



The Green Supply Chain Financial Innovation Path for New Energy Vehicle Enterprises: A Case Study of Xiaomi Automobile

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Abstract. Driven by the dual goals of "dual carbon" and the global automotive industry's electrification transformation, new energy vehicle enterprises need to solve the dual problems of low-carbon transformation of the supply chain and improvement of capital efficiency through green financial innovation. This article takes Xiaomi's car as a case to deeply analyze the collaborative operation model of its supplier advance payment financing and green bond innovation. Research has confirmed that Xiaomi has achieved a dual breakthrough in reducing supply chain financing costs and improving carbon emission reduction efficiency by building a collaborative system of green financial tools. The advance payment financing mechanism effectively alleviates the financial pressure on suppliers, while green bonds provide targeted support for the research and development of low-carbon technologies. The two form a virtuous cycle, significantly lowering the overall financing cost of the supply chain below the industry average. At the theoretical level of this study, it breaks through the single-dimensional analysis of green finance or supply chain finance in existing research and constructs a theoretical framework of the collaborative mechanism of "funds - technology - data".

Keywords: Green Supply Chain, Finance Advance Payment, Financing Green bonds, New energy vehicles, Xiaomi Car.

1 Introduction

Under the global trend of carbon neutrality, the green transformation of the new energy vehicle industry is no longer limited to competition at the technological level, but has deeply penetrated into the systematic transformation of the supply chain system [1]. Supply chain finance, as a financial link connecting upstream and downstream enterprises in the industrial chain, is a model that provides financial support to enterprises in the supply chain by effectively controlling the information flow, logistics and capital flow or applying commercial credit around the core enterprise. Green bonds are a type of bond instrument that specifically uses the raised funds to support green and environmental protection projects [2], aiming to guide the funds toward sustainable development areas [3]. The traditional supply chain finance model has long been in a dilemma,

that is, upstream suppliers are facing heavy financial pressure due to technological upgrades and environmental protection investments. While automakers are achieving their emission reduction targets, it is difficult for them to effectively control costs. This contradiction is more prominent when technology enterprises cross over into the automotive industry [4]. For instance, new forces in the automotive industry are represented by Xiaomi's car, although they attempt to solve the problem by innovating with financial tools, the relevant paths have not been fully analyzed. At present, most of the existing studies only focus on a single dimension of green bonds or supply chain finance, and there are relatively few discussions on the collaborative operation mechanism of the two, especially the lack of empirical analysis on the integration of low-carbon technologies by technology enterprises relying on their own ecological advantages [5]. Take Xiaomi's car as an example. It adopts the method of advance payment financing, signs emission reduction commitments with suppliers, and at the same time issues green bonds to raise low-cost funds, which are specifically used to support the upgrading of the supply chain [6], thereby building a closed-loop system of "funds - technology - data". This model not only reduces the comprehensive financing cost of the supply chain but also makes the carbon footprint of the entire supply chain more transparent. However, this model has also brought about some new problems, such as the relatively high threshold for small and medium-sized enterprises to participate and the lack of unified green certification standards. This article focuses on the innovative model of Xiaomi's green supply chain finance for automobiles, and delves deeply into how new energy vehicle enterprises can leverage green supply chain finance tools to achieve a dual improvement in the low-carbon transformation of the industrial chain and capital efficiency.

2 Analysis of Xiaomi's Green Transformation Path and Comprehensive Achievements

Xiaomi Auto has established the core framework of green supply chain finance through a collaborative design of "advance payment financing + green bonds".

This section of the research will focus on Xiaomi's green vehicle transformation path, analyze its comprehensive effectiveness from both economic and environmental dimensions, and clarify its competitive position through horizontal industry comparisons. In terms of economic effectiveness, the cost savings brought about by green bonds and advance payment financing will be quantitatively analyzed. In terms of environmental effectiveness, focus on indicators such as carbon emission intensity in the production process and reduction of carbon footprint throughout the product's entire life cycle. Finally, a comparison is made between Xiaomi and BYD as well as Tesla to reveal the uniqueness of Xiaomi's green transformation path and its industry reference value.

