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Does the subsidy policy for new energy vehicles increase the demand for commercial insurance?

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Abstract

The state vigorously develops the new energy automobile industry and launches the new energy automobile subsidy policy, at the same time, the commercial insurance industry is also developing rapidly, does the national new energy automobile subsidy policy have a significant impact on the demand for urban commercial insurance? Based on the theoretical analysis of the impact of the subsidy policy on the demand for commercial insurance, this paper systematically examines the impact of the subsidy policy on the demand for commercial insurance by constructing a multi-temporal double-difference model based on the subsidy pilot policy as a quasi-natural experiment. The results show that: the national new energy vehicle subsidy city pilot policy significantly improves urban commercial insurance demand, air quality as a mediating variable affects the demand for commercial insurance in China, and the implementation of the national new energy vehicle subsidy city pilot policy significantly reduces the AQI of the pilot city and improves urban air quality, which in turn positively affects the demand for commercial insurance. This paper expands the research field of the impact of the new energy vehicle subsidy policy on the behavior of the commercial insurance industry, enriches the theoretical literature on the influencing factors of the development of the commercial insurance industry, and can provide empirical references for the management and adjustment of premiums and so on in the development of the commercial insurance industry.

Keywords

New energy vehicle subsidy policy; commercial insurance; multi-temporal double-difference models

1. Introduction

The development of the NEV industry has become an important measure for countries worldwide to accelerate the upgrading of the automotive industry structure and address energy crises and ecological environmental deterioration. In China, the future transformation and upgrading direction of the automotive industry is the development of NEVs, which has attracted significant attention from the govern-

ment and has profound implications for driving new economic growth. The "Energy-saving and New Energy Vehicle Industry Development Plan (2012-2020)" released by the State Council in June 2012 clearly pointed out that it is necessary to accelerate the cultivation and development of NEVs and energy-saving vehicles. This move plays a significant role in easing energy and environmental pressures, promoting the sustainable development of the automotive industry, and driving industrial transformation and upgrading, creating new economic growth momentum, and helping China gain a competitive advantage in the international market.

The possible innovations of this article are as follows: First, in terms of theoretical research, this article incorporates the new energy vehicle subsidy policy and the development of the commercial insurance industry into the same analytical framework, proposing that the subsidy policy promotes the development of the commercial insurance industry. It connects the automotive industry with the insurance industry, enriching the theoretical literature on the influencing factors of the development of the commercial insurance industry, and providing empirical references for managing and adjusting insurance premiums in the development of the commercial insurance industry. Second, from an environmental perspective, this article further expands the study of the influencing factors of the development of commercial insurance, proposing and verifying that the subsidy policy improves residents' happiness by optimizing air quality, thereby promoting the development of the commercial insurance industry, which helps clarify the mechanism of the subsidy policy's impact on the development of commercial insurance and provides ideas for optimizing and adjusting existing subsidy policies. Third, in terms of empirical research, this article uses the multi-period difference-in-differences method to study the impact of the subsidy policy on commercial insurance, which can better alleviate endogeneity issues. The research conclusions of this article indicate the importance of the subsidy policy for the development of commercial insurance, providing empirical evidence for relevant departments to further improve the system.

The subsequent content arrangement of this article is as follows: In the second part, a review of the relevant literature on the new energy vehicle subsidy policy and commercial insurance demand will be conducted, and theoretical hypotheses will be analyzed; the third part will elaborate on the selection of variables and data sources in the empirical design; the fourth part will focus on the analysis of empirical results, robustness tests, heterogeneity discussions, and mechanism analysis; the fifth part will summarize the full text and provide corresponding suggestions.

