

## **ANALYSIS ON THE IMPACT OF US TARIFF POLICY ON THE TRADE PERFORMANCE OF SME IN CHINA FROM THE PERSPECTIVE OF ASYMMETRIC GAME**

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### **ABSTRACT**

Under the framework of asymmetric game theory, U.S. tariff policies exhibit the characteristics of "impact-transfer-differentiation" on China's small and medium-sized export enterprises. This paper takes China's export-oriented SMEs to the United States as research subjects, constructs a theoretical model of "tariff policy intensity (TAR) -tariff asymmetry (ASY) -trade flow (TRA) -export performance (EXP) -economic performance (ECO)" based on asymmetric game theory, and validates the model using SmartPLS through questionnaires from 51 SMEs across four provinces. The results reveal: 1) Tariff policy intensity (TAR) shows a significant direct positive impact on trade flow (TRA) and export performance (EXP), contradicting the initial negative hypothesis, which may stem from short-term cost transfer effects; 2) Export performance (EXP) serves as the core mediating factor for policy shock transmission, with short-chain mediation paths such as "ASY→EXP→ECO" and "TAR→EXP→ECO" showing significant and maximal effects, while trade flow (TRA) exhibits transmission failure due to insufficient supply chain resilience; 3) Tariff asymmetry (ASY) amplifies policy uncertainty to exert a significant negative mediating effect on export performance (EXP), but disrupts transmission to trade flow (TRA). Based on empirical conclusions, this study proposes optimization strategies from the SME perspective, including improving export pricing and customer structure, enhancing supply chain autonomy, and establishing tariff policy early warning mechanisms, providing references for SMEs to mitigate tariff impacts and enhance trade resilience.

**Key words:** Asymmetric games; United States tariff policy; SMEs; Export performance; Structural equation model

### **INTRODUCTION**

Economic globalization has enhanced the interdependence among countries, yet it has also accelerated the gradual convergence of comparative advantages, intensifying international competition to some extent and leading to frequent trade frictions, with the Sino-US trade friction being the most typical. In 1979, the bilateral trade volume between China and the United States was merely \$2.452 billion, which then entered a period of rapid growth, peaking at \$759.427 billion in 2022-equivalent to 310 times that of 1979. Subsequently, the impact of the US tariffs imposed on China caused the trade volume to drop to \$688.28 billion by 2024.

Since 2018, the United States has imposed substantial tariffs on Chinese goods exported to the U.S. citing "excessive trade deficits" and "intellectual property protection issues." China swiftly retaliated with reciprocal measures, leading to rapid escalation of trade friction. From 2018 to 2024, China's export growth to the U.S. significantly slowed, with increasing pressure for industrial chain relocation. Small and medium-sized enterprises (SMEs) serve as the mainstay of China's foreign trade exports, contributing over 60% of the country's total export value. Data shows that under the impact of the U.S. "tiered" tariffs and uncertainties surrounding exemptions, orders, profits, and cash flows declined simultaneously, making them the primary victims of trade disputes (Chen Xin, Lin Guijun, 2025). From the perspective of asymmetric game theory, China and the United States exhibit significant differences in trade negotiation capabilities, market size, and policy toolkits (Pablo Fajgelbaum, 2022). The United States, leveraging its position as the world's largest consumer market, exerts pressure on trading partners through tariff measures; Chinese small and medium-sized enterprises (SMEs) are highly dependent on the U.S. market, with limited access to information, resources, and strategic space, resulting in concentrated tariff impacts that are difficult to transfer. In this context, it is of great practical significance to clarify the impact path and mechanism of the US tariff policy on the trade performance of small and medium-sized enterprises in China.

### **METHOD**

#### **Theoretical Model And Research Hypotheses**

In order to study the impact of trade policy uncertainty on the performance of import and export enterprises, this paper constructs a theoretical model of "tariff policy intensity (TAR)-tariff asymmetry (ASY)-trade flow (TRA)-export performance (EXP)-economic performance (ECO)" based on asymmetric game theory and literature review. Combined with the following assumptions: H1: TAR has a significant negative effect on TRA; H2: TAR has a significant negative impact on EXP; H3: ASY acts as an intermediary between TAR and TRA; H4: ASY mediates between TAR and EXP; H5: TRA acts as an intermediary between TAR and EXP; H6: EXP acts as an intermediary between TRA and ECO, forming a chain of TRA→EXP→ECO intermediation.

At the same time, this paper adopts the measurement system of "latent variables and observed variables", and all observed variables are measured by Likert five-level scale (1=very disagree, 5=very agree).

**Methods of data collection and analysis**

The data collection method of this study mainly combines "online questionnaires+offline interviews". The SMEs exporting to the United States from China were the subjects of this survey, conducted in August-September 2025. The regional scope primarily covered major foreign trade provinces such as Guangdong, Zhejiang, Jiangsu, and Shandong, with export industries including electronics, machinery, textiles, furniture, and other sectors. During the survey process, we ensured sample representativeness through industry association recommendations and enterprise visits. A total of 60 questionnaires were distributed, with 51 valid responses collected, achieving an effective response rate of 85%, which meets the basic requirements for small sample sizes in PLS.

Based on the small sample characteristics, this paper follows the logical process of "data preprocessing→ measurement model verification→ structural model test", and uses SPSS 25.0 and SmartPLS 3.0 software to carry out data analysis such as reliability test, validity test, structural model fitting and path estimation, and mediation effect test (Zhou Li, 2020; Quan Jiawei, 2023).

