

The Impact of Digital Economy Development on Housing Price Fluctuations: An Empirical Analysis Based on Provincial Panel Data in China

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Abstract. In the context of economic structural transformation, examining the impact of the digital economy on housing price fluctuations is particularly important. This study employs a univariate linear regression model and utilizes provincial panel data from the National Bureau of Statistics of China spanning 2014 to 2023 to explore the influence of digital economy development on housing prices. Robustness tests are conducted using both the average sales price of newly built commercial housing and mobile internet access traffic. Furthermore, heterogeneity analyses are performed from the perspectives of different time periods, regions, social types, and real estate categories. It can be concluded from the results that housing prices are positively related to the development of China's digital economy; before the 2018 policy shift toward a long-term regulation framework centered on "stability," The impact of the digital economy in driving housing prices proved to be more significant.; the promoting effect of the digital economy on housing prices is strongest in eastern regions; the impact of urban digital economy development on housing prices is significantly greater than that in rural areas; residential and newly built commercial housing are most positively influenced by the digital economy. These findings suggest that digital economy development can partially explain fluctuations in Chinese housing prices, primarily due to the 2018 policy shift in the real estate sector and variations across regions, social types, and real estate categories.

Keywords: Digital economy development, housing price fluctuations, regression analysis, China

1. Introduction

Serving as an emerging driver of worldwide economic expansion, the concept of the digital economy has gradually been refined at both the international cooperation and national strategy levels. In 2016, the G20 Hangzhou Summit released the G20 Initiative on Digital Economy Development and Cooperation, which for the first time provided a clear multilateral definition: The digital economy is "a collection of economic activities that employ digital knowledge and information as primary production inputs, depend on contemporary information networks as major carriers, and utilize the effective application of information and communication technologies (ICT)

as a crucial force for enhancing efficiency and optimizing economic structures.” This definition establishes a global consensus on digital economy development from three dimensions: production factors, carriers, and driving forces. In January 2022, the State Council of the People’s Republic of China issued the 14th Five-Year Plan for Digital Economy Development (Guofa [2021] No. 29), further deepening its historical positioning. The plan emphasizes that the digital economy, following agricultural and industrial economies, constitutes a major economic form. Its essence lies in “employing data resources as fundamental elements and contemporary information networks as principal carriers, and the integrated application of ICT and full-factor digital transformation as core drivers, fostering a novel economic pattern that achieves a more effective integration of equity and efficiency.” The plan highlights the uniqueness of the digital economy in its “unprecedented speed of development, wide-reaching impact, and profound influence,” noting that it is transforming production methods, ways of living, and governance structures, and has evolved into a “crucial force for reallocating global resources, reconfiguring the world economic system, and reshaping international competitive dynamics.”

Housing prices, as a critical dimension of the economic price system, not only directly affect residents’ quality of life and well-being but also significantly influence social stability and economic structure. Since the beginning of the 21st century, however, housing prices in China have experienced notable fluctuations. Between 2010 and 2018, housing prices saw a significant upward trend. The average transaction price of newly built commercial residential properties steadily increased from 2010, with a total growth of 79%.

Since 2019, however, the trajectory of housing prices in China has undergone a notable change. The rapid growth momentum stalled and even reversed. According to data from the National Bureau of Statistics, housing prices experienced moderate increases from 2019 to 2021, but the growth rate gradually slowed. From 2022 to 2024, downward pressure intensified: in 2022, the national average price of new housing was 10,210 RMB per square meter, representing a year-on-year decline of 3.2%—the first drop since 2021. By June 2024, the 70-city housing price index published by the national statistical authorities showed that the average price of newly built commercial housing decreased by 0.67% month-on-month and 4.9% year-on-year, indicating a clear downward trend.

Notably, during the same period of significant housing price fluctuations, the digital economy in China experienced rapid development. According to the China Digital Economy Development Index Report (2024) released on September 26, 2024, the share of the digital economy in China’s GDP reached 42.8% in 2023, up 1.3 percentage points from the previous year. The nominal year-on-year growth of the digital economy was 7.39%, exceeding the nominal GDP growth rate by 2.76 percentage points, with its contribution to GDP growth reaching 66.45%.

