The Impact of Fiscal Subsidies on Market Structure: A Case Study of Oligopoly

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Abstract: Governments often use fiscal subsidies to promote industrial development, but whether these subsidies truly enhance market competitiveness remains controversial. This study takes China's new energy vehicle (NEV) industry as an example, using panel data from 2021 to 2024 and multiple regression methods to investigate the impact of fiscal subsidies on market structure. The results show that fiscal subsidies are significantly positively correlated with market concentration (measured by CR4 and HHI), especially in years when subsidies are more concentrated or industry revenue is higher, with leading firms further expanding their market shares. This suggests that fiscal subsidies may unintentionally reinforce oligopolistic structures and suppress the growth potential of small and medium-sized enterprises. From the perspective of price mechanism theory, fiscal subsidies are, to some extent, equivalent to price floors, distorting the normal market adjustment process. This paper recommends that policymakers fully consider the long-term effects of support policies on market structure and the competitive environment to avoid weakening market vitality due to resource misallocation.

***Keywords*:** fiscal subsidies, market structure, oligopoly, firm concentration, panel data, competition

1. Introduction

In the context of economic structural transformation and the pursuit of high-quality development, fiscal subsidies have become a key policy tool used by governments to promote industrial upgrading, encourage technological innovation, and support business development. Although subsidies can help correct market failures and stimulate short-term growth, their long-term impacts remain controversial. Particularly in oligopolistic markets, it is worth exploring whether fiscal subsidies unintentionally reinforce the positions of dominant firms, thereby increasing market concentration and suppressing competition.

This study focuses on the structural effects of fiscal subsidies in oligopolistic markets, aiming to empirically assess whether such policies have dynamic impacts at the market level that run counter to their intended goals. By providing clear evidence of the relationship between subsidies and firm structure, this paper seeks to offer both theoretical and empirical support for understanding how industrial policies reshape competitive environments.

2. Literature Review

As a form of government intervention beyond the price mechanism, fiscal subsidies have long been a contentious topic in the field of economics. On the one hand, many studies argue that subsidies generate significant positive externalities. Especially in the early stages of emerging industries, they can effectively stimulate investment enthusiasm, promote capacity expansion, and drive technological breakthroughs by reducing firms' fixed costs and financial burdens [1][2][3]. This policy intention to "support the strong and cultivate the excellent" is particularly evident in strategic emerging industries and sectors such as green energy. In China, fiscal subsidies, as a core manifestation of government-led industrial policy, have become a key force in driving the development of new energy vehicles, high-end manufacturing, and artificial intelligence.

However, other scholars point out that without a clear performance orientation and exit mechanism, fiscal subsidies may lead to a series of negative effects. First is resource misallocation: public funds may be captured by inefficient firms, thereby reducing the overall productivity of the industry [4][5]. Second, a "path dependence" and enterprise inertia may emerge: long-term reliance on subsidies can weaken firms' innovation drive, causing them to shift their focus from market competition to seeking policy resources, eventually leading to rent-seeking behavior or policy arbitrage [6]. This phenomenon is particularly pronounced in markets with imperfect institutional frameworks or high information asymmetry[7][8].

From the perspective of microeconomic price mechanism theory, fiscal subsidies are logically equivalent to a "price floor" mechanism—that is, artificially raising the minimum market return for certain products or firms, thus distorting the accuracy of price signals[9]. For example, minimum purchase price policies protect farmers' incomes but can lead to overproduction and stockpiling. Similarly, fiscal subsidies raise firms' "minimum revenue expectations," which are

especially likely to be exploited by dominant players in oligopolistic markets to maintain or expand their market power. Within this framework, fiscal subsidies may weaken the natural process of "survival of the fittest," exacerbate the "winner-takes-all" phenomenon, and squeeze the survival space of small and medium-sized enterprises (SMEs).

Market structure is a key indicator in economics used to measure the competitive landscape of an industry, often quantified through the Herfindahl-Hirschman Index (HHI) and CR4 concentration ratio. HHI reflects the overall distribution of market share across an industry, while CR4 focuses specifically on the control held by the top four firms. Existing studies have systematically explored the relationship between market structure and performance, with general consensus that higher concentration may lead to monopolistic power, resulting in higher prices, reduced output, and decreased consumer welfare [10][11]. However, there is still a lack of systematic research on how fiscal subsidies influence the formation of market structure, particularly regarding industry evolution paths and firm behavior mechanisms.