2. Literature Review and Theoretical Hypothesis

2.1. Literature Review

Through the collection of materials, it has been discovered that many scholars have conducted extensive research on the subsidy policies for new energy vehicles, analyzing the impact of these policies from various perspectives. Wu Yong (2010) [16]

found that the subsidy policies for new energy vehicles contribute to the development of China's new energy vehicle market through studying the impact of these policies on the automotive market, and to some extent, they help to achieve leapfrog development in China's automotive industry and promote the upgrading of the industry. Gnann et al. (2018) [17] compared the market diffusion model of plug-in electric vehicles from three aspects: perspective, method, and results, and found that in the U.S. market, automotive subsidy policies have a critical impact on the price reduction of electric vehicles. Similar conclusions have been reached in domestic research, indicating that the subsidy policies for new energy vehicles are closely related to the prices of automobiles. Furthermore, Wee et al. (2018) [18] conducted a survey in the 50 states of the United States, constructing a high-dimensional fixed effects model, and found that subsidy policies can increase the sales of electric vehicles in specific regions, indicating that subsidies drive consumer spending and promote the development of vehicle manufacturers, which helps automotive manufacturers expand their markets. Dai Hui (2021) found that the implementation of new energy vehicle subsidies over the past 12 years has played a significant role in promoting the development of the new energy vehicle industry. In summary, although existing research has found that new energy vehicle subsidy policies have significant impacts, most of the studies select micro-enterprise data and examine the impact of car subsidy policies on corporate research and development investment and corporate performance, but there is a lack of systematic evaluation of the implementation effects of new energy vehicle subsidy policies from a city perspective. Existing literature on the factors influencing commercial insurance demand has made profound explorations into the impact of household data on commercial insurance demand from a micro perspective and has also studied the impact of social phenomena on commercial insurance demand from a macro level, but has not yet explored the impact of new energy vehicle subsidy policies on commercial insurance demand at the city level. This article quantifies the impact of subsidy policies on the development of the commercial insurance industry through rigorous econometric models, providing a reference for the development of the commercial insurance industry.

2.2. Theoretical Hypotheses

The implementation of the subsidy policy for new energy vehicles has promoted the operation and development of automobile enterprises and also alleviated the pressure on people to purchase new energy vehicles. More people choose to buy new energy vehicles, which has rapidly developed and expanded the market for new energy vehicles. As we know, based on the different insurance targets, China's commercial insurance is mainly divided into property insurance and life insurance. From the perspective of property insurance, motor vehicle insurance is undoubtedly one of the most common types of insurance. With the increase in the number of people buying vehicles, people will inevitably purchase vehicle insurance, leading to

the rapid development of the vehicle insurance business. From the perspective of life insurance, according to Article 12 of the Insurance Law of the People's Republic of China [32], life insurance is a form of insurance that takes an individual's life and health status as the insurance target. The subsidy policy has also substantially reduced expenses for those who want to buy a car, and with the improvement of living standards and the increase in savings, people will pay more attention to personal health and control over personal risks, so the number of people purchasing life insurance has also increased accordingly. Insurance companies will pay close attention to social trends and develop more types of comprehensive insurance products to ensure the safety of the people. Based on this, we propose Hypothesis 1.

Hypothesis 1: The national new energy vehicle subsidy urban pilot policy has significantly increased the commercial insurance demand of urban residents.

Air pollution has been effectively managed, air quality has improved, and people live more comfortably, paying more attention to their own health and taking reasonable measures to deal with risks in life. The implementation of the new energy vehicle subsidy policy has a great attraction for people to purchase new energy vehicles, thus encouraging more consumers to choose to buy new energy vehicles, effectively reducing the emission of vehicle exhaust and alleviating air pollution. At the same time, compared to gasoline vehicles, the charging cost of electric vehicles is relatively low, allowing people to use more savings to improve the quality of life. With improved air quality, a comfortable living environment, and increased living standards, residents' happiness has significantly increased, thereby paying more attention to risk control and increasing the demand for commercial insurance. Based on this, we propose Hypothesis 2.

Hypothesis 2: The pilot policy can increase residents' demand for commercial insurance by alleviating the level of air pollution.

3. Estimation Methods, Variable Settings, and Data Sources

3.1. Multi-period DID Benchmark Regression Model

The national new energy vehicle subsidy pilot policy, which began in 2009, can be considered as an approximate natural experiment affecting the purchase behavior of commercial insurance as an external policy factor independent of purchasing commercial insurance. Given that this policy was gradually expanded to pilot cities in stages, to accurately assess the impact of this policy on the purchase behavior of commercial insurance in cities, we designed the following regression model:

$$insurance_{i,t} = \alpha + \beta\, policy_{i,t} + \gamma\, control_{i,t} + city_i + year_t + \varepsilon_{i,t}\# \quad (1)$$

Where, $insurance_{i,t}$ represents the amount of city insurance premiums, $policy_{i,t}$ represents the subsidy policy for new energy vehicles, and $control_{i,t}$ represents the set of control variables. $city_i$ is the city fixed effect,$year_t$ is the year fixed effect, and $\varepsilon_{i,t}$is the random disturbance term. The coefficient β measures the average difference in the urban commercial insurance industry before and after the subsidy

pilot policy impact.