2.1 Analysis of the Economic Effectiveness of the Xiaomi Mode

The direct benefits of green Bond innovation. Xiaomi Group has successfully achieved low-cost financing by issuing green bonds. Its issuance rate of 2.78% is significantly lower than the market average of 3.5%-4.5%, and the cumulative financing cost savings have exceeded 100 million yuan. This achievement is attributed to the group's well-developed green development layout: In the "Climate Action White Paper", Xiaomi proposed the "energy flow - material flow - information flow" carbon reduction framework and clarified its green transformation path [7]. The funds raised from this green bond issuance will mainly be used for the research and development of battery CTB integrated technology and the construction of a large-scale die-casting equipment cluster. As the project complies with the national green policy, Xiaomi has further received policy interest subsidies and tax preferences. As a result, the overall financing cost has significantly decreased by approximately 1.2 percentage points, effectively promoting the upgrade of green manufacturing. In addition, Xiaomi plans to further explore the asset securitization (ABS) model and intends to package and issue ABS from green assets such as the operating income of charging piles and the cash flow from battery leasing. Combined with the green finance subsidy policy, it is expected that the financing cost can be reduced by 15% to 20%. By revitalizing the existing assets and releasing liquidity, new impetus can be injected into the group's green industry layout [8].

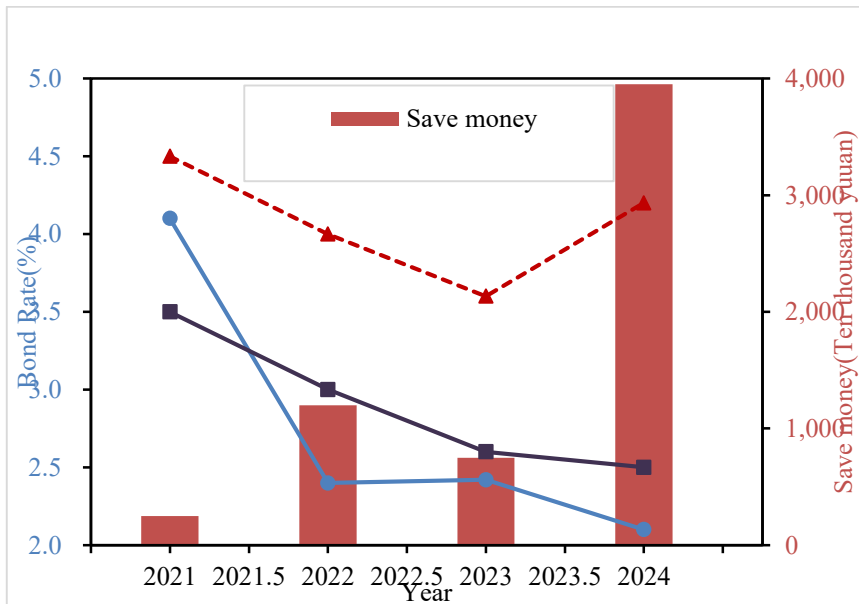


Fig. 1. Dynamic comparison of key indicators (Picture credit: Original).

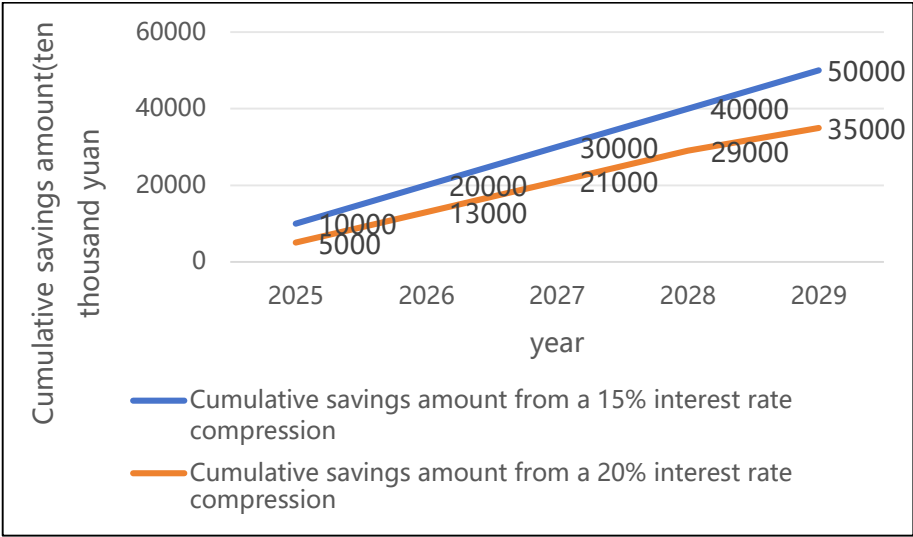


Fig. 2. The potential return forecast of asset-backed securities (ABS). (Picture credit: Original)

