Proceedings of the 10th International Conference on Economic Management and Green Development
DOI: 10.54254/2754-1169/2026.36310

Dual Subsidy Policies and Pricing Decisions of Cross-Border E-commerce Supply Chain

Yang Zhou

School of Economics and Management, Chongqing Jiaotong University, Chongqing, China
2035411033@qq.com

Abstract. There is synergy space for dual subsidy policies, but precise threshold management is required to improve the comprehensive benefits of the entire supply chain. Both government promotion subsidies and platform tariff subsidies are regarded as key means to promote the development of cross-border e-commerce supply chains, yet the synergy mechanism of the two subsidies remains unclear. Against the background of intensifying tariff trade frictions, this paper constructs a game model with the participation of the government, cross-border e-commerce platforms, settled merchants and overseas consumers, and compares and analyzes supply chain pricing decisions under four scenarios: no subsidy, platform tariff subsidy only, government subsidy only, and coexistence of dual subsidies. The results show that a single subsidy policy cannot fully offset the negative impact of rising tariffs. Meanwhile, excessive platform subsidies will squeeze their promotion budgets and may induce merchants to raise prices. Although the linkage of dual subsidies can slow down the decline of demand under high tariff conditions, its effect is restricted by multiple factors such as subsidy intensity and tariff level.

Keywords: cross-border e-commerce, supply chain, government subsidy, platform tariff subsidy, pricing decision

1. Introduction

1.1. Research background and problem statement

In recent years, with the rapid development of the global digital economy, cross-border e-commerce has become a strong engine driving the transformation of China's foreign trade economy. The *Outline of the 15th Five-Year Plan for National Economic and Social Development of the People's Republic of China* clearly states: "We will support the development of new forms and models of business such as cross-border e-commerce, optimize the layout and functions of overseas warehouses, and improve the policy environment for bonded maintenance and remanufacturing, new-type offshore trade, etc." This indicates that the country is actively promoting the development of cross-border e-commerce. However, as countries impose increasingly strict tariff regulations, tax issues encountered by cross-border consumers during shopping have become a key factor restricting the purchase decisions of overseas consumers. Platforms such as Amazon and Temu have innovatively launched tariff subsidies in the form of "tariff subsidy vouchers", and the Chinese government has also introduced promotion policy subsidies to boost the global expansion of cross-border e-commerce brands. On this basis, this paper discusses the impact of two types of subsidy policies on cross-border e-commerce supply chain

DOI: 10.54254/2754-1169/2026.36310

decisions under the tariff background, verifies the policy synergy effect and clarifies its effective boundary conditions.

1.2. Literature review and research innovations

A large body of existing literature focuses on the impact of different subsidy policies on supply chain pricing decisions. Among them, studies on platform subsidies mainly involve scenarios such as live streaming, and rarely touch upon tariff subsidies in the cross-border e-commerce field. Chen et al. [1] found that subsidies are superior to no subsidies, and lump-sum quota subsidies perform better when subsidy budgets are not considered; Sun et al. [2] held that recycling regulations and subsidies are the main factors affecting manufacturers' collection and proper disposal of end-of-life products. Jiang et al. [3] revealed the synergy mechanism between carbon subsidies and corporate social responsibility on emission reduction strategies; Liu et al. [4] studied the impact of government subsidy modes and intensity on dynamic pricing and investment strategies of supply chains.

Existing research on cross-border supply chain pricing decisions pays more attention to the impact of tariffs themselves, and seldom involves the coordination effect on supply chains under multi-agent subsidy policies. Jiang et al. [5] discussed the optimal pricing decisions of supply chain members; Wang et al. [6] proposed an online-offline revenue sharing contract based on consumer satisfaction to achieve win-win cooperation among supply chain entities and improve consumer satisfaction and enterprise benefits. Zhang et al. [7] found that the market position of platforms significantly affects the optimal subsidy intensity, and disadvantaged platforms often need to provide higher subsidies. Chen et al. [8] found that the implementation of platform subsidies usually depends on specific conditions (such as consumer net income and government regulation). This paper introduces parameters of government subsidies and platform tariff subsidies, broadens the subsidy research scenario of cross-border supply chains, and analyzes the synergy mechanism and threshold boundary of dual subsidy policies.

