. ② In 2004, Nanhui District was merged into Pudong District for calculations.

4.1.2. Changes in Industrial Land Performance at the Development Zone Level

Table 7 shows that (1) as far as development zone level is concerned, the performance indicators of various industrial land uses in national development zones are much higher than those in municipal development zones in Shanghai. (2) In terms of time, the performance indicators of various industrial land uses in national development zones fluctuated, increasing and then decreasing from 2004 to 2018, but the performance indicators of in-

dustrial land in municipal development zones were on the rise. This shows that industrial concentration has effectively improved the industrial land performance of Shanghai municipal development zones. However, the industrial land performance of national development zones is more influenced by changes in international economic development and by the regulation of national industrial policies than by municipal development zones. Previous research results show that at the micro scale, development zone level, industrial type, land use structure, investment intensity, employee quality and floor area ratio, etc., are the main factors that affect the land use performance of the development zones [32–34,49].

Table 7. Changes in indicators of intensive land use in Shanghai development zones.

Year	Development Zones	Industrial Fixed Asset Investment Intensity (10^8 yuan/km^2)	Industrial Output (10^8 yuan/km^2)	Industrial Tax (10^8 yuan/km^2)	Number of Employees (person/km^2)
2004	Shanghai	5.78	44.83	4.13	7902.79
	National development zones	10.00	101.82	14.89	12,602.48
	Municipal development zones	6.16	35.35	1.31	6771.26
2010	Shanghai	35.05	69.64	6.90	7175.65
	National development zones	82.71	160.36	38.45	22,489.65
	Municipal development zones	28.00	67.62	3.66	7533.79
2015	Shanghai	43.84	84.42	10.46	9724.63
	National development zones	70.95	134.74	27.65	22,048.13
	Municipal development zones	30.34	72.66	4.43	8706.25
2018	Shanghai	44.23	86.23	10.86	9022.43
	National development zones	68.56	132.48	28.48	21,086.84
	Municipal development zones	31.13	76.45	4.68	8796.32

Note: ① Industrial fixed asset investment intensity per km^2 of land = Industrial investment in fixed assets/Industrial land area; Industrial tax per km^2 of land = Total tax of industrial enterprises/Industrial land area. ② By 2015, Shanghai had 11 national development zones and 23 municipal development zones. Sources: Statistical Manual of Shanghai Development Zones for 2005, 2011, 2016 and 2019.

4.1.3. Changes in Industrial Land Performance at the Industrial Sector Level

Table 8 shows that (1) overall, the industrial output value per km^2 of land of key pillar and high-tech industries in Shanghai shows an upward trend, while the industrial output value per km^2 of land for traditional industries shows a fluctuating downward trend (including ferrous metal smelting and rolling processing). (2) The changes in profits and taxes per km^2 of land of different industrial sectors are complex; some increase, and some decrease, sometimes even turning negative. (3) The number of employees per km^2 of land for different industrial sectors has increased or decreased, which has not only been a result of the economic crisis but which has also been closely related to the nature of industrial sectors (such as labour-, capital- and technology-intensive industries). However, in general, compared to other land use benefit indicators, the change in the number of employees per km^2 of land is relatively minimal. Therefore, it is evident that the effects of industrial concentration on the land use performance of different industrial sectors are complex and diverse.

Table 8. Output benefits of typical industrial sectors in Shanghai.

Industrial Types	2004				2009				2015				2018			
	Industrial Output (10^8 yuan/km^2)	Industrial Profit (10^8 yuan/km^2)	Industrial Tax (10^8 yuan/km^2)	Number of Employees (10^4 person/km^2)	Industrial Output (10^8 yuan/km^2)	Industrial Profit (10^8 yuan/km^2)	Industrial Tax (10^8 yuan/km^2)	Number of Employees (10^4 person/km^2)	Industrial Output (10^8 yuan/km^2)	Industrial Profit (10^8 yuan/km^2)	Industrial Tax (10^8 yuan/km^2)	Number of Employees (10^4 person/km^2)	Industrial Output (10^8 yuan/km^2)	Industrial Profit (10^8 yuan/km^2)	Industrial Tax (10^8 yuan/km^2)
Computer, communications and other electronic equipment manufacturing	175.81	5.73	1.48	1.47	303.37	−0.58	0.96	0.57	333.34	7.59	−0.9	2.34	342.20	9.54	0.69
Transportation equipment manufacturing	77.13	9.88	4.22	0.92	160.07	19.27	10.47	0.85	257.58	53.16	18.02	1.12	471.90	68.25	26.69
General equipment manufacturing	23.98	1.68	0.62	0.57	56.26	4.16	2.1	0.44	65.12	4.18	1.9	0.59	180.75	13.17	4.54
Raw chemical materials and chemical products manufacturing	30.24	2.05	1.23	0.45	69.73	3.73	2.48	0.35	101.69	7.34	3.48	0.47	188.84	26.32	5.74
Electric machinery and equipment manufacturing	32.93	2.36	0.75	0.7	65.07	4.89	1.52	0.66	87.08	6.15	1.87	0.79	140.18	11.47	3.10
Ferrous metal smelting and rolling processing industry	57.8	9.08	3.04	0.31	70.09	3	2.25	0.21	64.53	0.9	1.5	0.2	77.20	10.24	1.91
Petroleum processing industry	26.13	2.04	1.68	0.11	38.65	1.65	5.63	0.08	45.69	1.99	12.16	0.07	85.71	6.79	15.19
Special purpose equipment manufacturing	15.19	0.87	0.45	0.49	41.52	2.91	1.39	0.48	50.55	2.94	1.45	0.55	78.49	7.60	1.79
Metal products manufacturing	22.09	1.41	0.43	0.64	34.68	1.89	0.94	0.53	41.33	2.44	1.25	0.62	60.98	3.47	1.85
Plastic products manufacturing	15.86	0.75	0.38	0.59	31.9	1.94	0.91	0.51	52.82	3.75	1.67	0.7	55.59	3.97	1.42
Non-metallic mineral products manufacturing	15.85	0.92	0.62	0.43	27.24	1.19	1	0.38	31.11	1.68	0.97	0.31	37.58	3.26	1.23
Medicine manufacturing	32.12	2.72	1.92	0.84	61.6	8.2	3.88	0.79	114.28	18.88	7.83	1.04	52.85	6.91	3.16