Figure 1 shows that the overall interest rate of Xiaomi bonds has been on a downward trend, gradually declining from a relatively high level in 2021 to a relatively low position in 2024. Both the upper limit (red line) and the lower limit (green line) of the market interest rate have been on a downward trend, and the amount saved (orange column) has been increasing significantly year by year, reaching a very high level in 2024. As can be seen from Figure 1, the bond interest rate of Xiaomi has decreased along with the decline of market interest rates, enabling Xiaomi to save a large amount of funds in bond financing and other aspects. Therefore, during the period from 2021 to 2024, as the overall market interest rate declined, the bond interest rate of Xiaomi was reduced accordingly, effectively lowering the financing cost and bringing about significant savings in funds. Figure 2 shows that as time progresses from 2025 to 2029, whether the interest rate is compressed by 15% or 20%, the cumulative savings continue to increase, indicating that in asset securitization projects, the cost savings achieved through interest rate compression are constantly accumulating over time. At the same time point, the cumulative savings amount corresponding to a 20% interest rate compression is always higher than that when the interest rate is compressed by 15%. This indicates that the greater the extent of interest rate compression, the more significant the cost-saving benefit brought by asset securitization. That is, the extent of interest rate compression is positively correlated with potential returns. In asset securitization projects, both extending the duration and increasing the extent of interest rate compression can help boost cumulative savings and achieve higher potential returns.

Indirect economic gains of supplier advance payment financing. Xiaomi Auto has built an efficient supply chain ecosystem by deeply integrating innovative financial tools with digital management. In terms of financial instrument innovation, a combined

model of commercial acceptance bills and order loans was adopted. Bills with a payment period of 6 to 9 months were issued to suppliers. Through the discounting operation of suppliers, a dynamic "interest-free fund pool" was successfully created. Meanwhile, the intelligent supply chain management platform built on IoT device interconnection and blockchain traceability technology realizes real-time and transparent monitoring of order flow, logistics and capital flow, and can dynamically adjust the credit limit according to the actual situation [8]. These innovative measures fully demonstrate the compound value of financial instrument innovation and digital management in cost optimization, efficiency improvement and production and sales synergy.

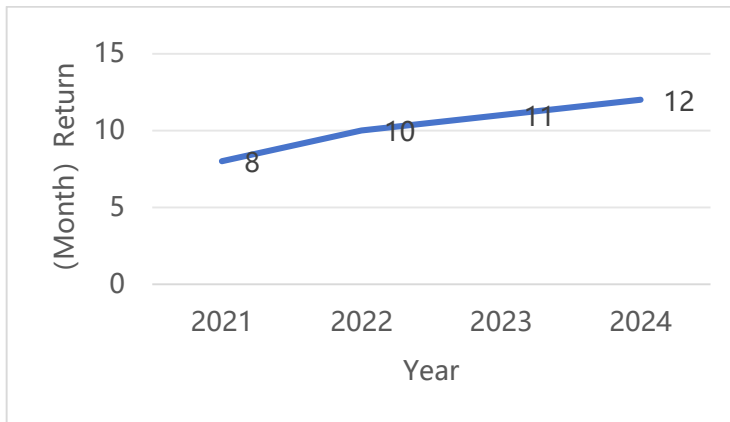


Fig. 3. Indirect economic benefits of supplier prepayment financing. (Picture credit: Original).

It can be seen from Figure 3 that the indirect economic gain of supplier advance financing of Xiaomi Auto shows a steady upward trend during 2021-2024, increasing from CNY 800 million in 2021 to CNY 1.2 billion in 2024. This shows that with the passage of time, the positive economic effect of supplier advance payment financing mode in enterprise operation has become more and more significant, and it has a positive role in promoting the improvement of enterprise economic benefits. This continuous growth shows that supplier advance financing can effectively help enterprises improve their financial status and optimize supply chain management, thus bringing more indirect economic benefits, reflecting that this financing model has good development potential and application value, which is worthy of continuous adoption and further exploration and optimization by enterprises.

2.2 Analysis of Xiaomi's Environmental Effectiveness

Optimization of the Full Carbon Footprint of Products. Only two levels of headings should be numbered. Lower level headings remain unnumbered; they are formatted as run-in headings.