3.2. Variable Setting

3.2.1. Explained Variable

Insurance premiums (insurance). This paper selects a core indicator reflecting the regional level of the commercial insurance industry, considering the availability and comparability of the data in this paper, and can scientifically depict the development of the urban commercial insurance industry, this paper chooses insurance premiums as the explained variable [33].

3.2.2. Core Explanatory Variable

New energy vehicle subsidy policy (policy). This paper regards the national new energy vehicle subsidy policy as an experimental scenario similar to a natural environment, wherein, the cross-term of the city type dummy variable and the policy implementation time point dummy variable (Group × Post) is referred to as the policy treatment effect (policy). Specifically, this paper sets the pilot cities of the national new energy vehicle subsidy policy as the experimental group, and its corresponding Group variable is set to 1; non-pilot cities are used as the control group, and their Group variable is set to 0. The time dummy variable Post before and after the pilot policy implementation is set to 0 and 1, respectively. Given that the pilot cities of the current new energy vehicle subsidy policy were established in batches from 2009 to 2012, the time points when different pilot cities began to enjoy the policy are not the same. This means that there will be differences in the setting of the time dummy variables (Post) for different pilot cities, to accurately reflect the specific time of policy implementation in each city. Such settings ensure the accuracy of the analysis and can more truly reflect the impact effect of the policy under different times and different city contexts.

3.2.3. Control Variables

Since other urban characteristic factors may also affect the development of the commercial insurance industry, this paper controls the following variables:

① Level of economic development (lngdp). It is used to examine the difference in the impact of the economic development index on the demand for commercial insurance, the higher the level of economic development in a region, the higher the acceptance of commercial insurance may be, and the stronger the purchasing power for commercial insurance. To reduce the interference of extreme values and alleviate the problem of heteroscedasticity, this paper uses the logarithmic form of the actual per capita GDP of the city as an indicator to measure the level of urban economic development.

② Industrial structure (structure). The objective differences in the industrial structure of cities reflect the differences in resource endowments and input factors at the city level. Such differences may lead to different city characteristics, thereby

affecting the willingness of urban residents to purchase commercial insurance. This paper uses the proportion of the added value of the tertiary industry to GDP to measure the changes in the industrial structure of the city.

③ Urbanization rate (urban). Compared to rural residents, urban people have higher income levels and are more dependent on socialized risk distribution mechanisms, so commercial insurance demand should be greater. Therefore, the level of urbanization is also one of the influencing factors of commercial insurance demand.

④ Level of financial development (finance). With the vigorous development of the financial industry, people's financial concepts are increasingly enhanced, which undoubtedly has a profound impact on the commercial insurance industry. As one of the means of financial management, the demand for commercial insurance also rises accordingly. At the same time, the increasingly improved financial system, especially the extensive layout of bank outlets, also provides strong support for the further development of the commercial insurance industry, increasing the supply of commercial insurance. Therefore, the degree of development of the financial industry in a place will have a certain impact on the commercial insurance market. This paper uses the ratio of the total loan balance of financial institutions at the end of the year to GDP to characterize the level of urban financial development.

⑤ Industrial Output Value (lnindustry). This article adopts the logarithm of the total industrial output value above designated size to represent it.

⑥ Human Capital Level (lnpd). Population density affects the level of labor supply, thereby influencing the purchase behavior of commercial insurance. It is represented by the logarithmic form of the population density of various prefecture-level cities.

⑦ Level of Openness (open). It is measured by the ratio of the total value of goods imports and exports to GDP (the total value of goods imports and exports is converted according to the exchange rate of the US dollar to the Renminbi for that year).

