Article

The Correlation between the Jobs–Housing Relationship and the Innovative Development of Sci-Tech Parks in New Urban Districts: A Case Study of the Hangzhou West Hi-Tech Corridor in China

Yue Wu [1,2,3], Yue Yang [1], Qiuxiao Chen [4] and Weishun Xu [1,*]

[1] Department of Architecture, Zhejiang University, Hangzhou 310058, China; ywu100@zju.edu.cn (Y.W.); 11512016@zju.edu.cn (Y.Y.)

[2] International Center for Architecture & Urban Development Studies, Zhejiang University, Hangzhou 310058, China

[3] China Institute for New Urbanization Studies, Zhejiang University, Hangzhou 310058, China

[4] Department of Regional and Urban Planning, Zhejiang University, Hangzhou 310058, China; chen_qiuxiao@zju.edu.cn

* Correspondence: xuweishun@zju.edu.cn

check for updates

Abstract: Sci-tech parks (STPs), as a key space carrier of urbanization, have transformed into comprehensive parks with mixed urban functions and advanced hi-tech industries. The jobs–housing relationship, which is closely related to the two major urban functions of work and residence, affects the efficiency of urban operation. This study focused on the correlation between the jobs–housing relationship and the innovative development of STPs, adopting the Hangzhou West Hi-Tech Corridor as a case study. Four indicators reflecting the jobs–housing balance index and commuting distance and ten indicators reflecting agglomeration degree, development scale, innovative ability, financial status, and comprehensive development level of enterprises were selected to perform partial least squares regression. The results show that the jobs–housing relationship was correlated with the innovative development of STPs. Relatively short commuting distance may promote the development and agglomeration of sci-tech enterprises. However, short average commuting distance was not necessarily good. The working space and living space needed to be mixed at an appropriate scale and distance—to be close but not too close. This study provides references for the future development of STPs and the application of mixed-use zoning in the urban spatial planning; additionally, it supports for the research and practice of industry–city integration and urbanization.

Keywords: jobs–housing relationship; sci-tech parks; urbanization; innovative development; the Hangzhou West Hi-Tech Corridor

1. Introduction

Industrial parks have played an important role in the large-scale construction of new urban districts over the past few decades of rapid urbanization in China [1,2]. As the main fronts of the export-oriented economy, industrial parks are critical to China's economic growth. Moreover, they are the effective and characteristic carriers of urbanization to gather talent and capital, support scientific and technological innovation, promote industrial upgrading, and drive regional economy [3]. From the Shenzhen Shekou Industrial Park in the 1980s, to the Shanghai Lujiazui central business district (CBD) and Yangtze River Delta Manufacturing Park in the 1990s, to Beijing Zhongguancun, Zhangjiang Hi-Tech Park II and Suzhou 2.5 Industrial Park in the beginning of the twenty-first century, the scale of

the parks has grown from a few square kilometers in the early days to hundreds of square kilometers now, resulting in a profound impact on the structure of urban space [4].

In the new era of innovative development, numerous hi-tech enterprises that deeply integrate information technology and traditional industries have emerged. This new industry has become a vital engine for promoting social and economic development and enhancing the competitiveness of cities [5,6]. Sci-tech parks (STPs) are spatial carriers used to develop such industries and cultivate all types of innovative technological achievements [7]. They are a powerful force leading scientific and technological innovation and future economic development [8]. Therefore, research in the planning of STPs is of critical importance in guiding the future development of China's new type of urbanization.

Working and living are the two key elements of urban land use [9]. In the process of urbanization, the jobs–housing relationship is the main factor affecting the urban spatial structure and the operational efficiency of new urban districts [10]. Due to the fact of urban spatial expansion and increasingly intensified suburbanization and spatial reconstruction in China, traditional industrial parks and new industrial parks are mostly located in the new urban expansion districts and have become the most important type of land use in the new urban districts [11]. This relatively single homogeneous land use type in the new urban districts has caused many problems, such as jobs–housing separation, imbalanced land resource distribution, low traffic efficiency, and long-distance traffic jams, which seriously restricted development [12]. Therefore, in the case of limited land resources, it is necessary to optimize the allocation of land resources to realize the mixing of urban functions and improve use efficiency. The strategy of industry–city integration was proposed against the background of homogenous industrial expansion in China [13]. As an urban development strategy, the "industry–city integration" refers to the integrated development of industry and other urban functions. City is the space carrier of developing industrial economy, and industry is the driving force of urban renewal. It has played a great role in alleviating traffic congestion, rationally allocating resources, and realizing the dynamic and sustainable development of industry, city, and people [14].

Although efforts have been made at the policy level to promote industrial–urban integration, existing literature is still unable to answer these following questions, which were to be solved in this study. What is the relationship between the "city" (jobs–housing relationship) and the "industry" (sci-tech parks), and how does the "city" influence the "industry" in the context of urbanization and innovative development? What suggestions could be provided for the future planning and development of new urban districts dominated by sci-tech and innovation?

As a national innovation demonstration zone, Hangzhou has gathered numerous innovation resources and sci-tech industries [15]. In 2019, Hangzhou's digital development index ranked first in China, and the overall development level of its digital economy ranked within the top five in China [16]. Hangzhou is striving to build an innovation and entrepreneurship center with global influence [17]. The Hangzhou West Hi-Tech Corridor (hereinafter referred to as "the Corridor") is the first sci-tech innovative industrial cluster in Zhejiang Province and represents the latest development trend of STPs in China [18]. The Corridor has gathered various STPs, such as Alibaba Headquarters Park, Zhejiang Overseas High-Level Talents Innovation Park, Characteristic Town (The Characteristic Town originated in Zhejiang Province in 2014 and differs from administrative areas, industrial parks, and new towns. This area focuses on characteristic emerging industries and builds a complete industrial chain surrounding a single distinctive industry. The "Characteristic Town" is the carrier of and platform for the organic integration of multiple functions such as industry, city, culture), etc. [19]. The Corridor has become an urban innovative space with highly mixed functions and advanced hi-tech industries. It is a vital case for research concerning the innovative development of the STPs and industry–city integration.

This study discusses the correlation between the jobs–housing relationship and innovative development of STPs based on findings from the Hangzhou West Hi-Tech Corridor as a case study. In essence, this study focused on the impact of the jobs–housing balance and mixed land use on hi-tech industries. The aim was to provide a reference for and support the planning of new urban districts and the development of STPs in the future. Based on the analysis, some suggestions on the planning

of spatial structures and land use are proposed to address problems in urban development such as jobs–housing separation and traffic congestion. This research may also offer reference for countries worldwide in demand for the construction of new industrial parks in many countries [20]. Therefore, it is of great significance for the internet economy and urban development to study the jobs–housing relationship in new urban districts and explore paths to realizing the innovative development of STPs. This study provides a reference for the future development of STPs and the application of mixed land use in the planning of new urban districts; it also enriches theoretical achievements in industry–city integration and urbanization.

The remainder of this article is structured as follows: Section 2 provides a literature review; Section 3 describes the research methods and data; Section 4 presents the results of this study; and Section 5 includes conclusions and discussions.

2. Review of Relevant Studies

This study is a reflection of the interactive relationship between industry and city in the new urban districts in the context of the urbanization transformation and innovative development in China. Previous studies have involved the functional transformation in the industrial parks, the jobs–housing relationship and the factors affecting the development of the science and technology parks.

A significant body of literature has mapped out the trajectory of the transformation of industrial parks from small-area, independent industrial zones with a single production function to higher-level, comprehensive parks with mixed urban functions over the past decades [21], and the development of such parks has entered a new stage of integrated development of industry and city [22]. Since the 20th century, many theories and practices regarding industrial parks in new urban districts emerged in the Western countries that have deeply influenced the development of industrial parks in China; the concepts involved included the "sleeping city", the central business district (CBD) model, "Urban Sprawl", the "New Urbanism", etc. [23]. In the early stage, most industrial parks were aimed to realize the economic development and the spatial agglomeration of production factors, characterized by a centralized layout, single function, and isolated space [24]. With the global industrial upgrading and promotion of urbanization, the practice of parks in China referring to these theories has already exposed negative effects. The imperfect functions within the parks and the separation between city and industry become increasingly serious, and they must be repaired and activated [25]. For example, all the commercial buildings planned in the Lujiazui CBD were changed into service space; the Zhangjiang Hi-Tech Park put forward the idea of a comprehensive city, considering the limitations of a single function; the Suzhou 2.5 Industrial Park accelerated the development by creating multiple functional carriers of new urban space, including production, residence, leisure, and other functions [26,27]. The industrial parks are gradually shifting from traditional parks that focus on a single short-term economic growth goal to modern parks that focus on multiple long-term comprehensive development goals. Focusing on the connotation, mechanism, and path of the industry–city integration, scholars generally believe that industry and city are closely related [28]. The industry is the key driver of city, and the city can continuously promote the development of industry and economy [29]. Previous studies generally believe that industry and city are closely related, but existing studies fail to systematically identify specific influencing factors of the interrelationship between "industry" and "city".

Since the development of industrial parks entered a new stage, their urban functions have been constantly improved, mostly through the supply of local housing markets. Work and residence are the two most important functions in a city and the jobs–housing relationship affects the efficiency of urban operation [10]. The concept of jobs–housing balance can be traced back to the belief that employment and residence should be close to each other and develop in balance, as presented in the "garden city" by Howard [30] at the end of the 19th century. After that, it has been applied and developed in the practice of urban planning in the 20th century. The current status of the jobs–housing relationship concept refers to the spatial connection and positional relationship between the workplace and living place of urban employees and residents [31]. It contains the three main contents of residence, employment,

and commuting and is a main content of studies on the urban spatial structure [32]. In previous studies, the STPs were mainly taken as a case area or a specified geographical scope of empirical research to study the jobs–housing relationship itself in different scales. These studies involved research on the matching and separation of the jobs–housing space, measurement of the jobs–housing balance, influencing factors of the jobs–housing relationship, commuting and accessibility, etc. [33–35]. Additionally, in the study of the effects of the jobs–housing relationship, it was usually related to population, urban planning, transportation, and other fields and discussed the proportion of employees and residents, urban spatial structure and functional layout, travel traffic, etc. [36]. The jobs–housing relationship not only has a significant impact on the employment, residence, and happiness of residents [37] but also on the rationality of urban spatial distribution [38] and the sustainability of urban operation efficiency. However, previous studies failed to establish the correlation between the jobs–housing relationship and industrial economy, and they ignored the role of the jobs–housing relationship on the development of industrial parks. There is a lack of study on the relationship between the jobs–housing relationship and the innovative development of science and technology parks in the new era.