2. Model description and assumptions

2.1. Problem description

This paper considers a cross-border e-commerce supply chain system consisting of four entities: the government, cross-border e-commerce platforms, settled merchants and overseas consumers. The cross-border e-commerce platform acts as the Stackelberg leader, and retailers settled on the platform act as followers. According to whether the government provides subsidies to the platform and whether the cross-border e-commerce platform offers tariff subsidies, the model is divided into four structural models: no subsidy from both the government and the platform (Model N), no government subsidy but platform tariff subsidy (Model Y), government subsidy but no platform subsidy (Model M), and both government and platform subsidy policies (Model T).

Model N: No subsidy policy

Model Y: Only the platform provides tariff subsidies to consumers

Model M: Only the government subsidizes the platform's promotion costs

Model T: Linkage of government promotion subsidy and platform tariff subsidy

2.2. Basic assumptions and parameter description

Based on the sales mode and relevant characteristics of cross-border e-commerce, the following assumptions are made:

Assumption 1: The ratio of a merchant's unit product cost to the selling price is θ, and the merchant pays a commission at the ratio of t to the platform.

DOI: 10.54254/2754-1169/2026.36310

Assumption 2: Market demand is jointly affected by price and platform promotion effort, and the promotion cost takes the form of a quadratic function.

Assumption 3: The government subsidizes the platform's promotion cost at the ratio of m.

Assumption 4: Import tariff is an ad valorem tax with a rate of δ.

Assumption 5: The platform subsidizes tariffs for consumers at the ratio of λ, and consumers actually bear the tariff cost of (1-λ) δ.

Table 1. Model parameter table

Symbol	Description
a	Market size, a>0
b	Price sensitivity coefficient, b>0
θ	Ratio of unit product cost to selling price, $1-t>\theta>0$
e	Promotion effort of cross-border e-commerce, e>0
m	Government promotion subsidy coefficient for cross-border e-commerce platforms,$0<m<1$
δ	Ad valorem tax rate of imported cross-border goods,δ>0
k	Promotion cost coefficient, k>0
λ	Tariff coverage ratio of cross-border e-commerce platform, $1\geq\lambda\geq 0$
t	Commission ratio of cross-border e-commerce platform, 0.15>t>0

The demand function is expressed as: $D=a-bp[1+(1-\lambda)\delta]+e$

The profit function of settled merchants: $\pi_r=p(1-\theta-t)D$

The profit function of cross-border e-commerce platform: $\pi_e=p(t-\lambda\delta)D-(1-m)ke^2$

The platform, as the Stackelberg leader, decides the promotion effort first; the merchant, as the follower, decides the retail price afterwards. The backward induction method is adopted to solve the equilibrium. All parameter values below satisfy the second-order condition for the existence of equilibrium.