Note: there is a lack of employment statistics in 2018, so this performance indicator is not calculated. Source: calculated by Shanghai Statistical Yearbook 2005, 2010, 2016 and 2019.

4.2. Does Industrial Concentration Improve Industrial Energy Efficiency?

Energy is not only an important material basis to support social and economic development but also a necessary guarantee for sustainable urban development. As the core goal of the Green New Deal, energy conservation and consumption reduction, emission reduction and efficiency increase have become the common pursuits of post-industrialized countries. Since 2004, with the improvement of industrial concentration, the industrial energy consumption in Shanghai has tended to rise on the whole under the background of the overall increase in total energy consumption; however, since 2014, the industrial energy consumption in Shanghai has been decreasing year by year. Although the proportion of industrial energy consumption in the total energy consumption fluctuated slightly, it tended to decrease on the whole, from 61.5% in 2004 to 46.8% in 2018. The industrial energy intensity also decreased from 0.30 tons of standard coal/ten thousand RMB of industrial output in 2004 to 0.15 tons of standard coal/ten thousand RMB of industrial output in 2018, indicating that the industrial energy utilization efficiency doubled (Table 9). Although the improvement of industrial energy utilization efficiency is the result of multiple factors (such as industrial structure adjustment, energy consumption structure optimization, technological progress, etc.), industrial concentration is also one of the influencing factors, and the correlation coefficient between the two is −0.9125.

4.3. Does Industrial Concentration Narrow Regional Disparities?

Industrial spatial agglomeration is an inevitable trend in the process of industrialization in developing countries. This agglomeration economy mainly comes from the sharing of infrastructures, the matching of labor forces and the knowledge spillover from geographical proximity [50]. Most studies believed that the deepening of industrial agglomeration or regional specialization leads to the widening of regional economic gap (income difference, individual welfare difference, etc.) [51–54].

The results of this article show that (1) from 2005 to 2012, the Gini coefficient showed a decreasing trend on the whole, indicating that the regional differences of per capita GDP in the suburbs of Shanghai tended to narrow. However, from 2013 to 2015, the regional differences of per capita GDP showed an increasing trend. The main reasons for the widening gap between urban and rural areas in this period are as follows: first, the general public budget revenue of the inner suburbs is obviously higher than that of the outer suburbs. Second, in the same district, the development of ecological water conservation area lags behind other areas. Third, the construction of urban and rural social security system is not coordinated and synchronized, and farmers not only receive a lower initial distribution but also find it difficult to receive more benefit compensation in the redistribution. Fourth, a large number of migrant population swarmed into the suburbs of Shanghai, affecting the non-agricultural employment opportunities and incomes of local farmers. From 2016 to 2018, the Shanghai municipal government has made great efforts to promote the integration of urban and rural development and has issued 21 supporting policies, while the Gini coefficient showed a slight decrease year by year again (Figure 6). (2) From 2004 to 2018, the difference of per capita disposable income between urban and rural areas in Shanghai showed a trend of "shrinking-expanding-shrinking-expanding-shrinking"; especially since 2008, the overall change trend has been shrinking (Figure 7). It shows that at the suburban level, the strategy of industrial concentration in the suburbs of Shanghai has narrowed the gap of economic development among the suburbs to some extent and promoted the relatively balanced allocation of industrial agglomeration areas in the suburbs; at a citywide level, restricted by the cyclical law of economic development, the evolution of the urban-rural gap in Shanghai does not show a stable narrowing trend, but shows a pattern of cyclical changes. In addition, this is also closely related to the government's phased economic regulation and control policies.

Table 9. Change in total energy consumption and energy intensity in Shanghai.