The development of STPs as a special form of industrial parks has also been well recorded. There is a lack of research on the influencing factors of STPs' innovative development from the perspective of urban spatial planning. In the 1950s, Stanford Research Park, the world's first STP founded by Stanford University on its campus, rapidly grew into Silicon Valley [39]. Since then, STPs have been seen as an effective way to promote the integration of science and technology with the economy and have sprung up all over the world. The innovative development of STPs, as platforms for promoting regional innovative economy and industrial upgrading and transformation [18], are affected and restricted by many factors and conditions. In terms of external conditions, national policies, market environment, financial support, and industry–university–research cooperation are the main factors. Firstly, national policy and a harmonious and stable relationship between regional policies are crucial to the development of STPs [40]. The government has formulated preferential policies and development strategies for enterprises [41]. Several studies confirmed that STPs tend to perform well in regions with strong industrial agglomeration or where the large high-tech firms located. The comprehensive effects of enterprise agglomeration provide support for the development of STPs [42]. Financial capital and guidance on how to access and manage funding are also important for the performance of STPs [43]. Besides that, some scholars argued that the impetus for innovation came not from the park itself but from the university–industry–government interaction shaped by the regional environment [44]. Sci-tech parks that have established strong collaboration with universities have higher levels of performance, e.g., higher numbers of patent applications and firms on the park [4]. However, other studies have focused on the internal factors of the parks, such as park management, availability of research personnel, marketing expertise, financial support, enterprise culture and brand, etc. [45,46]. To conclude, previous studies on factors related to the innovative development of STPs mainly focus on government policy guidance, market economy operation, scientific research platform support, the innovation and entrepreneurship environment, innovation factor agglomeration, industry–university–research cooperation, etc. These studies neglect to consider factors related to urban planning, and there are few studies on the correlation between the jobs–housing relationship and the innovative development of STPs.

In summary, the gaps in previous studies on the correlation between the jobs–housing relationship and the innovative development of STPs are as follows: (1) The development of industrial parks has gone through the process from having a single industrial function to mixed urban functions. In the new stage of the integrated development of industrial park and city, scholars generally believed that industry and city were closely related, but there are few quantitative studies on the specific influencing factors of the spatial relationship between "industry" and "city". (2) The effects of the jobs–housing relationship on the development of industrial parks are neglected. Most studies on the jobs–housing relationship related to the innovative development of STPs usually take the STP as the geographical scope of the study case in order to study the distribution characteristics of regional jobs–housing space

or to evaluate the jobs–housing relationship. The study on the effects of jobs–housing relationship is usually related to population, urban planning, transportation but not on the most critical role that the STPs play—economic performance. There is a lack of interdisciplinary quantitative research that combines the jobs–housing relationship with the innovation ability and economic development level of STPs. (3) Existing studies neglected the urban planning-level interference as explanatory factors for STP performance. The influencing factors related to the innovative development of STPs mainly focused on scientific research support, industry–university–research cooperation, innovation and entrepreneurship environment, policy guidance, market economy, etc. Research is still lacking on the correlation between the jobs–housing relationship and the innovative development of STPs from the perspective of urban space planning.

This study started from the above research gaps, and its innovation is mainly reflected in the particularity of the period studied, namely, the urbanization transition period and innovation-led development era as well as the specificity of the region, namely, the West Hi-Tech Corridor in Hangzhou, China. First, following the large-scale construction of parks in new urban districts, a series of problems caused by the rapid growth and expansion of urban space have seriously affected the development of future urban space and the construction of new urban district spaces [12]. This study actively responded to these problems and reflected on the past development process and practices of parks with a different attitude to guide the practices of new industrial parks and promote future large-scale urbanization processes. Second, this study focused on emerging industrial parks dominated by hi-tech industries that represent the future development trend. The population in the STPs is different from that in ordinary industrial parks, and the target population is high-tech talent with the knowledge and ability to engage in scientific and technological innovation, which leads to new requirements for the jobs–housing space of the STPs. Third, China's current development is rapidly shifting to an innovation-oriented trajectory; however, there is a lack of clear guidance for the construction of STPs in new urban districts. Hangzhou is an important economic growth core in the Yangtze River Delta, with a developed digital economy and internet industry [47]. The Yangtze River Delta Integration National Strategy and the goal of building a global sci-tech innovation center have brought new opportunities for future innovation development in Hangzhou [48]. This study took the Hangzhou West Hi-Tech Corridor as a case study, as it is conducive to timely summarizing the wisdom of innovative development in China and the new Chinese experience.

3. Study Area, Data, and Methods

3.1. Study Area

The Hangzhou West Hi-Tech Corridor is located in the west of Hangzhou and spans 15 towns and streets in the three districts of Xihu District, Yuhang District, and Lin'an District from east to west. It includes Zijingang Science and Technology City, Future Science and Technology City, and Qingshanhu Science and Technology City (see Figure 1). With Wenyi West Road as the main axis, it has a total planned area of approximately 224 square kilometers and a length of approximately 33 km [49].

The Corridor is referred to as the prototype of a new sci-tech town with highly mixed land use and active innovation and entrepreneurship. The reasons why the Corridor was suitable for this study are as follows.

First, the highly mixed urban space of the Corridor provides diverse and adequate samples supporting the study. The Corridor experienced the development processes of government planning, real estate exploitation, and the spontaneous embedding of urban villages in different periods, different scales, and different levels. It formed a highly integrated development mode featuring the integration of old and new urban space, the mixing of multiple functions, the coexistence of different types of industrial parks, and the win–win situation of economic benefits, social harmony, and ecological protection. The Corridor includes the world's internet economy giant Alibaba, a single enterprise giant entity with a new headquarters park; an incubator space for emerging small and medium enterprises

represented by Haichuang Park; and the Characteristic Town in Zhejiang Province represented by the Dream Town. Additionally, there are local contexts, such as Cangqian Town in the original Yuhang District, and complex and excellent natural conditions, such as Xixi National Wetland.
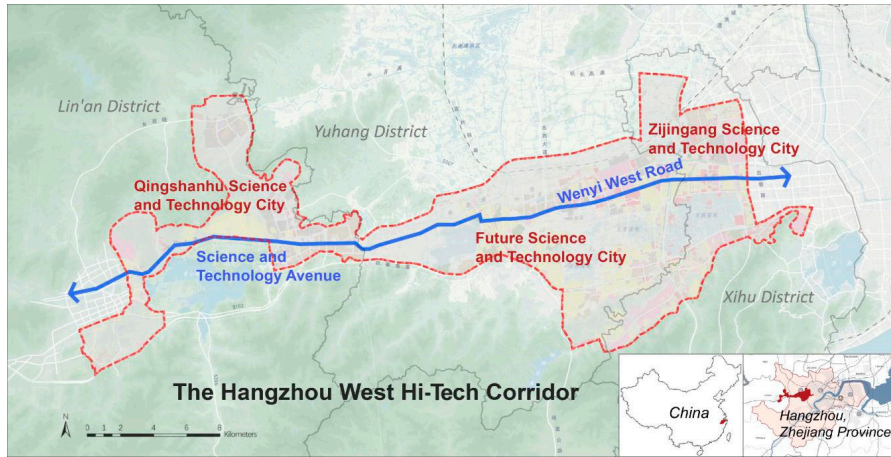

Figure 1. Location and spatial layout of the Hangzhou West Hi-Tech Corridor.

Second, the Corridor represents the latest trend in the development of STPs in China and provides an excellent case for timely summarizing the fresh Chinese experience of the innovative development of STPs. The Corridor has developed a new generation of information technology industrial clusters focusing on the industries such as the future networks, big data, cloud computing, and the Internet of Things. It focuses on the cultivation of six high-end industries, specifically, artificial intelligence, life science, new energy vehicles, new materials, technology services, and new finance.

Third, the Corridor is located in Hangzhou, the national innovation demonstration zone, and provides a template for the development of STPs for other regions of China.

As described in the Overall Space Planning of the Hangzhou West Hi-Tech Corridor, the Corridor could be divided into 31 functional areas according to the leading functions [49]. The internal functions of these areas are mixed and all kinds of service facilities facing the leading functions are gathered and shared. The types of these functional areas include a central area, scientific research area, higher education area, industrial area, residential area, comprehensive area and leisure area. (see Figure 2 and Table 1) In this study, the 31 functional areas are considered the sampling ranges to calculate the average value of the indicators reflecting the development of STPs' enterprises in each area.
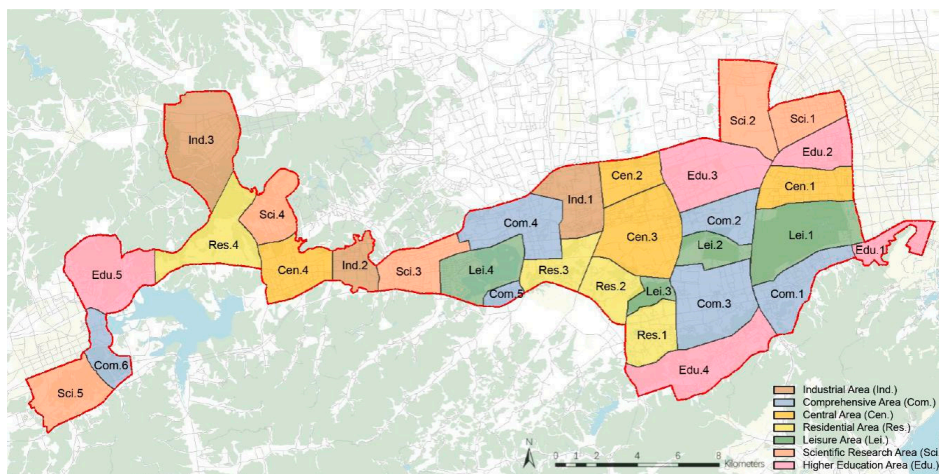

Figure 2. Distribution of the Hi-Tech Corridor's functional areas.