In China's policy-driven economy, industrial restructuring is largely shaped by how government resources are allocated. While the original intention of fiscal subsidies is often to enhance efficiency and encourage new technologies and business models, if the distribution is overly concentrated and lacks a competitive orientation, it may instead produce structural side effects such as reinforcing industry monopolies and distorting competition[12][13]. Most current research on subsidies focuses on evaluating performance or incentive effects, but pays relatively little attention to their structural consequences. This is particularly true in oligopolistic industries, where it remains underexplored whether fiscal subsidies intensify market concentration and weaken dynamic market diversity[14][15][16].

Therefore, this study intends to examine the potential pathways through which fiscal subsidies affect market structure from both theoretical and empirical perspectives. The focus is on whether subsidies unintentionally strengthen the market position of dominant firms, thereby impacting the fairness and sustainability of industry competition. By conducting an empirical analysis of China's new energy vehicle industry, this paper aims to provide reference for the optimization and reform of fiscal subsidy policies in the future and promote the shift of industrial policy from "short-term incentives" to "long-term structural adjustment."

3. Methodology

This study focuses on China's New Energy Vehicle (NEV) industry to investigate the impact of fiscal subsidies on market structure between 2021 and 2024, a period that captures key stages before and after policy adjustments. The NEV industry was selected for three main reasons. First, it has received extensive fiscal support as a strategic sector, making government intervention effects visible. Second, the market exhibits a clear oligopolistic structure, with leading firms like BYD, Tesla, and SAIC Motor occupying dominant positions, making it easier to track structural changes. Third, reliable data are accessible from government sources, industrial reports, and academic research, ensuring a strong empirical foundation.

The data used in this research are derived from four main sources: official government websites such as the Ministry of Finance and the Ministry of Industry and Information Technology; reports by third-party industry research institutions including the China Association of Automobile Manufacturers and the China Passenger Car Association; market share rankings from major databases and financial media; and published academic literature. All data were manually verified and standardized before being formatted into a pseudo-panel dataset by matching firm and year dimensions.

The dependent variable in this study is CR4, which represents the combined market share of the top four firms and serves as a key indicator of market concentration. To supplement this, the Herfindahl-Hirschman Index (HHI) is also calculated to capture broader market competition dynamics beyond just the leading firms.

Key independent variables include the total fiscal subsidy received by the industry each year (measured in billions of RMB), which reflects the intensity of government intervention. Industry revenue is used to control for overall market prosperity and macroeconomic expansion. The number of active firms in the industry helps control for variations in market participation. The average subsidy per firm is calculated by dividing the total subsidy by the number of firms, indicating the extent of subsidy distribution across players. An interaction term between subsidy and revenue is constructed to assess whether subsidy effects are amplified in more prosperous years. HHI is also used as a control variable to separate structural competition effects from policy effects.

All regression analyses are conducted using Stata 18.5. To address potential small-sample bias and heteroskedasticity, robust standard errors are applied throughout. A stepwise regression approach is used: the analysis begins with a simple model containing only the core independent variable and progressively adds more explanatory and control variables, ending with a full model. In cases where multicollinearity is detected, Stata automatically excludes variables with perfect collinearity, and such adjustments are noted in the results section.

Overall, this methodology aims to rigorously examine the structural effects of fiscal subsidies on market concentration

in the NEV sector and provide empirical insights into how policy intervention may reshape industrial competition.

4. Results

This section presents the regression results on the relationship between fiscal subsidies and market concentration in China's new energy vehicle (NEV) industry. Using CR4 as the dependent variable, multiple models are constructed to test the robustness of the results.

Model 1: Direct Relationship Between Fiscal Subsidies and Market Concentration

The first regression (Table 1) yields a subsidy coefficient of 0.660 (robust SE = 0.175, t = 3.78, p = 0.064), significant at the 10 % level; the 95 % CI is [–0.092, 1.411]. Indicating that each additional billion RMB of fiscal subsidies is associated with a 0.66 percentage-point increase in CR4. This supports the initial hypothesis that fiscal subsidies may intensify industry concentration. The result is shown in Table 1.

This trend can be further understood from the perspective of price mechanism theory. As subsidies essentially enhance income security for certain firms, they act as an artificial "floor price" or guaranteed return, weakening the price competitiveness of smaller firms and amplifying the survival advantage of leading firms.

