

A DID Empirical Analysis of The Impact of Urban Purchase Restrictions on Residents' Consumption Structure

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Abstract. To assess the dynamic impact of the housing purchase restriction policy on the consumption structure of residents and its mechanism of action, this study constructs a theoretical analysis framework that includes the mediating effect of housing prices. Based on the urban panel data of Beijing from 2010 to 2023, we conducted an empirical test using the difference-in-differences method. The research results show that the impact of purchase restrictions on the consumption structure of residents has significant dynamic characteristics. Benchmark regression indicates that after controlling for a series of urban economic characteristics, the direct effect of the policy is not significant, but its indirect effect generated by suppressing housing prices is intricately intertwined with wealth effect, crowding-out effect and mortgage effect. Both the parallel trend test and a series of robustness tests support the reliability of the above findings. Further mechanism analysis confirmed that housing prices are the key intermediary channel through which purchase restrictions affect the consumption structure. This study reveals the intrinsic path by which macro housing regulation policies influence micro household consumption decisions, emphasizing that future policy-making should fully consider their heterogeneity and dynamic impact on residents' consumption, in order to achieve the dual goals of stable and healthy development of the real estate market and upgrading of the consumption structure in a coordinated manner.

Keywords: Housing purchase restriction policy; residents' consumption structure; difference-in-differences method; mediating effect; dynamic effect.

1. Introduction

In recent years, with the acceleration of urbanization and the rapid development of the real estate market in China, the increase in housing prices has had a profound impact on the urban spatial structure, social equity and the quality of life of residents. To stabilize the real estate market, local governments across the country have successively implemented purchase restrictions since 2011 (Beijing). These policies vary significantly in terms of time, region and intensity. As an important component of residents' consumption, the price changes of real estate have a significant impact on the household consumption structure and even the economic vitality of the city. Current studies have analyzed the impact of purchase restrictions on the real estate market from macro or local perspectives (literature examples), but discussions on whether they further affect residents' consumption structure through housing prices are still insufficient, especially the lack of dynamic and multi-period quantitative analysis. Therefore, it is urgently necessary to systematically evaluate the dynamic and heterogeneous effects of purchase restrictions on housing prices and residents' consumption structure at different stages through measurement methods such as multi-period differ difference (DID).

The core value of this study lies in exploring the influence mechanism of housing regulation policies on real estate prices and consumption structure, and revealing how purchase restrictions, while regulating housing prices, further affect and change residents' consumption expenditure and asset allocation, ultimately influencing the economic structure of the city. Through empirical identification of the dynamic and heterogeneous effects of purchase restrictions, it is expected to provide empirical support for formulating more forward-looking, precise and sustainable urban housing policies in the

future. At the same time, it will also offer a research basis for understanding the relationship between the real estate market and residents' lives, promote the optimal allocation of urban resources, and facilitate the construction of a more inclusive and resilient sustainable urban system.

