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Exploring Strategic Collaboration Between Traditional Automakers and New Energy Vehicle Manufacturers Under the "Dual Credit" Policy

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Abstract: Under the impetus of the "Dual Credit" policy, traditional fuel vehicle manufacturers are confronted with significant pressure to meet new energy vehicle credit requirements. To address this challenge, these manufacturers are increasingly adopting the Original Design Manufacturer (ODM) strategy to collaborate with new energy vehicle enterprises, thereby acquiring credits and expanding their market presence. However, this strategic approach not only intensifies competition between new energy and traditional fuel vehicle markets but also reshapes the profit distribution between the two types of firms. Drawing upon the framework of the Dual Credit policy, this study establishes a Cournot game model to examine the strategic interactions between traditional fuel vehicle manufacturers and new energy vehicle producers. It further investigates the optimal production decisions under the ODM strategy and evaluates their implications for market dynamics and corporate profitability. The findings reveal that, although the ODM strategy heightens market competition, it leads to substantial profit improvements for both types of manufacturers compared to the alternative of directly purchasing credits, while also fostering the growth of the new energy vehicle sector. Moreover, the Case study demonstrates micro-level impact of the dual credit policy on enterprises' response strategies, offering valuable insights for policymakers and industry decision-makers.

Keywords: Credit compensation mechanism; Market competition dynamics; Profit optimization; Cournot game model; Industry synergy

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1. Introduction

Against the backdrop of the global push for sustainable transportation, the automotive industry is undergoing a significant transformation toward new energy vehicles. Governments worldwide have introduced policy measures to expedite this transition, with China's "Dual Credit" policy emerging as a pivotal regulatory framework. This policy, implemented by the Chinese government, serves as a comprehensive regulatory mechanism designed to curb fuel consumption in traditional internal combustion engine vehicles, promote energy conservation and emission reductions in passenger vehicles, and advance the production and widespread adoption of new energy vehicles. By employing a quantifiable credit-based system, it aims to balance the development trajectories of conventional and new energy vehicles. The policy mandates that automobile manufacturers comply with specific fuel efficiency standards and new energy vehicle production quotas, thereby exerting profound implications on both traditional and new energy vehicle producers [1]. Traditional automakers face substantial compliance challenges due to higher fuel consumption levels and insufficient credit accumulation. Conversely, while new energy vehicle manufacturers benefit from favorable credit standings, they continue to confront notable barriers in terms of market penetration and scaling up production capacity.

In 2017, the Chinese government introduced the “Dual Credit Policy for Passenger Vehicle Fuel Consumption and New Energy Vehicle Credits”, commonly referred to as the “Dual Credit Policy”. This regulatory framework comprises two core elements: Corporate Average Fuel Consumption Credits (CAFC) and New Energy Vehicle Credits (NEV) [2]. The CAFC is determined by the deviation between a manufacturer’s actual fuel consumption of conventional internal combustion engine vehicles and the prescribed fuel efficiency standard; lower fuel consumption results in higher credit accumulation. The NEV credits are calculated based on the production volume, driving range, and technological classification (e.g., battery electric or plug-in hybrid electric vehicles) of new energy vehicles. If an automaker’s average fuel consumption exceeds the regulatory threshold or its NEV credits fall below the mandated proportion, it will accumulate negative CAFC and/or NEV credits, which must be offset through the purchase or carryover of positive credits, including those acquired via inter-enterprise trading. Failure to comply may result in administrative penalties, such as suspension of new model approvals, restrictions on production capacity adjustments, and mandatory compliance rectification measures.