3. Equilibrium decisions and core conclusions

3.1. Summary of equilibrium results

Table 2. Optimal equilibrium results under four scenarios

Decision variable	Model N (No subsidy)	Model Y (Platform subsidy)	Model M (Government subsidy)	Model T (Dual subsidies)
Retail price	$p^{N^*}=\frac{2ak}{4bk(1+\delta)-t}$	$p^{Y^*}=\frac{2ak}{4bk[1+(1-\lambda)\delta]+\delta\lambda-t}$	$p^{M^*}=\frac{2ak(1-m)}{4bk(1+\delta)(1-m)-t}$	$p^{T^*}=\frac{2ak(1-m)}{4bk(m-1)[-1+(-1+\lambda)\delta]+\delta\lambda+t}$
Promotion effort	$e^{N^*}=\frac{at}{4kb(1+\delta)-t}$	$e^{Y^*}=\frac{a(t-\delta\lambda)}{\delta[4bk(1-\lambda)+\lambda]+4bk-t}$	$e^{M^*}=\frac{at}{4kb(1+\delta)(1-m)-t}$	$e^{T^*}=\frac{a(t-\delta\lambda)}{4kb(m-1)[-1+(\lambda-1)\delta]+\delta\lambda-t}$
Market demand	$D^{N^*}=\frac{2abk(1+\delta)}{4bk(1+\delta)-t}$	$D^{Y^*}=\frac{2abk[1+(1-\lambda)\delta]}{\delta[4bk(1-\lambda)+\lambda]+4bk-t}$	$D^{M^*}=\frac{2abk(1+\delta)(1-m)}{4bk(1+\delta)(1-m)-t}$	$D^{T^*}=\frac{2abk(1-m)[1+(1-\lambda)\delta]}{\delta[4bk(1-m)(1-\lambda)+\lambda]+4bk(1-m)-t}$
Platform profit	$\pi_e^{N^*}=\frac{a^2kt}{4bk(1+\delta)-t}$	$\pi_e^{Y^*}=\frac{ka^2(t-\delta\lambda)}{\delta[4bk(1-\lambda)+\lambda]+4bk-t}$	$\pi_e^{M^*}=\frac{a^2kt(1-m)}{4bk(1+\delta)(1-m)-t}$	$\pi_e^{T^*}=\frac{a^2k(1-m)(t-\delta\lambda)}{4bk(m-1)[-1+(\lambda-1)\delta]+\delta\lambda-t}$
Merchant profit	$\pi_r^{N^*}=\frac{2a^2k^2b(1+\delta)(1-t-\theta)}{[4bk(1+\delta)-t]^2}$	$\pi_r^{Y^*}=\frac{a^2bk^2(1+\delta)(1-t-\theta)[1+\delta(1-\lambda)]}{4\left\{\left[kb(1-\lambda)+\frac{\lambda}{4}\right]\delta+kb-\frac{t}{4}\right\}^2}$	$\pi_r^{M^*}=\frac{2a^2bk^2(1-m)^2(1+\delta)(1-t-\theta)}{[4bk(1+\delta)(1-m)-t]^2}$	$\pi_r^{T^*}=\frac{a^2bk^2(1-m)^2(1-t-\theta)[1+(1-\lambda)\delta]}{4\left\{(m-1)bk[(\lambda-1)\delta-1]+\frac{\delta\lambda}{4}-\frac{t}{4}\right\}^2}$

3.2. Effect analysis of single subsidy policy

Rising tariffs will lead to the shrinkage of cross-border market demand, which in turn reduces the promotion willingness of cross-border e-commerce platforms and lowers the unit selling price of settled merchants. If neither the government nor the platform provides subsidies, the profits of all members in the cross-border e-commerce supply chain will be eroded.

DOI: 10.54254/2754-1169/2026.36310

After the platform provides tariff subsidies, the profits of supply chain members, social welfare and market demand will still decline as tariffs rise. That is, a single platform subsidy cannot reverse the negative trend brought by rising tariffs. On the contrary, it will squeeze the platform's promotion budget, resulting in a decline rather than growth of overall market demand. Meanwhile, there is a threshold for the subsidy effect: platform subsidies can mitigate the impact of tariffs on demand only when the tariff rate is above the critical value; the policy effect is weak in low-tariff scenarios. Merchants' pricing behavior will adjust the policy effect. When price sensitivity is high, merchants will raise prices by taking advantage of subsidies, offsetting the tariff preferences on the consumer side.

Government subsidies can effectively boost market demand and the profits of supply chain members, but there is a strict upper limit on the intensity of government subsidies. Once the subsidy exceeds the critical value, the subsidy cost will surpass the incremental income, and social welfare will turn negative.