Table 1. List of functional areas.

Functional Areas	Serial Number	Name
Industrial area (An area dominated by industrial function)	Ind. 1	Yongle Industrial Area
	Ind. 2	Lin'an Development Zone Industrial Area
	Ind. 3	Hengfan Industrial Area
Comprehensive area (An area with the integrated development of multiple functions)	Com. 1	Liuxia Comprehensive Area
	Com. 2	Taobao City Comprehensive Area
	Com. 3	Wuchang Comprehensive Area
	Com. 4	Laoyuhang Comprehensive Area
	Com. 5	Zhongtai Comprehensive Area
	Com. 6	Chengdong New City Comprehensive Area
Central area (A core development area located in the center of a science and technology city or an administrative district)	Cen. 1	Jiangcun Central Area
	Cen. 2	Chengxi Hub Central Area
	Cen. 3	Future Science and Technology City Central Area
	Cen. 4	Qingshanhu Science and Technology City Central Area
Residential area (An area dominated by living function)	Res. 1	Xianhu Residential Area
	Res. 2	Xianlin East Residential Area
	Res. 3	Xianlin West Residential Area
	Res. 4	Qingshanhu North Residential Area
Leisure area (An area dominated by leisure function or green space)	Lei. 1	Xixi Wetland Leisure Area
	Lei. 2	Wuchang Wetland Leisure Area
	Lei. 3	Xianlin Wetland Leisure Area
	Lei. 4	South Lake Leisure Area
Scientific research area (A functional area dominated by scientific research spaces such as research institutes or laboratories)	Sci. 1	West Lake Sci-Tech Innovative Parks Scientific Research Area
	Sci. 2	Yungu Scientific Research Area
	Sci. 3	South Lake West Scientific Research Area
	Sci. 4	Cloud Manufacturing Town Scientific Research Area
	Sci. 5	Yiyang Town Scientific Research Area
Higher education area (An area dominated by higher education function)	Edu. 1	Zhejiang University Xixi Higher Education Area
	Edu. 2	Zhejiang University Zijingang Higher Education Area
	Edu. 3	Hangzhou University City Higher Education Area
	Edu. 4	Xiaoheshan Higher Education Area
	Edu. 5	Zhejiang Agriculture and Forestry University Higher Education Area

3.2. Data Source

3.2.1. Jobs–Housing Relationship Data Based on Location-Based Service (LBS)

Location-Based Service (LBS) refers to the location information of mobile terminal users obtained through a radio communication network [50]. As a type of big data, it is widely used in research related to geographic information and location services [51]. It includes two meanings: first is to identify the geographical location of the mobile device or user; second is to provide location-related information services. In this study, the workplace and living place of employees and residents in the Corridor can be identified through LBS data, which provides a basis for the calculation of occupation-related indicators. In this study, the jobs–housing relationship data include the total number of employees, the total number of residents, the number of people who both work and live in the Corridor, and the commuting distance. The data reflect the population of employees and residents, the distribution and connection of working and living places, etc., and provide a basis for the calculation of jobs–housing relationship indicators. The data, LBS, were procured from Ground Truth, a professional company that provides big data services. The company has partnered with a number of mobile apps and web companies to run advertisements across over 150,000 apps. The location data of mobile phones within a certain range of time and place were observed; then, the workplace and living place of each commuter in the Corridor were inferred. Finally, the data results were obtained, such as the number of employees or residents, commuting distance, for the calculation of the jobs–housing relationship indicators (see Figure 3).
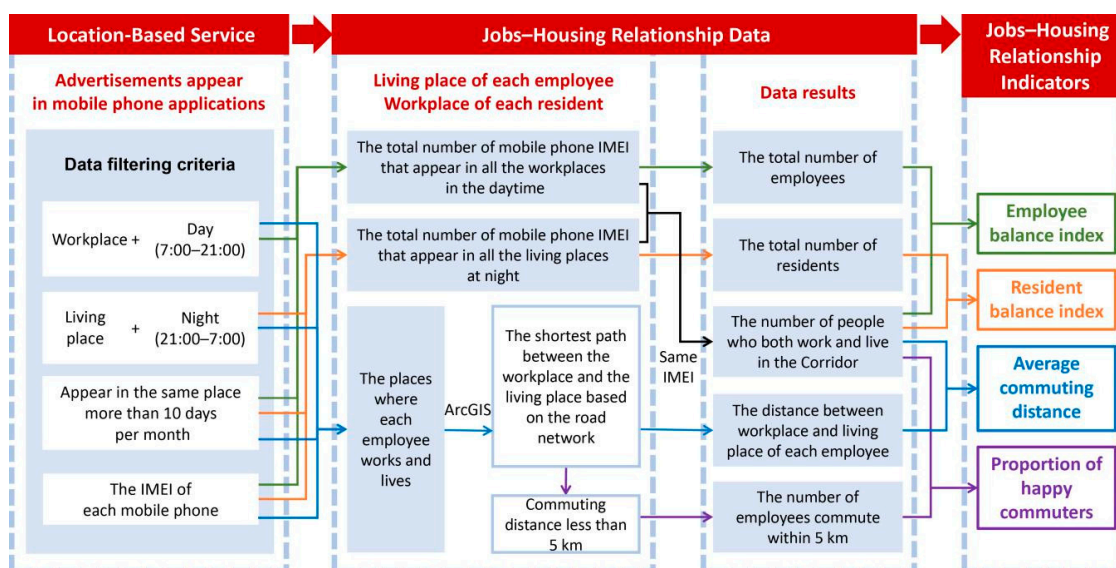
Figure 3. Jobs–Housing relationship indicators based on Location-Based Service (LBS) data. IMEI = international mobile equipment identity.

The data acquisition process is as follows. First, the scopes and geographical coordinates of each STP and residential area were clarified, and the company's advertisements were placed in mobile apps such as Alipay, WeChat, and Weather. Once users entered their workplace or living place and opened the mobile apps, they saw ads in the apps. Simultaneously, the background program recorded the unique international mobile equipment identity (IMEI) of their mobile phones and their location. Second, all data appearing in the workplace during the daytime (7:00–21:00) and in the residential area at night (21:00–7:00) were screened, and repeated device information was deleted according to the IMEI. Third, the frequency of the same mobile phone appearing in the same STP or residential area within 3 months was counted. If the frequency of occurrence in the same place exceeded 10 days per month, the place was considered the workplace or living place of the mobile phone's user. In this way, the total number of employees in each STP and the total number of residents in each residential area could be obtained. Finally, due to the uniqueness of IMEIs, the mobile phone IMEI of employees and residents were compared to identify the "same IMEI". User with the "same IMEI" were identified as people who both work and live in the Corridor. Then, the living place of each employee and the workplace of each resident could be identified. Additionally, the commuting distance could be calculated by connecting the workplace and living place of each employee through the road network using ArcGIS.

According to the jobs–housing relationship data, there were 24,563 employees in the workplace, 93,449 residents in the living place, and 12,032 people who both worked and lived in the Corridor. These data can be used to calculate indicators related to the jobs–housing relationship.

Most of the previous studies measured the jobs–housing relationship from the aspects of population of employees and residents, land use of industry and residence, transportation and commuting, etc. The common indicators included the jobs–housing ratio, jobs–housing balance index, commuting distance, and commuting time [33].

This study refers to the index designed by Ewing to describe the jobs–housing balance ratio and calculated the jobs–housing balance index to reflect the real jobs–housing balance [52]. Differing from the jobs–housing ratio, which focuses on the jobs–housing balance in quantitative terms and neglects the situation in which the residential population is employed outside the region or the employed population lives outside the region, the jobs–housing balance index reflects the actual quality of the jobs–housing balance [53]. The jobs–housing balance index refers to the proportion of people who both work and live in the same area. It includes the employee balance index, which reflects the proportion of all employees living in the Corridor, and the resident balance index which reflects the proportion of all

residents working in the Corridor. They can be calculated based on the population of employees and residents in each functional area. The closer the index is to 1, the higher the degree of the jobs–housing balance and the lower the degree of the jobs–housing separation.

The Employee Balance Index is defined by the following Formula (1):

$$JHBR_{J,i} = \frac{MATCH_i}{J_i}, \tag{1}$$

In Formula (1), $MATCH_i$ refers to the number of people who both work and live in the Corridor, and J_i refers to the total number of employees in the Corridor.

The Resident Balance Index is defined by the Formula (2):

$$JHBR_{H,i} = \frac{MATCH_i}{H_i}, \tag{2}$$

In Formula (2), $MATCH_i$ refers to the number of people who both work and live in the Corridor, and H_i refers to the total number of residents in the Corridor.

The commuting distance between the workplace and the living place can be calculated by ArcGIS based on the road network. This study selected the proportion of happy commuters as a jobs–housing relationship indicators, i.e., the proportion of employees who commute within 5 km among all the employees living in the Corridor. The proportion of commuters within 5 km can be used as an indicator to measure the jobs–housing balance and happy commuting according to the Commuting Monitoring Report of Major Cities of China in 2020 released by the Ministry of Housing and Urban-Rural Development, China Academy of Urban Planning and Design [54]. Additionally, the Beike Research Institute, which is a real estate research platform, took the commuting distance within 5 km as the standard for a happy commute, and they drew a "happy commute circle" with a radius of 5 km. It is generally believed that a commuting distance within 5 km indicates that residents have a reasonable and controllable commuting time and various transportation options. In addition to public transportation and private cars, residents can arrive at work by walking, bicycling, or using other non-motorized vehicles, resulting in a happy commuting experience. The higher the proportion of commuters within 5 km, the more people have a pleasant commuting experience, indicating that they work and live nearby. A shorter commute is conducive to achieving a jobs–housing balance and green traveling.