2. Literature Review

In recent years, with the development of the real estate industry, the issue of housing prices has become a major focus of people's livelihood. As an important tool for regulating the real estate market, the housing purchase restriction policy not only directly affects the supply and demand of the market and the trend of housing prices, but also may reshape residents' consumption decisions through the wealth effect. Both domestic and foreign scholars have conducted research on the relationship between the housing purchase restriction policy, housing prices, and consumption structure. Zhu Tianxing et al. believe that housing prices play a crucial role in people's lives and in regulating national economic growth. Consumption, as one of the three major drivers of the economy, in the increasingly competitive and volatile global environment of the 21st century, stabilizing domestic demand and having a consumption market is undoubtedly the key to long-term stable economic growth [1]. Zhang Tao et al. took the "1+8" Wuhan Urban Agglomeration as the research object and used the panel vector autoregressive model and impulse response to conclude that the introduction of the housing purchase restriction policy played a certain role in suppressing the increase in real estate prices in the short term, but its impact gradually weakened over time; the housing purchase restriction policy has spillover effects, and changes in housing prices in core cities under the restriction policy can trigger fluctuations in housing prices in other cities [2]. Xiong Beitai proposed that consumption propensity and disposable income are the main factors determining residents' consumption expenditure. Within a certain period, if residents' consumption propensity and disposable income are regarded as constants, the total consumption expenditure will increase with the increase in disposable income [3]. With the increase in residents' income, the focus of China's residents' consumption development has shifted from consumption level to consumption structure, and the upgrading of consumption structure has gradually become a research hotspot. Housing prices have had a certain impact on the consumption structure [4]. Wang Wei et al. conducted an empirical study on 35 large and medium-sized cities in China and found that high housing prices have suppressed the upgrading of urban residents' consumption structure, and the impact of housing price increases on upgrading expenditures such as transportation and communication, education, culture and entertainment, and medical care and health is significantly different [5]. For homeowners, an increase in housing prices means an increase in household net wealth. On the one hand, these residents can realize capital gains through investment, rental or sale, thereby increasing their consumption level; on the other hand, even if they do not sell their houses, the confidence effect brought by the increase in housing prices will also increase residents' consumption, which is conducive to the development of upgrading consumption. For some low-income residents who have not yet owned a house, high housing prices may have a reverse wealth effect, causing them to abandon their housing purchase plans, reduce housing savings, and spend more income on upgrading consumption [6]. Due to the differences in the housing market, local governments have a lot of discretion in implementing housing purchase restriction policies. In 2010, Beijing issued the first local version of the housing purchase restriction policy, and other major cities such as Shanghai, Guangzhou and Shenzhen also implemented it successively [7]. Campbell et al. found that there is considerable heterogeneity in the response of household consumption to housing prices. More specifically, there is a huge positive effect on the consumption of older households who are homeowners, while the impact on the consumption of younger households who are tenants is close to zero [8]. The consumption response to permanent housing price shocks can be approximated by a simple and robust empirical formula: the marginal propensity to consume from temporary income multiplied by the value of housing [9]. Consumption variables include durable and non-durable consumption as well as service costs. One possible impact of rising housing prices can be conveyed through rising rents. If rents increase due to rising housing prices, consumption may merely reflect the increase in rents and does not necessarily mean a higher level of household wealth [10].

3. Theoretical Hypothesis

Resident consumption structure, as a crucial indicator for measuring economic and social development and improvement in people's well-being, is influenced by various macro policies. Real estate market regulation policies, especially administrative intervention measures such as purchase restrictions, aim to curb excessive housing price growth and stabilize market expectations. While these policies affect the housing market, they may also profoundly influence residents' consumption behavior and structure by altering their perception of wealth, credit constraints, and budget allocation. The upgrading of consumption structure typically manifests as a shift in residents' consumption focus from daily necessities for basic survival to development-oriented consumption that emphasizes personal growth and quality of life improvement.

Based on relevant theories in consumption economics, policy intervention may impact consumption structure through multiple pathways. On one hand, restricting purchase qualifications and curbing housing price increases may weaken the wealth effect and mortgage effect of real estate, thereby constraining the consumption capacity of residents, especially homeowners, and particularly suppressing their spending on non-essential development-oriented consumption. On the other hand, the stability or decline in housing prices brought about by policies can alleviate the pressure on residents to save for housing purchases, releasing some disposable income and potentially promoting an increase in the proportion of development-oriented consumption. Therefore, the net impact of policies on consumption structure depends on the balance of these opposing forces.

Based on this, this study proposes the following core theoretical hypothesis: The implementation of purchase restrictions on real estate will influence residents' consumption decisions by altering their actual and expected housing expenditures as well as asset values. It is expected that this policy will, on the whole, lead to changes in residents' consumption structure, specifically reducing the proportion of daily necessities in total consumption expenditure while increasing the proportion of development-oriented consumption, thereby promoting the evolution of residents' consumption structure towards an upgraded direction. This study will subsequently test this hypothesis through empirical analysis.

4. Research Design

4.1. Model Specification

The empirical research method employed in this study is the Difference-in-Differences (DID) method. Grounded in the existing literature research, the specific model specification of this study is as follows:

$$Y_{it} = \alpha + \beta(\text{Treat}_i \times \text{Post}_i) + \gamma X_{it} + \mu_i + \lambda_t + \epsilon_{it}$$

Y_{it} represents the consumption structure level of urban residents, which is reflected by the proportion of daily consumption to total consumption. α is the intercept term, β is the coefficient indicating the impact of restricted purchase after policy implementation on the consumption structure of urban residents, and γ is the coefficient of control variables. In the empirical regression results, if the coefficient β of the interaction term " $\text{Treat}_i \times \text{Post}_i$ " is greater than 0, it indicates that the existence of high-quality educational resources will push up urban housing prices; conversely, it indicates that high-quality educational resources restrain the increase in housing prices. X_{it} is a series of control variables, μ_i is the city fixed effect, λ_t is the time fixed effect, and ϵ_{it} is the random disturbance term.