Against this backdrop, a series of questions warrant further investigation: Does the digital economy affect housing price fluctuations? Can China’s digital economy development explain the substantial volatility in its domestic housing market? Looking forward, how can the state leverage digital economy development to ensure stable housing prices? These questions are critical for understanding the relationship between economic structural changes and real estate market stability and may provide new perspectives for policy formulation and academic research.

In summary, this study empirically analyzes the impact of digital economy development on housing prices in China. Based on macro-level data from 2014 to 2023 and using a univariate linear regression model, the analysis is further strengthened by robustness tests and heterogeneity analyses to obtain a more comprehensive understanding.

2. Literature review

With the emergence of the digital economy era, research has begun to assess the progression of the real estate sector under this context. Yi Zheng [1] examined the main factors driving digital transformation in real estate enterprises, as well as potential challenges encountered during this transformation process.

The literature most closely related to this study focuses on the relationship between digital economy development and housing prices. Research by Cong et al. [2] indicated that the digital economy had no significant effect on housing prices in first- and second-tier cities, but it did exert an upward effect concerning housing prices in lowest-tier cities. He Qingfeng Ye's [3] empirical analysis revealed that the digital economy exerts a substantial impetus on the rise of housing prices, exhibiting a nonlinear pattern. Xueqiang Ji et al. [4] found that the positive impact of the digital economy on housing prices primarily operates through two channels: attracting population inflows and raising residents' income levels. Shu Qin Lei et al. [5] confirmed that regional-level digital economy development helps to curb local average residential prices.

Additionally, other studies have examined alternative factors influencing housing prices. Lei Xiao et al. [6] found that relaxing residency restrictions had little effect on short-term housing price growth, but over the long term, the policy modestly increased housing price growth, although its effect remained limited. Zhiji Huang et al. [7] pointed out that increasing housing supply while reducing local government land transfer revenue growth rates—through “three-old” renovations—helped restrain housing price growth. Guang Yang et al. [8] demonstrated a significant positive correlation between urban high-quality development and commercial housing prices.

Notably, several studies explored the broader economic effects of housing price changes. Fan Yang and Weimin Liang [9] found that rising housing prices significantly promoted the upgrading of consumption structures but simultaneously had a negative effect on urban-rural income disparities. Fang Ju and Shiqi Nie [10] studied the transmission mechanism of housing prices on technological innovation and verified that housing price increases could negatively affect high-quality economic development. Shuoyi He [11] confirmed that the real estate economy directly influences the rationalization and upgrading of industrial structure through cost and wealth effects.

Based on the above literature, this study may contribute in four main ways: First, in terms of research methodology, it empirically analyzes the propositions using quantitative statistical tools, applies robustness checks to discuss the baseline regression results, and conducts heterogeneity analyses across different regions, time periods, social types, and real estate types in China, thereby deeply exploring The influence of digital economy advancement on housing prices. Second, in terms of research topic, it is highly timely, addressing the concurrent rapid advancement of the digital economy and transformations within the real estate market, with a specific focus on the impact of the digital economy on housing prices. Third, in terms of research data, it uses comprehensive and novel data with a long temporal dimension, Encompassing all 31 Chinese provinces, municipalities, and autonomous regions. Fourth, against the backdrop of accelerating digital transformation in contemporary China, it analyzes the effect of digital economy development on housing price dynamics based on China's unique real estate market characteristics. This not only helps to understand the development trajectory of China's real estate under emerging technological changes but also provides a “Digital China”-style reference for other developing countries aiming to stabilize their real estate markets in the context of the digital economy, further expanding the research boundary at the intersection of digital economy and real estate economics.

3. Characteristics of digital economy and real estate development in China

Figure 1 presents the growth trajectory of internet users in China during 1997–2024, which functions as an indicator of digital economy development. From a trend perspective, the population of internet users in China has shown a continuous upward trajectory, reflecting the ongoing improvement of China’s digitalization since the beginning of the 21st century. From the perspective of growth speed, the period from 1997 to 2006 represents the initial stage of internet adoption, during which the number of users grew relatively slowly. From 2006 to 2021, growth accelerated significantly. This period was a critical window for China’s informatization efforts and the deep expansion of the digital industry, marked by rapid expansion in the number of internet users. Since 2021, the growth rate has slowed somewhat, although the overall magnitude continues to stay at an elevated level. It is noteworthy that the growth rate of internet users surged significantly in 2006, followed by a slight decline in 2012.