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2018
Total energy consumption (ten thousand tons of standard coal)	7167.16	7730.66	8355.49	9103.30	9608.49	9759.35	10,243.26	10,489.09	10,573.00	10,890.39	10,639.86	10,930.53	11,453.73
Total industrial energy consumption (ten thousand tons of standard coal)	4405.55	4692.65	4987.81	5351.93	5544.13	5472.16	5890.93	5946.66	5798.02	5965.53	5796.95	5745.55	5360.68
Proportion of industrial energy consumption in total energy consumption (%)	61.5	60.7	59.7	58.8	57.7	56.1	57.5	56.7	54.8	54.8	54.5	52.6	46.8
Gross domestic product (100 million RMB)	8165.38	9365.54	10,718.04	12,668.89	14,276.79	15,287.56	17,436.85	19,539.07	20,558.98	22,264.06	24,068.20	25,659.18	32,679.87
Gross industrial output value (100 million RMB)	14,595.29	16,876.78	19,631.23	23,108.63	25,968.38	24,888.08	31,038.57	33,834.44	33,186.41	33,899.38	34,071.19	33,211.57	36,451.84
Energy intensity (Tons of standard coal/ten thousand RMB of GDP)	0.88	0.83	0.78	0.72	0.67	0.64	0.59	0.54	0.51	0.49	0.44	0.43	0.35
Industrial energy intensity (Tons of standard coal/ten thousand RMB of industrial output)	0.30	0.28	0.25	0.23	0.21	0.22	0.19	0.18	0.18	0.18	0.17	0.17	0.15

Source: calculated by Shanghai Statistical Yearbook 2019.

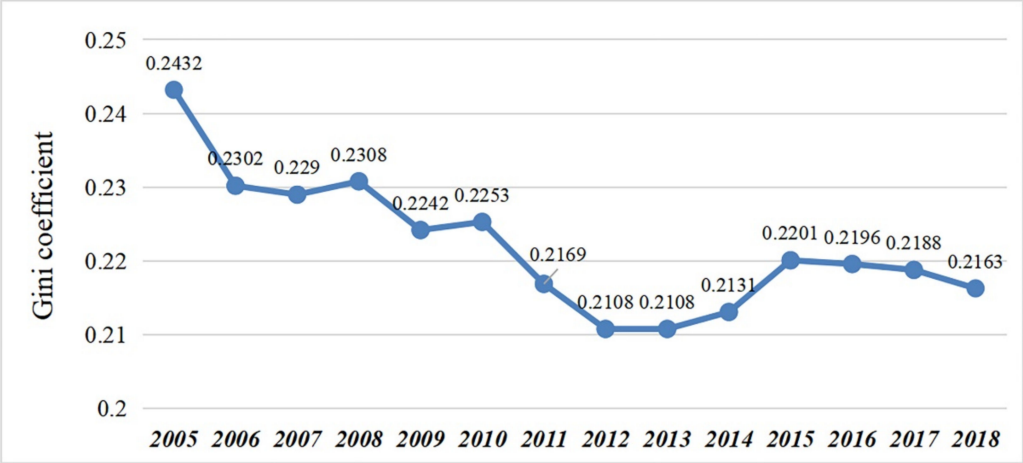

Figure 6. Gini coefficient variation trend of per capita GDP in the Shanghai suburbs from 2005 to 2018. Source: calculated by Shanghai Statistical Yearbooks (2006–2019).

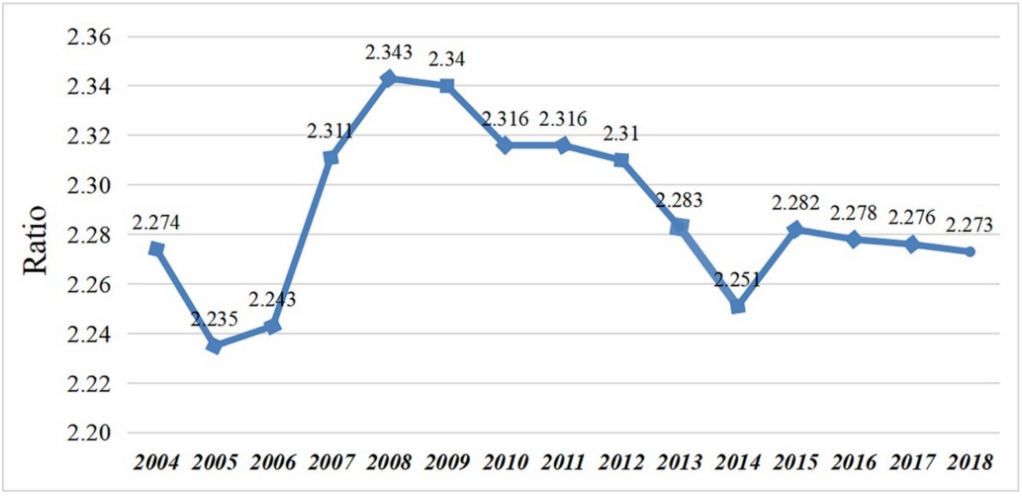

Figure 7. Differences in per capita disposable income between urban and rural areas in Shanghai from 2004 to 2018. Source: calculated by Shanghai Statistical Yearbooks (2005–2019).