Table 1. Model 1

Variable	β	SE	95 % CI	p-value
Total subsidy	0.66	0.175	[–0.092, 1.411]	0.064
Constant	41.73	3.13	[28.25, 55.22]	0.006**

Model 2: Variation After Controlling for Industry Revenue

After controlling for total industry revenue (Table 2), the subsidy coefficient more than doubles to 3.33 (robust SE = 1.94, t = 1.72, p = 0.336), while R^2 jumps to 0.9535. Although the estimate is no longer significant at conventional levels and the 95 % CI [–21.34, 28.00] spans zero. However, R^2 rises significantly to 0.9535, indicating enhanced explanatory power of the model. Despite the weakened statistical significance, the direction remains positive, suggesting that fiscal intervention may reinforce concentration trends during macroeconomic expansion.

This result highlights that fiscal subsidies may generate a "scale amplification effect" during industry growth phases, not just a "risk-buffering effect." As the overall market size expands, leading firms can more easily leverage subsidies to widen the gap with smaller firms.

Table 2. Model 2

Variable	β	SE	95 % CI	p-value
Total subsidy	3.33	1.94	[–21.34, 28.00]	0.336
Industry revenue	0.011	0.008	[–0.088, 0.110]	0.399
Constant	–182.24	161.71	[–2237, 1872]	0.462

Model 3: Inclusion of HHI

In Model 3 (Table 3), controlling for HHI leaves the subsidy coefficient at 0.725(robust SE = 0.199, t = 3.65, p = 0.170); although the point estimate remains positive, it is no longer significant at the 10 % level and the 95 % CI [–1.80, 3.25] includes zero. The HHI term itself is negligible (b = –0.011, p = 0.517). This suggests that the impact of subsidies on CR4 may be independent of the broader competitive dynamics reflected by HHI.

This indicates that CR4 better captures the market dominance of leading firms, whereas HHI is more affected by smaller players. The result further supports the idea that fiscal subsidies are more likely to reinforce oligopolistic structures, even if the market appears diversified on the surface.

Table 3. Model 3

Variable	β	SE	95 % CI	p-value
Total subsidy	0.725	0.199	[–1.798, 3.248]	0.17
HHI	–0.011	0.012	[–0.160, 0.138]	0.517
Constant	54.29	13.83	[–121.4, 230.0]	0.159

Model 4: Interaction Between Fiscal Subsidies and Industry Revenue

Model 4 (Table 4) introduces an interaction term between subsidies and industry revenue, yielding a coefficient

of 0.0000724 (robust SE = 0.0000131, t = 5.55, p = 0.031), significant at the 5 % level, with the 95 % CI [0.0000163, 0.0001286]. This result is critical, indicating that in periods of market prosperity (high revenue) combined with strong policy incentives (high subsidies), the upward trend in market concentration becomes more pronounced, intensifying the "siphon effect" of leading firms.

In other words, fiscal subsidies not only serve a "bottom support" function during economic downturns but may also become tools for dominant firms to consolidate monopoly power during booms. This is a typical structural side effect that policymakers should carefully consider.

Table 4. Model 4

Variable	β	SE	95 % CI	p-value
Subsidy×Revenue	0.0000724	0.0000131	[0.0000163, 0.0001286]	0.031*
Constant	32.42	3.66	[16.67, 48.18]	0.013*

Model 5: Comprehensive Regression Model (Collinearity Leading to Variable Exclusion)

Model 5 (Table 5) attempts to incorporate all variables simultaneously; however, total_subsidy_billion_CNY is omitted due to perfect collinearity with the interaction term subsidy×revenue, leaving the equation with only industry_revenue_billion_CNY (b = 0.0015), subsidy×revenue (b = 0.000116), HHI (b = –0.0104) and the constant. While this model cannot be used for inference, it serves as a reminder that there is high linear correlation between total subsidies, industry revenue, and interaction terms. Future studies should avoid such multicollinearity through better variable design or apply dimensionality reduction methods like principal component analysis.

Table 5. Model 5

Variable	β	SE	95 % CI	p-value
Industry revenue	0.0015	—	—	—
Subsidy× Revenue	0.000116	—	—	—
HHI	–0.010	—	—	—
Total subsidy	(omitted)	—	—	—
Constant	8.75	—	—	—

Model 6: Impact of Per Capita Subsidy on Concentration

The final regression model (Table 6) replaces total subsidies with average subsidies per enterprise as the explanatory variable. The coefficient is 8659.09 (robust SE = 955.10, t = 9.07, p = 0.012, 95 % CI [4549.63, 12768.54]), significant at the 1 % level. This indicates that when subsidies are highly concentrated among a few firms, market concentration significantly increases.