3.2.4. Mechanism Variables

The Air Quality Index (AQI) is used to quantify and describe the condition of air quality, making it more intuitive for people to understand the quality of air. It provides strong data support for environmental protection and public health. The index comprehensively considers various pollutants such as PM10, PM2.5, SO2, NO2, O3, and CO, which have different impacts on human health, ecology, and the environment. According to the size of the AQI value, air quality can be divided into six levels, as shown in Table 1.

Table 1. Air Quality Index Table

AQI Index	Air Quality Level	Air Quality Category
0-50	Level 4	Excellent
51-100	Level 4	Good
101-150	Level 4	Mild pollution
151-200	Level 4	Moderate pollution

201-250	Level 4	Heavy Pollution
>300	Level 4	Severe pollution

In Table 2, we have listed in detail the data descriptions of the aforementioned explained variables, core explanatory variables, and control variables, and conducted a descriptive statistical analysis to gain a more comprehensive understanding of the basic conditions of these variables.

Table 2. Descriptive Statistics

Variable	Data Description	Obs	Mean	Std.Dev.	Min	Max
insurance	Insurance Premiums	1,338	68.49	123.5	0	1404
lngdp	Level of Economic Development	1,337	7.174	1.044	4.592	10.13
urban	Urbanization Rate	1,339	0.529	0.157	0.172	1
structure	Industrial Structure	1,338	37.43	9.929	11.22	79.65
lnpd	Level of Human Capital	1,339	5.937	0.792	3.611	7.730
finance	Level of Financial Development	1,337	0.838	0.468	0.112	3.354
open	Level of Openness to the Outside World	1,333	0.266	0.396	0.000645	3.253

3.3. Data Sources

The explanatory variables in this article mainly originate from authoritative sources such as the "China City Statistical Yearbook" and the "China Regional Economic Statistical Yearbook" over the years. The data for the explained variables are taken from the official website of the China Banking Regulatory Commission. Furthermore, based on the availability of relevant data, the time window for this study is selected as 2006—2015. In the selection of the experimental group,南昌 (Nanchang), 昆明 (Kunming), 樊襄 (Fanxiang), and 呼和浩特 (Hohhot) were deleted due to severe data missing issues. In addition, to maximize the construction of balanced panel data and avoid interference from different urban administrative levels on the empirical results, this article takes 145 prefecture-level cities (including 21 national new energy vehicle subsidy policy pilot cities and 124 control group cities) from 2006—2015 as the research subjects.

4. Empirical Analysis

4.1. Benchmark Regression

This paper utilizes data from 145 prefecture-level cities in China from 2006 to 2015, and by constructing a difference-in-differences model, examines the impact effect of the national new energy vehicle subsidy policy on commercial insurance demand, with the benchmark regression results shown in Table 3. Column (1) presents the preliminary estimation results without considering control variables and fixed effects; Column (2) incorporates city and year fixed effects on this basis, to more accurately reflect the policy impact; while Columns (3) and (4) further add control variables to Columns (1) and (2), respectively, to comprehensively examine the influence of various factors on the results. After these treatments, we find that regardless of whether control variables are included, the estimated coefficients of the

explanatory variables are significantly positive, indicating that this explanatory variable has a significant positive impact on the results, and to some extent, it shows that the national new energy vehicle subsidy city pilot policy has significantly increased the demand for urban commercial insurance. Hypothesis 1 is verified.

Table 3. Benchmark Regression Results

VARIABLES	insurance	insurance	insurance	insurance
policy	251.3304***	120.7935***	96.2557***	100.7592***
	(28.0569)	(4.9704)	(12.3910)	(5.1913)
lngdp			43.6732***	16.4690
			(16.8225)	(0.7827)
urban			60.3450***	-70.7527**
			(3.9468)	(-2.2582)
structure			2.6202***	1.1040**
			(9.4042)	(1.9996)
lnpd			0.1362	173.9621**
			(0.0466)	(2.5271)
finance			-7.9814	4.4514
			(-1.3295)	(0.5305)
open			39.5242***	-35.5101*
			(7.1301)	(-1.8345)
Constant	43.5338***	30.4376***	-390.4850***	-1,105.3168**
	(15.4085)	(6.0649)	(-21.0285)	(-2.5710)
Observations	1,337	1,337	1,330	1,330
R-squared	0.3709	0.4650	0.6490	0.5458
city fe	no	yes	no	yes
year fe	no	yes	no	yes
Number of id		145		145

Note: Values in parentheses are t-values; ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. The same applies to the tables below.