5. Discussion

Industrial centralization or industrial agglomeration is the premise and foundation of regional specialization, and the industrial concentration index can be used to measure the degree of regional specialization. However, the relationship between regional industrial concentration (regional specialization or diversification) and regional economic growth has not yet formed a complete theoretical system [55–57], and previous studies mainly focused on the empirical identification of this relationship. As industrial concentration is affected by a variety of factors, and these factors have distinct regional differences, the research results are inevitably diverse. Among the empirical studies on industrial concentration (specialization or diversification) and regional economic growth, most studies are based on mega-region [4,57] provincial administrative regions [23,54], cities at and above the prefecture level [58,59] and urban agglomerations [1,37,60]; there are relatively few research results at the micro level. Therefore, this paper reveals the relationships between industrial concentration and land use intensification from the meso and micro scales (districts, industrial zones and industrial sectors), which is helpful for understanding the spatial heterogeneity of industrial economic activities in the suburbs of Shanghai in more detail. Industrial development may take two agglomeration forms: specialization (intra-industry agglomeration) and diversification (inter-industry agglomeration) [61]. It is generally believed that on a macro scale, the selection of industrial concentration (specialization or

diversification) models is strongly related to the size of cities. Large cities tend to be more diversified and less specialized, while small cities tend to be more specialized [51,57,59,60]. We believe that the functional orientation of a city also has a certain influence on the selection of industrial concentration (specialization or diversification) and that there are conspicuous differences in the development directions and modes of comprehensive and specialized cities. At the mesoscale, the use of either industrial concentration (specialization or diversification) is strongly related to urban location or regional economic development level. The inner suburbs prefer industrial diversification, while the outer suburbs prefer industrial specialization. In other words, the productive structure of economically developed regions tends to be diversified, while that of economically less developed regions tends to be specialized. This is consistent with Jiang's conclusions [54]. In addition, we find that on the micro scale, the use of industrial concentration (specialization or diversification) is strongly related to the nature of industrial sectors. In general, levels of industrial concentration in dominant industrial sectors are unusually high, and levels of industrial concentration in technology- or capital-intensive industries tend to rise. However, the concentration of urban and labour-intensive industries tends to decline overall.

The development of industrial concentration and regional specialization is generally the result of the combined effects of various factors, including supply, demand, location, historical and institutional factors [54]. Success in the development process depends on successful specialization and re-specialization [62]. Through the process of urban industrial transformation and upgrading, although some original industrial sectors must be eliminated, most traditionally successful specialized industrial sectors in the suburbs of Shanghai still maintain strong development momentum. However, some other industrial sectors that have not enjoyed the advantages of concentration and specialization have gradually risen up and formed a new pattern of specialization. In general, industry is characterized by centralized distribution, specialized production and a high degree of cooperation. There are three main forms of industrial agglomeration, i.e., mono-agglomeration, related agglomeration and co-agglomeration [63]. However, the role of concentration and specialization is not omnipotent, and achieving more concentration and specialization is not always beneficial. If a city's industrial structure is highly specialized, the city's ability to adapt to and cope with sudden risks will be weakened, and the city will face more unanticipated crises. Therefore, moderate levels of centralization or specialization may be more important than excessive centralization or specialization. The combination of moderate specialization and long-term diversification can help curtail the risks of single specialization and promote the sustainable development of the urban economy.

The relationship between industrial concentration and land use intensification is not linear but nonlinear. This shows that industrial concentration is not the only factor or even the main factor involved in land use performance. In fact, existing research results have confirmed that the macroeconomic environment, the industrial location, traffic accessibility, the enterprise scale, investment intensity, human capital stock and increments, sectoral features, industrial policies, landforms, land lease terms and other factors comprehensively affect the performance of industrial land use [32,36,64].

The suburban industrial agglomeration areas represented by Pudong, Baoshan, Minhang, Songjiang and Jiading account for more than 85% of Shanghai's industrial added value and 90% of its industrial energy consumption. Although in the past ten years industrial energy efficiency has had a certain degree of improvement in Shanghai, five industries with high energy consumption (the ferrous metal smelting and rolling processing industry is concentrated in Baoshan district, the oil processing industry focused on Jinshan district, the chemical raw materials and chemical products manufacturing is concentrated in Baoshan and Jinshan districts, the non-metallic mineral products are concentrated in Baoshan, Jinshan and Qingpu districts and the production and supply of electricity and heat is concentrated in Pudong New Area) are still the dominant industries in the suburbs of Shanghai. This shows that the task of reducing energy consumption and greenhouse-gas emissions in the suburbs of Shanghai is still arduous.