China’s automotive manufacturing industry can be broadly categorized into three types: traditional fuel vehicle manufacturers (e.g., FAW Group, SAIC Motor, and GAC Group), new energy vehicle manufacturers (e.g., NIO, Li Auto, and XPeng), and hybrid manufacturers capable of producing both conventional fuel vehicles and new energy vehicles (e.g., BYD, Geely, and Chery). Among these, traditional fuel vehicle manufacturers are typically characterized by high sales volumes and elevated fuel consumption levels. Due to the absence of dedicated new energy vehicle production lines, they often accumulate substantial negative credits under the Dual Credit Policy. Consequently, these manufacturers are required to purchase positive credits directly from the credit market to offset their deficits, thereby incurring significant compliance costs. For example, according to a public announcement issued by the Ministry of Industry and Information Technology of China, the total negative credit balance of all FAW Group-affiliated automakers exceeded 1.7 million points. Based on the relatively conservative credit trading price of RMB 2,000–3,000 per point at that time, the estimated cost for credit compensation reached between RMB 4 to 5 billion yuan. Even after accounting for carried-over positive credits from 2019 within the group, increased NEV sales by FAW-Volkswagen in 2021, and potential bulk-purchase discounts, the total credit compensation still surpassed RMB 3 billion [1]. Where there are substantial losses from credit transactions, there are also notable beneficiaries. According to NIO’s financial report, as of the first three quarters of 2021, revenue generated from the sale of 2020 new energy vehicle credits amounted to RMB 517 million, representing 5.27% of the company’s total revenue during that period [3]. This contrast clearly underscores the pressing need for traditional automakers to develop strategic alternatives aimed at alleviating financial pressures and effectively meeting regulatory compliance requirements.

Therefore, this study investigates strategic collaborations between traditional automotive manufacturers and new energy vehicle producers within the framework of China's "Dual Credit Policy," with a specific emphasis on Original Design Manufacturing (ODM) strategies. The research seeks to elucidate how ODM partnerships can optimize credit management efficiency, strengthen market competitiveness, and accelerate the adoption of new energy vehicles. Through an in-depth analysis of the operational dynamics and strategic implications of such collaborations, this study aims to deliver actionable insights for policymakers and key industry stakeholders. It highlights both the potential advantages and limitations of ODM strategies in achieving regulatory compliance and facilitating market expansion. Ultimately, the study endeavors to demonstrate that well-structured ODM cooperation can serve as a mutually beneficial solution—enabling compliance with policy mandates while fostering sustainable and resilient growth across the automotive sector.

2. Model framework

Within the contemporary automotive supply chain, in addition to traditional fuel vehicle and new energy vehicle manufacturers, a diverse array of key participants and stakeholders play integral roles. These include component suppliers, dealerships and retail networks, infrastructure developers, recycling and remanufacturing enterprises, technology and digital service providers, logistics and transportation operators, research and development institutions, academic and vocational training centers, financial institutions, end consumers, as well as governmental bodies and industry associations. In recent years, as national subsidies for new energy vehicles have progressively declined, the "Dual Credit Policy" has emerged as a pivotal regulatory instrument driving industrial transformation and technological upgrading [4]. Under the oversight of carbon emission regulators, production planning for both conventional internal combustion engine vehicles and new energy vehicles remains highly sensitive to shifts in policy frameworks.

The central objective of the "Dual Credit" policy is to transition from fiscal subsidies to market-oriented regulatory instruments. On one hand, the policy employs CAFC credits to constrain enterprise-level fuel consumption, thereby compelling traditional automakers to advance fuel-efficient technologies. On the other hand, it progressively increases the mandatory NEV credit ratio to incentivize expanded production and supply of new energy vehicles. The ultimate goal is to simultaneously realize dual technological pathways: achieving energy conservation and emission reduction through improved internal combustion engine efficiency, while scaling up new energy vehicle output. This dual-track strategy aims to foster the development of a comprehensive electrified automotive industry chain and establish sustainable long-term competitive advantages.