3.3. Synergy effect of dual subsidy policies

Under the background of high tariffs, the simultaneous implementation of dual subsidy policies produces a more significant mitigation effect than a single policy, which is mainly reflected in a notable slowdown of the decline rate of demand and profits as tariffs rise. However, government subsidies themselves will accelerate the erosion of platform profits by tariffs. Only when the subsidy intensity exceeds a specific threshold can it curb the continuous shrinkage of demand. Meanwhile, the tariff subsidies provided by the platform can form effective cooperation with government subsidies only when the tariff rate or subsidy coefficient is higher than a certain value. In addition, the commission ratio charged by the platform plays a regulatory role in profit distribution. When the commission ratio is relatively high, merchants gain more benefits from dual subsidies. Government subsidies can also reduce the platform's promotion expenditure, and the freed-up resources can partially offset the platform's expenditure pressure on tariff subsidies. Nevertheless, these two types of subsidies do not always reinforce each other. Excessive subsidies can easily lead to inefficient resource utilization.

4. Numerical simulation analysis

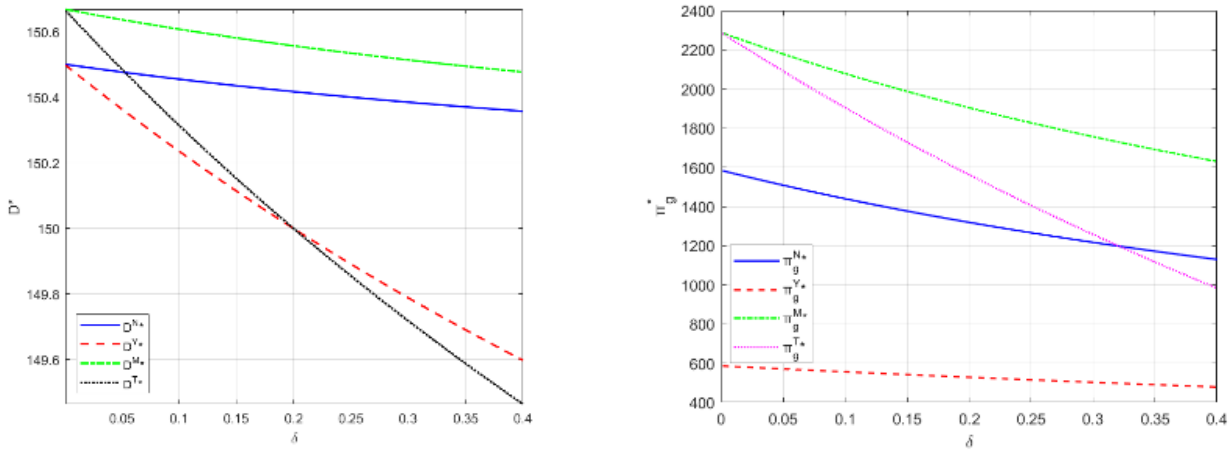
4.1. Parameter setting

The commission rate refers to the actual rates of mainstream cross-border platforms such as Shopee and Amazon, and the cost ratio refers to the publicly available merchant cost structure in the industry: platform commission rate $t=0.08$, unit cost ratio $\theta=0.65$, market size $a=300$, price sensitivity coefficient $b=5$, promotion cost coefficient $k=1.2$; tariff rate $\delta \in [0,0.4]$, subsidy coefficient $m \in [0,0.5]$, tariff subsidy ratio $\lambda \in [0,0.8]$.

4.2. Core simulation results

Regarding the critical point effect in dual subsidy policies, the verification results further show that when the tariff rate has not reached a certain low critical value, the tariff subsidies provided by the platform will instead reduce social welfare. Once the tariff level exceeds this critical point, the social welfare under the combined effect of the two subsidies is better than that under government subsidies alone. Meanwhile, with the continuous rise of the tariff rate, the market demand and overall social welfare under the four scenarios keep decreasing. Among them, the decline is the most significant without any subsidies, the overall level is the highest with only government subsidies, and the decline rate is the slowest with the coexistence of dual subsidies.