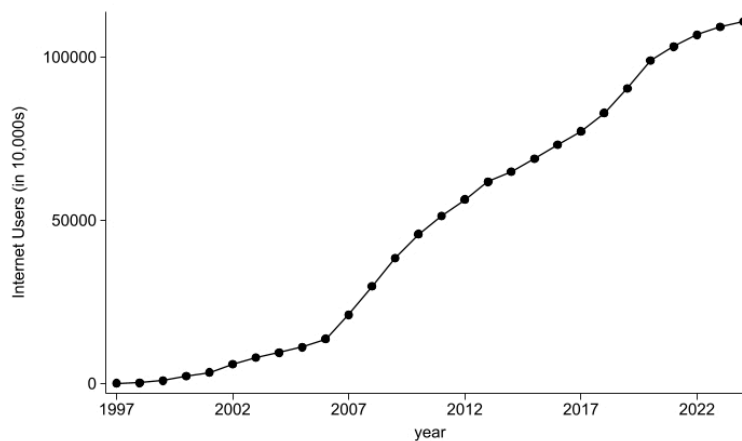


Figure 1. Development trend of China’s digital economy

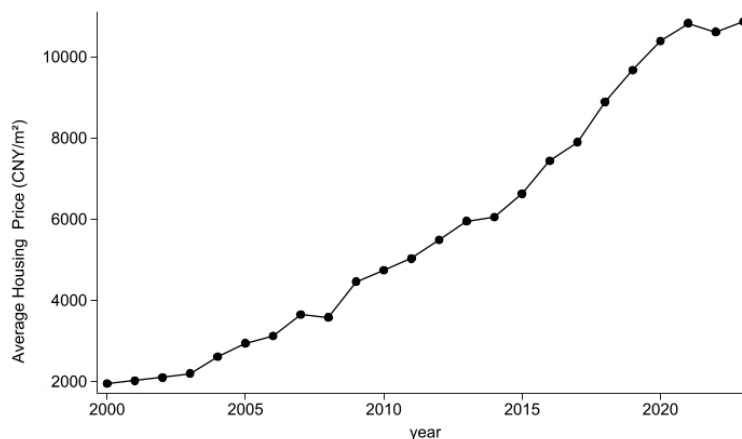


Figure 2. Development trend of housing prices in China

Figure 2 depicts the trend in the average sales price of residential commercial housing in China from 2000 to 2023, providing a measure of housing price development. From a trend perspective, the average sales price of residential properties has shown a generally continuous upward trajectory, despite fluctuations and adjustments during different periods. From the perspective of growth speed,

housing prices rose slowly from 2000 to 2007, with a relatively low growth rate. Between 2007 and 2021, prices increased rapidly, marking an accelerated development phase in the real estate market. After 2021, housing price growth slowed, with a decline in growth rate and a brief correction in 2022, though prices recovered slightly in 2023, indicating a post-adjustment rebound. Notably, housing prices experienced a short-term stagnation in 2008 as a consequence of the global financial crisis, and 2022 marked the first significant decline in recent years.

4. Research design

4.1. Variable selection

The dependent variable in this study is housing prices, measured by the average sales price of residential commercial properties. The key independent variable is the development of the digital economy, proxied by the number of mobile internet users. For robustness checks, this research additionally employs the average sales price of newly built commercial housing and mobile internet traffic. In addition, urban and rural heterogeneity analyses are conducted using the number of broadband users in urban areas and rural areas, respectively. For real estate heterogeneity analyses, the study employs the average sales prices of high-end villas and apartments, office buildings, commercial properties, and other types of commercial housing.

4.2. Data sources

The empirical investigation encompasses 31 Chinese provinces, municipalities, and autonomous regions, spanning the observation period of 2014–2023. All sample data were obtained from the National Bureau of Statistics of China.. The descriptive statistics are displayed in Table 1.