The strategy of industrial centralization in Shanghai has made remarkable achievements, which not only promotes the relatively balanced distribution and characteristic development of suburban industries, but also narrows the economic development gap among the suburbs. However, it does not lead to the corresponding narrowing of the urban-rural gap in Shanghai, instead showing the characteristics of periodic evolution. It shows that the urban-rural gap is more influenced by macroeconomic environment and policies. There are, of course, problems with industrial suburbanization: (1) due to the incoordination between suburban industrial layout and urban functional layout (housing development and living services facility configuration), coupled with the enthusiasm of real estate development enterprises for residential suburbanization, the job-housing separation pattern of "living in the suburbs and working in the downtown" has been intensified. Many office workers living in the suburbs have to spend a lot of time commuting, greatly sacrificing personal available time. This is contrary to the human-centred concept of "Society 5.0" [65]. Therefore, increasing the proportion of people who "live in the downtown and work in the suburbs" can not only improve the efficient utilization of rail transit facilities, but also help to increase the carrying capacity of the metropolitan area. (2) Industrial suburbanization leads to the sharp decline of agricultural land resources, the increase in energy consumption and the deterioration of suburban environmental quality [66].

With the advent of the digital economy era, descaling will become the only means to transform from an industrial economy to a digital economy [67]. Through descaling, companies can achieve a scale economy through existing platforms instead of having to build all of the links themselves. The approach may also combine the advantages of large-scale production by large companies with the continuous innovation of small companies to create highly concentrated markets. This new technology wave, driven by new AI companies, has a considerable impact on urban jobs, land use, wealth distribution and industrial organization. The transformation and upgrading of the industrial structures in the suburbs of Shanghai and other metropolises must be highly prioritized.

6. Conclusions and Recommendations

From 2004 to 2018, the industrial concentration or industrial agglomeration in the suburbs of Shanghai has promoted the growth of gross industrial output value, employment capacity, GDP and economic benefits for Shanghai and Shanghai development zones, plus the implementation performance of the industrial concentration strategy was generally favourable. However, it is worth noting that in the industrial development and layout of Shanghai, "agglomeration in diffusion" and "diffusion in agglomeration" actually coexist. At the level of the whole city, in the past 30 years, the industrial layout has generally been shifting and spreading from the central city to the suburbs; at the same time, the suburban industries have gradually concentrated to the industrial parks. The urban industries (tobacco, food processing and manufacturing, watches, clothing and apparel, packaging and printing, cosmetics and cleaning products manufacturing, arts and crafts and tourism products manufacturing, etc.) are concentrated in the central urban areas and, of course, scattered in the main suburban towns. In the process of the development of Shanghai as a global city, the service-oriented central city is playing an increasingly important role. Therefore, it is necessary to pay more attention to the high-end and centralization of urban industries in the central city, and promote the rise and agglomeration of creative industries in the central city with the opportunity of old city renewal.

There are two ways of industrial agglomeration: specialization (intra-industry agglomeration) and diversification (inter-industry agglomeration). The selection of industrial specialization and diversification models shows obvious spatial differences. (1) At the macro scale, the selection of industrial specialization or diversification is strongly related to the size of the city or the functional orientation of the city. (2) At the meso scale, the selection of industrial specialization or diversification is strongly related to urban location and regional economic development levels. (3) At the micro scale, the use of industrial specialization or diversification is strongly related to the nature of industrial sectors. This

suggests that differentiated industrial agglomeration strategies should be implemented for different regions and different industrial sectors. It is necessary to combine manufacturing with service industries, industrial agglomeration with scientific and technological innovation, industrial transformation and upgrading with city and town construction, and promote the interactive development of manufacturing and service industries and the integrated development of industry and city according to the functional orientation of inner and outer suburbs and the development direction of leading industries.

The strategy of industrial centralization in the suburbs of Shanghai aims to transform the traditional urban system based on "function centralization and high degree" into one based on "decentralization and diversification". The former focuses on seeking "centralized interests" with improving economic efficiency and resource utilization as the core. The latter focuses on improving residents' social well-being and quality of life, and realizes the comprehensive optimization of industrial structure, population structure, land use structure and spatial structure. The key to this transformation lies in the gradual transformation from the past concept of urban development centred on economic efficiency to a concept of diversified lifestyles, resource and energy conservation and intelligent social operation. Therefore, moderate control of the scale and speed of industrial suburbanization and residential suburbanization can help to reduce the commuting flow between the central city and the suburbs, reduce energy consumption and carbon emissions and protect the suburban arable land and natural ecological landscape.

The relationship between industrial concentration and land use intensification is complex. At the district level for Shanghai, there are spatial differences in the influence of industrial concentration on the performance of industrial land in different regions. At the level of development zones, industrial centralization has effectively improved the industrial land performance of municipal development zones. At the industrial sector level, the effects of industrial concentration on the land use performance of different industrial sectors are complex and diverse. Among them, the industrial output value per km^2 of land for key pillar and high-tech industries in Shanghai generally presents an upward trend, while the industrial output value per km^2 of land of traditional industries presents a fluctuating downward trend. This is one of the main achievements of Shanghai's industrial structure adjustment and optimization. In the future, we should further promote the reduction of the traditional inefficient industrial land in the suburbs of Shanghai, promote the transformation of the traditional industrial land into "industry + R&D + business and office + exhibition" and improve the intensity and efficiency of land development.