4.2. DID Estimation Validity Test

4.2.1. Parallel Trends Test and Dynamic Effect Analysis

The prerequisite for applying the multi-period DID model is to ensure that the treatment and control groups have the same trend of change before the policy implementation, which aligns with the assumption of the parallel trends test. Given that the pilot cities received the policy impact at different times, it is inappropriate to simply use a specific year as the key time point for policy implementation to set the time dummy variable. Instead, for each pilot city, relative time value dummy variables should be set according to the actual time they received the innovative city pilot policy. This paper [4] constructs equation (2) to conduct a parallel trends test and verify the dynamic effects of the policy pilot, as follows:

$$insurance_{i,t} = \alpha + \beta_1 Before3_{i,t} + \beta_2 Before2_{i,t} + \beta_3 Before1_{i,t} + \beta_4 Current_{i,t} + \beta_5 After1_{i,t} + \beta_6 After2_{i,t} + \beta_7 After3_{i,t} + \beta_8 After4_{i,t} + \beta_9 After5_{i,t} + \beta_{10} After6_{i,t} + \gamma control_{i,t} + city_i + year_t + \varepsilon_{i,t} \quad (2)$$

Among them, the time dummy variables are the observed values for the n years before the policy pilot, the year of the policy pilot, and the n years after the policy pilot

for each prefecture-level city. The time dummy variables for cities not implementing the policy are all 0. Since the observation period of this article is from 2006 to 2015, and the implementation time of the policy varies, this article focuses on the dynamic effects within 3 years before and 6 years after the policy implementation. The results of the parallel trend test are shown in Figure 1. At the 90% confidence interval, the estimated coefficients before the policy implementation are not significant, indicating that there is no significant difference between the experimental group and the control group, satisfying the parallel trend test conditions. In terms of the dynamic effects of the policy, the effect of the subsidy policy has a certain time lag, and it is not until one year after the pilot policy implementation that the estimated coefficient becomes significantly positive. This is because it takes some time for the pilot city planning policy to be introduced, for local adjustments to be made according to relevant methods, and for the policy to be implemented at the grassroots level and begin to take effect. The policy effect is not stable in the early stages, but as the pilot time gradually progresses, the policy is effectively implemented at the grassroots level, and the policy effect gradually strengthens. In the sixth year of policy implementation, the estimated coefficient remains very significant, indicating that the policy effect has strong sustainability.

