

Article

Identifying Critical Factors Influencing the Rents of Public Rental Housing Delivery by PPPs: The Case of Nanjing

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Academic Editor: Gang Liu

Received: 1 December 2016; Accepted: 20 February 2017; Published: 26 February 2017

Abstract: The occupancy rate of Public Rental Housing (PRH) in China is relatively low due to the unreasonable rents. At the same time, the development of PRH using Public Private Partnerships (PPPs) increases the complexity of the rents. Therefore, the critical factors influencing the rents of PRH delivery by PPPs should be identified. Based on the comprehensive literature, this article identified a conceptual model for the factors influencing the rents of PRH delivery by PPPs in China, composed of 14 factors grouped in three factor packages, and discussed the relationships among three factor packages. A survey based on Nanjing was conducted to assess the relative significance of 14 factors. According to the results, six critical factors were identified: construction costs, household income, floor area and structure, transportation, market rents in the same district and public facilities. In addition, the proposed conceptual model had a good fit. The results also supported two hypothetical relationships among three factor packages: (1) the increase of the affordability of the target tenants had a positive effect on the increase of profits of private sectors; and (2) the increase of the affordability of the target tenants had a positive effect on the increase of level of the characteristics of PRH units. For future research, six critical factors and the relationships among three factor packages can be used to determine the reasonable rents for PRH delivery by PPPs in China.

Keywords: Public Private Partnership; critical factors; public rental housing; rents

1. Introduction

Since 2000, housing prices in China experienced a rapid increase, which made the housing affordability issue become critical to Chinese. Low and middle income groups, who expected to buy their own houses from the market, suffered greatly from the affordability issue as well as indecent living conditions [1,2]. To solve the problems, the Central Government launched the Affordable Housing Program for improving the situation. Public Rental Housing (PRH) was one scheme within the program. The PRH was designed for the so-called “sandwich class”, who cannot afford the market housing price but are not eligible for other government housing program (e.g., Cheap Rental Housing and Economical and Affordable Housing) [3]. Especially, millions of rural–urban migrants and college graduates became the largest group of potential candidates of PRH [4,5].

Unfortunately, PRH in China did not work as the Chinese government expected. Although the demand of PRH was enormous, only a relatively small proportion of PRH was rented out (e.g., only 5%

in Nanjing, 39% in Shanghai, 35% in Wuhan and 46% in Zhengzhou) [6]. To help PRH in China work well, scholars tried to explore reasons behind the low occupancy rates. High rents, a complicated and ambiguous application process, remote location, and poor house quality resulted in the low occupancy rate [1,6]. Particularly, the unreasonable rents were believed to be the major one [7,8]. The targeted “sandwich class”, who are more sensitive to rent variation with limited financial capacity, would easily give up on applying for PRH units [9]. Thus, finding a reasonable rental price for PRH would be one way to solve the current puzzle.

Besides, most local governments can hardly guarantee the quality and long-term operation of the PRH [10]. Since 2014, the Central Government tried to limit the public debts and control the size of fixed asset investment [11]. The PRH, which should obtain long-term and intensive investments from the local government, was influenced greatly due to this round of tightening up. Thus, local governments started to seek external resources of capital, management, operation, and services for completing the PRH development plan designed by the Central Government. Aiming at absorbing external resources, PPPs (Public Private Partnerships) can help local governments fill the capital gaps and resolve the management problems in project operation, resources utilization, and service delivery [12]. Therefore, since 2015, the Central Government has also encouraged the PPP approach to develop PRH [13]. In this case, the rents for PRH delivery by PPPs are more complicated because the benefits of tenants and private sectors should be carefully considered.

Thus, this research tries: (1) to construct a conceptual model including different factors grouped in different factor packages influencing the rents of PRH delivery by PPP in China and to hypothesize the relationships among factor packages; (2) to assess the relative significance of factors using survey data and to identify the critical factors; and (3) to test whether the conceptual model and the hypothetical relationships among factor packages are supported based on survey data.

This paper begins with a literature review in the related fields followed by a research design of this study. Then, the conceptual model of different factors grouped in factor packages influencing the rents of PRH delivery by PPP in China is proposed and the relationships among factor packages are hypothesized. Next, a structured questionnaire survey is conducted to identify the critical factors. A structural equation model (SEM) is used to test the conceptual model and the hypothetical relationships among factor packages. Finally, this paper provides conclusions with suggestions.

2. Literature Review

2.1. PPPs in Public Rental Housing

Using PPP for developing public housing is not a new thing in China. Many other countries, such as the U.S., Canada, Australia, India, Nigeria, and Malaysia, also adopt PPP methods to develop public housing or social housing [14].

In a typical Chinese PRH PPP project, the private sector (i.e., private investors) needs to establish a Special Purpose Vehicle (SPV). SPV is an independent project company, which is invested and operated by both the public and private sectors and only focuses on the PRH PPP project. SPV is responsible for financing, designing, building, operating and maintaining PRH units. The local government (i.e., the public sector) is responsible for determining the PRH rents, checking tenants' qualification, supervising the service quality provided by SPV and providing some political support to SPV. Tenants apply for PRH units to the local government and pay the monthly rents to SPV. The private sector gets the monthly incomes from SPV [13]. Figure 1 shows the Chinese PPP model for PRH projects.

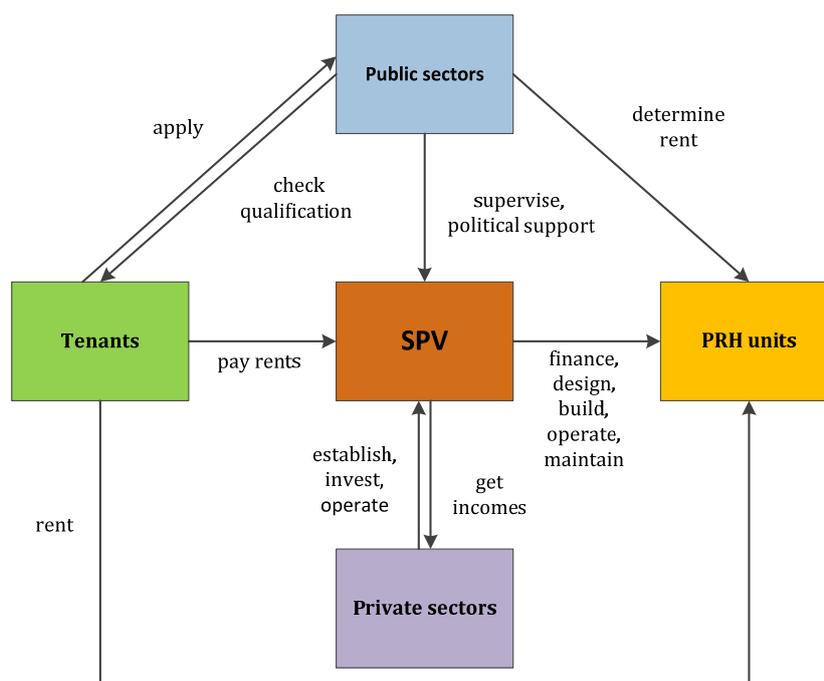


Figure 1. The Chinese PPP (Public Private Partnerships) model for PRH (Public Rental Housing) projects.

Factors affecting the success and failure of PPPs in PRH have received extensive attention. Transparent and consistent communication between public sectors and private sectors was viewed as the most critical success factor of PPP PRH in the UK by Dixon et al. [15]. Meanwhile, the developers with a social sense of obligation also impact heavily on the success of PPP PRH in Malaysia according to Abdul-Aziz and Kassim [16]. In contrast, corruption and political intervention had the greatest negative impact on PPP in PRH, which even directly resulted in failures [17]. Besides, the absence of a relevant regulatory policies or a robust and clear agreement was considered as the main reason for failure to delivery social housing by PPPs in Malaysia [16].