In general, the industrial concentration strategy in the suburbs of Shanghai has effectively narrowed the income gap between and within districts. However, these differences still appear to be a short-term rebound phenomenon. In order to realize the continuous narrowing of income gap between urban and rural residents in Shanghai, it is necessary not only to strengthen the capital, manpower and technology support of the central city to the suburbs but also to strengthen the policy support and economic compensation to the ecological water source protection areas and the permanent basic farmland protection areas, as well as to further improve the rural social security system.

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References

1. Nguyen, T.X.T.; Diez, J.R. Multinational enterprises and industrial spatial concentration patterns in the Red River Delta and Southeast Vietnam. *Ann. Reg. Sci.* **2017**, *59*, 101–138. [CrossRef]
2. Setiawan, M.; Lansink, A.G.J.M.O. Dynamic technical inefficiency and industrial concentration in the Indonesian food and beverages industry. *Br. Food J.* **2018**, *120*, 108–119. [CrossRef]
3. Bloom, N.; Guo, A.; Lucking, B. Outsourcing, Occupational and Industrial Concentration. Working Paper, American Economic Association Annual Meeting. 2020. Available online: https://www.aeaweb.org/conference/2020/preliminary/2180 (accessed on 1 November 2021).
4. Brülhart, M. Trading places: Industrial specialization in the European Union. *J. Common Mark. Stud.* **1998**, *36*, 319–346. [CrossRef]
5. Kalemli-Ozcan, S.; Sørensen, B.E.; Yosha, O. Economic integration, industrial specialization, and the asymmetry of macroeconomic fluctuations. *J. Int. Econ.* **2001**, *55*, 107–137. [CrossRef]
6. Azzoni, C.R. *Recent Trends in Regional Competitiveness and Industrial Concentration//Structure and Structural Change in the Brazilian Economy*; Routledge: London, UK, 2017; pp. 107–123.
7. Abson, D.J. The Economic Drivers and Consequences of Agricultural Specialization. In *Agroecosystem Diversity: Reconciling Contemporary Agriculture and Environmental Quality*; Lemaire, G., Carvalho, P.C.D., Kronberg, S., Recous, S., Eds.; Academic Press Ltd.: Cambridge, MA, USA, 2019; pp. 301–315.
8. Fan, C.C.; Scott, A.J. Industrial agglomeration and development: A survey of spatial economic issues in East Asia and a statistical analysis of Chinese regions. *Econ. Geogr.* **2003**, *79*, 295–319. [CrossRef]
9. Liao, F.H.F. Industrial agglomeration of Taiwanese electronics firms in Dongguan, China: A town-level analysis. *Asian Geogr.* **2009**, *26*, 1–21. [CrossRef]
10. Mosk, C. Japanese industrial history: Technology, urbanization and economic growth. *Soc. Sci. Electron. Publ.* **2011**, *54*, 807–808.
11. Wandel, C. *Industry Agglomerations and Regional Development in Hungary: Economic Processes during European Integration*; Peter Lang International Academic Publishers: New York, NY, USA, 2018.
12. Cohen, J.P.; Coughlin, C.C.; Paul, C.J.M. Agglomeration, productivity and regional growth: Production theory approaches. In *Handbook of Regional Growth and Development Theories*; Edward Elgar Publishing: Cheltenham, UK, 2019.
13. Mucchielli, J.L.; Yu, P. MNC's location choice and agglomeration: A comparison between US and European affiliates in China. *Asia Pac. Bus. Rev.* **2011**, *17*, 431–453. [CrossRef]
14. Du, J.; Vanino, E. Agglomeration externalities of fast-growth firms. Regional Studies. *Reg. Stud.* **2021**, *55*, 167–181. [CrossRef]
15. Zeng, L.; Chen, M.; Zhang, F. Urban cost performance and industrial agglomeration: City-level evidence from China. *Emerg. Mark. Financ. Trade* **2020**, *56*, 1615–1629. [CrossRef]
16. Okubo, T.; Tomiura, E. Skew productivity distributions and agglomeration: Evidence from plant-level data. *Reg. Stud.* **2014**, *48*, 1514–1528. [CrossRef]
17. Jang, S.; Kim, J.; von Zedtwitz, M. The importance of spatial agglomeration in product innovation: A microgeography perspective. *J. Bus. Res.* **2017**, *78*, 143–154. [CrossRef]
18. O'Clery, N.; Heroy, S.; Hulot, F.; Beguerisse-Díaz, M. Unravelling the forces underlying urban industrial agglomeration. In *Handbook of Cities and Networks*; Edward Elgar Publishing: Cheltenham, UK, 2021.
19. Lee, Y.; Chyi, Y.L.; Lin, E.S.; Wu, S.Y. Do local industrial agglomeration and foreign direct investment to China enhance the productivity of Taiwanese firms? *J. Int. Trade Econ. Dev.* **2013**, *22*, 839–865. [CrossRef]
20. Yang, N.; Hong, J.; Wang, H.; Liu, Q. Global value chain, industrial agglomeration and innovation performance in developing countries: Insights from China's manufacturing industries. *Technol. Anal. Strateg. Manag.* **2020**, *32*, 1307–1321. [CrossRef]
21. Ke, S.; He, M.; Yuan, C. Synergy and co-agglomeration of producer services and manufacturing: A panel data analysis of Chinese cities. *Reg. Stud.* **2014**, *48*, 1829–1841. [CrossRef]
22. Grodach, C.; Martin, D. Zoning in on urban manufacturing: Industry location and change among low-tech, high-touch industries in Melbourne, Australia. *Urban Geogr.* **2021**, *42*, 458–480. [CrossRef]
23. He, C.; Wei, Y.D.; Xie, X. Globalization, institutional change, and industrial location: Economic transition and industrial concentration in China. *Reg. Stud.* **2008**, *42*, 923–945. [CrossRef]
24. Yu, W. Creative industries agglomeration and entrepreneurship in China: Necessity or opportunity? *Ind. Innov.* **2020**, *27*, 420–443. [CrossRef]
25. Zhang, L.; Yue, W.; Liu, Y.; Fan, P.; Wei, Y.D. Suburban industrial land development in transitional China: Spatial restructuring and determinants. *Cities* **2018**, *78*, 96–107. [CrossRef]
26. Zheng, D.; Shi, M. Industrial land policy, firm heterogeneity and firm location choice: Evidence from China. *Land Use Policy* **2018**, *76*, 58–67. [CrossRef]
27. Chen, W.; Shen, Y.; Wang, Y. Does industrial land price lead to industrial diffusion in China? An empirical study from a spatial perspective. *Sustain. Cities Soc.* **2018**, *40*, 307–316. [CrossRef]