However, after several years of implementation, the policy has revealed three critical structural deficiencies. First, persistent imbalances between credit supply and demand have resulted in substantial price volatility. In 2019, an oversupply caused transaction prices to plummet to 200–500 CNY per credit, effectively nullifying the intended economic incentives. Second, the policy's technical thresholds have disproportionately prioritized driving range while underemphasizing energy efficiency and safety standards, thereby incentivizing undesirable behaviors such as "range stacking" and oversized vehicle design. Third, inadequate investment in conventional energy-saving technologies has yielded minimal improvements in fuel efficiency—only a 1.6% reduction in average fuel consumption for internal combustion engine vehicles between 2018 and 2020. Small and medium-sized enterprises (SMEs) face particularly severe financial pressures due to simultaneous deficits in both CAFC and NEV compliance. Moreover, the frequent recalibration of regulatory targets complicates the formulation of medium- and long-term strategic plans, ultimately undermining the policy's intended effectiveness.

3. Interpretation of policy measures for the "Dual Credit" system

The calculation formula for Corporate Average Fuel Consumption credits is as follows: CAFC credits = (CAFC target value - CAFC actual value) * production volume or import volume of passenger vehicles.

Among them, the CAFC compliance target value is obtained by multiplying the enterprise's average fuel consumption target value by the upper limit of the ratio (such as 120%), representing the minimum compliance standard allowed by the policy; meanwhile, the actual CAFC value is calculated based on the weighted average of the actual fuel consumption of vehicle models, with different power types of vehicles adopting different weighting coefficients (for example, fuel vehicles are calculated based on the curb weight, and new energy vehicles are calculated based on zero fuel consumption).

That is, suppose a certain car manufacturer's target value is 6L/100km, the actual value is 7.5L/100km, and the production volume is 200,000 units. Then, the CAFC score = (6 * 120% - 7.5) * 200,000 = -60,000 points.

The formula for calculating NEV credits is as follows:

NEV Credits = Actual NEV Value − NEV Target Value.

Meanwhile, the actual value of NEV credits is determined by the actual production volume of new energy vehicles manufactured by automakers, including but not limited to battery electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs). The specific credit value is calculated separately based on vehicle type classifications and further adjusted through sales volume-based weighting factors. Meanwhile, the NEV compliance threshold is derived by applying a regulatory ratio—such as 0.8 or the revised 0.4—to the total output of traditional internal combustion engine vehicles, thereby reflecting governmental policy support for the promotion of new energy vehicle development.

And the calculation of credits for each vehicle is based on the comprehensive records of previous years. For pure electric passenger vehicles, the credit calculation formula is 0.0056 * R + 0.4 (where R represents the driving range of the electric vehicle under the working condition method, measured in kilometers). When R is less than 100, the credit is 0; when $100 \leq R < 150$, the credit is 1; the upper limit of the credit is 3.4 points. For plug-in hybrid passenger vehicles, each vehicle is assigned a fixed credit value of 1.6. For fuel cell passenger vehicles, the credit calculation formula is 0.08 *P (where P represents the rated power of the fuel cell system, measured in kilowatts; the upper limit of the credit is 6 points).

When the NEV credits of an automaker are positive, these credits can be traded in the credit market, transferred among affiliated enterprises, or carried forward to subsequent years (with the carry-forward ratio decreasing year by year), and NEV credits can be used to offset the negative CAFC credits on an equal basis. Currently, there are mainly two credit compensation strategies in the market. One is to directly purchase NEV credits to offset negative CAFC credits. The other is to obtain NEV credits through the original equipment manufacturer (OEM) model of new energy vehicles, that is, traditional fuel vehicle manufacturers cooperate with new energy vehicle manufacturers, purchasing a certain number of new energy vehicles from new energy vehicle manufacturers at an agreed wholesale price, and then affix their own brand logos to these vehicles and sell them as their own products in the market [5]. In this context, traditional fuel vehicle manufacturers and new energy vehicle manufacturers face the same automotive market demand and compete with each other in the market in a Cournot competition model.

Looking ahead, the "Dual Credit" policy is expected to transition from a "quantity-driven stimulus" to a composite regulatory mechanism emphasizing both "quality enhancement and market stability." Regulatory requirements will continue to intensify: the NEV credit ratio is projected to rise to 38% by 2025, while the average credit value per vehicle will decline by 40%. The CAFC target will be tightened to 4 L/100 km. Under these conditions, traditional automakers will struggle to meet compliance targets based solely on incremental improvements in fuel efficiency technologies.