Therefore, many scholars tried to understand government's roles and responsibilities in PPPs for further facilitating the success of PRH development. Sengupta [18] studied PRH PPP projects in Kolkata and argued that the government's responsibility was to fend off possible negative externalities of PPP on the low income households. Sengupta [19] further indicated that the government needed to act as a facilitator and regulator for balancing between market forces and the needs of the low-income people. Parashar [20] also described the government as "enabler" when discussing its role in PPP for PRH development in India. Taiwo [21] studied PRH projects in Nigeria and argued that the government must create a stable economic environment to encourage the active involvement of the private sector in PRH delivery.

Meanwhile, how to construct a reasonable financing structure and mode is also one significant issue in PPP Public Rental Housing, which can help private sectors facilitate the development of projects. Shan and Ye [22] developed a Chinese PPP financing mode for public rental housing by considering four aspects (cost transfer, risk sharing, project investment recovery, and project control). Xu et al. [14] built a robust model to determine the financing structure, particularly the ratio of private investment in Chinese PPP social housing. Li et al. [23] analyzed financial feasibility of the private sector based on PPP Public Rental Housing projects in China.

2.2. Factors Influencing the Housing Rental Price

Many studies have discussed factors influencing housing rents, which can be helpful for this study. Factors mentioned in different studies can be subdivided into macro level (i.e., influencing the average rent for housing at the city level) and micro level (i.e., influencing the rent for housing at the housing unit level).

Factors at macro level may influence the average rent for housing at the city level. These include the total size of urban population, household incomes, urban economy, urban amenities, housing prices and construction costs [24–26].

Factors at micro level are those that may influence the rent for housing at the housing unit level, such as architectural features, neighborhood features, location features, and indoor facilities. Specifically, architectural features are the number of bedrooms, the number of bathrooms, floorage, floor, indoor decoration, the age of housing, etc. [27–29]. The relative neighborhood features are the number of different type of workers, property management, schools, shopping centers, garages, swimming pools, fitness centers, laundries, etc. [27,30,31]. The relative location features are the distance to the center of the town, the distance to the workplace, the distance to the nearest bus station, the distance to the nearest subway station, etc. [28,32,33]. Indoor facilities are televisions, air-conditions, dish-washing machines, washing machines, micro-wave oven, etc. [27,30].

2.3. Knowledge Gap

According to the above-mentioned literature review, prior studies mainly analyzed the success and failure factors, government's roles and responsibilities, and financing in PRH PPP projects. Few studies discuss factors influencing the rents of PRH delivery by PPP.

Although many prior studies discussed factors influencing the rents for housing, these studies paid more attention to the commercial housing based on a commercial perspective and the market impacts. However, PRH in China belongs to the affordable housing rather than the commercial housing. For the rent, the affordability of the target tenants must be considered [34]. Thus, the prior studies about factors influencing the rent for housing are not completely applicable for PRH.

In China, PPPs are now introduced to develop PRH. Therefore, it is necessary to identify the critical factors influencing the rents, which would contribute to determine reasonable rents for PRH delivery by PPPs in China and provide a guideline for other countries. This paper aims at filling the knowledge gap to identify critical factors influencing the rents of PRH delivery by PPPs in China.

3. Research methodology

3.1. Research Design

Based on the literature review and the characteristics of PRH delivery by PPP in China, a conceptual model including factors grouped in factor packages influencing the rents of PRH delivery by PPP in China is built, and the relationships among factor packages are hypothesized. A questionnaire survey using a stratified random sampling method is then conducted to assess the relative significance of factors, based on which the statistical analyses are performed using the SPSS 19.0 software (IBM, Armonk, NY, USA) package including Cronbach's alphas and mean value, to identify the critical factors influencing the rents of PRH delivery by PPP in China. A structural equation model (SEM) is used to test whether the conceptual model and the hypothetical relationships among factor packages are supported based on survey data through AMOS 20 software (IBM, Armonk, NY, USA). The organization of methodology adopted in the research is shown in Figure 2.

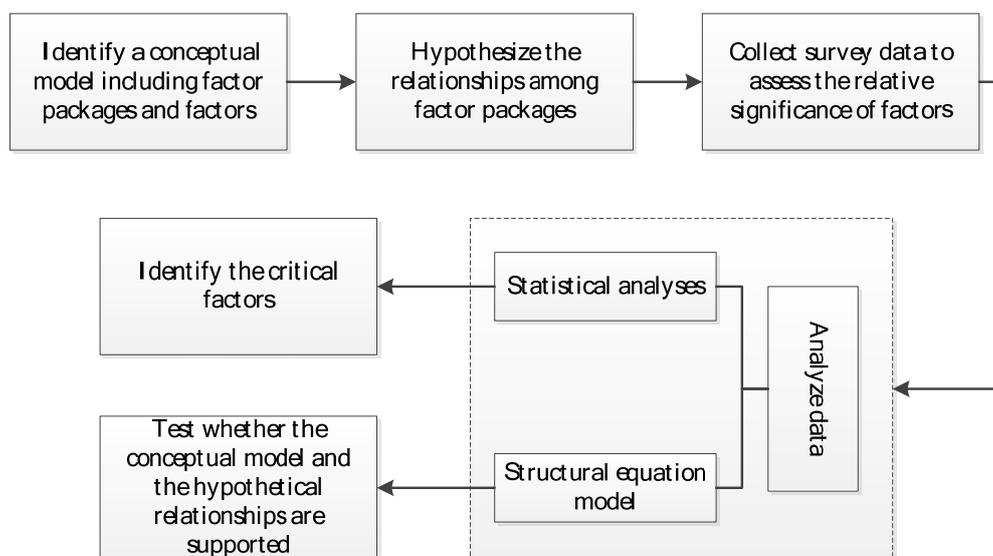


Figure 2. The methodology adopted in this study.

3.2. Data Collection

A structured survey focusing on officials from public sectors, managers for private sectors, and target tenants of PRH was then conducted from October to November 2015. The questionnaire covered two parts. The first part was about the background information of the respondents, including occupation, role and related experience about PRH. In the second part, the respondents were asked to use Likert-style rating questions with a five-point scale, to score the relative significance of factors for determining the rents of PRH delivery by PPP in China. The scale intervals were ranked as: (1) Can be ignored or not important; (2) Possibly important; (3) Important; (4) Very important; and (5) Most important. A Likert scale is the most widely used approach to scaling responses in survey research with a psychometric scale commonly involved in research that employs questionnaires [35,36]. The interchangeably with five-point rating scale is often used in related prior researches [37,38]. In our study, Likert scale with five-point can help respondents specify their opinions of agreement or disagreement on the significance of different factors (e.g., rental prices, tenants income, units characteristics, private participation, etc.) and capture the intensity of their feelings for those given items [39].

Totally, 230 questionnaires were sent out, and 158 responses were received, within which 26 were invalid due to incomplete answers. Therefore, 132 were valid replies and used for analysis. This represented a valid response rate of 57.4%, which was acceptable and adequate for the data analysis. The respondents were major stakeholders in PPP PRH projects including officials from public sectors, managers from private sectors, and target tenants of PRH (Table 1).

Table 1. The Status of the Effective Respondents in the Survey.