28. Jiang, G.; Ma, W.; Zhou, D.; Zhao, Q.; Zhang, R. Agglomeration or dispersion? Industrial land-use pattern and its impacts in rural areas from China's township and village enterprises perspective. *J. Clean. Prod.* **2017**, *159*, 207–219. [CrossRef]
29. Guo, Y.; Tong, L.; Mei, L. The effect of industrial agglomeration on green development efficiency in Northeast China since the revitalization. *J. Clean. Prod.* **2020**, *258*, 120584. [CrossRef]
30. Liu, J.; Cheng, Z.; Zhang, H. Does industrial agglomeration promote the increase of energy efficiency in China? *J. Clean. Prod.* **2017**, *164*, 30–37. [CrossRef]
31. Su, Y.; Yu, Y. Spatial agglomeration of new energy industries on the performance of regional pollution control through spatial econometric analysis. *Sci. Total Environ.* **2020**, *704*, 135261. [CrossRef]
32. Shi, Y.; Huang, Y. Relationship between morphological characteristics and land-use intensity: Empirical analysis of Shanghai development zones. *J. Urban Plan. Dev.* **2013**, *139*, 49–61. [CrossRef]
33. Zhou, L.; Shi, Y.; Cao, X. Evaluation of land intensive use in Shanghai Pilot Free Trade Zone. *Land* **2019**, *8*, 87. [CrossRef]
34. Yin, G.; Lin, Z.; Jiang, X.; Qiu, M.; Sun, J. How do the industrial land use intensity and dominant industries guide the urban land use? Evidences from 19 industrial land categories in ten cities of China. *Sustain. Cities Soc.* **2020**, *53*, 101978. [CrossRef]
35. Wang, J.; Sun, K.; Ni, J.; Xie, D. Evaluation and factor analysis of the intensive use of urban land based on technical efficiency measurement-A case study of 38 districts and counties in Chongqing, China. *Sustainability* **2020**, *12*, 8623. [CrossRef]
36. Ye, L.; Huang, X.; Yang, H.; Chen, Z.; Zhong, T.; Xie, Z. Effects of dual land ownerships and different land lease terms on industrial land use efficiency in Wuxi City, East China. *Habitat Int.* **2018**, *78*, 21–28. [CrossRef]
37. Xie, H.; Chen, Q.; Lu, F.; Wu, Q.; Wang, W. Spatial-temporal disparities, saving potential and influential factors of industry land use efficiency: A case study in urban agglomeration in the middle reaches of the Yangtze River. *Land Use Policy* **2018**, *75*, 518–529. [CrossRef]
38. Raźniak, P.; Dorocki, S.; Winiarczyk-Raźniak, A. Spatial changes in the command and control function of cities based on the corporate centre of gravity model. *Misc. Geogr. Reg. Stud. Dev.* **2020**, *24*, 35–41. [CrossRef]
39. Raźniak, P.; Csomós, G.; Dorocki, S.; Winiarczyk-Ra´zniak, A. Exploring the shifting geographical pattern of the global command-and-control function of cities. *Sustainability* **2021**, *13*, 12798. [CrossRef]
40. Taylor, P.J.; Ni, P.; Derudder, B.; Hoyler, M.; Huang, J.; Lu, F.; Pain, K.; Witlox, F.; Yang, X.; Bassens, D.; et al. Measuring the World City Network: New Results and Developments. GaWC Research Bulletin 300. 2009. Available online: http://www.lboro.ac.uk (accessed on 5 October 2021).
41. Derudder, B.; Cao, Z.; Liu, X.; Shen, W.; Dai, L.; Zhang, W.; Caset, F.; Witlox, F.; Taylor, P.J. Changing connectivities of Chinese cities in the world city network, 2010–2016. *Chin. Geogr. Sci.* **2018**, *28*, 183–201. [CrossRef]
42. Tang, Z. The change trend of the world city system and the status of Shanghai in the next 30 years. *Sci. Dev.* **2016**, *9*, 92–103. (In Chinese)
43. Yuan, Y. "Three Concentrations" strategy and the course of urbanization in the suburbs of Shanghai. *Shanghai Rural. Econ.* **2016**, *46*, 34–38. (In Chinese)
44. Lei, S. Performance evaluation and transformation development of Shanghai development zones. *Shanghai Manag. Sci.* **2017**, *39*, 70–75. (In Chinese)
45. Safari, M.A.M.; Masseran, N.; Ibrahim, K. A robust semi-parametric approach for measuring income inequality in Malaysia. *Phys. A Stat. Mech. Appl.* **2018**, *512*, 1–13. [CrossRef]
46. Lambert, P.J.; Aronson, R.J. Inequality decomposition analysis and the Gini coefficient revisited. *Econ. J.* **1993**, *103*, 1221–1227. [CrossRef]
47. Wang, S.; Zhang, Y.; Wen, H. Comprehensive measurement and regional imbalance of China's green development performance. *Sustainability* **2021**, *13*, 1409. [CrossRef]
48. Giorgi, G.M. *Gini Coefficient*; SAGE Publications Limited: Singapore, 2020.
49. Peng, H.; Zeng, G. Evaluation of intensive use of land in Shanghai development zones. *Econ. Geogr.* **2009**, *29*, 1177–1181. (In Chinese)
50. Duranton, G.; Puga, D. Diversity and specialization in cities: Why, where and when does it matter? *Urban Stud.* **2000**, *37*, 533–555. [CrossRef]
51. Gao, H. Industrial Agglomeration and Regional Unbalance of Economic Development: Theoretic Study and China's Experience. Ph.D. Thesis, Wuhan University, Wuhan, China, April 2005. (In Chinese)
52. Ezcurra, R.; Gil, C.; Pascual, P. Regional specialization in the European Union. *Reg. Stud.* **2006**, *40*, 601–616. [CrossRef]
53. Yu, W. Study on the Relationship between Industrial Agglomeration and Regional Disparity in China. Master's Thesis, Tianjin University of Finance and Economics, Tianjin, China, May 2012. (In Chinese)
54. Jiang, Y. *Studies on Regional Specialization and Economic Growth in China*; Economic Management Press: Beijing, China, 2012. (In Chinese)
55. Jackson, R.W. An evaluation of alternative measures of regional industrial diversification. *Reg. Stud.* **1984**, *18*, 103–112. [CrossRef]
56. Siegel, P.B.; Johnson, T.G.; Alwang, J. Regional economic diversity and diversification. *Growth Chang.* **1995**, *26*, 261–284. [CrossRef]
57. Chandra, S. Regional economic size and the growth-instability frontier: Evidence from Europe. *J. Reg. Sci.* **2003**, *43*, 95–122. [CrossRef]
58. Li, J.; Song, D. Specialization, diversification and urban agglomeration economy: An empirical study based on the panel data of Chinese prefecture-level units. *Manag. World* **2008**, *24*, 25–34. (In Chinese)