DOI: 10.54254/2754-1169/2026.36310



(a)Impact of tariffs on total social welfare (b) Impact of tariffs on market demand

Figure 1. Impact of tariffs on total social welfare and market demand

5. Conclusions and management implications

5.1. Research conclusions

When the intensity of government subsidies is insufficient, it will accelerate the erosion of platform profits by tariffs. Only when the subsidy intensity exceeds a certain critical point can it play a stabilizing role in demand. Although there is potential for cooperation between platform tariff subsidies and government subsidies, such cooperation requires multiple conditions to take effect. For example, the tariff rate, subsidy intensity and market characteristics must reach specific thresholds. In a high-tariff environment, the simultaneous implementation of the two policies can indeed help slow down the decline of demand. However, a single subsidy policy cannot completely eliminate the comprehensive suppression of cross-border e-commerce supply chain performance caused by rising tariffs. Moreover, excessive tariff subsidies from the platform may even weaken the intended positive effect of the policy.

5.2. Management implications

At present, in terms of policy formulation, the government should establish a flexibly adjustable subsidy mechanism linked to tariff changes. When the tariff level is high, it is necessary to appropriately increase investment in promotion subsidies, and at the same time strictly control the upper limit of subsidies to avoid losses in social welfare. From the perspective of platform operation, platforms need to allocate subsidy resources according to different situations. In the low tariff rate range, more resources can be invested in promotion; in the high tariff rate range, the intensity of tariff subsidies should be strengthened, so as to achieve a relatively balanced resource allocation between the two types of subsidies. For merchants, they should reasonably adjust their pricing strategies, refrain from raising commodity prices sharply just because of subsidies, and actively cooperate with various policies launched by the platform. This will help release consumers' purchase demand and further improve the overall revenue of the entire supply chain. In the future, the research scope can be extended to more complex scenarios such as multi-platform competition or consumers with heterogeneous preferences.

DOI: 10.54254/2754-1169/2026.36310

References

[1] Chen, J., Zhang, W., & Gong, B. (2022). Optimal policy for the recycling of electric vehicle retired power batteries. *Technological Forecasting and Social Change, 183*, 121930.

[2] Sun, H., & Liu, Y. (2023). Production decisions in remanufacturing under the cap-and-trade considering consumer education and government subsidies. *Computers & Industrial Engineering, 182*, 109358.

[3] Jiang, J. X., He, X. H., & Hu, W. F. (2022). Emission reduction strategies of three-echelon supply chain considering carbon subsidies and corporate social responsibility. *Systems Engineering, 40*(1), 97–106.

[4] Liu, L., Han, T. Y., & Gu, Y. R. (2024). Pricing and investment strategies of green supply chain with different government subsidy modes from a dynamic perspective. *Mathematics in Practice and Theory, 54*(12), 36-50.

[5] Jiang, Y., & Li, W. (2023). Cross-border fresh agricultural product supply chain: Production decisions, tax subsidies and social welfare. *Systems Engineering - Theory & Practice, 43*(12), 3587-3607.

[6] Wang, D., & Li, W. (2021). Optimization algorithm and simulation of supply chain coordination based on cross-border E-commerce network platform. *EURASIP Journal on Wireless Communications and Networking, 2021*(1), 1-19.

[7] Zhang, Y., & Xu, B. (2021). How should e-commerce platforms subsidize retailers with logistics constraints during an epidemic scenario? Considering power structure and altruistic preference. *Journal of Theoretical and Applied Electronic Commerce Research, 16*(5), 1680-1701.

[8] Chen, M., Xue, W., & Chen, J. (2022). Platform subsidy policy design for green product diffusion. *Journal of Cleaner Production, 359*, 132039.