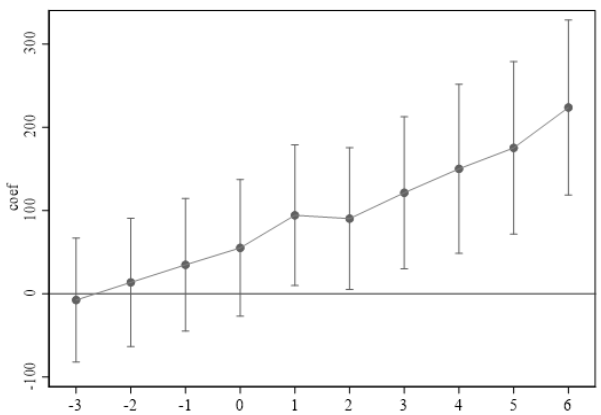

Figure 1. Results of the Parallel Trends Test

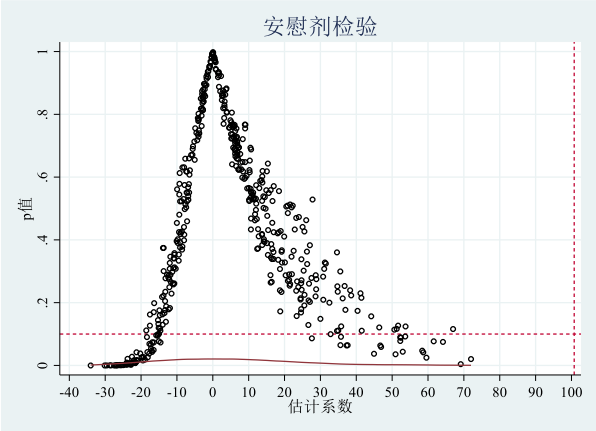

Figure 2. Placebo Test Results

4.2.2. Placebo Test

Due to the potential existence of unobserved urban characteristic factors, these factors may still cause potential interference or impact on the evaluation results of the new energy vehicle subsidy city pilot policy. Given the significant differences in the policy implementation time among pilot cities in the multi-period DID model, to ensure the accuracy and reliability of the study, it is necessary to simultaneously randomly generate pseudo-treatment group dummy variables Group_random and pseudo-policy shock dummy variables Post_random. This approach can randomly assign a policy implementation time to each sample object, thereby better controlling for various potential influencing factors and accurately assessing the policy effect. To verify that the policy has no actual impact on the commercial insurance demand of urban residents, Stata software was used to simulate 500 random subsidy pilot policy shocks in 145 sample cities. Each time, 21 cities were randomly selected as the experimental group, and the policy implementation time was randomly determined, resulting in 500 sets of dummy variables policy_random (i.e., the product of Group_random and Post_random). The kernel density of β and its p-value distribution are shown in Figure 2. During the random treatment process, we observed that the β values were concentrated around 0, and the vast majority of p-values exceeded the 0.1 significance level. However, when we compared these random results with the estimated coefficients of the actual policy, we found that the estimated coefficient of the actual policy was as high as 100.7592, a value that is significantly different from the results of the placebo test, passing the validity test.

4.3. Robustness Test

4.3.1. PSM-DID Test

Based on the model setting, this paper adopts a method combining multi-period propensity score matching with the difference-in-differences approach (PSM-DID model). Although the difference-in-differences method has certain advantages in separating the average treatment effect of pilot policies, we also need to recognize

that the new energy vehicle subsidy pilot policy is not a completely natural experiment, and the observed research data may be affected by selection bias.

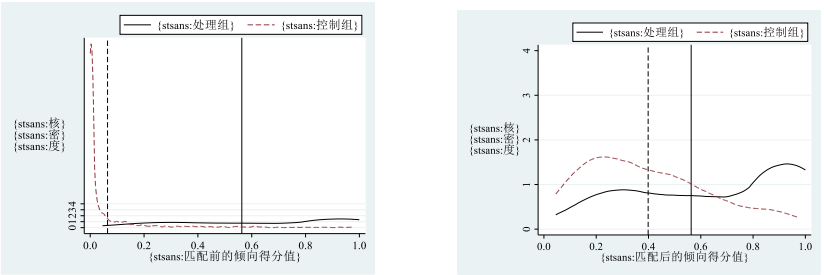

Figure 3. Kernel density plots before and after matching for the experimental group and the control group.

Column (3) in Table 4 reports the regression results of the multi-period PSM-DID. The results indicate that the estimated coefficient of the explanatory variable policy is significantly positive at the 5% level, suggesting that the effect of the national subsidy city pilot policy on increasing the demand for commercial insurance among urban residents is robust.

Table 4. Results of the PSM_DID Test

	(1)	(2)	(3)
	ols	fe	on_support
policy	96.2557***	100.7592***	20.0946**
	(12.3910)	(5.1913)	(2.1639)
lngdp	43.6732***	16.4690	141.2679**
	(16.8225)	(0.7827)	(2.5545)
urban	60.3450***	-70.7527**	-1.2e+02***
	(3.9468)	(-2.2582)	(-2.7816)
structure	2.6202***	1.1040**	1.6939
	(9.4042)	(1.9996)	(1.2619)
lnpd	0.1362	173.9621**	89.0100**
	(0.0466)	(2.5271)	(2.1120)
finance	-7.9814	4.4514	3.6198
	(-1.3295)	(0.5305)	(0.4045)
open	39.5242***	-35.5101*	16.5329
	(7.1301)	(-1.8345)	(0.5792)
Adj. R2	0.6472	0.5403	0.7331

4.3.2. Robustness Check of Tail Trimming

To prevent the regression results from being affected by extreme values, this paper has conducted a 2% tail trimming on the insurance premium variable. The results in Table 5 indicate that the coefficients of the core explanatory variables remain highly significant and the coefficient changes are minimal. All these tests demonstrate that the estimation results of this paper are robust and reliable.