4.2. Variable Selection and Descriptive Statistics

In this study, the consumption structure index of urban residents (consumption) is employed to gauge the level of urban residents' consumption structure. In accordance with the classification of per capita consumption expenditures in the China Statistical Yearbook, food, tobacco and alcohol, clothing, housing, and daily necessities are categorized as daily consumption. Transportation and

communication, education, culture and entertainment, medical care, and other goods are classified as developmental consumption. The consumption structure index of urban residents is computed as the ratio of urban residents' daily consumption to total consumption. Regarding the treatment variable $Treat_i$, this research classifies cities with purchase restrictions based on the implementation of relevant policies. Specifically, Beijing is regarded as a city with purchase restrictions. If a sample pertains to a city with purchase restrictions, $Treat_i$ is assigned a value of 1; otherwise, it is assigned a value of 0. For the policy dummy variable $Post_i$, the categorization is based on the time point of the implementation of the purchase restriction policy in 2010. If the sample period is after the policy implementation, $Post_i$ is assigned a value of 1; otherwise, it is assigned a value of 0.

As shown in table 1, to mitigate the interference of other macro - factors as much as possible, in the selection of control variables, this paper incorporates per capita GDP, social consumption level, urbanization rate, permanent resident population, and local fiscal expenditure. Per capita GDP can mirror the regional economic development level and residents' income conditions, serving as a crucial fundamental factor influencing the consumption structure. The total retail sales of social consumer goods measure the overall consumption scale of a region, enabling the control of differences in the market environment and consumption vitality. The urbanization rate and the permanent resident population reflect the degree of population aggregation and urban development, both of which have a significant influence on housing demand and residents' consumption habits. Local fiscal expenditure represents the government's investment in education, healthcare, and public services, potentially exerting either a substitution or a promotion effect on residents' consumption choices. By comprehensively considering these factors, it is possible to effectively avert estimation biases resulting from omitted variables, thereby enabling a more accurate identification of the impact of purchase restriction policies on the consumption structure.

Table 1. Descriptive Statistical Analysis

	Sample values	Mean	Standard deviation	Minimum	Maximum
consumption	24	0.621	0.060	0.547	0.722
pol	24	0.583	0.504	0.000	1.000
gdp	24	98363.792	55133.542	25014.000	200278.000
soc	24	0.406	0.043	0.330	0.495
city	24	0.847	0.034	0.775	0.878
pop	24	1901.442	320.491	1363.600	2195.400
fin	24	3895.988	2760.160	443.000	7971.600

4.3. Data Sources

This study primarily utilizes the per capita consumption expenditure data of urban residents in Beijing from 2010 to 2023 as the main sample. This data is sourced from the "People's Livelihood" section of the China Statistical Yearbook from 2010 to 2023, which presents the composition of per capita expenditures by different types of residents. All data for the control variables are derived from the China Statistical Yearbook of the National Bureau of Statistics, the statistical yearbooks of each province and city, as well as statistical data from various research websites.

5. Empirical Analysis

5.1. Correlation Analysis

As shown in table 2, the correlation coefficient between the purchase restriction policy (denoted as pol) and the residents' consumption structure index (denoted as $consumption$) is 0.636, and it is statistically significant at the 10% significance level (*). This finding implies that, in the absence of controlling for other variables, the purchase restriction policy and the residents' consumption structure

index exhibit a positive correlation. That is to say, after the implementation of the policy, the proportion of daily consumption may increase.

The correlation coefficients between pol and other variables (such as GDP, city, pop, and fin) are relatively high (all exceeding 0.8). This situation indicates the potential existence of multicollinearity issues. Multicollinearity may undermine the stability of the regression results, thus necessitating cautious interpretation in the benchmark regression analysis.