Status of Respondents	Percentage
Target tenants of PRH	30.75%
Officials from public sectors	35.29%
Managers from private sectors	33.96%

The sample in this study was composed of 132 completed replies. Compared to other researches in field of PPP, the size of sample is acceptable [40]. Meanwhile, the respondents are from three groups, including 41 prospective tenants, 46 government employees related to PHR, and 45 private managers in PPPs. In fact, the final proportion (41:46:45) is very useful for further analysis in this study because

the balance between public sectors and private sectors are pursued in the research, in which the opinions of target tenants can be used as references in real projects because the most significant role to determine the rents is the local government.

Therefore, an important hypothesis is that the opinions of respondents can be viewed as whole though they may have different expectations, visions and expertise. Cronbach's alpha should be used to support hypotheses. As mentioned above, public sectors are decision-maker of rents in PRH PPP projects. However, public sectors should consider the opinions of private sectors and target tenants when determining the rents. The return of private sectors and the affordability of target tenants are the most important issues that should be considered by public sectors. In this case, the respondents from tenants, government, and private sectors all can provide insightful hints on the present failures, and possible hints on rent pricing. Moreover, in order to get effective opinions on research questions, Nanjing is selected as the location to collect data because its proportion of PRH that is rented out is very small. Regional variations can be neglected in this study, because the role and position of three groups are similar in China. Furthermore, the factors influencing the rents are also the same for residential buildings.

Meanwhile, the sample of government employees were from the Nanjing Housing Security and Real Estate Management Bureau and related public clients; the sample of private managers were from companies including Vanke, Green Town, China State Construction, China Communication Construction, etc.; and the sample of target tenants were selected from the database of government, who were qualified to be the tenants. Hence, the sample in this study are typical stakeholders in PRH PPP projects who can represent the opinions of different groups, which would strengthen the robustness of research results. In the context of PRH PPP projects, government determines the rents and provides social welfare for the tenants in PRH, which would meet the requirements of private sectors to earn long-term stable reasonable profits from PPP projects. Consequently, the sample size of tenants is not so important when public sectors and private sectors can achieve the balance in the PPP environment, which is the research goal in this study. In order to integrate the interests of different stakeholders, different perceptions, interests and expertise of stakeholders drawn from survey are mixed in our study because the number of effective replies is similar for each group of stakeholders. Although the viewpoints of different stakeholders on different factors influencing rents of PRH are significant, the method to determine the rents should consider the benefits of public sectors, private sectors, and target tenants. Therefore, the data from each group of stakeholders are viewed all the same in the process of data analysis for the balance of different stakeholders' benefits, which meets the requirements of our study.

3.3. Data Analysis

3.3.1. Statistical Analysis

Statistical tests were conducted to ensure that the sample could be treated as a whole and used for further analysis by SPSS 19.0 (IBM, Armonk, NY, USA). Cronbach's alpha was calculated for this purpose. The Cronbach coefficient of this sample size is 0.878 (F-statistic = 45.366, sig. = 0.000), higher than the 0.7 benchmark. According to Nunnally's [41] guideline and Yuan's [38] similar researches, in the early stages of research on predictive tests or hypothesized measures of a construct, reliability of 0.70 or higher should suffice. A Cronbach's value was derived for each factor. A value exceeding 0.9, between 0.9 and 0.7, and lower than 0.35 indicates high, acceptable, and low reliability, respectively. Therefore, the results of consistency test indicated that the questionnaire with relatively high and acceptable reliability that could meet the requirements of subsequent analysis. The results of Cronbach's alpha support that respondents can be viewed as whole though they are heterogeneous.

The ranking of the factors should accord to the mean value from individual respondents' judgments. A higher mean value indicates a more significant effect on the PRH rents. In order

to identify the critical factors influencing the rents of PRH delivery by PPP in China, mean value and standard deviation (SD) for each factor can be derived from total samples.

3.3.2. Structural Equation Model

This study expands analysis of survey results using SEM. The SEM approach can be used to unveil the relationships among factor packages as it is considered as an effective method for establishing the structural relationships among the latent variables, and for testing the hypothetical model. SEM is an extension of multivariate regression and factor analysis techniques, and is applicable where models need to be constructed to explain how several variables may be related to each other, how strong the relationships involved are, taking into account the influence of all variables [42]. SEM has been used in the field of PPP and PRH management [40,43].

The SEM requires a theoretical model consisting of the measurement and structural models. The measurement model gives the relationships between the latent and observed variables (factors and factor packages), while the structural model shows the relationships among latent variables (factor packages) [44]. The research model was analyzed by using data from the above-mentioned survey and AMOS 20 through the predominant data analysis and covariance structure analysis (CVA) to facilitate model examination using latent variables with multiple indicators. The AMOS 20 can be adopted to evaluate whether the constructs are measured with satisfactory accuracy and to test and analyze the hypothesized relationships.

A critical issue in relation to any SEM is the assessment of the overall model fit. The most widely used index for the assessment of a specified model is the chi-square (χ^2) statistic to demonstrate that the specified model is not a null model. In order to avoid problems associated with dependence on the sample size, varieties of indices from different families have been included in the evaluation of the model. These include χ^2 /degree of freedom (Df), the comparative fit index (CFI), Normal fit index (NFI), and the root mean square error of approximation (RMSEA). According to Holbert and Stephenson [45], Jashapara [46], and Ng et al. [40], the recommended level of goodness-fit (GOF) measures is shown in Table 2.

Table 2. The recommended level of goodness-fit (GOF) measures.

Goodness of Fit Measure	Recommended Level of GOF Measure
χ^2 /degree of freedom (Df)	From 1 to 2
Comparative fit index (CFI)	0 (no fit) to 1 (perfect fit)
Normal fit index (NFI)	0 (no fit) to 1 (perfect fit)
Root mean square error of approximation (RMSEA)	<0.05 indicate very good fit (Threshold level = 0.1)

Sample size is usually critical for conducting a SEM analysis in research, which depends on model complexity but also on many other factors (e.g., normality of the data, missing patterns). Most researchers would recommend using sample sizes of at least 200 samples or 5–10 times greater than the number of survey questions [47]. However, Sideridis et al. [48] found that a sample size of 50–70 would be enough for SEM. Thus, the questionnaire in this study involving 132 samples can meet the requirements of minimum sample size.

4. Identification of Factors Influencing the Rents for PRH Delivered by PPP in China

4.1. The Conceptual Model for the Factors Influencing the Rents of PRH Delivery by PPP in China

PRH in China is a rented-only affordable housing program. For the target tenants, they need to pay the PRH rent. The essence of PRH in China is a kind of social welfare provided by the local governments. The affordability of the target tenants is relatively low [3]. Therefore, from the social welfare perspective, the affordability of the target tenants is an important aspect to be considered in order to ensure that the target tenants can afford the rents when the local governments determine

the PRH rents [34]. At the same time, the local governments intend to employ PPP model to develop PRH projects to relieve their capital and managerial stress. However, private investors always seek profits [23]. For private sectors in PPP, collecting the PRH gross rent is the primary way to gain their investment profits [13]. Therefore, from the PPP investment perspective, the profit of private sectors is also an important aspect to be considered in order to ensure that enterprises are willing to participate in PRH projects when the local governments determine the PRH rents [23]. Moreover, there are some differences among different PRH units including the location, architectural structure and surrounding environment [49]. According to the market impacts, when determining the commercial housing rent, characteristics of housing have a major effect on the housing rents [31–33]. Thus, from the market impact perspective, the local governments also need to consider the characteristic of each PRH unit in order to reflect the PRH rent differentials when the local governments determine the PRH rents [34]. To sum up, the local governments need to consider the influences of three factor packages, which are affordability of target tenants, profits of private sectors, and characteristics of PRH units from three perspectives including social welfare, PPP investments, and market impacts.