Table 1. Descriptive statistics

Variable	Obs	Mean	Std.Dev.	Min	Max
Mobile internet users (10,000 households)	310	4045	2901	162.3	15815
Average sales price of residential commercial housing (RMB/m ²)	310	9408	7714	3605	47784
Average sales price of newly built commercial housing (RMB/m ²)	310	9280	6742	4111	40526
Mobile internet traffic (10,000 GB)	310	382133	504547	528	3431673
Urban broadband users (10,000 households)	310	969.9	729	22.1	3704
Rural broadband users (10,000 households)	305	393.8	382.8	0	1577
Average sales price of high-end villas/apartments (RMB/m ²)	185	13075.	10156	4444	65458
Average sales price of office buildings (RMB/m ²)	310	11931	6511	4968	46181
Average sales price of commercial properties (RMB/m ²)	310	11233	4967	6655	36370
Average sales price of other commercial housing (RMB/m ²)	308	5154	2244	1648	24187

4.3. Model design

The study employs a univariate linear regression model, specified as follows:

$$Y=\alpha X+\beta+\varepsilon \quad (1)$$

where Y represents the housing price, X denotes the level of digital economy development, and ε is the random error term.

5. Empirical analysis

5.1. Correlation analysis

Figure 3 depicts the association between housing prices and the digital economy. At a preliminary glance, the average sales price of residential commercial housing appears to increase alongside the growth in mobile internet users. Notably, the figure shows a set of outliers with significantly steeper slopes, where both housing prices and their growth rates are much higher than the overall level. This phenomenon may be ascribed to major first-tier cities including Beijing, Shanghai, Guangzhou, and Shenzhen where, although the number of mobile internet users may not be exceptionally high, housing prices and their growth rates are far above those in other provinces. The relationship between housing prices and the digital economy requires further verification through regression analysis.

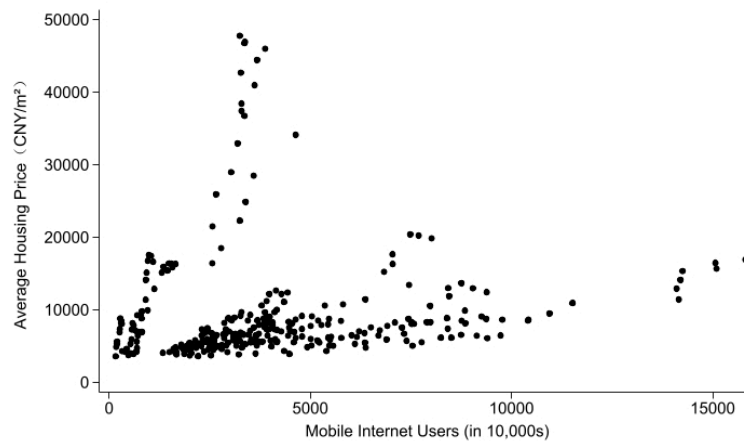


Figure 3. Correlation between housing prices and digital economy level

5.2. Baseline regression

Table 2, Model (1) reports the main regression results investigating the influence of mobile internet users on the average transaction price of residential commercial housing. In particular, the estimated coefficient for the primary explanatory variable equals 0.8498, which is significantly positive at the 1% level. This preliminary result suggests that, overall, digital economy development positively influences on housing prices.

5.3. Robustness tests

To test the stability and reliability of the baseline regression results, robustness checks are conducted by substituting alternative measures of housing prices and the digital economy, as well as including regional fixed effects. Since both the average sales price of residential commercial housing and newly built commercial housing serve as indicators of housing prices, and both mobile internet users and mobile internet traffic measure digital economy development, the robustness checks proceed as follows: Replace the core dependent variable (average sales price of residential commercial housing)

with the average sales price of newly built commercial housing. Replace the core explanatory variable (mobile internet users) with mobile internet traffic. Include regional fixed effects in the regression. The empirical results in Table 2, Models (2), (3), and (4) show that, after substituting the measures of housing prices and the digital economy and including regional fixed effects, the impact of digital economy development on housing prices remains significantly positive, indicating the robustness of the baseline model.