In this study, four indicators were selected, including employee balance index, resident balance index, average commuting distance, and proportion of happy commuters. These indicators were used as independent variables in the quantitative analysis (see Table 2).

Table 2. List of the jobs–housing relationship indicators.

Category	Independent Variable	Indicator	Explanation
Balance index	X1	Employee balance index	The proportion of the number of people who both work and live in the Corridor among all the employees in the Corridor
	X2	Resident balance index	The proportion of the number of people who both work and live in the Corridor among all the residents in the Corridor
Commuting distance	X3	Average commuting distance	The average commuting distance of people who both work and live in the Corridor
	X4	Proportion of happy commuters	The proportion of employees who commute within 5 km among all the employees living in the Corridor

3.2.2. Innovative Development Data of STPs' Enterprises

The improvement in innovative capacity, the accumulation of human resources, the continuous growth of asset levels and economic benefits are important manifestations of the innovative development of STPs' enterprises. According to the Detailed Rules of Standards for the Recognition and Grading of National Sci-Tech Enterprises in 2019, intellectual properties and scientific and technological achievements transformation ability are important indicators for measuring the innovative ability of enterprises [55]. Scholars mostly use the status of patent applications, especially innovative and utility model patents, as the evaluative standard of scientific and technological innovation [56,57]. The Chinese Enterprises Scale Classification Standard in 2011 categorizes enterprises by scale according to the number of employees, total assets, and operating income [58].

This study collected data from 16,504 sci-tech enterprises in STPs in the Corridor obtained through Qichacha and Tianyancha, which are the industrial and commercial information query platforms of the National Enterprise Credit Information Publicity System. The contents included ten indicators related to the innovative development of STPs' enterprises in terms of the agglomeration degree, development scale, innovative level, financial status, and comprehensive development level. Among them, staff size and the number of insured persons reflect the enterprises' development scale; the number of intellectual properties, number of patents, and total content of sci-tech innovation reflect the enterprises' level of sci-tech innovation; total assets, total sales, and average salary reflect the enterprises' financial status; and the comprehensive score reflects the enterprises' comprehensive development level. These indicators are used as dependent variables in the quantitative analysis and their specific information is as follows (see Table 3).

Table 3. List of innovative development indicators of sci-tech park (STP) enterprises.

Category	Dependent Variables	Indicator	Explanation
Agglomeration degree	Y1	Enterprise distribution density	The number of sci-tech enterprises per unit area in each area
Development scale	Y2	Staff size	The average staff size of enterprises in each area, including the number of regular staff, temporary staff and all other staff
	Y3	Number of insured persons	The average number of insured persons in enterprises in each area. It refers to the number of regular employees
Innovative ability	Y4	Number of intellectual properties	The average number of intellectual properties of enterprises in each area
	Y5	Number of patents	The average number of patents of enterprises in each area
	Y6	Total content of sci-tech innovation [1]	The total content of sci-tech innovation of enterprises in each area
Financial status	Y7	Total assets	The average total assets of enterprises in each area
	Y8	Total sales	The average total sales of enterprises in each area
	Y9	Average salary	The average salary of enterprises in each area
Comprehensive development level	Y10	Comprehensive score [2]	The comprehensive score of enterprises in each area

[1] Total content of sci-tech innovation: published by the Qichacha platform; this indicator is converted according to the following five intellectual properties of enterprises: invention publication patents, invention authorization patents, utility model patents, software copyrights, and design patents. [2] Comprehensive score: published by the Tianyancha platform; this score involves more than 300 dimensions of the enterprises' public information. The score is given as a percentage and computed by a unique algorithm of Tianyancha. The score is related to not only the registered capital of the enterprise itself but also industry characteristics and market competition.

3.3. Study Methods

The correlation between the jobs–housing relationship and the innovative development of STPs was analyzed using the partial least squares regression (PLSR) method. A flowchart of the methods is shown in Figure 4.
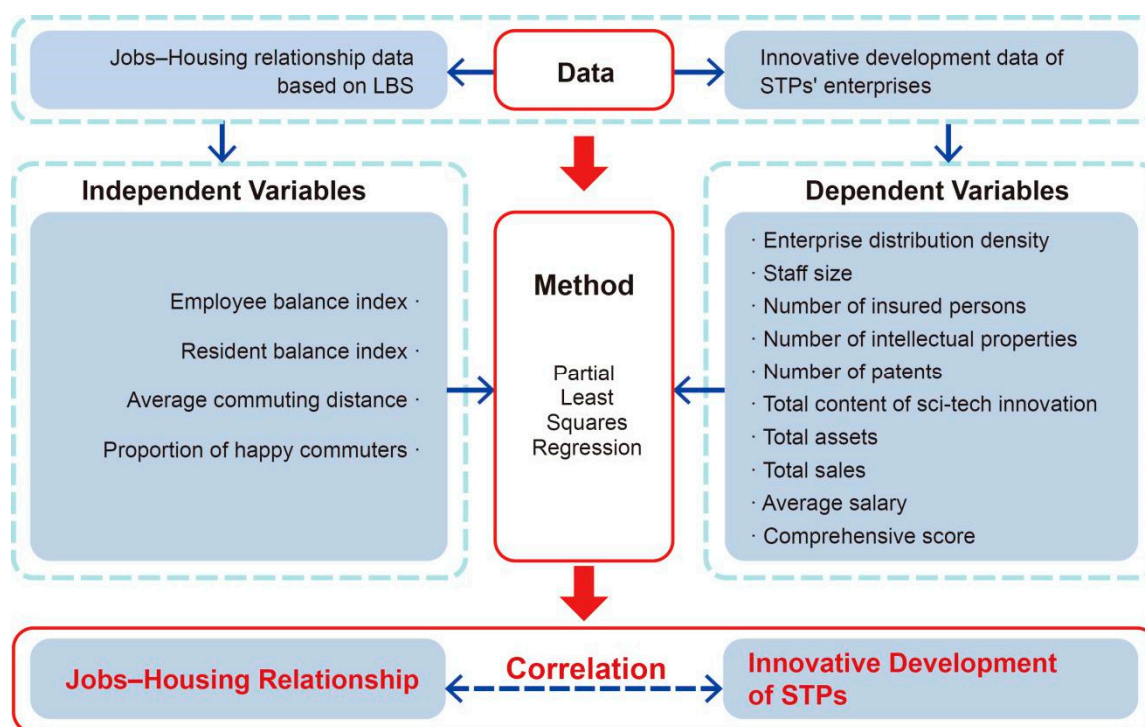

Figure 4. Flowchart of the methods.

The partial least squares regression method, which was first proposed by S. Wold and C. Albano et al. [59] in 1983, is a commonly used multiple linear regression analysis methods for studying correlations. This method is mainly suitable for regression modeling of multiple independent variables with multiple dependent variables and can effectively solve the problems of variable multicollinearity and a small sample size. The PLSR consists of a combination of a principal component analysis, canonical correlation analysis, and multiple linear regression analysis [60]. The main difference between PLSR and traditional least squares regression is that the PLSR adopts information synthesis and selection in the modeling process. It extracts a number of components in a variable system that have the best explanatory ability and then conducts regression modeling, instead of directly considering the regression modeling of the set of dependent variables and the set of independent variables.

This study performed statistics to analyze the correlation between the jobs–housing relationship indicators and innovative development indicators of STPs' enterprises in the 31 functional areas. Due to the small sample size and high collinearity among the variables, the PLSR method was suitable for this study.

The analysis methods follow a three-step calculation listed as follows:

Suppose that p dependent variables $Y_1, \ldots, Y_p$ and m independent variables $X_1, \ldots, X_m$ are all standardized variables; the n-times standardized observation data matrix of the dependent variable group and that of the independent variable group were denoted as follows (see Formula (3)). In this study, $p = 10$ (ten indicators related to the innovative development of sci-tech enterprises in STPs were

considered dependent variables), $m = 4$ (four indicators related to the jobs–housing relationship were considered independent variables), and $n = 31$ (n indicates the sample size).

$$\underset{n \times p}{Y_0} = \left\{ \begin{array}{ccc} y_{11} & \cdots & y_{1p} \\ y_{11} & \cdots & y_{2p} \\ \vdots & \ddots & \vdots \\ y_{n1} & \cdots & y_{np} \end{array} \right\}, \ \underset{n \times m}{X_0} = \left\{ \begin{array}{ccc} x_{11} & \cdots & x_{1m} \\ x_{11} & \cdots & x_{2m} \\ \vdots & \ddots & \vdots \\ x_{n1} & \cdots & x_{nm} \end{array} \right\} \tag{3}$$

Step 1: The optimal number of principal components was confirmed to be 1 through a cross-validity analysis. The analysis results can be reflected by the value of Q_h^2.

$$Q_h^2 = 1 - PRESS_h / SS_{(h-1)} \tag{4}$$

In Formula (4), h indicates the number of principal components, SS indicates the error sum of squares, and PRESS indicates the predicted error sum of squares, where SS and PRESS are the intermediate process values of the cross-validity analysis. When there is only one principal component, $Q_h^2 = 1$; when there are two principal components, $Q_h^2 \le 0.0975$. Therefore, the optimal number of principal components is one (see Table 4).

Table 4. Cross-validity analysis.

