# The research of smart city construction on the well-being of urban residents-analysis based on CFPS data

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**Abstract.** With the rapid progress of China's economy, improving people's happiness has become one of the main goals of China's future social development. As a populous country, China has been lagging behind in the World Happiness Index Report released by the United Nations every year. Therefore, improving people's happiness has become one of the important social issues in China. Since the 16th National Congress, China has been urbanizing rapidly and the urbanization rate is planed to reach 70% by 2050. With the rapid development of urbanization, "urban diseases" caused by uneven development and demographic problems have become obstacles to urbanization development. To solve the problem, the construction of smart cities has become a new plan to ensure the rapid development of urbanization while solving the problem of "urban diseases". Investigating the relationship and mechanism of people' happiness between smart city construction and people's happiness can help clarify the fundamental needs of smart city construction, improve people's happiness, and have certain significance for the future development direction of smart city construction. The research of this paper centers on whether smart city construction can affect the happiness of the residents and investigates through what mechanism it can affect the happiness of the residents. This paper compares the relevant literature on smart city construction and happiness, takes data from the China Family Panel Studies (CFPS), the 2012 China Smart City Development Level Assessment Report, the 2014 China Smart City Development Level Assessment Report, and the 2016 China Smart City Development Level Assessment Report, and uses the econometric method of panel data analysis to empirically test the influence degree of smart city construction on residents' happiness. The experimental results show that (1) smart city construction has a significant impact on people's happiness, and the results are positively correlated. (2) The influence degree of smart city construction on people's happiness varies across different city levels, with no significant impact in first-tier cities and more significant impact in second-tier and third-tier cities. (3) Population heterogeneity can lead to some differences in residents' happiness feeling smart city construction.

## 1 Introduction

With the rapid development of Chinese society, the quality of people's life has also improved at a high speed, and it is also accompanied by higher requirements for people's daily life. General Secretary Xi Jinping has repeatedly emphasized the promotion of various social undertakings to add new momentum and open up new horizons, and to continuously enhance people's sense of access, happiness and security. This shows that constantly improving the happiness of the residents has become one of the most important social goals in China. The happiness index of Chinese people has been lagging behind in the world ranking, which shows that compared with other countries, China should be more committed to improving people's happiness.

China's urbanization process is at a high level of development. Since the first census to the sixth census, China's urbanization rate has increased from 12.84% to 49.86%. Along with the high rate of urbanization, a large number of people are rapidly flocking to cities, which are overburdened with challenges in transportation, education, healthcare, and uneven distribution of resources. The rapid urbanization has led to the birth of "urban diseases".

The concept of smart cities was first proposed by IBM in 2008. The purpose of smart cities is to make the key infrastructure components and services that make up cities, such as urban management, education, healthcare, real estate, transportation, utilities, and public safety, more connected, efficient, and intelligent through the application of intelligent computing technologies such as the Internet of Things, cloud computing, big data, and spatial geographic information integration. At the same time, the construction of smart cities has also become a major direction to solve the "urban disease" in China. In 2012, China announced the first batch of smart city construction pilots, and as of 2020 there are more than 750 smart city construction pilots distributed in various provinces and cities in China. This shows the importance that the country attaches to the construction of smart cities.

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## 2 Literature Review

Since 2012, when China announced the first batch of smart city pilots, more and more scholars in China have started to pay attention to the development of smart city construction and its possible impacts. More scholars have focused on the impact of smart city construction on enterprises, cities, and the economy. Using the 2012 smart city pilot as a policy shock, some scholars have used the DID model to demonstrate that smart city construction can significantly contribute to urban economic growth [1]. The same approach as well as the model has been demonstrated by scholars that smart city construction can significantly contribute to high-quality business development. Whereas, the impact of smart city construction on residents is a direction that scholars neglect [2].

Regarding the happiness of the population, it has been one of the most important social issues that scholars have been concerned about, and the factors that affect happiness and the methods of measuring happiness have been the issues that scholars have been investigating. On the subjective side, some scholars believe that individual income, education, and social status significantly affect happiness levels [3]. On the objective side, the level of financial development and housing prices significantly affect the happiness of the population [4] [5].

## 3 Research Methodology

This paper uses data from the China Family Panel Studies (CFPS) 2012, 2014 and 2016 adult questionnaires and the 2012, 2014 and 2016 China Smart City Development Level Assessment Report data based on a panel data model for empirical analysis.