5.4. Heterogeneity analysis

5.4.1. Temporal heterogeneity analysis

Against the backdrop of China stepping into a new stage of socialism with Chinese characteristics, with economic development transitioning from a stage of rapid growth to one of high-quality development, this study uses 2018—the year in which housing policies transitioned from short-term “restriction”-based mechanisms to long-term “stability”-based mechanisms—as a temporal node. The observation period is segmented into two sub-periods for temporal heterogeneity analysis. Table 2, Models (5) and (6) report the regression results of mobile internet users on the average sales price of residential commercial housing for 2014–2018 and 2019–2023, the estimated coefficients of the explanatory variable stand at 0.6542 and 0.1698, respectively, with Model (5) significant at the 1% level and Model (6) significant at the 5% level. These results indicate that digital economy development had a positive effect on housing prices in both periods. Moreover, the effect was strongest during 2014–2018 and weaker in 2019–2023, suggesting that China’s “restriction”-based housing control mechanisms effectively mitigated the price-increasing effect of digital economy development.

Table 2. Baseline regression, robustness tests, and temporal heterogeneity analysis

	(1)	(2)	(3)	(4)	(5)	(6)
	y	y	y	y	2014-2018	2019-2023
x	0.8498*** (21.3839)	0.7021*** (20.1307)	0.1134*** (41.0623)	0.9533*** (24.5931)	0.6542*** (13.5430)	0.1698** (2.4254)
_cons	2.1600*** (6.4860)	3.3608*** (11.4559)	7.6466*** (80.6038)	1.3308*** (4.2842)	3.6397*** (9.2882)	7.7617*** (13.4193)
N	310	310	310	310	155	155
R2	0.6851	0.6485	0.8580	0.6851	0.6831	0.0580

*Note: ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively. Z-values are in parentheses.

5.4.2. Regional heterogeneity analysis

Following the 2011 regional classification of the National Bureau of Statistics, all Chinese provinces are divided into four regions: East, Central, West, and Northeast. This classification is used to explore regional characteristics of the digital economy’s impact on housing prices. Table 3, Models (1)–(4) report the regressions of mobile internet users on the average sales price of residential commercial housing in the East, Central, West, and Northeast regions, respectively. The computed coefficients for the explanatory variable amount to 0.9386, 0.7202, 0.4211, and 0.7744, all significant at the 1% level. These results indicate that, in China, digital economy development has

the strongest positive effect on housing prices in the Eastern region, followed by the Central and Northeast regions, while the impact in the Western region is relatively smaller.

Table 3. Regional heterogeneity analysis

	(1)	(2)	(3)	(4)	(5)	(6)
	East	Central	West	Northeast	Urban	Rural
x	0.9386*** (9.0173)	0.7202*** (16.3883)	0.4211*** (7.5124)	0.7744*** (6.3651)	0.5005*** (27.8278)	0.2541*** (18.8806)
_cons	1.6807* (1.8868)	2.6955*** (7.2051)	5.4986*** (12.7940)	2.6083*** (2.6924)	1.0818*** (3.6321)	5.2986*** (24.5291)
N	100	60	120	30	310	304
R2	0.6208	0.8810	0.7278	0.6827	0.7488	0.6050

Data sources: East: Beijing, Hebei, Tianjin, Shandong, Shanghai, Jiangsu, Zhejiang, Guangdong, Hainan, Fujian (10 provinces/municipalities); Central: Inner Mongolia, Shanxi, Henan, Anhui, Jiangxi, Hubei, Hunan (7 provinces/regions); West: Xinjiang, Tibet, Gansu, Qinghai, Sichuan, Yunnan, Guangxi, Ningxia, Guizhou, Chongqing, Shaanxi (11 provinces/regions); Northeast: Heilongjiang, Jilin, Liaoning (3 provinces).

5.4.3. Urban-rural heterogeneity analysis

Based on urban-rural development classification, this study examines the heterogeneity of digital economy development across urban and rural areas. Table 3, Models (5) and (6) report the regression results of urban broadband users and rural broadband users on the average sales price of residential commercial housing. The estimated coefficients are 0.5005 and 0.2541, respectively, both significant at the 1% level. These results indicate that, compared with rural areas, digital economy development in urban areas has a stronger positive effect on housing prices.