Xiaomi Auto takes life-cycle carbon footprint management as the core and realizes systematic optimization of carbon emission intensity in the production stage through the innovation of green manufacturing technology systems. In the practice of Wuhan

Intelligent Factory, according to the data of Xiaomi 2023 Sustainable Development Report, the coating process replaces the traditional solv-based coating through the whole process of water-based coating, combined with zirconium phosphorus-free pre-treatment technology, To achieve dual environmental benefits of 99% reduction of volatile organic compounds (VOCs) emissions and 85% reduction of heavy metal wastewater emissions [9]; In terms of energy structure, the annual power generation of the rooftop distributed photovoltaic power station deployed by the factory reaches 16.4 million KWH, accurately covering 23% of the production electricity demand, and combined with the 100% green electricity procurement strategy, the carbon emission of single vehicle production is reduced by 30% compared with the reference value of traditional fuel vehicle factories in the White Paper on Carbon Emission of China's Automobile Industry [10]. In the field of key process innovation, the number of solder joints has been sharply reduced from 840 to 0, the weight of parts has been reduced by 17%, and the energy consumption in the production process has been reduced by 45% compared with the traditional impact welding process. This technology has passed ISO 14067 product carbon footprint certification, and a single body can reduce 68kg of carbon dioxide equivalent emissions [11]. The combination of the above technologies forms a three-dimensional carbon reduction matrix covering materials, energy and technology, and constructs a benchmark paradigm of low-carbon manufacturing in the production process of new energy vehicles. Based on the carbon footprint accounting model of China Automobile Data Co., LTD. (CATARC) (GB/T 40891-2021 standard), the carbon emission performance of Xiaomi SU7 in the whole life cycle is as Table 1.

Table 1. Life cycle carbon emission performance of Xiaomi SU7.

link	SU7 standard version carbon emissions (gCO ₂ e/km)	Industry C-level pure electric sedan aver- age	Carbon re- duction rate
Raw material acquisition and production	98.2	122.4	19.8%
Vehicle manufacturing	23.7	35.1	32.5%
Usage stage (energy consumption)	47.6	49.9	4.6%
recycling	6.04	7.74	22.0%

By comparing with the average value of C-class pure electric sedans in the industry, the Xiaomi SU7 has achieved a certain degree of carbon reduction in all stages of its entire life cycle, including raw material acquisition and production, vehicle manufacturing, usage stage, and recycling. This indicates that Xiaomi's car not only innovates in technology but also performs outstandingly in actual carbon reduction achievements,

setting a benchmark for optimizing the full carbon footprint of products in the new energy vehicle industry.

Synergistic Carbon Reduction Effects of the Supply Chain. Based on the theory of Green Supply Chain Finance, Xiaomi gives full play to the advantages of the chain leader enterprise, builds a green finance closed loop of tripartite collaboration among "chain leader enterprise - supplier - financial institution", and systematically promotes the low-carbon transformation of supply chain enterprises [12]. As of 2024, Xiaomi has signed "Green Cooperation Agreements" with over 300 core suppliers, incorporating more than 80% of its automotive business procurement into the green management system, and requiring suppliers to disclose carbon data and formulate emission reduction plans [10]. In specific practice, Xiaomi helps its suppliers upgrade their technologies through green financial tools such as advance payment financing. Take solid-state battery supplier Weilan New Energy as an example. After completing the production line transformation with the financial support of Xiaomi, the carbon emissions in its battery production process have been significantly reduced, achieving a breakthrough in green production. Meanwhile, Xiaomi is actively laying out in the field of power battery recycling. Through advanced resource recycling technology, it significantly reduces its reliance on primary materials and lowers carbon emissions throughout the entire chain. This innovative model not only helps suppliers achieve green transformation but also builds a low-carbon competitive advantage for Xiaomi itself, promoting the entire supply chain to develop in a sustainable direction.

2.3 Industry Horizontal Comparison

Table 2. Industry comparison.