For the affordability of the target tenants, it emphasizes that tenants are willing to pay for their housing without unreasonable burden on household income [9,50]. Thus, household income has a direct influence on tenants' affordability and can be viewed as a factor influencing the PRH rents [34,50]. Except for household income, demand elasticity and renting duration are also relative factors influencing the PRH rent. The demand elasticity refers to price elasticity of demand. It reflects tenants' dependency on PRH (i.e., lower demand elasticity of tenants indicates higher dependence on PRH) [51]. Renting duration refers to the period that the tenants rent PRH units. The increase of the rent could result in a remarkable decrease of the affordability when the demand elasticity is low or renting duration is long and household income does not change [23]. Thus, the demand elasticity and renting duration, which can be viewed as factors influencing the PRH rent, have indirect impacts on tenants' affordability.

For the profits of private sectors, the governmental policy support (e.g., taxation policy, subsidy policy and land policy) [13] is very important because these policies can help private sectors save costs or increase incomes. For example, the land policy can help private sectors save land costs. Thus, governmental policy supports should be a factor influencing the PRH rents. In addition, introducing private section into the PRH provision is a popular way [16,18,19], which may help the local governments complete the plan given by the Central Government and release the heavy fiscal burden at the same time. Thus, jointly understanding the needs from the private sector is also crucial for PRH development. PPP projects always have long concession periods [52]. In such a long concession period, time value of money and inflation can influence significantly profits of private sectors [34,53]. Time value of money can be reflected by interest rate and inflation rate [34,53]. Thus, interest rate and inflation rate, which can be viewed as factors influencing the PRH rent, can affect profits of private sectors.

For the characteristics of PRH units, the housing properties themselves should be the important considerations when determining the rents [31,32]. The characteristics include location features, architectural features, neighborhood features, and indoor facilities, which could have strong impacts on the housing rents [31–33]. For location features, the market rents in the same district can directly reflect the basic value of location (i.e., the distance to the center of the town, the distance to the workplace) [28]. Hence, the market rents in the same district should be a factor influencing the PRH rent. Actually the current public rental housing price are regulated as 60%–70% of the market rental price in many Chinese cities, which means market rental price impact directly on the rental of PRH [23]. Transportation can determine whether most of tenants can go out smoothly. Good transportation can bring additional value to the location (i.e., good transportation can offset remote location to some extent) [32,33]. Thus, transportation is another important factor influencing the PRH rent. For architectural features, construction costs can directly reflect the quality of housing and the quality of housing is an important architectural feature [54]. As a result, construction costs are a factor

influencing the PRH rent. Except for the quality of housing, floor area and structure (i.e., the space distribution in different rooms) as well as floor and orientation are also important architectural features [27,29,55], which should be factors influencing the PRH rent. For neighborhood features, public facilities (such as schools, supermarkets and athletic facilities) and surrounding environment (such as crime rate, noise, and pollution) are important neighborhood features [30,56,57], which should be factors influencing the PRH rent. For indoor facilities, indoor facilities refer to whether the PRH units provide televisions, air-conditions, washing machines, micro-wave oven, etc. [27,30]. The indoor facilities can provide convenience for tenants. Then tenants are willing to pay more for better indoor facilities and convenience [58]. Thus, indoor facilities should be a factor influencing the PRH rent.

According to the above analysis, a framework of factors that can influence the rents of PRH delivery by PPP in China can be identified as shown in Table 1. There are three factor packages, including affordability of target tenants, profits of private sectors, and characteristics of PRH units, from three perspectives, respectively. Each factor package includes several factors. Totally, 14 factors influencing the rents of PRH delivery by PPP in China are identified (Table 3).

Table 3. Factors influencing the rents of PRH delivery by PPP in China.

Factor Packages	No.	Factors	Description	References
A. Affordability of Target Tenants	A1	Household income	A direct influence on tenants' affordability	[34,50]
	A2	Demand elasticity	Price elasticity of demand that reflects tenants' dependency on PRH	[51]
	A3	Renting duration	The period that the tenants rent PRH units	[23]
B. Profits of Private Sectors	B1	Governmental policy support	Another important source to gain investment profits	[13,59]
	B2	Interest rate	Reflect time value of money that can influence significantly profits of private sectors	[53]
	B3	Inflation rate	Reflect inflation that can influence significantly profits of private sectors	[34]
C. Characteristics of PRH Units	C1	Market rents in the same district	Directly reflect the basic value of location and is one important location feature that has strong impacts on the housing rents	[28]
	C2	Transportation	Bring additional value to the location and is another important location feature that has strong impacts on the housing rents	[32,33]
	C3	Construction costs	Directly reflect the quality of housing (an important architectural feature that has strong impacts on the housing rents)	[54]
	C4	Floor area and structure	An important architectural feature that has strong impacts on the housing rents Structure means the space distribution in different rooms	[29,55]
	C5	Floor and orientation	An important architectural feature that has strong impacts on the housing rents	[27,55]
	C6	Public facilities	Such as schools, supermarkets and athletic facilities	[30,57]
	C7	Surrounding environment	Such as crime rate, noise, and pollution	[56]
	C8	Indoor facilities	Such as televisions, air-conditions, washing machines, and micro-wave oven	[27,30]

4.2. The Hypothetical Relationships among Factor Packages

As factors mentioned above are working jointly, therefore, it is necessary to understanding relationships among categories.

4.2.1. The Relationship Between Affordability of Target Tenants and Profits of Private Sectors

The affordability of the target tenants refers to the level of rent that the target tenants can afford [9,50]. When the affordability of the target tenants is higher, the target tenants can afford higher rent. In the case of PRH delivery by PPP in China, collecting the PRH gross rents is the major way to gain investment profits for private sectors [13]. If the demands for PRH do not change, the

profits of private sectors will become higher when the rents of PRH are higher. Thus, the increase of the affordability of the target tenants has a positive effect on the increase of profits of private sectors (H1).

4.2.2. The Relationship Between Affordability of Target Tenants and Characteristics of PRH Units

Better house conditions usually mean higher rents [31–33]. Furthermore, people are always willing to pay more for a better house condition if the rents are still affordable [60]. When the affordability of the target tenants is higher, the target tenants prefer to choose a better house condition because they are able to pay higher rents for a better house condition. Good house conditions mean high level of characteristics of PRH units. Thus, the affordability of the target tenants can influence the target tenants to choose PRH units because of relevant characteristics. In this case, the affordability of the target tenants actually determines the characteristics of PRH in the PPP projects. The characteristics of PRH can be flexibly adjusted according to the affordability of target tenants. If the affordability of the target tenants is becoming higher, the level of characteristics of PRH units should be improved. Hence, the increase of the affordability of the target tenants has a positive effect on the increase of level of the characteristics of PRH units (H2).

4.2.3. The Relationship Between Characteristics of PRH Units and Profits of Private Sectors

The characteristics of PRH units include location features, architectural features, neighborhood features, and indoor facilities [31–33]. If the PRH units are located in the place with high location value and have good house qualities, indoor facilities and public facilities, costs of PRH projects will increase, which would cause the decrease of profits of private sectors [23]. Therefore, the increase of level of the characteristics of PRH units has a negative effect on the increase of profits of private sectors (H3). Figure 3 shows the relationships among three factor categories.