Table 4. Urban-rural and real estate type heterogeneity analysis

	(1)	(2)	(3)	(4)	(5)	(6)
	Residential Commercial	Newly Built Commercial	High-End Villas/Apartments	Office Buildings	Commercial Properties	Other Commercial
x	0.8498*** (21.3839)	0.7021*** (20.1307)	0.3187*** (5.5215)	0.1549*** (3.6402)	0.0968*** (2.8915)	-0.0740 (-1.6147)
_cons	2.1600*** (6.4860)	3.3608*** (11.4559)	6.7984*** (14.6340)	8.0454*** (23.1270)	8.4855*** (30.9353)	9.0673*** (24.3755)
N	310	310	185	310	310	308
R2	0.6851	0.6485	0.1924	0.0434	0.0388	0.0210

5.4.4. Real estate type heterogeneity analysis

Based on property use classification, this study examines heterogeneity across six types of real estate in China: residential commercial housing, newly built commercial housing, high-end villas/apartments, office buildings, commercial properties, and other commercial housing.

Table 4, Models (1)–(6) report the regression results of mobile internet users on the average sales prices of these property types. The estimated coefficients are 0.8498, 0.7021, 0.3187, 0.1549,

0.0968, and -0.0740, respectively. Except for other commercial housing, where the effect is not significant, all coefficients are positively significant at the 1% level. These results indicate that digital economy development in China has the largest positive impact on residential and newly built commercial housing, followed by high-end villas/apartments and office buildings, while having no significant effect on other commercial properties.

6. Conclusion

Based on the empirical findings above, this study identifies a positive association with the digital economy development and housing prices in China. When examining different time periods, the price-increasing effect of the digital economy was stronger prior to 2018—the year in which China’s housing policy shifted from short-term “restriction”-based mechanisms to long-term “stability”-based mechanisms—and weakened thereafter. Regionally, the digital economy has the greatest positive impact on housing prices in the Eastern region, followed by the Central and Northeast regions, while its effect in the Western region is relatively weak. In terms of social type, urban digital economy development exerts a stronger positive effect on housing prices than rural development. Regarding property types, the digital economy has the largest effect on residential and newly built commercial housing prices, followed by high-end villas, apartments, and office buildings, while its impact on other commercial housing types is not significant.

These findings indicate that digital economy development generally exerts a positive influence on a country’s housing prices. In China, this development can partially explain housing price fluctuations, which mainly stem from the 2018 shift in housing policy mechanisms, as well as substantial differences across regions (East, Central, West, Northeast), social types (urban vs. rural), and property types.

Based on these findings, this study provides five policy implications for advancing digital economy development while ensuring housing price stability: First, considering the positive effect of digital economy on housing prices, the government should promote digital industry development while strengthening expectation management and supply-demand regulation in the real estate market, ensuring balanced, coordinated growth between the two sectors. Second, adjustments to housing policies have a critical influence on market expectations, highlighting the importance of timely and continuous policymaking to guide real estate market transformation smoothly and avoid sudden shocks from short-term policy fluctuations. Third, adopt region-specific measures and improve differentiated regulatory mechanisms. Increase investment in digital infrastructure in Western and Northeastern regions to promote balanced regional digital economy development and prevent regional imbalances in housing prices. Fourth, accelerate rural broadband deployment and digital service provision to enhance rural residents’ digital skills and quality of life, thereby boosting rural development potential while mitigating the risk that digital economy growth exacerbates urban-rural disparities. Fifth, guide real estate developers to optimize product structures, promoting a more rational supply-demand balance in the housing market to meet multi-level housing needs.

While the present research focuses on the effect of the digital economy on housing prices, other potential determinants might not have been accounted for. Subsequent studies may investigate various aspects of the digital economy, such as the evolution of digital business models, efficiency in data resource allocation, and levels of digital infrastructure construction, to assess their potential influence on housing price trends in China. Furthermore, when investigating whether the evolution of digital business models affects housing price formation mechanisms, platform economy activity could serve as a key explanatory variable. To measure the impact of digital infrastructure on housing

prices, data sources such as the People's Bank of China website, China Economic Net database, or the Wind database could be explored.

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