Dimension	Xiaomi Auto	BYD	tesla
supply chain finance	The scale of advance payment continues to grow (CAGR 14.4%), and the delivery cycle is shortened by 15% -20%	Reverse factoring improves financing efficiency (with a shortened cycle to 1 day), but the scale of advance payments has not been disclosed	Payment cycle of 90 days, no pre-payment mode adopted, relying on technical standards and brand premium
Green bond interest rate	4.1% (2021)+policy discount of 0.8% → actual cost of 2.1%	1.96% (2023 green ABS), but the use of funds is biased towards the consumer end	No green bonds, relying on carbon credits (accounting for 34% of profits) and green credit

Dimension	Xiaomi Auto	BYD	tesla
			(interest rate of 3.9%)
ABS financing cost	Expected compression of 15% -20% (target interest rate of 2.5% - 3.0%)	1.96% (Consumer Loan ABS)	4.827% (car loan ABS)
Policy compatibility	Enjoy purchase tax reduction (5% -8% lower car purchase cost) and battery recycling policy subsidies (target recycling rate of 90%)	The battery recycling system is well-established (with a recycling rate of 95%), and the double point policy benefits	Relying on subsidies from the US IRA Act, the adaptability of China's localization policies is moderate

It can be seen from Table 2 that Xiaomi Auto has advantages in supply chain advance payments, financing tools and green bonds, which form a significant difference from its core competitors BYD and Tesla. In terms of supply chain management, Xiaomi has achieved continuous growth in the scale of supplier advance payment financing from 800 million yuan in 2021 to 1.2 billion yuan in 2024 by dynamically adjusting the advance payment ratio. The delivery cycle of core components has been shortened by 15% to 20%, strengthening the stability of the supply chain. In contrast, BYD mainly relies on the reverse factoring model to compress the financing cycle for suppliers to one day, but the scale of the advance payment has not been explicitly disclosed. Tesla maintains supply chain efficiency by shortening the payment cycle to 90 days, but does not adopt the advance payment financing model. Instead, it relies more on technical standards and brand premiums. In terms of innovation in financing tools, Xiaomi adopts a dual-wheel drive strategy of "green bonds + ABS": The interest rate of green bonds issued in 2021 was 4.1%, 1.2 percentage points lower than the industry average. After the policy interest subsidy was added, the actual financing cost decreased by another 0.8%, and the cumulative interest savings exceeded 150 million yuan, forming a closed loop of "financing - technology - policy". Byd optimizes its capital cost through green ABS, but the funds are mainly used for the consumer end. Tesla has not directly issued green bonds. It mainly relies on carbon credit income and green credit, with relatively high financing costs. In terms of policy alignment, Xiaomi, relying on its 70 billion yuan of own funds and the policy dividends of the circular economy, enjoys multiple supports such as tax reduction and exemption on purchases and subsidies for battery recycling. Its self-developed integrated die-casting technology has increased production efficiency by 50% and reduced vehicle weight by 15%, further obtaining policy preferences. Byd has consolidated its policy advantages through vertical integration of

the entire industrial chain and a battery recycling system (with a recycling rate of 95%), while Tesla relies on subsidies under the US IRA Act and has a moderate degree of adaptation to local policies in China. Xiaomi has built a positive cycle of "financing - technology - policy" through low-cost financing tools such as green bonds and supply chain collaborative innovation. Its differentiated path has demonstrated unique competitiveness in the new energy vehicle industry.

3 Conclusion

Xiaomi's exploration in the automotive field has provided the industry with an innovative model of deep integration of "technology + finance + green". Relying on the concept of ecological collaboration, it connects the resources of the upstream and downstream of the industrial chain and significantly reduces the cost of supply chain collaboration. At the same time, by flexibly applying tools such as green bonds and supply chain finance, and using funds as a link to promote the low-carbon transformation of the industrial chain, the practical value of the "chain leader enterprise leading" model in the new energy vehicle industry has been fully verified, opening up a new path for the sustainable development of the industry. Facing the development opportunities of cutting-edge technologies such as hydrogen energy and solid-state batteries, Xiaomi can further expand the scale of green bond issuance to provide sufficient financial support for technological research and development and industrial upgrading. By deepening the industry-university-research cooperation with universities and research institutions, accelerating the transformation of scientific research achievements, and enhancing the technological resilience of the green supply chain. Furthermore, with the wide application of green financial tools, it is necessary to establish a complete risk prevention and control mechanism, be vigilant against the risk of "greenwashing", and avoid neglecting the independent research and development of green technologies due to excessive reliance on financial means. Only by continuously strengthening the accumulation of underlying technologies can truly achieve high-quality development of the green supply chain, provide more solid support for the green transformation of the automotive industry, and lead the industry to steadily move towards a low-carbon and sustainable direction.

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