Table 2. Correlation Analysis

	consumption	pol	gdp	soc	city	pop	fin
consumption	1						
pol	0.636***	1					
gdp	0.811***	0.807***	1				
soc	0.0306	0.275	-0.108	1			
city	0.486**	0.799***	0.824***	0.135	1		
pop	0.646***	0.929***	0.880***	0.237	0.933***	1	
fin	0.824***	0.857***	0.974***	0.0932	0.823***	0.918***	1

5.2. Results

Table 3 (1) without controlling for other variables: The coefficient of pol is 0.076 and is significant at the 1% level (***). This indicates that, without considering other factors, the purchase restriction policy has a significant positive impact on the consumption structure of residents, that is, the proportion of daily consumption increases after the policy is implemented. Table 3 (2) with other variables controlled: When control variables (gdp, soc, city, pop, fin) are added, the coefficient of pol becomes -0.026 and is not significant (t-statistic is -0.71, no asterisks). This shows that after controlling for economic and social factors, the impact of the purchase restriction policy on the consumption structure of residents is no longer significant. Based on the above benchmark regression results, it is indicated that the impact coefficient of the housing purchase restriction policy in Beijing on the consumption structure of residents is negative. The policy may slightly reduce the proportion of daily consumption. Although the independent and net effect of the policy is not significant, the direction of its impact is negative.

Table 3. Benchmark regression

	(1)	(2)
	consumption	consumption
pol	0.076***	-0.026
	(3.87)	(-0.71)
gdp		0.000**
		(2.39)
soc		0.735**
		(2.12)
city		-1.791**
		(-2.68)
pop		0.000
		(0.56)
fin		-0.000
		(-1.04)
_cons	0.577***	1.534***
	(38.36)	(4.19)
N	24	24
r2	0.405	0.845
r2_a	0.377	0.791
F	14.948	15.490

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

5.3. Results of Parallel Trend Test

Based on the sample, according to the specific implementation time of the housing purchase restriction policy in Beijing, 2010 is set as the processing period. After 2019, the world was affected by COVID-19, which had a significant impact on residents' consumption structure. Based on the above considerations, this study will explore the test results of the four years before and nine years after the implementation of the policy. Let pre_4=2006, pre_3=2007, pre_2=2008, pre_1=2009, current=2010, post_1=2011, post_2=2012, post_3=2013, post_4=2014, post_5=2015, post_6=2016, post_7=2017, post_8=2018, post_9=2019.

Figure 1 shows the results of the parallel trend test of the model. In the early stage of the policy (2006-2009), the estimated values fluctuated around 0. There was no significant difference in the changing trend of the consumption structure between the treatment group and the control group, meeting the parallel trend assumption. The estimated values for the current and later periods (2010-2019) of the policy turned negative and showed a downward trend. This indicates that after the implementation of the purchase restriction policy, the proportion of daily consumption in the treatment group was significantly lower than that in the control group, and the residents' consumption structure index declined, that is, the proportion of daily consumption decreased. The policy effect persists and shows a stable or expanding trend.