59. Sun, X.; Zhang, L.; Zhao, Z. Sources of urban agglomeration economy: Specialization or diversification? Empirical analysis based on China's urban panel data. *Financ. Econ.* **2016**, *40*, 113–122. (In Chinese)
60. Chen, L. Research on Urban Agglomeration Economy of Yangtze River Delta and Pearl River Delta: From the Perspective of Localization and Diversification. Master's Thesis, Zhejiang University, Hangzhou, China, January 2011. (In Chinese)
61. Wang, T. Specialized, diversified industrial agglomeration and carbon emission. *J. Ind. Technol. Econ.* **2019**, *37*, 131–138. (In Chinese)
62. Storper, M. *Keys to the City: How Economics, Institutions, Social Interaction, and Politics Shape Development*; Princeton University Press: Princeton, NJ, USA, 2013.
63. Henderson, V. Externalities and industrial development. *J. Urban Econ.* **1997**, *42*, 449–470. [CrossRef]
64. Wang, H.; Shi, Y. Research on the expansion and benefit of industrial land in Shanghai under the influence of policy. *World Reg. Stud.* **2014**, *23*, 133–141. (In Chinese)
65. H-U Tokyo Lab. *Society 5.0: A Super-Intelligent Human-centred Society*; Shen, D., Ed.; China Machine Press: Beijing, China, 2020. (In Chinese)
66. Shi, Y.; Yu, Y. Whether suburbanization exacerbates or alleviates urban diseases—Evidences from Shanghai, China. *Econ. Geogr.* **2016**, *36*, 47–54. (In Chinese)
67. Taneja, H.; Maney, K. *Unscaled: How AI and a New Generation of Upstarts Are Creating the Economy of the Future*; Hachette Book Group: New York, NY, USA, 2018.