Table 5. Robustness Check: Results of Tail Trimming

	(1)
VARIABLES	insurance
policy	70.8193***
	(5.6462)

Constant	-1,009.6942***
	(-3.2507)
Observations	1,330
Number of id	145
R-squared	0.5887
city fe	yes
year fe	yes

4.4. Heterogeneity Analysis

The heterogeneity analysis in this article aims to explore several key issues: Does the national new energy vehicle subsidy city pilot policy have a different enhancing effect on the development of the commercial insurance industry due to differences in geographical location? Does the pilot policy produce significant differences in cities with varying levels of industrialization? Furthermore, does the policy effect show differentiated impacts due to differences in market potential?

4.4.1. Divided by Geographical Location

Table 6. Geographical Location Heterogeneity Test

	(1)	(2)	(3)
VARIABLES	Esat	Mid	West
policy	76.3038***	76.5825***	165.1224***
	(3.0904)	(5.2940)	(5.5749)
Constant	-1,502.3451***	-264.0275**	-781.9769
	(-2.7328)	(-2.4187)	(-0.8974)
Observations	685	567	78
R-squared	0.5926	0.6276	0.8026
Number of id	74	62	9

In terms of regional heterogeneity testing, the regression results in Table 6 indicate that regardless of the region, the subsidy policy has a significant positive correlation with the demand for commercial insurance among residents, suggesting that the impact of the subsidy policy is widespread. However, it can be seen from the table that the impact in the eastern and central regions is about the same, while the impact in the western region is the greatest, indicating that regional heterogeneity still exists. This may be because the eastern region is economically developed, and those willing to accept insurance have already purchased it. Data also shows that the insurance density in the eastern and central regions is higher than that in the western region, so the effect of the policy may not be as high as in the western region, where the development of the insurance industry is lacking.

4.4.2. Heterogeneity in the Level of Industrialization

In terms of the heterogeneity classification of the level of industrialization, the classification criteria are based on the median of the total output value of industrial enterprises above a designated size. Classification basis: the more developed the industry, the more refined the division of labor, the higher the total output value of industrial enterprises above a designated size. Therefore, we define lnindustry<7.57 as a low level of industrialization and lnindustry>=7.57 as a high level of industrial-

ization. From Table 7, it can be seen that regardless of the level of industrialization, the impact of the subsidy policy on the commercial insurance industry is significantly positive, but it can also be seen that the impact in cities with a high level of industrialization is greater. This may be because in cities with a high level of industrialization, there are more enterprises, and people are more willing to move to places with more job opportunities, so a large base is also one of the factors contributing to the demand for commercial insurance; in addition, with a high level of industrialization, the risk coefficient of most workers' jobs tends to be higher, and companies are more likely to purchase commercial insurance for their employees; finally, the automotive industry is prevalent, leading to a higher level of industrialization, so it is evident that the impact of the automotive subsidy policy on cities with a greater demand for automobiles is greater, affecting a larger group of people, and therefore the response to the commercial insurance industry is greater.

Table 7. Heterogeneity in the Level of Industrialization

	(1)	(2)
VARIABLES	Low level of industrialization	High level of industrialization
policy	16.0205***	69.1795***
	(14.6466)	(3.3749)
Constant	38.3508	-1,623.0565*
	(0.6310)	(-1.9580)
Observations	665	665
R-squared	0.6873	0.6456
Number of id	105	100
city fe	yes	yes
year fe	yes	yes

4.4.3. Heterogeneity of Market Potential

In terms of the segmentation of market potential heterogeneity, the segmentation criteria are based on the median of the gross domestic product (GDP). The basis for segmentation is: the higher the GDP, the greater the market potential. Therefore, we define regions with lngdp<7.11 as low potential areas, and regions with lngdp>=7.11 as high potential areas. As can be seen from Table 8: under different segmentation criteria, the vehicle subsidy policy has a positive impact on the demand for commercial insurance, but there are differences. This may be due to the higher consumption level in high market potential areas, where people, after meeting their basic living standards, pursue higher levels of security. Some may choose commercial insurance as a financial management tool, and thus this impact is more pronounced.