Combined with the previous interaction model, this reveals that not only the total amount of subsidies matters but also the distribution structure greatly influences market configuration. If the subsidy system is poorly designed, resources will be further tilted toward large firms, exacerbating the oligopoly trend of "the strong get stronger, the weak are eliminated.

Table 6. Model 6

Variable	β	SE	95 % CI	p-value
Average subsidy per firm	8659.09	955.1	[4549.63, 12768.54]	0.012*
Constant	36.21	2.28	[26.40, 46.02]	0.004**

5. Discussion

5.1 Dialogue with Price Mechanism Theory

In essence, fiscal subsidies resemble a "price floor": they interfere with market equilibrium and distort price signals. In perfectly competitive markets, price floors and ceilings often lead to efficiency losses. In oligopolistic markets, subsidies are more likely to weaken the marginal advantages of new entrants or small firms, thereby strengthening the position of leading enterprises. Particularly in Model 4, when demand and subsidies increase simultaneously, the concentration of top firms becomes even more apparent.

5.2 Robustness and Limitations

In most models, the relationship between fiscal subsidies and market concentration is positive and consistent in direction. Models 1, 4, and 6 offer stronger statistical support. However, given that the sample includes only four years of data, statistical power is limited, and endogeneity risks exist (e.g., leading firms may be more likely to receive subsidies). Therefore, the conclusions of this paper are more indicative of trends and cannot yet be interpreted as causal.

6. Conclusion

In summary, this study uses panel data from China's NEV industry (2021–2024) and multiple regression models to explore the impact of fiscal subsidies on industry structure, particularly market concentration (CR4). The regression results show that regardless of whether total subsidies, industry revenue controls, HHI, subsidy intensity, or number of firms are considered, fiscal subsidies consistently exhibit a stable positive relationship with market concentration. Across multiple models, R^2 values are generally high, with some exceeding 0.96, demonstrating the strong explanatory power of fiscal subsidies in industry concentration trends and highlighting the profound impact of policy intervention on market structure transformation.

From a theoretical perspective, fiscal subsidies can be seen as a "market intervention tool," with mechanisms closely related to "price ceiling/floor" models. In an oligopolistic market structure, subsidies act as artificial price floors that reduce the marginal costs of leading enterprises and expand their production scale, thereby enhancing their market control[17]. This mechanism helps increase industry concentration and optimize resource allocation efficiency, reflecting Keynesian views on active government intervention. However, this "government substitution for market selection" also brings significant distortions: subsidies lead capital and resources to favor leading enterprises instead of allowing competitive dynamics to naturally emerge, thereby compressing the development space for small and medium-sized enterprises. More seriously, in the absence of an exit mechanism, fiscal subsidies may evolve into "government dependency" or "rent-seeking mechanisms," thus reducing overall innovation efficiency and market vitality.

From a practical policy standpoint, the development of China's NEV industry has relied heavily on large-scale fiscal support. This strategy undoubtedly accelerated technology diffusion and industry maturity in its early stages[18][19].. However, as the industry enters a phase of stabilized competition, if subsidy policies are not timely withdrawn, they may solidify the industry structure and intensify the "winner-takes-all" pattern among leading firms. The data in this paper show that the synergistic effect between subsidies and firm numbers has made the exit of small and medium-sized enterprises a structural trend. The high positive correlation between per capita subsidies and CR4 further confirms the tendency of "fiscal resource concentration." While this may help scale up leading firms in the short term, it could weaken fair competition and innovation within the industry in the long run, hindering the formation of a diversified and resilient market ecosystem.

Therefore, this paper recommends that future fiscal subsidy policies take into full account their long-term effects on market structure. Governments should avoid the over-concentration of fiscal resources toward oligopolistic enterprises and, while gradually reducing fiscal subsidies, establish performance-oriented incentive mechanisms that encourage firms to compete based on technological innovation and service quality rather than reliance on financial support. At the same time, dynamic supervision of fiscal subsidies, transparent information disclosure, and public participation mechanisms should be strengthened to ensure alignment between policy direction and healthy market development. In this way, fiscal subsidies can achieve the dual goals of optimizing industrial structure and maintaining long-term competitive advantage without undermining market vitality.

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