The introduction of the credit pool system and the three-year carry-forward mechanism will be implemented concurrently, aiming to stabilize the market by anchoring transaction prices within the range of 2,000–3,500 CNY per credit, thereby mitigating enterprise risks associated with speculative price volatility.

Furthermore, the commercial vehicle segment is poised for inclusion in the policy framework, with hydrogen fuel-cell heavy-duty trucks and battery-swap logistics vehicles emerging as new growth areas. Plans are also underway to integrate carbon emissions from both production and end-of-life disposal stages into the assessment criteria, ultimately aligning with the national carbon market. This evolution will establish a dual regulatory constraint combining "credit obligations and carbon quotas."

To remain competitive, automakers must adopt strategies centered on "high-efficiency technologies and full life-cycle emissions reduction." Failure to do so will result in declining competitiveness due to widening credit deficits and rapidly escalating compliance costs.

4. Analysis of the Cournot game model

The foundational assumption of this study is the presence of a duopoly market structure comprising a single traditional fuel vehicle manufacturer and a single NEV manufacturer. From a product differentiation perspective, fuel vehicles and NEVs are considered substitutable goods, with consumers exhibiting substitution preferences between the two. With respect to decision-making, both firms simultaneously determine their respective production quantities. Furthermore, both firms operate under the regulatory framework of the "Dual Credit Policy," which imposes compliance obligations; non-compliant firms incur credit-related costs. In terms of information structure, the model assumes complete information symmetry, whereby both parties have full knowledge of each other's cost structures, policy parameters, and underlying market demand. **Table 1** shows the establishment and definition of notation symbols.

Table 1. Symbolic notation in the Cournot game model

Symbol	Implication	Symbol	Implication
q_f	output of fuel vehicle enterprises	q_e	output of new energy vehicle enterprises
p_f	market price of fuel vehicles	p_e	market price of new energy vehicles
c_f	unit production cost of fuel vehicles	c_e	unit production cost of new energy vehicles
π_f	profits of fuel vehicle enterprises	π_e	profits of new energy vehicle enterprises
p_z	market price of points (unit: CNY/point)	α	substitution coefficient between fuel vehicles and new energy vehicles ($0 < \alpha < 1$)

4.1. Demand function setting

Since fuel vehicles and new energy vehicles are substitutes for each other, a linear demand function is adopted here:

$p_f = a - b(q_f + \alpha q_e)$
$p_e = a - b(\alpha q_f + q_e)$

Here, a represents the potential market demand; b is the price sensitivity coefficient; and α indicates the degree of substitution of new energy vehicles for fuel vehicles (the larger the α, the stronger the substitutability).

4.2. Integral cost function

The cost of fuel vehicle enterprise credits is as follows: Fuel vehicle enterprises generate negative CAFC credits due to the production of fuel vehicles and need to offset them by purchasing NEV credits or manufacturing new energy vehicles. Therefore, the credit gap for them is set as:

$$Z_f = \beta q_f - \gamma q_e^{(self)}$$

Among them, β represents the negative credits generated by each unit of fuel vehicles; γ represents the positive credits generated by each unit of new energy vehicles; $q_e^{(self)}$ refers to the number of new energy vehicles produced by the fuel vehicle enterprise through ODM or self-production. If $Z_f > 0$, then the credits need to be purchased at the price of p_z and the cost of the credits is:

$$C_f = p_z * Z_f$$

While the revenue from NEV credits for new energy vehicle enterprises is as follows: New energy vehicle enterprises generate positive NEV credits solely due to their production of NEV, which can be sold for profit. Let the surplus of such credits be:

$$Z_e = \gamma q_e - \delta$$

Here, δ represents the required new energy vehicle credit standard set by policy. If $Z_e > 0$, the credit income is:

$$R_e = p_z * Z_e$$

4.3. Construction of the profit function

(1) Profits of fuel vehicle enterprises:

$$\pi_f = (p_f - c_f)q_f - C_f$$

(2) Substituting the cost of points yields:

$$\pi_f = (a - b(q_f + \alpha q_e) - cf)qf - p_z(\beta q_f - \gamma q_e^{(self)})$$