Number of Principal Components (h)	SS	PRESS	Q_h^2
1	861.347	999.379	1
2	815.022	1014.743	−0.178
3	794.654	1081.560	−0.327
4	758.364	1152.617	−0.450

Step 2: Principal component U1 was extracted from the independent variable X, and principal component V1 was extracted from independent variable Y. Then, an accuracy analysis was performed to examine the information extraction rate (variance interpretation rate) of the principal components of X and Y. The components U1 and V1 must extract as much information as possible from the variable groups to which they belong.

The comprehensive extraction ratio of principal component U1 for all four independent variables was 0.557 (variance interpretation rate, 55.7%). The comprehensive extraction ratio of principal component V1 for all 10 dependent variables was 0.612 (variance interpretation rate, 61.2%).

Step 3: The correlation between the jobs–housing relationship indicators (X, independent variables) and innovative development indicators of STPs' enterprises (Y, dependent variables) as identified by the regression is analyzed.

4. Results

4.1. Analysis of the Jobs–Housing Relationship

For the jobs–housing balance index in the whole Corridor, the employee balance index was 0.49, indicating that nearly half of the employees lived in the Corridor and achieved a jobs–housing balance; the resident balance index was 0.13, indicating that most residents worked outside the Corridor. For each functional area, it can be seen that the employee balance index varied greatly across areas, ranging from 0.12 to 0.88, while the resident balance index was generally small, basically within 0.27 (see Figures 5 and 6).
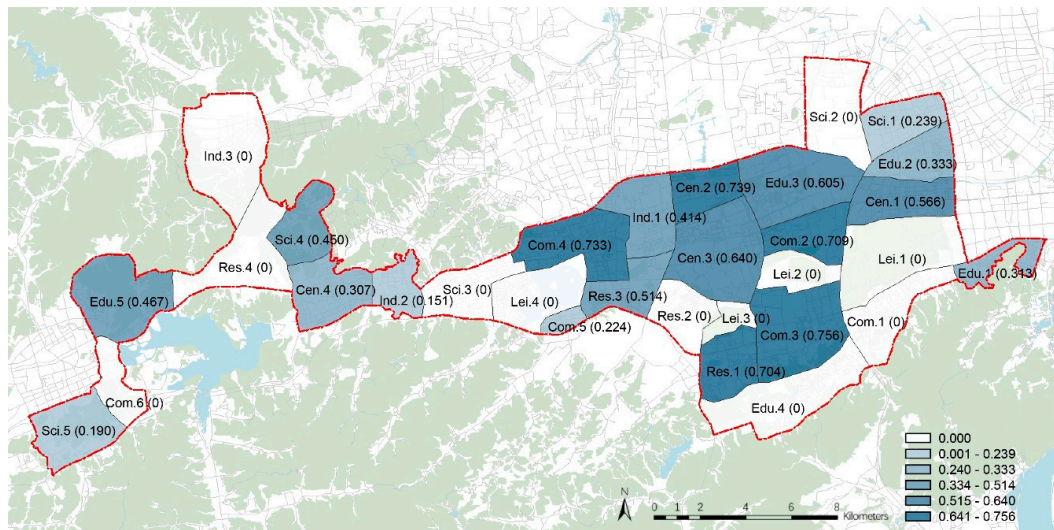
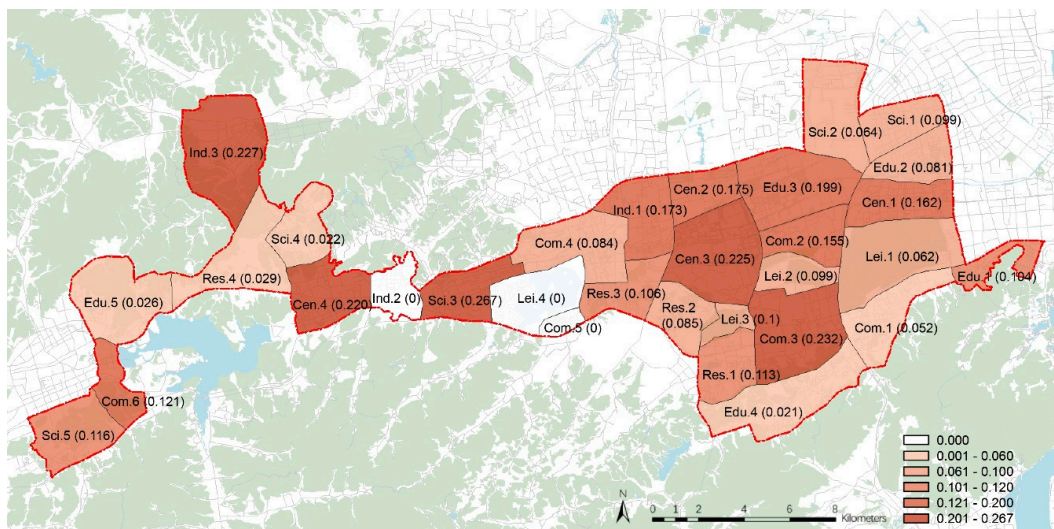**Figure 5.** Employee Balance Index of each area in the Corridor.

Figure 6. Resident Balance Index of each area in the Corridor.

First, the employee balance index of functional areas in the Future Science and Technology City is generally high, indicating that many employees in these areas live inside the Corridor, especially the Xianhu Residential Area (Res. 1), Chengxi Hub Central Area (Cen. 2), Taobao City Comprehensive Area (Com. 2), Wuchang Comprehensive Area (Com. 3) and Laoyuhang Comprehensive Area (Com. 4). The resident balance index was generally low, indicating that few residents in these areas worked inside the Corridor. Many STPs are located along Wenyi West Road, with various types of talent apartments such as Zhejiang Overseas High-Level Talents Innovation talent apartment, You+ apartment, and Rookie apartment. Additionally, there were sufficient residential capacities in the south of Wuchang and Xianlin areas that have provided rental residences for all kinds of innovative and entrepreneurial talents. Second, the two jobs–housing balance indexes of functional areas in the Zijingang Science and Technology City, located in the east of the Corridor, were generally low, except for the Jiangcun Central Area (Cen. 1). These areas are close to the center of Hangzhou city, and a large proportion of employees and residents would like to live and work in the downtown area. Third, the employee balance index of functional areas in the Qingshanhu Science and Technology City, located in the west of the Corridor, was generally low. The resident balance index of the central area (Cen. 4) and Hengfan industrial area (Ind. 3) were both relatively high. Many traditional industrial parks in

the two areas originated from local private manufacturing factories in the past. These people work close to where they live, demonstrating a generally observed pattern in manufacturing industry.

Commuting distance can be calculated based on the road network using ArcGIS. The 5268 shortest commuting paths between workplace and living place of 12,032 employees who live inside the Corridor are obtained. Then, the number of commuters in each distance range was counted. According to statistical analysis, approximately 75.21% of the commuters live within 5 km of their workplace and very few farther than 15 km away (see Figure 7). It indicates that the overall jobs–housing relationship in the Corridor was relatively close and more than three-quarters of commuters who both lived and worked in the Corridor achieved a "happy commute". The average commuting distance of employees living in the Corridor was approximately 3.8 km. In terms of the spatial distribution of the average commuting distance, more than two-thirds of the areas had average commuting distances within 5 km, and in all the functional areas, the proportions of commuters within 5 km were above 50% (see Figures 8 and 9). Among these areas, the Laoyuhang Comprehensive Area (Com. 4), the Wuchang Comprehensive Area (Com. 3), and the Xianhu Residential Area (Res. 1) had the shortest average commuting distance and the highest proportion of employees with commuting distances below 5 km, presenting the closest jobs–housing relationship.
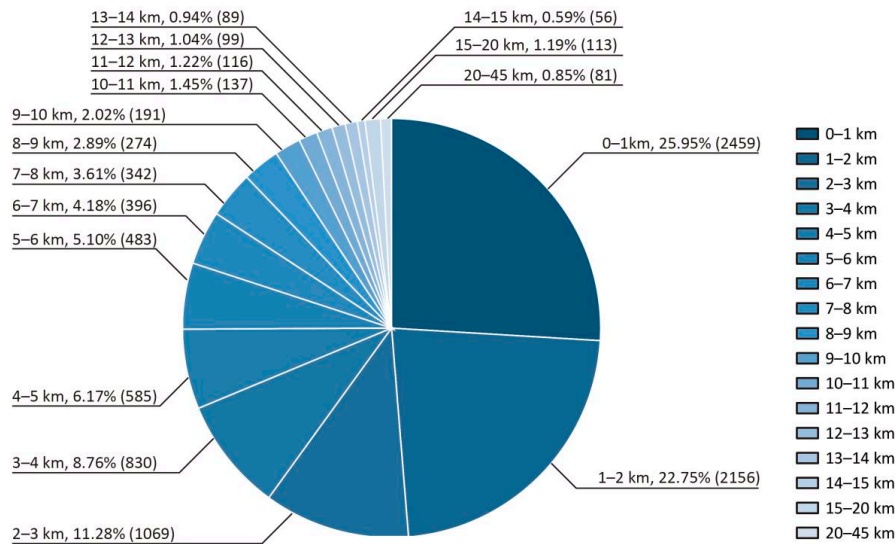

Figure 7. Number and proportion of employees living in the Corridor with different commuting distances.
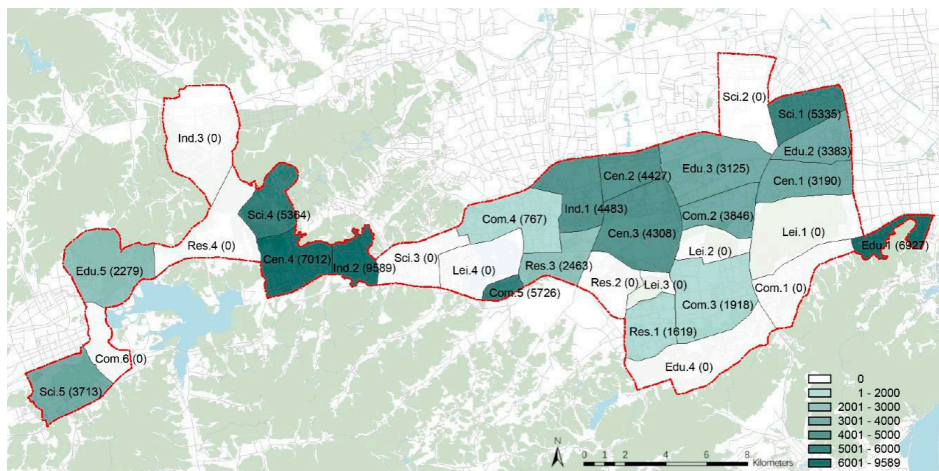