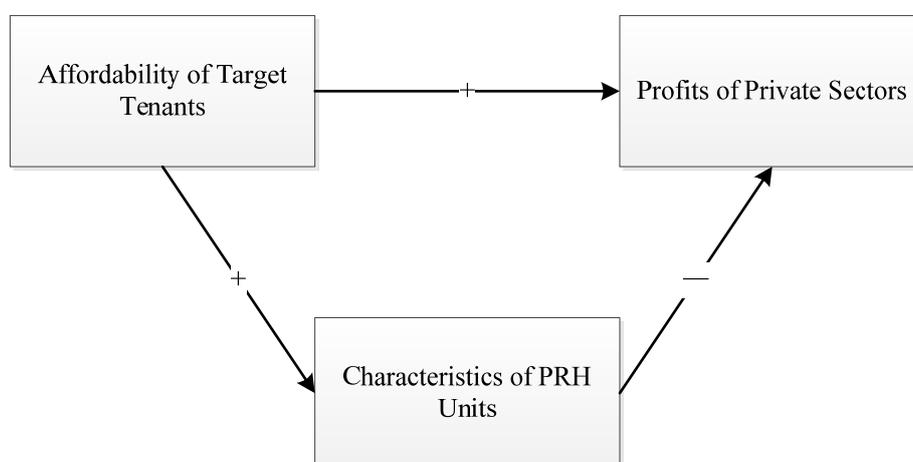


Figure 3. Relationships among three packages of the Chinese PRH Rent.

The conceptual model including 14 factors grouped into three factor packages influencing the rents of PRH delivery by PPP in China has been identified. In addition, the relationships among three packages have been identified. In next section, the relative significance of factors should be further identified to help the local governments determine the rents.

5. Critical Factors Influencing the Rents of PRH Delivery by PPP in China

This section presents the results of the survey and identifies the critical factors.

5.1. Survey Results

Mean value, standard deviation (SD) and ranking of each factor are showed in Table 4.

Table 4. The Mean Values and Rankings for influential factors to Rents in PRH in China.

Factor Packages	No.	Factors	Mean Value	SD	Ranking in All Packages	Ranking within Different Packages	Mean Value for Packages
A. Affordability of Target Tenants	A1	Household income	4.235	0.898	2	1	3.586
	A2	Demand elasticity	3.492	1.037	11	2	
	A3	Renting duration	3.030	0.899	13	3	
B. Profits of Private Sectors	B1	Governmental policy support	3.909	0.984	7	1	3.475
	B2	Interest rate	2.924	1.189	14	3	
	B3	Inflation rate	3.591	1.191	9	2	
C. Characteristics of PRH Units	C1	Market rents in the same district	4.129	1.003	5	4	3.905
	C2	Transportation	4.136	1.017	4	3	
	C3	Construction costs	4.250	1.007	1	1	
	C4	Floor area and structure	4.205	0.871	3	2	
	C5	Floor and orientation	3.780	0.570	8	6	
	C6	Public facilities	4.091	1.022	6	5	
	C7	Surrounding environment	3.083	0.989	12	8	
	C8	Indoor facilities	3.568	0.783	10	7	

For 14 factors, the mean values range from 4.250 (C3, construction costs) to 2.924 (B2, interest rate). Differences among the mean values for the 14 factors are significant (more than 1.3). None of them fell into the “extremely important” (>4.50) and “not important” (<1.50), which indicates that all of these 14 factors are important to be included in analyzing impacts on rents. According to Table 4, there are small different opinions on the factors for different stakeholders. Differences are from the external influence including economic impacts (B2 and B3), market impacts (A2 and C1) and governmental impacts (C2 and C6). However, SD for influential factors to influence the rents in PRH PPP projects is acceptable for the further research compared to other surveys in the field of construction management and PPP research [40,61,62].

Based on the survey results (Table 4), the mean values of 10 factors are higher than 3.50. These 10 factors are separated in three packages, with one factor from package A, two factors from package B, and seven factors from package C. Nevertheless, mean values of each package varied a lot when considering the factor package as a whole. The highest mean value is Characteristics of PRH Units (3.905) and the lowest mean value is Profits of Private Sectors (3.475), which indicate that the features of PRH units including location features, architectural features, neighborhood features, and indoor facilities are more important to influence the rents. However, the differences among the mean values for three packages are not very significant (less than 0.5), which are all around 3.5 and reflect that the three factor packages weighted in similar importance on influencing the rents of PRH. In detail, the significance of social welfare perspective is slightly more important than the significance of PPP investment perspective. The significance of market impact perspective is the most important, which indicate that PRH delivery by PPP in China has unique feature. PRH is provided to new college graduates, migrant workers, and low-and-middle-income urban residents, which not only need help of the local governments (social welfare perspective) but also pursue relatively comfortable houses with relatively good conditions (market principle perspective). At the same time, PRH is also provided by PPP through introduction of private sectors, which should obtain reasonable profits from project financing, construction, and operation of maintenance (PPP investment perspective). Therefore, the proposed three packages have a situation of tripartite confrontation and influence on the rents of PRH delivery by PPP in China together.

As mentioned in the discussion of the survey instrument, all factors are assigned to one of three packages in the proposed conceptual model. In the questionnaire survey, factors from each of the packages were investigated. Thus, a discussion of the survey results with respect to the different packages is necessary. The rankings of factors within the different packages are also shown in Table 4. Some important findings can be summarized based on the results of the survey.

A. Affordability of Target Tenants: The score of A1 “Household income” is much higher than A2 “Demand elasticity” and A3 “Renting duration”, which indicates that the level of income for target tenant is the most important factor to imply the affordability as presented by Hui [34]. Meanwhile, A2 is another important factor for indicating the affordability according to the survey results. Although different target tenants have different perceptions of PRH demand based on their economic and demographic factors, the level of rents would depend on price elasticities of housing demand [63]. Furthermore, elasticities in China would vary from a base value in a known way with interior area, unit type or neighborhood characteristics, which has a very strong relationship with package C [64].

B. Profits of Private Sectors: The score of B1 “Governmental policy support” is much higher than B2 “Interest rate” and B3 “Inflation rate”, which indicates that political issues would strongly influence the rents for PRH in PPP scheme. Usually, governmental fiscal supports for financing long term infrastructure projects would help reduce the rents of PRH [19,65]. The local governments may play the role of guarantees and provide subsidies in promoting PPP projects in making financing and securing budgets feasible for long term operation, which could bring economic benefits for private sectors to obtain reasonable profits [59,66]. On the other hand, change of inflation rate has been identified as a critical risk factor in PPP projects by many prior studies [67,68]. Change of inflation rate could result in inadequate allowances and cost overrun, which may lead to the change of rents or decrease of profits for private sectors when rents cannot be changed [67,68]. For example, the rent of PRH in India is adjusted to inflation to overcome the shortage as presented before [18].

C. Characteristics of PRH Units: In this package, survey results indicate that the significance of external impacts is almost equal to internal impacts when influencing the rents. The factors related to external impacts include C1 “Market rents in the same district” (4.129), C2 “Transportation” (4.136), C6 “Public facilities” (4.091) and C7 “Surrounding environment” (3.083). The factors related to internal impacts include C3 “Construction costs” (4.250), C4 “Floor area and structure” (4.205), C5 “Floor and orientation” (3.780), and C8 “Indoor facilities” (3.568). The external impacts can reflect the market value of PRH in the market, in which location is the most important being related to C1 and C2 [28,33]. The internal impacts can reflect the actual value of PRH including lifecycle costs and comfort [27,29,54]. Therefore, the external and internal impacts should be both considered carefully when determining the rents for PRH delivery by PPP in China.