(3) Profits of new energy vehicle enterprises:

$$\pi_e=(p_e-c_e)qe+R_e$$

(4) Substituting the integral income, it can obtain:

$$\pi_e=(a-b(\alpha q_f+q_e)-c_e)q_e+p_z(\gamma q_e-\delta)$$

5. Derivation of Cournot equilibrium solutions

5.1. First-order conditions (FOC)

Take the partial derivatives of the profit function with respect to q_f and q_e, respectively, and set them to zero:

$$\partial\pi_f/\partial q_f=a-2bq_f-b\alpha q_e-c_f-p_z\beta=0$$
$$\partial\pi_e/\partial q_e=a-b\alpha q_f-2bq_e-c_e+p_z\gamma=0$$

By simultaneously solving the above system of equations, the Cournot equilibrium outputs q_f^* and q_e^* can be obtained.

Through comparative static analysis, any number in the "dual credit" policy can be directly mapped to the changes in the output, market share, and profit of enterprises, thus transforming the abstract policy provisions into measurable economic consequences. By using the explicit expressions of q_f^* and q_e^*, the critical points such as "at what level of ODM wholesale price w would traditional car manufacturers prefer to directly purchase credits" and "to what extent should the fuel consumption target be relaxed for the production of fuel vehicles to rebound" can be solved, providing quantitative basis for policy fine-tuning. In addition, by substituting q_f^* and q_e^* into the consumer surplus, enterprise profit, and social welfare functions, the net impact of different credit compensation strategies on the total social welfare and the penetration rate of new energy vehicles can be evaluated, avoiding "guesswork" policy recommendations [6]. In short, the Cournot equilibrium output is the hub that links the "policy parameters - enterprise behavior - market outcome" into a logical chain; without them, the micro-transmission mechanism of the dual credit policy would be impossible to discuss.

5.2. Integration of ODM production strategies

Under the "dual credit" policy, traditional fuel vehicle manufacturers are facing significant credit pressure. To reduce credit costs and quickly enter the new energy vehicle market, some traditional automakers are choosing to engage in ODM cooperation with new energy vehicle manufacturers [7]. It is obvious that the advantage of adopting the ODM strategy lies in that traditional automakers do not need to build new energy vehicle production lines in the short term, which can reduce the cost of transformation; new energy vehicle manufacturers can also obtain stable orders and profit sources. While achieving complementary resources, both sides can jointly enhance overall competitiveness.

Building upon the original Cournot game model, this study incorporates the ODM strategy. The newly added variable definitions are presented in **Table 2** as follows:

Table 2. New variables and definitions after the introduction of the ODM strategy

Symbol	Implication
$q_e^{(odm)}$	Number of new energy vehicles purchased by traditional automakers through the ODM model
w	ODM wholesale price (unit: CNY per vehicle)
p_{e1}	Retail price of ODM new energy vehicles sold by traditional automakers
p_{e2}	Retail price of NEVs sold by new energy vehicle manufacturers themselves

5.3. Market demand function adjustment

As there are two types of new energy vehicles in the market (ODM NEVs sold by traditional automakers and NEVs produced by new energy vehicle manufacturers), it is necessary to set up demand functions respectively:

$$p_{e1}=a-b(q_e^{(odm)}+\alpha q_{e2})$$
$$p_{e2}=a-b(\alpha q_e^{(odm)}+q_{e2})$$

5.4. Reconstruction of the enterprise profit function

The profit sources of the profit function of traditional fuel vehicle enterprises include: profits from selling fuel vehicles; profits from selling ODM new energy vehicles, and the cost (or income) of credits.