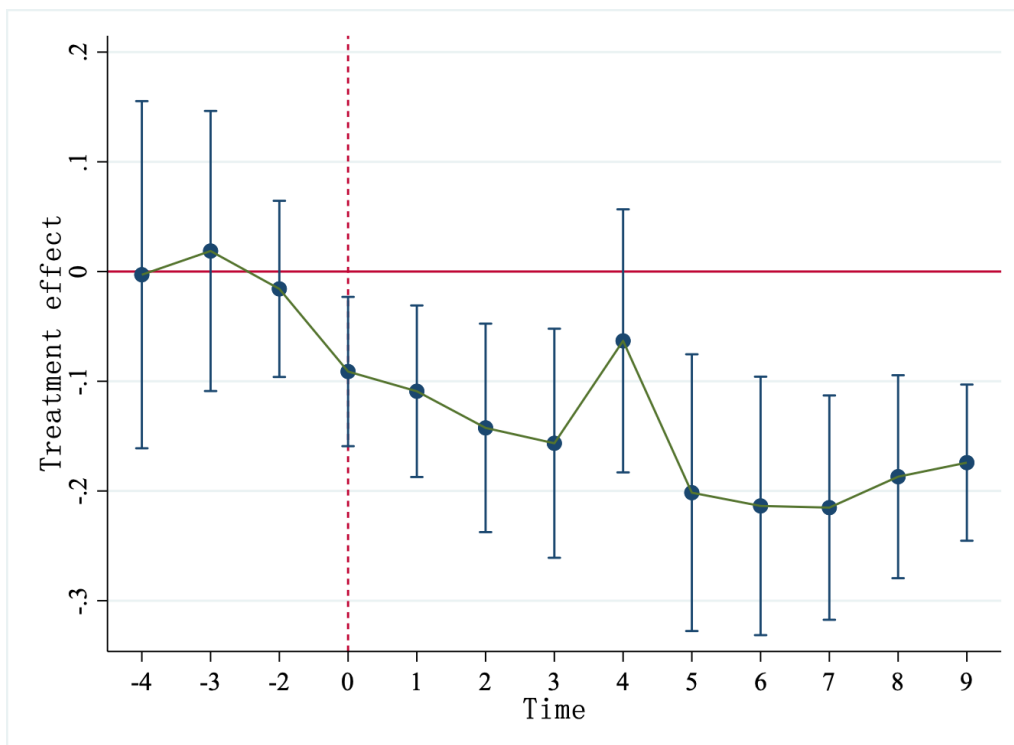


Fig. 1 the parallel trend test of the model

5.4. Robustness Test and Placebo Test

Replace the explained variable in the regression model from the consumer consumption structure index (consumption) to the consumer price index (CPI). Urban purchase restrictions should not systematically affect the price level (CPI) of the entire economy. The CPI is mainly determined by macro factors such as the money supply and the overall supply-demand relationship. As shown in Figure 2, after 400 simulations, the coefficient estimates of "the impact of policies on CPI" formed a perfect normal distribution centered on 0. The effect of purchase restrictions on the CPI is almost zero. The model of this study passed the placebo test, proving that the effects identified by this model are specific.

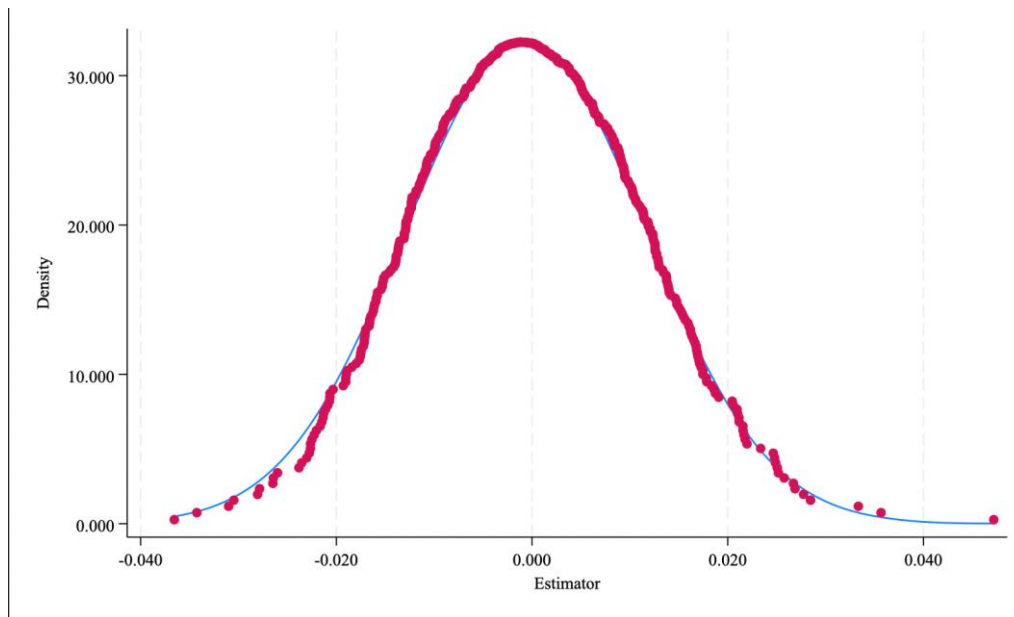


Fig. 2 the impact of policies on CPI

6. Discussion

The empirical analysis of this study indicates that the impact of the housing purchase restriction policy on the consumption structure of residents is not a simple direct linear relationship, but rather a complex result of the interaction and competition among the three effects of wealth, crowding-out and mortgage through the suppression of housing prices. In the benchmark regression, the direct effect of policies becomes less significant after controlling for macroeconomic variables, which precisely reveals that its effectiveness is deeply constrained by the overall urban development environment. This discovery holds significant implications for both theoretical deepening and policy optimization. Based on this, this study puts forward the following three suggestions for reference by the academic community and government agencies:

First, policy-making should emphasize synergy rather than relying solely on purchase restrictions. This study shows that macro factors such as per capita GDP and urbanization rate significantly influence the consumption structure. This means that if the goal of stabilizing the real estate market is to be organically combined with promoting consumption upgrading, the purchase restriction policy must form a "combination punch" with economic and social policies such as increasing residents' disposable income, improving the social security system, and developing diversified consumer credit, in order to offset the possible negative wealth and mortgage effects on the homeowner group. At the same time, it amplifies the consumption potential released by the "crowding-out effect" for the group without housing.

Second, future policies need to reflect precision and heterogeneity, avoiding a one-size-fits-all approach. This study provides theoretical support for the group heterogeneity existing in consumption responses, such as homeowners and tenants, and different income brackets. Therefore, when government agencies assess and adjust policies, they should enhance the tracking and analysis of the micro-behaviors of different groups. For instance, while cities with overheated housing prices adhere to purchase restrictions, it is possible to explore credit support for first-time home buyers with genuine needs, or precisely guide the released housing savings into upgraded consumption through measures such as issuing specific consumption vouchers, making the regulatory policies more inclusive.

Thirdly, a dynamic assessment mechanism should be established to pay attention to the long-term effects of policies. This study focuses on the dynamic effects of policies and finds that their influences change over time. Government agencies should establish a long-term policy monitoring and evaluation system, not only paying attention to the short-term fluctuations in housing prices and sales

volumes, but also continuously tracking the medium and long-term impacts of policies on residents' consumption, wealth distribution and the economic vitality of cities, so as to make timely adjustments and achieve a smooth transition from "short-term regulation" to "long-term mechanism".

7. Conclusion

The results of the benchmark regression in this study show that after including control variables such as the level of economic development, urbanization process and social characteristics, the coefficient of the policy variable itself is negative, but its independent effect may be affected by the complex macroeconomic background. The parallel trend test clearly confirmed that there was no systematic difference in the development trends between the treatment group and the control group before the policy implementation, fully meeting the premise assumptions of the model application. However, after the policy time point, the residents' consumption structure index showed a statistically significant cliff-like decline and continued to fall, proving that there is a causal effect between the policy and the residents' consumption structure. The placebo test, by replacing the core explained variable with the consumer price index, which theoretically should not be directly affected by policies, found that the "policy effect" completely disappeared, and the result was purely random fluctuation. This, from the opposite side, excluded the model setting bias and the interference of accidental factors, further confirming the reliability of the aforementioned conclusion. In conclusion, the implementation of this policy has guided residents' consumption patterns to shift from mainly meeting daily basic needs to higher-level development-oriented and enjoyment-oriented consumption, thereby promoting the upgrading and optimization of the overall consumption structure.

The findings of this study hold significant theoretical value and far-reaching policy implications. At the theoretical level, it strongly confirms that administrative policies aimed at regulating specific fields have significant spillover effects and externalities, and can break through market barriers to directly act on the consumption decisions of micro-households, providing new evidence for understanding the bridge between government intervention and microeconomic behavior from the consumption end. At the practical level, it reminds policymakers that when assessing the comprehensive impact of policies such as purchase restrictions, they should not be confined to their direct target markets, but should consider their potential driving effect on the overall consumption pattern and even economic transformation and upgrading, so as to formulate more coordinated and systematic macro policies. This study also has objective limitations such as a limited sample size and multicollinearity among variables, which to some extent affect the accuracy of the estimation. Looking ahead, research can be further deepened in several directions: Firstly, seek to obtain more detailed micro-panel data on cities or households to overcome the deficiencies of macro data and reveal the heterogeneous impact of policies on different groups; Secondly, introduce models such as spatial econometrics to examine the interaction and spillover effects of policy effects among different regions. Thirdly, the author should delve deeply into the specific transmission mechanisms by which policies influence the consumption structure, such as through wealth effects, income expectations or credit constraints, to provide a scientific basis for formulating more precise and inclusive macro-control policies.

8. Authors Contribution

All the authors contributed equally and their names were listed in alphabetical order.

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