5.2. Discussion on the Critical Factors

According to the survey results, the proposed 14 factors have different influence. In the 14 factors, there are six factors whose mean values are more than 4.00, i.e., construction costs, household income, floor area and structure, transportation, market rents in the same district and public facilities, which means that these six factors are very important and can be viewed as critical factors for the influencing rents of PRH delivery by PPP in China. Details about the six critical factors are discussed as followed.

5.2.1. Construction Costs

The factor C3, construction costs, ranks the first among the 14 factors (mean value: 4.250). The survey results indicate that the construction costs of PRH have very close relationship with rents. As an intrinsic property, construction costs determine the quality of PRH [54]. Unreasonable low construction costs may mean low quality because private sectors can obtain high profits from using unqualified material or decreasing the normal usage of material to reducing costs. Moreover, unreasonable low construction costs may mean that private sectors have to pay high operation fees because housing with low quality needs more repair and maintenance in the operational process. Moreover, poor cost control from SPV in a PPP project would result in cost overrun, which would inevitably decrease profits of private sectors. Therefore, C3 also has relationship with package B. Therefore, construction costs have a significant impact on the rents of PRH.

5.2.2. Household Income

The factor A1, household income, ranks the second among the 14 factors (mean value: 4.235). As demonstrated before, PRH in China is a form of the social welfare. From the social welfare perspective, the PRH rent needs to match with household income of the tenants in order to ensure that the PRH rent does not occupy a large proportion in household income of tenants and the PRH should play its social security role [9,34,50]. Moreover, according to welfare economics, household income is closely related to total social utility under the same subsidy amount [69]. Hence, in order to acquire higher total social utility, household income must be considered when determining the rents [70]. Therefore, household income has a significant impact on the rents of PRH.

5.2.3. Floor Area and Structure

The factor C4, floor area and structure, ranks the third among the 14 factors (mean value: 4.205). For commercial housing, floor area and structure (e.g., the number of bedrooms and the number of bathrooms) have a positive effect on the rents [29,55]. For PRH, floor area has a direct effect on the rents because multiply floor area by the rent per square meter to get the rent of each PRH unit [71]. Meanwhile, PRH belongs to affordable housing so that the floor area of each PRH unit must be controlled within about 60 square meters, according to the policies of affordable housing in China [3]. Moreover, floor area and structure also influence PRH tenants' demands and satisfaction because people are always willing to live in a bigger house with better space distribution in different rooms [60,72,73]. Therefore, floor area and structure have significant impacts on the rents of PRH.

5.2.4. Transportation

The factor C2, transportation, ranks the fourth among the 14 factors (mean value: 4.136). Transportation may influence target tenants' demands for PRH and the level of rent for the reason that good transportation can save tenants' commuting time and costs as well as improve tenants' living quality [74]. In China, the implementation of PRH programs has been problematic and sometimes ineffective [1,2]. One particular problem that has received wide attention but insufficient systematic analysis is a discriminatory site selection practice for PRH. Thus, compared to commercial housing, the reachability of PRH community is relatively low, which could influence the rents of PRH. The survey results from prior researches on satisfaction of residents of public housing including PRH indicate that weak public transportation and low reachability would reduce the satisfaction [73].

5.2.5. Market Rents in the Same District

The factor C1, market rents in the same district, ranks the fifth among the 14 influential factors (mean value: 4.129). When determining the rents of commercial housing, the market rent in the same district is the most critical factor. Using the market rents in the same district to get the rents is the most frequently-used method [75]. However, PRH is affordable housing rather than commercial housing. Market rents in the same district can only be used as a reference when determining the rents of PRH. Thus, the survey results indicate that the effect of market rents in the same district on the PRH rent is critical, but not the most critical. In addition, the PRH rent should be lower than the market rent in the same district. If not, PRH will lose the function of social security. For most cities in China, the present PRH rent is about 30%–70% of the rent in the private market in the same district. For example, the PRH rent in Guangzhou is about 40%–60% of the market rent in the same district [76]. Therefore, market rents in the same district can be used as an important reference factor to influence the rents of PRH delivery by PPP in China.

5.2.6. Public Facilities

The factor C6, public facilities, ranks the sixth among the 14 influential factors (mean value: 4.091). Prior studies implicate that residential satisfaction of PRH could be improved through the better

provision of public facilities [73,77]. Public facilities can influence tenants’ demands to influence the rents because the degree of perfection for public facilities near the PRH is in positive relevance with the living quality of tenants [78], which is actually similar to the public facilities near the commercial housing. School, market, and hospital have been identified as important public facilities that could influence the rent of commercial housing and further lead to the change of rents for PRH [30,57].

6. The Relationship Analysis of Different Factor Packages

6.1. SEM analysis of Survey Data

The proposed conceptual model and the hypothetical relationships among factor packages are further analyzed through SEM. Since relationships between different variables within a SEM can be very complicated, path diagrams are prepared to illuminate these relationships as shown in Figure 4. In the path diagrams, the latent and measure variables are represented in ovals and rectangles, respectively, while arrows are used to connect the variables and represent the causal flow of relations. The one-headed arrows signify the regression relationships with the direction of the arrow implying the direction of influence, and the double-headed arrows symbolize the inter-correlation between variables.

The initial model showing the relationships between the factors and factor packages is shown in Figure 4. Each of these three factor packages and their corresponding factors are connected by one-headed arrows to represent the direction of hypothesized influence.

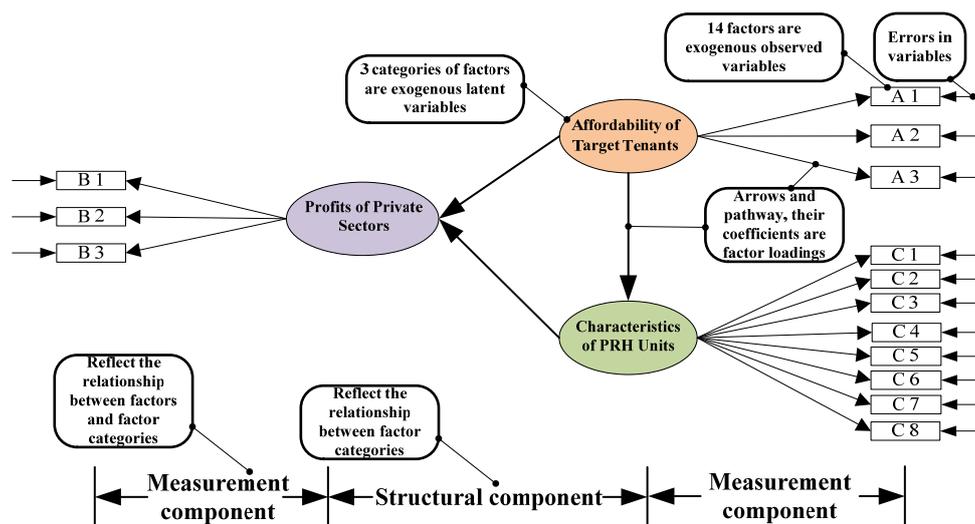


Figure 4. The hypothetical model for SEM (Structural Equation Model).

6.2. Performing SEM to Analyze Results

The variables and the errors among the variables are presented in Figure 5. The arrows and pathway coefficients (factor loadings) in Figure 5 indicate the causal effect statistically and in terms of the relationship of factor packages and factors influencing the rents of PRH delivery by PPP in China in the proposed model. The measurement and structural components are also shown in Figure 5, demonstrating that the model directly reflects the relationships between factor packages and factors.