$$\pi_f=(p_f-c_f)q_f+(p_{e1}-w)q_e^{(odm)}-p_z(\beta q_f-\gamma q_e^{(odm)})$$

And the profit sources of the profit function of NEV enterprises include: profits from selling self-produced new energy vehicles; ODM wholesale profits and bonus income.

$$\pi_e=(p_{e2}-c_e)q_{e2}+(w-c_e)q_e^{(odm)}+p_z(\gamma q_{e2}+\gamma q_e^{(odm)}-\delta)$$

6. Solution of Cournot game equilibrium

Take the partial derivatives of the profit function with respect to q_f, $q_e^{(odm)}$, and $q_{e2,}$ respectively, and set them to zero (FOC):

$$\partial\pi_f/\partial q_f=a-2bq_f-b\alpha q_e^{(odm)}-c_f-p_z\beta=0$$
$$\partial\pi f/\partial q_e^{(odm)}=a-b\alpha q_f-2bq_e^{(odm)}-w-p_z\gamma=0$$
$$\partial\pi_e/\partial q_e=a-2bq_{e2}-b\alpha q_e^{(odm)}-c_e+p_z\gamma=0$$

By simultaneously solving the above system of equations, the Cournot equilibrium outputs q_f^*, $q_e^{(odm)*}$, and q_{e2}^* can be obtained. Assume that traditional automakers are now permitted to procure $q_e^{(odm)}$ units of new energy vehicles from new energy enterprises at a wholesale price of w=35 CNY per unit for private-label sales. The retail price of these vehicles remains identical to that of the models manufactured and sold directly by new energy enterprises, implying product homogeneity. Accordingly, the updated profit functions are formulated as follows.

(1) Traditional fuel vehicle enterprises:

$\pi_f=(100-q_f-q_e^{(odm)}-q_e^{(self)})q_f+(100-q_f-q_e^{(odm)}-q_e^{(self)}-35)q_e^{(odm)}-p_z(\beta q_f-\gamma q_e^{(odm)})$

(2) New energy vehicle enterprises:

$\pi_e=(100-q_f-q_e^{(odm)}-q_e^{(self)}-30)q_e^{(self)}+(35-30)q_e^{(odm)}+p_z(\gamma*q_e^{(self)}+\gamma*q_e^{(odm)}-\delta)$ (Assume that the benchmark for meeting the standard is 0)

Thus, the FOC is:

$$\partial\pi_f/\partial q_f=100-2q_f-q_e^{(odm)}-q_e^{(self)}-40-20=0$$
$$\partial\pi_f/\partial q_e^{(odm)}=100-q_f-2q_e^{(odm)}-q_e^{(self)}-35-30=0$$
$$\partial\pi_e/\partial q_e^{(self)}=100-q_f-q_e^{(odm)}-2q_e^{(self)}-30+30=0$$

Solve the system to obtain the new equilibrium solution: $q_f=7.5, q_e^{(odm)}=7.5, q_e^{(self)}=12.5$, as shown in **Table 3** below.

Table 3. The benefits of both sides under the new equilibrium solution

Indicator	No ODM	ODM	Variation
Production of fuel-powered vehicles	10	7.5	↓25%
Production of fuel-powered vehicles	20	20	keep balance
The credit gap of traditional automakers	20 points	2*7.5−3*7.5=−7.5 points	Turn from negative to positive
The credit gap of traditional automakers	100	156.25	↑56%
Profits of new energy vehicle manufacturers	400	443.75	↑11%

As can be seen from the above, embedding the ODM production strategy into the Cournot game framework is equivalent to endogenizing policy constraints (credits) into the output decisions of enterprises, thereby for the first time explaining the three forces of "compliance costs - cooperative benefits - output competition" within the same mathematical language. First, it can quantitatively answer at what level of wholesale price *w* cooperation will break down; second, it explains why raising the credit price p_z through policy, which seemingly "subsidizes new energy", actually accelerates the ODM demand of traditional automakers; finally, it provides a testable proposition that when *w* is within a certain reasonable range, the profits of both parties will be higher than the "no ODM" benchmark, that is, there exists a cooperation range.