Figure 8. Average commuting distance of each area in the Corridor (units are in meters).
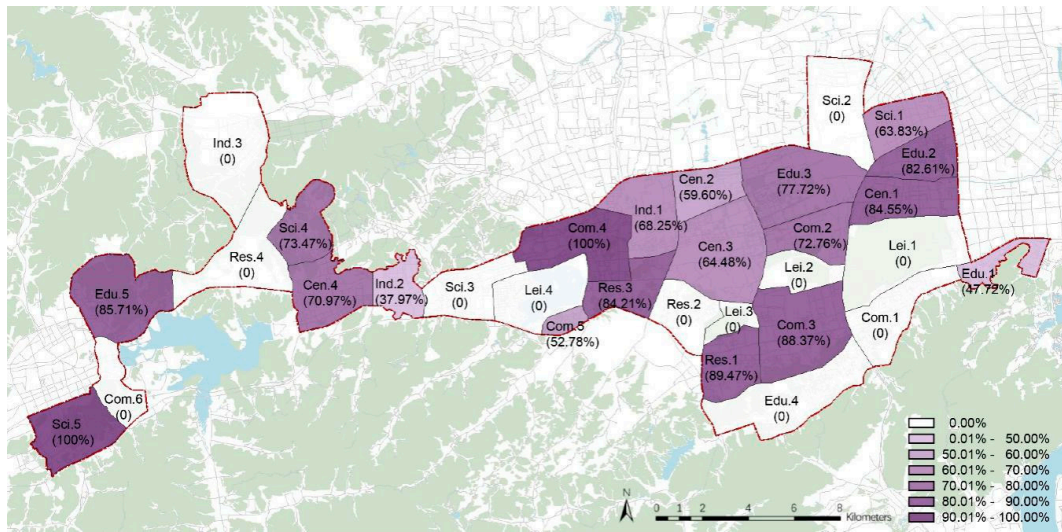
Figure 9. Proportion of happy commuters in each area in the Corridor.

4.2. Analysis of Innovative Development of Enterprises in the STPs

The 16,504 sci-tech enterprises were mainly distributed along the Wenyi West Road of the Future Sci-Tech City and around the Zijingang Campus of Zhejiang University, including the Future Sci-Tech City Central Area (Cen. 3), the West Lake Sci-Tech Park Scientific Research Area (Sci. 1), the Jiangcun Central Area (Cen. 1), and the Hangzhou University City Higher Education Area (Edu. 3). There are few sci-tech enterprises in the Qingshanhu Sci-Tech City area in the west of the Hi-Tech Corridor, and only a few enterprises were concentrated in the central area (Cen. 4) and in the Cloud Manufacturing Town scientific research area (Sci. 4) (See Figure 10).
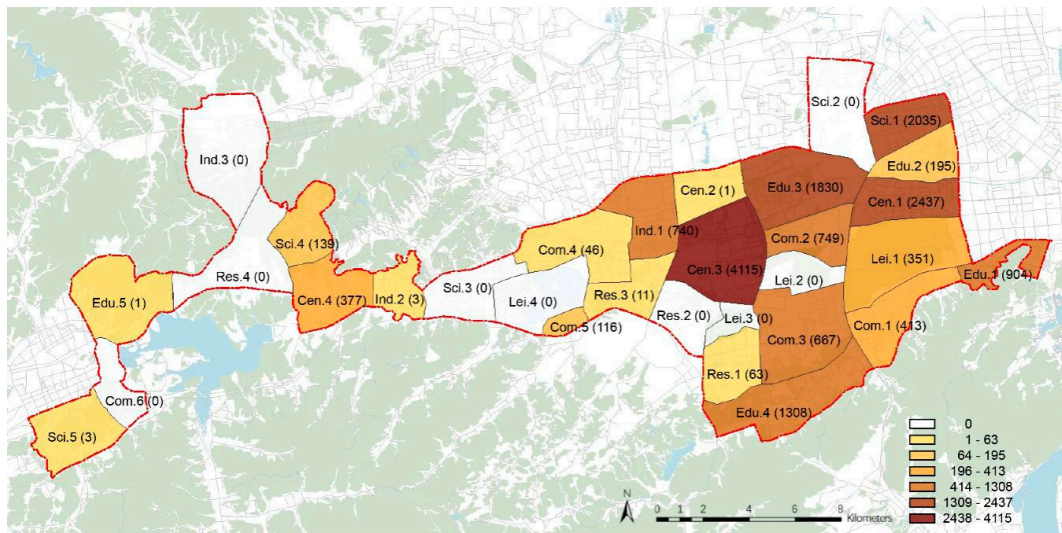

Figure 10. Distribution of sci-tech innovative enterprises of each area in the Corridor.

4.3. Partial Least Squares Regression

In this study, the partial least squares method was applied for multiple linear regression analysis to study the correlation between the jobs–housing relationship and the innovative development of STPs. Four indicators reflecting the jobs–housing relationship were used as independent variables, and ten indicators reflecting the innovative development of sci-tech enterprises in STPs were used as dependent variables. The results of the PLSR analysis are as follows (see Table 5).

In general, the jobs–housing relationship was correlated with the innovative development of enterprises in the STPs. Different indicators showed different correlations and significance levels. For the enterprise distribution density reflecting the agglomeration degree, the employment balance index and the proportion of happy commuters had a significant negative correlation, while the resident balance index had a significant positive correlation. For other indicators reflecting the quality of enterprises' innovative development, the employment balance index and the proportion of happy commuters had a significant positive correlation with most indicators, while the resident balance index had a significant negative correlation. The average commuting distance was not significantly correlated with most indicators related to the innovative development of STPs, except for the total assets and the number of insured persons.

For the employee balance index and the resident balance index, two indicators related to the jobs–housing relationship, they had different correlations on the innovative development of the STPs. The resident balance index had a significant positive correlation with the enterprises' distribution density, reflecting the degree of agglomeration, while the employee balance index has a significant negative correlation. The employee balance index had a significant positive correlation with the total assets, total sales, and average salary, which reflects the financial status of the sci-tech enterprises, and also with the number of insured persons reflecting the development scale, while the resident balance index had a significant negative correlation. In addition, the employee balance index had a significant positive correlation with the number of intellectual properties, but the resident balance index had a significant negative correlation with the number of patents. It can be inferred that the improvement of the resident balance index, that is, the increase in the number of residents employed in the Corridor, is conducive to the agglomeration of sci-tech enterprises; the improvement of employee balance index, that is, the increase in the number of employees living in the Corridor, is conducive to the innovative development of enterprises in the STPs, which is reflected in the improvement of financial status, the expansion of development scale, and the enhancement of innovative ability.

For the two indicators related to commuting distance, the proportion of happy commuters had a stronger correlation with the innovative development of STPs than the average commuting distance. The proportion of happy commuters had a significant negative correlation with the enterprises' distribution density reflecting the degree of agglomeration, while it had a significant positive correlation with the staff size, number of patents, total assets, average salary, and comprehensive score. The average commuting distance had a significant positive correlation with the number of insured persons and total assets, but it did not have a significant correlation with other indicators related to the innovative development of STPs. It can be inferred that the increase in the proportion of happy commuters, that is, the increase in the number of commuters within 5 km in the Corridor, is conducive to the improvement of sci-tech enterprises in terms of the development scale, innovation ability, financial status, and comprehensive development level, while it is not conducive to the agglomeration of enterprises in quantity. The increase in the average commuting distance promotes the improvement of enterprise scale and financial status but it had no impact on the other indicators.

Table 5. Regression coefficients [1] and *p*-value [2] of the partial least squares regression (PLSR).

		Y1 Enterprises Distribution Density	Y2 Staff Size	Y3 Number of Insured Persons	Y4 Number of Intellectual Properties	Y5 Number of Patents	Y6 Total Content of Sci-Tech Innovation	Y7 Total Assets	Y8 Total Sales	Y9 Average Salary	Y10 Comprehensive Score
	Con.	0.313	−0.053	−0.238	−0.12	−0.452	−0.617	−0.011	−0.061	0.66	0.289
X1	Employee balance index	−0.86 *	1.521	1.278 **	1.044 *	0.542	0.223	2.311 **	2.005 **	2.771 **	1.723
X2	Resident balance index	0.845 **	−1.494 **	−1.255 **	−1.026	−0.533 **	−0.219	−2.27 **	−1.969 *	−2.722 **	−1.692 **
X3	Average commuting distance	−0.123	0.218	0.183 **	0.15	0.078	0.032	0.332 **	0.288	0.398	0.247
X4	Proportion of happy commuters	−0.873 **	1.544 **	1.297	1.06	0.551 **	0.226	2.347 **	2.035	2.814 **	1.749 **
	R Square [3]	0.122	0.6	0.448	0.476	0.106	0.022	0.487	0.481	0.459	0.664

[1] Regression coefficient represents the influence of independent variable X on dependent variable Y. The larger the regression coefficient, the greater the influence of X on Y. A positive regression coefficient indicates that y increases as x increases, while a negative regression coefficient indicates that y decreases as x increases. [2] *p*-value is the probability of obtaining a result at least as extreme as the one that was actually observed or a more extreme result given that the null hypothesis is true. The smaller the p-value is, the more significant the result (** Significant at $p = 0.01$; * significant at $p = 0.05$). [3] R square refers to the goodness of fit. R square is the fitting degree of the regression equation to the explained variable, and its value ranges from 0 to 1. The more the value of R approaches 1, the better the fitting degree of the regression equation.