SEM was performed to test the initial model, producing a parameter estimation and GOF of the initial model as shown in Figure 5. The estimates of pathway coefficients are presented in Figure 5. According to the estimation, the initial model, which includes all assumed factors and relationships, shows a good model fit ($\chi^2/Df = 1.87$, CFI = 0.952, NFI = 0.910, RMSEA = 0.088). According to Table 2, the hypothetical model has relative high GOF measure except for RMSEA. In fact the CFI and RMSEA are the most important and reported indices to indicate the model fitness [79]. For the proposed model, the value of CFI is good enough, and the value of 0.088 for RMSEA also indicates that the model fit can

meet the requirements of further analysis according to Ng et al. [40] and Doloi et al. [37]. Therefore, there is no necessary to adjust the model to improve the level of GOF measure.

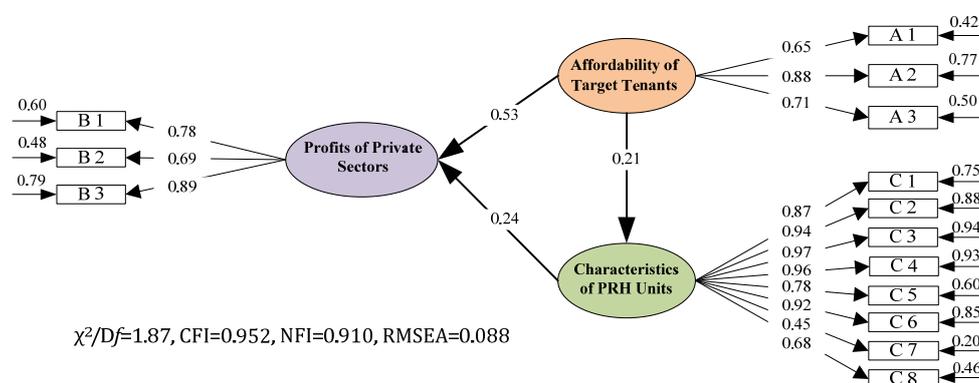


Figure 5. Pathway coefficients for the hypothetical model.

Based on Figure 5, all three factor packages are significant and had correlations with each other. All factors are found to be significant correlated positively with their corresponding packages. The factor loadings between three factor packages and factors within corresponding packages are shown in Figure 5. Most of the factor loadings are greater than 0.50, which is considered adequate for estimation [38], except for C7. According to the SEM results for the initial model and Table 2, the proposed initial model correlated relatively well with observed data (RMSEA = 0.088). The three factor packages, factors, and their assumed relationships are confirmed by the correlation with empirical data. The three factor packages, which are Affordability of Target Tenants, Profits of Private Sectors, and Characteristics of PRH Units, construct a relatively balanced relationship to influence rents of PRH delivery by PPP in China. The value of GOF measure and factor loadings from performing SEM indicate that proposed model has a good fit and can be used to describe the relationships between factors and factor packages, and provide an accurate model for the critical factors influencing the rents of PRH delivery by PPP in China.

6.3. Discussion

6.3.1. Measurement Component of SEM Framework

The latent variables describing the Affordability of Target Tenants are measured by A1–A3. All factors in this factor package contribute greatly in the affordability, but in different levels. The most significant impact is from A2 (demand elasticity). Although this factor does not receive the highest score in the questionnaire survey, the results of SEM still indicate that tenants' dependency on PRH could strongly influence the rents of PRH delivery in PPP model. In contrast, the factor A1 (household income) receives relatively low factor loading in SEM but a very high mean value in questionnaire survey, which indicates that the income would not be the most important factors influencing the PRH rents. The reason could be that the qualified tenants of PRH are low- to middle-income group instead of the lowest income group. People in this group have better economic situation, which can help to explain why demand elasticity is more important compared to income.

The latent variables describing the Profits of Private Sectors are measured by B1–B3. Factors in this factor package all have important contributions to the profits differently. B3 (Inflation rate) receives highest factor loadings in this factor package, which indicates that the inflation rate would heavily influence the profits when private sectors are introduced to finance, build, and operate a PRH project by using PPP method in China. Chileshe and Yirenkyi-Fianko [67] and Ke et al. [68] also indicated that change of inflation rate could result in cost overrun so as to affect the financial viability of PPP projects. Furthermore, B1 (Governmental policy support) contributes greatly to the profits, which is

the same with in other PPP projects [66]. Although B2 (Interest rate) does not receive high score in questionnaire survey, the result of SEM still highlights it as a sensitive factor for long-term operating a PPP project [53].

The latent variables describing the Characteristics of PRH Units are measured by C1–C8. Except for C7, other factors in this factor package have strong positive impacts. C3 (Construction costs) receives highest factor loading within this factor package, which indicate that costs account for a dominant proportion of total costs of PRH units. Moreover, according the analysis, construction cost would not only influence the characteristics but also the profits of private sectors. The most important finding from the results of SEM is that the contributions from external factors (C1, 0.87; C2, 0.94; C6, 0.92; C7, 0.45; average factor loading is 0.795) are smaller than the contributions from internal factors (C3, 0.97; C4, 0.94; C5, 0.78; C8, 0.68; average factor loading is 0.842), which indicates that the internal factors should be paid more attentions to when determining the rents of PRH delivery by PPP in China.

6.3.2. Structural Component of SEM Framework

The structural components of the proposed model are presented in Figure 5. The relationships among three factor packages are found to be significant in proposed model as shown in Figures 3 and 5. As presented before, there are three hypothetical relationships among factor packages.

The first hypothesis (H1) is that the increase of the affordability of the target tenants has a positive effect on the increase of profits of private sectors. H1 is supported by the results of SEM ($A \rightarrow B$, 0.53), which means high affordability of the target tenants can help the private sectors earn more profits from investing PRH PPP projects as target tenants may afford higher rent.

The second hypothesis (H2) is that the increase of the affordability of the target tenants has a positive effect on the increase of level of the characteristics of PRH units. H2 is also supported by the results of SEM ($A \rightarrow C$, 0.21), which means PRH delivery by PPP in China should improve the external and internal quality to meet the requirements of target tenants as they can pay higher rents for a better house condition and intend to improve their living quality because they are temporarily cannot afford market price.

The third hypothesis (H3) is that the increase of level of the characteristics of PRH units has a negative effect on the increase of profits of private sectors. H3 is not supported by the results of SEM ($C \rightarrow B$, 0.24), which means higher level of characteristics of PRH units actually would help the private sectors earn more profits from investing PPP PRH projects. The reason why H3 is not supported may be complicated. Although increasing the level of characteristics of PRH units can increase costs of PRH projects, it can also require higher rents. When the affordability level of the target tenants is improved, the target tenants are willing to pay more rents for better PRH units (H2), which may further generate more revenue of PRH projects (H1). When the increase of the revenue is greater than the increase of the costs, private sectors can gain more profits from investing PPP PRH projects. Thus, improving the overall standards of PRH units has a positive effect on the increase of profits of private sectors.

In addition, comparing factor loadings among these three relationships, the affordability of target tenants can influence the profits of private sectors and the characteristics of PRH units, which is the most essential factor package to influence the rents of PRH delivery by PPP in China. Although the profits of private sectors are influenced by the affordability of target tenants and the characteristics of PRH units, the affordability of target tenants should be firstly considered compared to the characteristics of PRH units if the private sectors in PPP PRH projects wish to obtain reasonable profits. Meanwhile, the characteristics of PRH units are an intermediate variable that can be weakly influenced by the affordability of target tenants as well as can weakly influence the profits of private sectors.