The model was established through variables as follows.

$$happiness_t^i = a_1 SCS_t^i + a_2 GEND + a_3 LNINC + a_4 EDU$$

$$+ a_5 HD + a_6 AGE + a_7 SS + \mu$$

Where, happiness indicates happiness index i represents time t represents the city, SCS indicates smart city score, GEND indicates gender, INC indicates income, EDU indicates years of education, HD indicates health, AGE indicates age, and SS indicates social status.

Data source:

The happiness index was obtained from the adult questionnaire "How happy do you feel (on a scale of 1-5)" in the China Family Panel Studies, and the smart city scores were obtained from the scores of each city in the China Smart City Development Level Assessment Report. The rest of the control variables were obtained from the adult questionnaire data in the China Family Panel Studies. Missing data and rural data were excluded, and the results were analyzed by stata panel data in order to eliminate heteroskedasticity as table 1 shown below.

**Table 1.** Panel data regression [owner-draw]

| | **HI** |
|---|---|
| SCS | 0.00451*** |
| | (3.78) |
| GEND | -0.100*** |
| | (-3.67) |
| LNINC | -0.0012 |
| | (-0.40) |
| EDU | 0.0115*** |
| | (3.51) |
| HD | 0.213*** |
| | (15.76) |
| AGE | 0.0107*** |
| | (10.95) |
| SS | -0.0139 |
| | (-0.95) |
| _cons | 1.986*** |
| | (17.51) |
| R-squared | 0.0539 |
| Adj R-squared | 0.0526 |
| F | 43.13*** |
| N | 5311 |

## 4 Empirical Analysis

The empirical results show that among the explanatory variables, the high rating of smart city construction has a positive influence on residents' happiness and passes the 1% significance test. However, the regression coefficient of the impact of smart city construction on residents' happiness is not significant, which indicates that although smart city construction has a positive impact on residents' happiness, the degree of impact is not high, probably because the smart city construction is not strong enough or the development direction of smart city construction is not oriented to improve residents' happiness, indicating that there is still much room for improvement in China's smart city construction. The gender regression coefficient is significant, which indicates that the happiness index of men is higher than that of women in the context of smart city construction, probably because the convenience and benefits brought by smart city construction are more enjoyed and used by men. The regression result of years of education is positively correlated, indicating that the higher the years of education, the higher the happiness index will be, probably because higher knowledge level will bring better job opportunities, income and social status, and with the rapid development of Chinese society and technology, highly knowledgeable people can better

adapt to social changes. The happiness index increases with age, but is affected differently for different age groups in the context of smart city construction, as will be analyzed in the subsequent heterogeneity analysis for different age groups. Social status was not significant in the regression, probably because the social status variable was derived from the subjective questions in the questionnaire, and there is often some error between the judgment of one's subjective social status and the actual one.

## 5 Heterogeneity analysis

Due to the differences in economic development as well as demographic structure of each region in China, it leads to some differences in different cities as well as different groups of people being affected by the construction of smart cities. Therefore, this paper will analyze the heterogeneity from the city level and the age of the population respectively.

### 5.1 City size

In this paper, city size is divided into first-tier cities, second-tier cities and third-tier cities for analysis.

**Table 2.** Analysis of urban grade heterogeneity[owner-draw]

| HI | First-tier cities | Second-tier cities | Third-tier cities |
|---|---|---|---|
| SCS | -0.203 | 1.146** | 0.345** |
| | (-1.11) | (2.39) | (2.54) |
| GEND | -0.0639* | -0.185*** | -0.113*** |
| | (-1.83) | (-3.37) | (-3.49) |
| LNINC | 0.000728 | -0.00429 | -0.00140 |
| | (0.19) | (-0.72) | (-0.50) |
| EDU | 0.0101** | 0.0175** | 0.00527 |
| | (2.47) | (2.53) | (1.27) |
| HD | 0.221*** | 0.221*** | 0.168*** |
| | (12.50) | (8.20) | (12.14) |
| AGE | 0.0115*** | 0.0117*** | 0.0030** |
| | (9.34) | (6.07) | (2.08) |
| SS | 0.00237 | -0.0299 | -0.0471** |
| | (0.12) | (-1.06) | (-2.19) |
| _cons | 2.298*** | 1.578*** | 2.653*** |
| | (14.51) | (5.45) | (20.99) |
| R-squared | 0.0579 | 0.0615 | 0.2338 |
| Adj R-squared | 0.0558 | 0.0569 | 0.2269 |
| F | 27.27*** | 13.14*** | 33.96*** |
| N | 3113 | 1411 | 787 |