This means that raising the price of new energy credits, the credit value per vehicle, and the credit ratio requirements can simultaneously exert pressure from both the demand and supply sides. On the one hand, traditional fuel vehicle manufacturers, in order to reduce the high compliance costs, will be forced to cut fuel vehicle production and produce a large number of new energy vehicles through OEM methods to obtain positive credits. On the other hand, new energy vehicle manufacturers will also expand production capacity due to the credit premium [8]. The combined force of these two aspects will jointly promote the expansion of the new energy vehicle industry and curb the production of traditional fuel vehicles.

Conversely, if the fuel consumption target is relaxed, the production expectations of traditional fuel vehicle manufacturers will rise, and the resulting negative CAFC credits will also increase simultaneously. To make up for the shortfall, the orders for new energy vehicles from their OEMs will further expand. Although this alleviates the credit pressure on traditional automakers, it leads to a sudden increase in supply and intensified competition in the new energy vehicle market, ultimately squeezing the production volume and profit margins of new energy vehicle manufacturers.

7. Case study

Since its implementation, the "dual credit" policy has become an important policy tool for promoting the green transformation of China's automotive industry. In the actual implementation process, different enterprises have adopted diverse response strategies, forming rich case study materials [9].

7.1. Typical enterprise cases analysis

As a leading enterprise in the new energy vehicle sector, BYD has achieved significant innovation and autonomous control over core technologies—including batteries, motors, and electronic control systems—through vertical integration of its industrial chain. Under the framework of the "Dual Credit" policy, BYD has accumulated substantial positive credits due to its large-scale production of new energy vehicles. These credits not only fulfill its internal compliance requirements but also generate additional revenue through credit trading. Furthermore, BYD is proactively exploring strategic collaborations with traditional fuel vehicle manufacturers, thereby expanding its market presence through technology transfer and brand partnerships.

NIO specializes in the high-end segment of the new energy vehicle market and has strengthened its brand competitiveness through innovative service models, including battery swapping solutions and user community engagement. Under the framework of the "Dual Credit" policy, NIO has accumulated significant positive credits by producing new energy vehicles with extended driving ranges. Furthermore, NIO has established strategic partnerships with traditional automakers such as Jianghuai Automobile, leveraging their production qualifications and manufacturing capabilities to accelerate product launches and expand its market presence.

Li Auto employs range-extended hybrid technology, effectively mitigating consumer concerns regarding driving range. Under the framework of the "Dual Credit" policy, the company has accumulated substantial positive credits through the manufacturing of range-extended electric vehicles. Moreover, Li Auto is proactively advancing its portfolio of battery electric vehicles to align with anticipated regulatory requirements concerning the proportion of new energy vehicles in the market.

Great Wall Motor has established a comprehensive market presence across both traditional fuel vehicle and new energy vehicle segments through its diversified brand portfolio, including Haval, WEY, and Ora. Faced with the regulatory pressures of the "Dual Credit" policy, the company has significantly enhanced its R&D investment in new energy vehicle technologies, resulting in the launch of multiple plug-in hybrid and battery electric models. Concurrently, Great Wall Motor has implemented technological innovations to improve the fuel efficiency of conventional internal combustion engine vehicles, thereby minimizing the accumulation of CAFC negative credits.

7.2. Cases of corporate cooperation and strategic alliances

As a traditional fuel vehicle manufacturer, Jianghuai Automobile has engaged in contract manufacturing of new energy vehicles through its strategic collaboration with NIO. This collaborative model has not only allowed

Jianghuai Automobile to utilize its excess production capacity but also provided the company with valuable production experience and financial benefits derived from new energy vehicle credits.

BYD and Toyota have initiated a strategic partnership in the new energy vehicle sector, jointly developing battery electric vehicle models. Through this technological collaboration, BYD has further strengthened its innovation capabilities, while Toyota has expedited its new energy vehicle deployment by integrating BYD's advanced battery technology.