Table 8. Results of Market Potential Heterogeneity Test

	(1)	(2)
VARIABLES	Economically backward	Economically developed
policy	17.1445***	68.3558***
	(17.7053)	(3.4215)
Constant	42.3977	-1,675.4129**
	(0.8323)	(-2.1044)
Observations	664	666
R-squared	0.7321	0.6567

Number of id	99	99
city fe	yes	yes
year fe	yes	yes

4.5. Analysis of the Mechanism of Action

Based on the theoretical analysis presented earlier, to examine the mechanism by which the national subsidy pilot policy for new energy vehicles affects the development of the commercial insurance industry, this paper constructs the following mediation effect model:

$$AQI_{i,t} = \alpha + \varphi policy_{i,t} + \gamma control_{i,t} + city_i + year_t + \varepsilon_{i,t} \quad (3)$$

$$\text{insurance}_{i,t} = \alpha + \theta \text{policy}_{i,t} + \delta \text{AQI}_{i,t} + \gamma \text{control}_{i,t} + \text{city}_i + \text{year}_t + \varepsilon_{i,t} \quad (4)$$

In which AQI is a mediating variable, and the Air Quality Index is used to replace it. Other variables are consistent with those mentioned earlier. If both coefficients ϕ and δ are significant, it indicates that the mediating effect is established. Furthermore, if θ is also significant and its sign is consistent with $\varphi \times \delta$, it indicates that AQI has a partial mediating effect, and its contribution rate to the total effect is $\varphi \times \delta / (\varphi \times \delta + \theta)$.

Air Quality Index Mediating Effect: As mentioned earlier, air quality may be an important indicator affecting residents' willingness to purchase commercial insurance. In this paper, we choose the Air Quality Index (AQI) as the measure standard to evaluate the level of air quality, and the regression results are shown in Table 9. The coefficient of the variable policy in column (2) is significantly positive, indicating that the implementation of the national new energy vehicle subsidy city pilot policy has significantly reduced the AQI in pilot cities, improving urban air quality. The subsidy pilot policy not only brings benefits to consumers but also promotes the social ecological environment, improving the living environment of residents and having a positive impact on the improvement of living standards in pilot cities. Furthermore, the coefficients of variables AQI and policy in column (3) are both significant, indicating that AQI has a partial mediating effect on the development of the urban commercial insurance industry, and the contribution of this effect to the total effect can be calculated to be about 4.4%.

Table 9. Results of Mechanism Verification

	(1)	(2)	(3)
VARIABLES	insurance	AQI	insurance
AQI			-82.0284**
			(-2.1897)
policy	100.7606***	-0.0545**	97.0470***
	(5.1911)	(-2.5271)	(4.9339)
Constant	-1,105.3543**	0.2743	-1,070.1854**
	(-2.5708)	(0.6297)	(-2.4188)
Observations	1,327	1,309	1,308
R-squared	0.5458	0.4486	0.5519
Number of id	144	144	144
city fe	yes	yes	yes
year fe	yes	yes	yes

5.Research Conclusions

This paper conducts a study using 145 prefecture-level cities (21 of which are national pilot cities for new energy vehicle subsidy policies) from 2006 to 2015. It is the first to apply the multi-period difference-in-differences model to the impact of new energy vehicle subsidy policies on commercial insurance demand, providing evidence for research on how the national focus on new energy vehicles affects residents' insurance consumption behavior. The findings indicate that:

(1) The national pilot policy for new energy vehicle subsidies has significantly increased commercial insurance demand in cities. After controlling for additional variables, adding fixed effects, conducting propensity score matching analysis, and performing robustness checks such as winsorization, the results remain significant. Further research reveals that the impact is more pronounced in cities that are more economically and industrially developed.

(2) Air quality, as a mediating variable, affects commercial insurance demand in China. The implementation of the national pilot policy for new energy vehicle subsidies has significantly reduced the Air Quality Index (AQI) in pilot cities, improved urban air quality, enhanced residents' happiness, and strengthened people's risk planning awareness, thereby exerting a positive influence on the demand for commercial insurance.

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