The regression results show that in the context of smart city construction, the effect on the happiness index of residents in first-tier cities is not significant, the effect on second-tier cities is significant and has the highest coefficient, and the effect on third-tier cities is also significant and all are positively correlated. The regression results for first-tier cities are not as expected, probably because the urban construction and technology investment in first-tier cities are more advanced than in second- and third-tier cities and have reached a certain scale, and the residents' convenience of life is also more advanced than in second- and third-tier cities. Therefore, the effect of smart construction on residents' happiness in first-tier cities may have diminishing marginal utility, resulting in insignificant results. The most significant impact on the happiness of residents in second-tier cities may be due to the fact that the residents in second-tier cities have a more stable life, which leads to the benefits and convenience brought by smart city construction for residents to be more obvious in accordance with the expected estimation. For the third-tier cities, the smart city construction will improve the convenience of the city to a greater extent and bring happiness to the residents, but because the level of infrastructure in the third-tier cities is lower than that of the first and second-tier cities, the sudden increase in the level of technological construction will lead to some residents not adapting to it and therefore lead to a lower regression coefficient in the third-tier cities than in the second-tier cities.

### 5.2 Age

Referring to the age segmentation in other literature, this paper regresses the population in different age groups, such as the long growth period of life (under 23 years old), the struggle period of life (24-45 years old), the stable period of life (46-60 years old) and the enjoyment period of life (61 years old and above). The results of smart city construction have significant and positive coefficients on the happiness of people in the growth period, stable period and enjoyment period. For the population in the growth period, this group is more willing to contact and accept new things, and more skilled in the use of high technology. For people in the stable and enjoyable periods of life, these people have more free time and stronger purchasing power, and can better experience the convenience brought by the construction of smart cities. For people in the struggling stage of life, the impact of smart city construction on these people is not significant, probably because these people are usually busy with work and live under great pressure, and they focus more on income and social status improvement, and do not pay attention to smart city construction.

### 5.3 Gender

In this paper, the regressions of men and women were conducted separately, and the results showed that men's happiness was positively and significantly influenced by

smart city construction, while women were not significantly influenced by smart city construction. The possible reason for this is that in the context of the traditional Chinese concept of "men dominate outside and women dominate inside", men have more attention to external contacts and are more willing to buy and experience smart products and services. Women, on the other hand, are more concerned about family and marriage, and therefore are not sensitive to smart city construction.

## 6 Conclusions

The following conclusions are drawn from the empirical analysis of residents' happiness and the assessment scores of smart city construction in each city, and the actual situation in China.

Smart city construction has a positive impact on residents' happiness, but the current impact coefficient of smart city construction on residents' happiness is not large. It can be seen that the development process of smart city construction in China still needs to be accelerated, and in the actual implementation process, the construction direction should be adjusted appropriately, and the actual situation of local residents should be combined to better meet the needs of residents, so as to achieve the effective improvement of residents' happiness while solving the "urban disease".

Heterogeneity in the impact of smart cities on residents' happiness. In terms of city level, the impact of smart city construction on residents' happiness depends on the actual situation of each city. Except for first-tier cities, the happiness of residents in second- and third-tier cities is positively influenced by the construction of smart cities. It indicates that under the excellent urban construction foundation of the first-tier cities, the smart city construction should be increased to achieve the goal of improving the happiness of residents. In terms of demographic heterogeneity, smart city construction has a positive effect on men's happiness. With the change of age, the happiness of the rest of the age group is positively influenced by the smart city construction, except for those who struggle in life. The possible reason for this is that the struggling groups face greater life pressure, social pressure and economic pressure, these groups have less spare time and more energy to work, so they are equally insensitive to the construction of smart cities. Therefore, in the process of smart city construction and development, attention should be paid to how to drive the development of urban enterprises, develop related industries, and drive the economic development of the city in order to alleviate the social pressure of this group of people and thus achieve the goal of improving their sense of well-being.

## 7 Shortcomings

The source of the happiness index variable in this paper is "how happy do you feel" in the CFPS adult questionnaire, because this variable comes from the subjective judgment of the respondents, so this data may deviate from the objective calculation data, and there are short-term fluctuations. For example, if a good thing happens to the respondent in the near future, such as a promotion or a salary increase, it will lead to a significant increase in his or her happiness judgment, and if something unpleasant happens to the respondent in the near future, it will lead to a significant decrease in his or her happiness rating.

Since the development of smart city construction in China started late, the evaluation system about smart city construction is not perfect, and the evaluation details of smart city construction can be found in the "China Smart City Development Level Evaluation Report" published by the Informatization Research Center of Chinese Academy of Social Sciences every year. Therefore, it leads to the difference between the rating of the development level of smart cities and the actual one.

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