5. Conclusions and Discussion

This study focused on the innovation and development of STPs dominated by the internet economy and sci-tech industry and explored the correlation between the jobs–housing relationship and the innovative development of STPs in new urban districts. It was a positive response to the problems in urban development during the urbanization transformation stage and a reflection of the interaction between industry and city in the new urban districts. The Hangzhou West Hi-Tech Corridor, which represents the recent development trend for STPs in China, was selected as a case study. First, based on geospatial information and LBS data, indicators related to the jobs–housing balance and commuting distance were selected to evaluate the jobs–housing relationship. Second, indicators related to the innovation and development of enterprises in the STPs were selected from agglomeration degree, development scale, innovative ability, financial status, and comprehensive development level. Finally, partial least squares regression was used to explore the correlation between the jobs–housing relationship indicators and the enterprise development indicators.

The conclusions of this study are as follows:

(1)   There was a correlation between the jobs–housing relationship and the innovative development of STPs. The jobs–housing balance may promote the innovative development of enterprises in the STPs to a certain extent.

(2)   Living near the workplace and working near the living place may promote the development and agglomeration of sci-tech enterprises. More residents working around the residential area, which is reflected in the improvement of resident balance index, is conducive to the agglomeration of sci-tech enterprises in this area. More high-tech talents living around the parks, which is reflected in the improvement of the employee balance index, is conducive to the development of sci-tech enterprises in this area, which is highlighted in the financial status, innovation ability, and development scale of enterprises.

(3)   More people commuted within 5 km, which is reflected in the proportion of happy commuters, was conducive to the innovative development of sci-tech enterprises. However, the shorter average commuting distance was not necessarily better. The increase in the proportion of commuters within 5 km was not conducive to the agglomeration of enterprises. The shortening of the average commute distance may also hinder the expansion of the development scale and the improvement of financial status.

The contribution of this study can be seen more clearly when it is compared with previous studies. First, some studies believed that a balanced jobs–housing relationship has a positive impact on optimizing urban spatial structure, alleviating traffic congestion and realizing intensive utilization of urban land resources, which is helpful to solve the problems in the process of urbanization. These views have been validated in this study. However, in addition, this study also found that the jobs–housing relationship was correlated with the agglomeration and innovative development of enterprises in the STPs. Furthermore, most previous studies argued that the commuting distance should not be too long and should be controlled within a certain range. This has also been verified. However, it was further discovered in this study that the average commuting distance in an area should be neither too long nor too short. Too short a commuting distance may have a negative impact on the expansion of development scale and the improvement of financial status of enterprises in the STPs.

Some suggestions are put forward for the future practice of STPs and planning of new urban districts.

First, in the early stage of urban construction, sufficient residential capacity should be allocated, and a reasonable location and distribution should be planned within a certain range around the industrial parks, based on the consideration of the scale and future development trend of the industrial parks. Proper planning and mixed layout of residential area and other urban functional space around the STPs may form a balanced jobs–housing relationship that may promote the development of STPs and stimulate the vitality of new urban districts.

In addition, a good living condition and environment should be provided in order to let talents settle down, besides vigorously introducing talents. In the early stage of the development of new urban districts, most of the residents are local residents engaged in traditional industries or agriculture and lack high-tech knowledge and abilities. They have the labor force and need more employment opportunities provided by the enterprises. This has promoted the agglomeration of enterprises, especially some service industries related to the sci-tech industrial chain and intelligent equipment manufacturing industry transformed from traditional manufacturing industry, to a certain extent. When the industrial agglomeration reaches a certain scale and produces positive effects, it will attract more enterprises to settle in. However, besides the agglomeration of enterprises in quantity, the innovative development level of enterprises in quality should be constantly improved. The employees of STPs are mainly high-end talents engaged in sci-tech industry with certain knowledge level and innovation ability. They provide a continuously strong driving force for the innovation and development of hi-tech enterprises. This will also have a positive impact on the development of enterprises in the STPs.

Finally, a more flexible mixed use of urban land should be adopted in urban planning within a certain urban scale; working space and living space need to be mixed at an appropriate medium streets(town) scale and distance—to be close but not too close. Indeed, commuting within 5 km may be conducive to the improvement of employees' work efficiency and has a positive impact on the development of sci-tech enterprise. However, this study also finds that the increase in the proportion of happy commuters and the shortening of the average commuting distance may have a restraining effect on the development of STPs. This indicates that the shorter commuting distance is not always better and the working and living space needs to be mixed on a certain range and spatial scale. For the STPs, industrial agglomeration needs sufficient space carrier. If too many residential areas and public service spaces are built around the parks, it will occupy the development space of the enterprises, which is not conducive to the formation of industrial chain and industrial cluster effect. On the other hand, for the residential area, too close to the STPs will also bring some negative effects. It destroys the relative independence and integrity of the residential area and is not conducive to ensuring the quality of life and the safety of living. For the residents, it will blur the boundary between work and life. They need a buffer zone to separate work and life so that they can relax completely after work.

This study was an application of geographic information in urban space research. It provides a reference for the development of STPs in the new urban districts and the application of mixed use in future urban space planning and supports future research and practice of industry–city integration and urbanization. The Corridor is one of the most innovative and vibrant economic hubs in China in the era of digitalization, which provides abundant samples for this study. This study is of great significance for timely summing up the wisdom of innovation and development from China.

There are some limitations in this study in terms of data bias and indicator selection. First, there may be selection bias in the acquisition of LBS data. The data came from mobile phone location information of people who work and live in specific places during specific time periods. Bias can come from different use frequencies in different user groups in terms of age, gender, and income level. Second, some indicators related to the jobs–housing relationship and the innovative development of STPS were selected according to previous studies and national standards. However, only some of the available indicators were selected as variables, which may have had an impact on the results. Moreover, due to the confidentiality of economic data, some enterprises' information was not disclosed, and the data sample did not cover all of the enterprises in the Corridor.

Future research will extend the conclusions of the research by conducting analysis in sci-tech parks in different regions for comparison. Furthermore, the effects of transportation accessibility on the jobs–housing relationship and the influences on the development of STPs will be explored. Additionally, the research field will be extended to other aspects such as society, economy, culture and ecology, and explore new attitudes, new ideas, and new methods for the development of STPs and the new urban districts in the context of the future innovation economy and the development of urbanization.

References

1. Hua, X.; Wenhui, L.; Xinzhi, Z. The Empirical Analysis of Industrial Parks Development and Urbanization Process Take Jiangxi Province as an Example. In Proceedings of the 2010 International Conference of Information Science and Management Engineering ISME 2010, Xi'an, China, 7–8 August 2010; pp. 389–392. [CrossRef]

2. Васильєва, O.I. Industrial Parks as a Tool to Promote the Development of Regions. *Management* **2016**, *9*, 213–221.

3. Li, Y.; Arora, S.; Youtie, J.; Shapira, P. Using web mining to explore Triple Helix influences on growth in small and mid-size firms. *Technovation* **2016**. [CrossRef]

4. Albahari, A.; Pérez-Canto, S.; Barge-Gil, A.; Modrego, A. Technology Parks versus Science Parks: Does the university make the difference? *Technol. Forecast. Soc. Chang.* **2017**, *116*, 13–28. [CrossRef]

5. Wang, J.; Liu, N.; Ruan, Y. Influence Factors of Spatial Distribution of Urban Innovation Activities Based on Ensemble Learning: A Case Study in Hangzhou, China. *Sustainability* **2020**, *12*, 1016. [CrossRef]

6. Tan, Y.; Rosemary, A.; Isil, E. How can contemporary innovation districts be classified? A systematic review of the literature. *Land Use Policy* **2020**, *95*, 104595. [CrossRef]

7. Jin, W.; Chunpeng, J.; Guangzhong, L. Promoting reformation of sci-tech innovation carrier and shaping new space of R&D and innovation in Jiangsu: Based on analysis of innovation practice of sci-tech innovation carrier in Zhejiang and Guangdong. *Heilongjiang Sci. Technol. Inf.* **2020**, *16*, 169–171.

8. Yucai, Z.; Qiuming, W. The empirical analysis of the relationship between sci-tech innovation platform and innovative city. In Proceedings of the 2013 International Conference on Management Science and Engineering 20th Annual Conference Proceedings IEEE, Harbin, China, 17–19 July 2013.

9. Xiaochen, M.; Jing, W.; Fanpu, S. The Study Review of Urban Jobs-Housing Balance. *Urban Stud.* **2009**, *16*, 23–28, 35.

10. Waddell, P. UrbanSim: Modeling urban development for landuse, transportation and environmental planning. *J. Am. Plan. Assoc.* **2002**, *68*, 297–314. [CrossRef]

11. Caiyuan, C.; Zhiqian, S.; Tao, L. Improvement of the Balance of Employment and Residence in the New District Based on the Traffic Composite Corridor—A Case Study of Liangjiang New District in Chongqing. 60 Years of Planning: Achievements and Challenges. In Proceedings of the 2016 China Urban Planning Annual Conference (05 Urban Transport Planning), Shenyang, China, 24–26 September 2016.

12. Bingwen, Q.; Haiwen, L.; Zhenghong, T.; CHongcheng, C.; Joe, B. How cropland losses shaped by unbalanced urbanization process? *Land Use Policy* **2020**, *96*, 104715. [CrossRef]

13. He, C.; Wang, X.; Li, J. Discussion on the Method of Industrial Park Planning under the goal of integration of industry and city: A Case study of Shenzhen. *Urban Plan.* **2017**, *41*, 27–32. [CrossRef]

14. Zhang, Q.; Cao, Y. The internal mechanism and action path of "industry-city integration" under the background of new urbanization. *Commod. Qual.* **2016**, *47*, 80.