8. Policy impact and changes in corporate behavior

The "Dual Credit" policy has exerted a significant influence on corporate behavior within the automotive industry. On one hand, companies have substantially increased their R&D investments in new energy vehicles, thereby driving technological innovation and facilitating industrial upgrading. On the other hand, inter-firm collaborations and strategic alliances have proliferated, enabling enterprises to collectively address regulatory pressures through resource integration and complementary competitive advantages.

Obviously, under the original design manufacturing (ODM) strategy, both traditional fuel vehicle manufacturers and new energy vehicle manufacturers can realize enhanced profitability. As national average fuel consumption (CAFC) targets become progressively stricter, compliance costs for traditional automakers are expected to rise regardless of whether they opt to directly purchase new energy credits or implement the ODM strategy. Nevertheless, the adoption of ODM may potentially lead to increased profits rather than declines. Meanwhile, the mandated proportion of new energy credits and the per-unit credit value are determined by regulatory frameworks and technical specifications, independent of the market price of credits. Furthermore, new energy vehicle manufacturers benefit from increased credit demand, with profits rising as a result of ODM implementation. Should any of the key indicators—such as new energy credit price, credit proportion requirements, or per-unit credit value—increase, the profitability of new energy enterprises would be further enhanced. This analysis aligns with the "2023 Annual Dual Credit Calculation Table" released by the Ministry of Industry and Information Technology in 2024. Among the 141 passenger vehicle manufacturers surveyed, traditional automakers employing the "direct purchase of credits" strategy incurred an average compliance cost of approximately 3,300 CNY per vehicle, whereas those adopting the "ODM branding" strategy experienced a reduction in average compliance costs to the range of 2,100–2,600 CNY per vehicle, thereby substantiating the hypothesis that the ODM strategy effectively reduces credit expenditure [10]. These findings suggest a stronger preference for the ODM strategy over direct purchases in the new energy credit market.

9. Conclusion

In conclusion, this study demonstrates that within the framework of the "Dual Credit" policy, the credit compensation strategies of traditional fuel vehicle manufacturers and new energy vehicle manufacturers do not constitute a binary choice between competition and cooperation, but rather reflect a dynamic equilibrium characterized by both. By integrating the ODM (Original Design Manufacturer) branding strategy into the Cournot output competition model, we reveal that traditional automakers can expand their sales volumes in both fuel-powered and new energy vehicles without investing in dedicated new energy production facilities, thereby achieving minimized compliance costs. Meanwhile, new energy vehicle manufacturers benefit from increased wholesale orders, enabling rapid scale-up of production. Collectively, these strategic interactions contribute to a significant increase in the overall volume of new energy passenger vehicles. Although the adoption of ODM intensifies market and inter-firm competition, its net impact on the penetration rate of new energy vehicles remains positive. Consequently, from a policy perspective, this mechanism serves as an effective instrument for promoting industry transformation through strategic collaboration.

The effectiveness boundary of the ODM strategy exhibits a pronounced dynamic convergence trend—as regulatory pressures intensify and technological advancements accelerate, the cooperation threshold range progressively narrows over time. Enterprises are advised to establish a comprehensive three-dimensional monitoring framework encompassing "policy, technology, and market" dynamics. When the credit price falls below the dynamically calculated unit cost and the collaborating partner is capable of offering a minimum threshold of technology premium compensation, traditional automakers may adopt the ODM strategy to simultaneously enhance new energy market penetration and achieve profit maximization. However, in scenarios where the credit price reaches the upper threshold and the technology premium falls below a critical level, firms should promptly revert to a hybrid defensive strategy combining "credit procurement and incremental, controllable in-house technology development." This evolutionary trajectory is expected to catalyze the emergence of a novel industrial organization model—"policy-driven technology alliances." Concurrently, this dynamic equilibrium is fostering the development of a new competitive-cooperative paradigm in the automotive industry, characterized by the principle of "technology for market."

Disclosure statement

The author declares no conflict of interest.

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