7. Research Findings and Potential Uses

This research clearly presented factors influencing rents of PRH delivered by PPP in China, as well as their inter-relationship. The statistical analysis verified significance of the 14 factors for identifying the top six critical ones. According to the SEM of the 14 factors included in the proposed model, the

causal linkages between different factor packages are also demonstrated. In order to provide a basis for reasonable rents of PRH delivery by PPP in China to improve the application rate of PRH in China, some research findings and potential uses of proposed factors as well as relationships are provided as followed.

- Which influences more: The construction costs are a most crucial factor to influence rents of PRH in China. Thus, optimizing construction costs, which can further reduce the lifecycle costs, may: (1) increase profits of participant enterprises; (2) decrease the PRH rent to improve the social welfare of PRH projects; (3) reduce tenants' rent burdens; and (4) improve the application rate of PRH in China. To achieve this goal, there are mainly three approaches. The first way is that the government can reduce the land-transferring fees or provide the land for free because the cost of land occupies a great percentage of the construction costs [65]. The second one is that the government can reduce or remit taxes, which accounts for a significant percentage of the construction costs. Lastly, private sectors can optimize design to save life-cycle costs [80]. Household income and market rents in neighborhood area are another two critical ones. However, they both are not stable. Thus, a dynamic rent adjustment system is necessary according to household income and market rents in the same district. The local governments need to assess the tenants' household income and market rents in the same district at regular intervals for adjusting rents of PRH accordingly.

On the other hand, useful suggestions to influence the reasonable rents in PRH PPP projects can be drawn from the perspective of improving the social sustainability of PRH PPP projects. Firstly, the reachability of PRH projects should be improved by better conditions of transportation to bring additional value to the location and reduce the transportation costs of tenants. Secondly, more public facilities should be planned and provided by government and private sectors including schools, supermarkets, healthcare center, and athletic facilities etc. to help tenants improve the quality of life.

- How to balance: According to the questionnaire survey results, three factor packages (affordability of target tenants, profits of private sectors, and characteristics of PRH units) shared same significance level but interrelated with each other. Therefore, the social welfare should be firstly put into consideration for the PRH rents. Moreover, the profits of private sectors in the PPP investments have direct impacts on the rents through governmental policy support when considering the change of interest rate and inflation rate. The important issue to balance the benefits of private sectors and target tenants is to control the quality of PRH units including location features, architectural features, neighborhood features, and indoor facilities, which can also influence the rents of PRH. The quality of PRH units should be kept in a relatively high level to attract target tenants to live [72]. At the same time, too high quality of PRH units may increase the rents of PRH, which would exceed the affordability of target tenants [33,34,50]. Thus, the characteristics of PRH units can be viewed as a primary variable to influence the rents of PRH.

However, the mentioned-above "balance" is a difficult status to be achieved indeed. Hence, PPPs should be more adopted by government to provide more and more PRHs and reach the balance between social welfare and market benefits. In the future, PPPs can help governments fill the capital gaps to smooth and optimize fiscal expenditures as well as resolve the management problems in project operation, resources utilization, and service delivery. Thus, the suggestions for facilitating the PRH PPP project is that the public sectors should generate more methods to entice the private sector to participate, including reducing the financing costs, approving earlier participation in the project since the stage of planning, and providing more commercial facilities to compensate the costs in public service delivery.

8. Conclusions

This paper presents a framework describing factors to influence the rents of PRH in China by applying PPP approach. Questionnaire survey is used to verify the significance of proposed factors. SEM is adopted to test relationships among different factors and factor packages. Through reviewing characteristics of PRH delivery by PPP in China, three factor packages (affordability of target tenants, profits of private sectors, and characteristics of PRH units) are identified from three perspectives (social welfare, PPP investments, and market impacts). Based on the three factor packages, 14 corresponding factors are then further identified. Moreover, hypothesized relationships among them are proposed.

Before analyzing the questionnaire survey results, a reliability analysis was conducted to test the internal consistency of the variables by conforming that opinions of different stakeholders on factors are consistent. The survey results demonstrate that, although all of the 14 factors are important and can influence the rents of PRH, the significances of the factors from the three factor packages vary. According to the statistical analysis, the stakeholders assign greater value to construction costs, household income, floor area and structure, transportation, market rents in the same district and public facilities. These six factors are the critical factors out of 14 factors. The results of the survey also indicated that the rents of PRH delivery by PPP in China could influence the balance among social welfare, PPP investments and market impacts. In addition, relatively high mean for the factor package “Characteristics of PRH Units” indicate that the local condition influences the general level of the rents, while, relatively low mean values for the factor package “Profits of Private Sectors” indicate that social welfare characteristics make the rent of PRH outstanding from the market rent.

The SEM method was also used to test whether the hypothesized model correlated with data collected from the survey. The results of the SEM on the proposed model reflect a strong correlation-ship, which indicate that all identified factors contribute to their corresponding factor packages. The three hypothetical relationships among factor packages were tested by the SEM results. H1 (the increase of the affordability of the target tenants has a positive effect on the increase of profits of private sectors) and H2 (the increase of the affordability of the target tenants has a positive effect on the increase of level of the characteristics of PRH units) were positively supported by the SEM method, and H3 (the increase of level of the characteristics of PRH units has a negative effect on the increase of profits of private sectors) was negatively supported by the SEM method. The results of performing SEM indicate that the affordability of target tenants is the most important factor package to influence the rents of PRH delivery by PPP in China and the features of target group should be carefully considered when taking the characteristics of PRH units and profits of private sectors into account.

The 14 factors offer a useful tool for distinguishing different perspectives of influencing the rents of PRH delivery by PPP in China and identifying the most important factors related to the rents. Moreover, SEM results provide a basis for clarifying the relationship among different factor packages and setting priorities of different factor packages to establish the calculation methods of rents. The proposed factors and model contribute to combine three perspectives (social welfare, PPP investments, and market impacts) to balance the benefits of public sector, private sectors, and target tenants in PPPs. Although this research promotes understanding the rents of PRH, there are some limitations of the study. First, the size of factors remains large, which would not be convenient to determine the rents through mathematical formulas. Therefore, future studies should focus on further reducing the size of factors through mathematic modeling and practical application of the 14 factors in actual PRH PPP projects. Meanwhile, the interrelationship between different factors should also be further clarified through pathway coefficient analysis. Second, a balanced mathematical model to determine the rents considering the cause and effect relationships among different factor packages should be further developed through elaborate design, which should guarantee the target group can afford the rents, the private sectors can earn reasonable profits, and the local governments can provide high quality public services. Therefore, the game theory can be introduced to analyze the process of rents setting, which would be helpful for understanding the balance of different interests. Meanwhile, the real value of identified critical factors can be used to estimate the rents and discuss the possible

changes of reasonable rents. In addition, the historical time series of identified critical factors can be used to compare the historical rents with estimated rents to improve the accuracy of methods.

Acknowledgments: The authors' special thanks go to all reviewers of the paper and to the National Natural Science Foundation of China (NSFC-71472037, and 71671042); the Social Foundation of Jiangsu Province, China (13GLB005); the Program for Outstanding Young Teachers of Southeast University (2242015R30009); and the Fundamental Research Funds for the Central Universities for financially supporting this research.

Author Contributions: Jingfeng Yuan contributed to research design, organization of survey, data collection and analysis, and discussion; Xiaodan Zheng contributed to literature review, factor identification, and data analysis; Jia You contributed to research design, linguistic check and modification; Mirosław J. Skibniewski contributed to linguistic check and modification.

Conflicts of Interest: The authors declare no conflict of interest.

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