15. Geng, Z. Study on the path of establishing national Independent Innovation Demonstration Zone in Hangzhou. *Hangzhou Technol.* **2015**, *216*, 10–15. [CrossRef]

16. Urban Digital Development Index Report in 2019. Available online: http://www.e-gov.org.cn/article-170143.html (accessed on 20 October 2020).

17. Digital Governance Will Promote Modernization of the Urban Governance System and Intelligent Management Ability. Available online: https://baijiahao.baidu.com/s?id=1663012600799901323&wfr=spider&for=pc (accessed on 4 July 2020).

18. Wu, Y.; Xia, M.; Yang, Y. Research and Evaluation on the Open Space System in Hangzhou West Technology Innovation Corridor. *Arch. Cult.* **2020**, *7*, 207–210.

19. Wu, Y.; Yang, Y.; Xu, W.; Chen, Q. The Influence of Innovation Resources in Higher Education Institutions on the Development of Sci-Tech Parks' Enterprises in the Urban Innovative Districts at the Stage of Urbanization Transformation. *Land* **2020**, *9*, 396. [CrossRef]

20. Kang, B.J. A Study on the Establishing Development Model for Research Parks. *J. Technol. Transf.* **2004**, *29*, 203–210. [CrossRef]

21. Katz, B.; Wagner, J. *The Rise of Innovation Districts: A New Geography of Innovation in America*; Brookings Institution Press: Washington, DC, USA, 2014; pp. 7–10.

22. Li, D.; Liu, S.; Kong, Y. Research progress on spatial organization of industrial parks. *J. Shandong Jianzhu Univ.* **2018**, *33*, 61–66. [CrossRef]

23. Wu, Y.; Song, S. Comparative Study on the Spatial Form of "Internet +" Emerging Industrial Parks in Hangzhou West Innovation Corridor—Taking Xixi Park of Alibaba, the First Phase of ZOTP and Dream Town as Examples. *Arch. Cult.* **2018**, *10*, 83–85.

24. Xu, S.; Li, J.; Cao, Y.; Liu, Y. Application of "Industrial Neighborhood Unit" on Planning of High-tech Industrial Park: A Case Study on Nansha Electronics and Information Industrial Park in Guangzhou. *City Plan. Rev.* **2013**, *5*, 42–46.

25. Wu, Y. Repairing and Revitalizing Urban Function of Newly Built Urban Area in China—Two Conceptual Planning Projects in Pudong, Shanghai. *Arch. Cult.* **2007**, *3*, 13–14; discussion 12.

26. Zhao, Y.; Xu, Y. Research on innovation Ability Evaluation of Zhangjiang High-tech Zone in Shanghai. *Sci. Res. Manag.* **2017**, *38*, 90–97.

27. Shi, Y.; Wang, X. Research on the Redevelopment Mode of Innovation-Oriented Development Zones—A Case study of Suzhou Industrial Park. *Mod. Urban Res.* **2019**, *7*, 118–125. [CrossRef]

28. Song, J.; Zhang, P.; Xing, J.; Zhang, Y. Research the Interactive Development of New-Type Industrialization and New-Type Urbanization in the Context of Industrialization-urbanization Integration in China. *Sci. Tech. Progress Policy* **2016**, *33*, 49–55. [CrossRef]

29. Zhang, K.H. Urbanization and Industrial Development in China. *Chinas Urban. Socioecon. Impact* **2017**, *9*, 21–35. [CrossRef]

30. Entringer, T.C.; Lívia, L.D.S. Critical success factors in science and technology parks: A bibliographic review and analysis. *Indep. J. Manag. Prod.* **2020**, *11*, 343–359. [CrossRef]

31. Liu, W.; Hou, C. Research progress and prospect of the relationship between working and living space of urban residents at home and abroad. *Hum. Geogr.* **2013**, *28*, 7–12.

32. Han, H.; Yang, C.; Song, J. Research progress and prospect of the relationship between urban residence and employment space. *Hum. Geogr.* **2014**, *29*, 24–31.

33. Louis, A.M. Measuring community completeness: Jobs–housing balance, accessibility, and convenient local access to non-work destinations. *Environ. Plan. B Urban Anal. City Sci.* **2014**, *4*, 736–756. [CrossRef]

34. Zenou, Y. Spatial versus social mismatch. *J. Urban Econ.* **2013**, *74*, 113–132. [CrossRef]

35. Haddad, E.A.; Barufi, A.M.B. From rivers to roads: Spatial mismatch and inequality of opportunity in urban labormarkets of a megacity. *Habitat Int.* **2017**, *68*, 3–14. [CrossRef]

36. Roberts, J.; Hodgson, R.; Dolan, P. "It's Driving Her Mad": Gender Differences in the Effects of Commuting on Psychological Health. *J. Health Econ.* **2011**, *30*, 1064–1076. [CrossRef]

37. Dickerson, A.; Hole, A.R.; Munford, L.A. The Relationship between Well-Being and Commuting Revisited: Does the choice of methodology matter? *Reg. Sci. Ur-Ban Econ.* **2014**, *49*, 321–329. [CrossRef]

38. Liuyan, D.; Huafu, J.; Lin, X. A review in jobs-housing spatial matching of urban residents. *Hum. Geogr.* **2013**, *2*, 27–31.

39. Chen, J.K.C. Exploring the influence factors for creation one Knowledge hub of Science Park: Comparison between Silicon Valley and Hsinchu Science Park. In Proceedings of the 2016 Portland International Conference on Management of Engineering and Technology (PICMET), Honolulu, HI, USA, 4–8 September 2016; pp. 1156–1171.

40. Huang, W.J.; Fernández-Maldonado, A.M. High-tech development and spatial planning: Comparing the Netherlands and Taiwan from an institutional perspective. *Eur. Plan. Stud.* **2016**, *24*, 1662–1683. [CrossRef]

41. Yan, M.R.; Chen, K.M.; Hong, L.Y.; Yang, T.N. Evaluating the collaborative ecosystem for an innovation-driven economy: A systems analysis and case study of science parks. *Sustainability* **2018**, *10*, 887. [CrossRef]

42. Yun, S.; Lee, J. An innovation network analysis of science clusters in South Korea and Taiwan. *Asian J. Technol. Innov.* **2013**, *21*, 277–289. [CrossRef]

43. Salvador, E. Are science parks and incubators good "brand names" for spin-offs? The case study of Turin. *J. Technol. Transf.* **2011**, *36*, 203–232. [CrossRef]

44. Etzkowitz, H.; Zhou, C. Innovation incommensurability and the science park. *Res. Dev. Manag.* **2018**, *48*, 73–87. [CrossRef]

45. Lindelöf, P.; Löfsten, H. Growth, management and financing of new technology-based firms-assessing value-added contributions of firms located on and off science parks. *Omega* **2002**, *30*, 143–154. [CrossRef]

46. McCarthy, I.P.; Silvestre, B.S.; von Nordenflycht, A.; Breznitz, S.M. A typology of university research park strategies: What parks do and why it matters. *J. Eng. Technol. Manag.* **2018**, *47*, 110–122. [CrossRef]

47. Li, Y. The high level platform is the important foundation stone of realizing the high quality development. *Hangzhou Wkly.* **2018**, *31*, 45.

48. Huang, B. Hangzhou's urban international development under the background of Yangtze River Delta integration. *Zhejiang Econ.* **2019**, *3*, 35–37. [CrossRef]

49. *Hangzhou West Hi-Tech Corridor Planning*; Hangzhou Municipal People's Government: Hangzhou, China, 2016; p. 19.

50. Yus, R.; Bobed, C.; Mena, E. A Knowledge-Based Approach to Enhance Provision of Location-Based Services in Wireless Environments. *IEEE Access* **2020**, *8*, 80030–80048. [CrossRef]

51. Ciepłuch, C.; Mooney, P.; Jacob, R.; Zheng, J.; Winstanley, A.C. Assessing the quality of open spatial data for mobile location-based services research and applications. *Arch. Photogramm.* **2011**, *22*, 105–116.

52. Ewing, R.; Pendall, R.; Chen, D. Measuring sprawl and its transportation impacts. *Transp. Res. Rec. J. Transp. Res. Board* **2003**, *1831*, 175–183. [CrossRef]

53. Ziegler, G.; Dahnke, R.; Winkler, A.D.; Gaser, C. Partial least squares correlation of multivariate cognitive abilities and local brain structure in children and adolescents. *NeuroImage* **2013**, *82*, 284–294. [CrossRef]

54. *Commuting Monitoring Report of Major Cities of China in 2020*; Ministry of Housing and Urban-Rural Development & China Academy of Urban Planning and Design: Beijing, China, 2020; p. 14.

55. *Detailed Rules of Standards for the Recognition and Grading of National Sci-tech Enterprises*; Ministry of Industry and Information Technology of the People's Republic of China: Beijing, China, 2019; pp. 1–3.

56. Xiaotong, A.; Yuping, L. The Influence Factor of Scientific and Technological Innovation—Taking an Example of the Number of Patent Applications. *Emerg. Circ. Wealth* **2016**, *6*, 1–7. [CrossRef]

57. Xiaozhuang, L. Mapping of China's patent application situation—Thinking about the driving force of scientific and technological innovation. *Res. Sci. Technol. Manag.* **2009**, *11*, 323–325.

58. *Chinese Enterprises Scale Classification Standard*; Ministry of Industry and Information Technology of the People's Republic of China: Beijing, China, 2011; pp. 5–9.

59. Wold, S.; Albano, C.; Dunn, W.J. *Pattern regression finding and using regularities in multivariate data*; Analysis Applied Science Publication: London, UK, 1983; pp. 147–188.

60. Huiwen, W.; Zaibin, W.; Jie, M. *Partial Least Squares Regression—Linear and Nonlinear Methods*; National Defense Industry Press: Beijing, China, 2006; pp. 138–149.