**Empirical analysis**

**Test of reliability and validity**

The Cronbach's  $\alpha$  values for all questionnaire variables exceeded 0.7, indicating excellent internal consistency with stable and reliable data results. The communalities (CR) of all latent variables were above 0.7, ranging from 0.887 to 0.958, demonstrating strong correlations among observed variables within the surface-level latent constructs and effective item synergy in capturing their underlying meanings. The average variance explained (AVE) values for each latent variable ranged between 0.615 and 0.852 (all > 0.5), reflecting good convergent validity where items accurately reflect their corresponding latent constructs.

**Table 1. Reliability test of questionnaire and Convergence validity test**

Latent variables	Cronbach's	Alpha rho_A	CR	AVE
ASY	0.932	0.94	0.949	0.787
ECO	0.927	0.946	0.946	0.778
EXP	0.918	0.922	0.938	0.753
TAR	0.914	0.926	0.948	0.858
TRA	0.831	0.879	0.887	0.614

Through the Fornell-Larcker criterion test, the squared variance (AVE) values of each latent variable (0.784-0.927) are all greater than the correlation coefficients between this variable and other latent variables. Moreover, the heterogeneity-to-homogeneity ratio (HTMT) among all latent variables is < 0.9, indicating good discriminant validity of the scale and no conceptual confusion between latent variables.

**Structural model fitting and path estimation**

The model has the strongest explanatory power for ASY (asymmetric export performance of tariffs) ( $R^2=0.623$ ), and the explanatory power for ECO (economic performance) reaches an acceptable level ( $R^2=0.280$ ). The overall explanatory power of the model meets the requirements of small sample PLS-SEM analysis.

By using Bootstrap2000 sampling to test the significance of the path, the results are as follows:

**Table 2. Bootstrap test path results**

path	Standardization coefficient ( $\beta$ )	standard error (SE)	p	Hypothesis verification results
ASY -> EXP	-0.483	0.229	0.035	significant negative effects
ASY -> TRA	0.014	0.263	0.957	Not significant, mediator chain breakage
EXP -> ECO	0.561	0.103	0	a very significant positive effect
TAR -> ASY	0.789	0.063	0	extremely significant positive effects
TAR -> EXP	0.604	0.24	0.012	a significant positive impact
TAR -> TRA	0.518	0.259	0.046	a significant positive impact

path	Standardization coefficient ( $\beta$ )	standard error (SE)	p	Hypothesis verification results
TRA -> EXP	-0.512	0.121	0	significant negative effects

①The TAR has a significant positive impact on both TRA and EXP, with values of 0.518 and 0.604 respectively, which contradicts Hypotheses H1 and H2. This indicates that the direct negative impacts of TAR on TRA and TAR on EXP are not established; ②From the  $\beta$  values, the transmission effects of TAR on ASY and ASY on EXP are significant. ASY serves as a mediator between TRA and EXP; TRA acts as a mediator between TAR and EXP; and EXP functions as a mediator between TRA and ECO.

After testing the mediating effect of salience, the conclusion is as follows:

**Table 3. Results of Bootstrap mediation effect test**

Intermediate pathway	indirect Effect values	standard error	95%confidence interval	the mediating effect is significant or not	Hypothesis verification results
ASY -> EXP -> ECO	-0.271	0.132	[-0.541,-0.008]	significant	support
TAR -> ASY -> EXP -> ECO	-0.214	0.111	[-0.458,-0.007]	Not significant	nonsupport
TAR -> EXP -> ECO	0.338	0.139	[0.08,0.639]	significant	support
ASY -> TRA -> EXP -> ECO	-0.004	0.092	[-0.219,0.147]	Not significant	nonsupport
TAR -> ASY -> TRA -> EXP -> ECO	-0.003	0.076	[-0.182,0.119]	Not significant	nonsupport
TRA -> EXP -> ECO	-0.287	0.107	[-0.553,-0.141]	significant	support
TAR -> TRA -> EXP -> ECO	-0.148	0.107	[-0.395,0.036]	Not significant	nonsupport
TAR -> ASY -> EXP	-0.381	0.187	[-0.761,-0.009]	significant	support
ASY -> TRA -> EXP	-0.007	0.148	[-0.339,0.242]	Not significant	nonsupport
TAR -> ASY -> TRA -> EXP	-0.006	0.123	[-0.293,0.201]	Not significant	nonsupport
TAR -> TRA -> EXP	-0.265	0.165	[-0.608,0.006]	Not significant	nonsupport
TAR -> ASY -> TRA	0.011	0.216	[-0.332,0.513]	Not significant	nonsupport

The①data reveals that the indirect effects from ASY to EXP to ECO measure-0.271, while the TAR-to-EXP-to-ECO pathway demonstrates a significant 0.338 effect. Both short-chain pathways pass significance tests, confirming that EXP acts as a core and stable mediator between ASY, TAR, and ECO. This indicates that through either suppressing or enhancing export performance, efficient transmission can occur in both the ASY→EXP→ECO and TAR→EXP→ECO pathways. The findings further demonstrate that export performance serves as the critical bridge connecting policy shocks to enterprises' ultimate economic outcomes.

②Based on the significant mediating effects shown in Table 8, we can conclude that in the four pathways ("ASY→TRA→EXP"), ("TAR→ASY→TRA"), ("TAR→ASY→TRA→EXP→ECO"), and ("TAR→TRA→EXP→ECO"), the indirect effect values of the mediation pathway with TRA as the intermediate link are either zero or significantly lower in absolute value compared to short-chain pathways without TRA involvement. This indicates that TRA demonstrates weak capacity and poor path stability in mediating transmission, making it unable to effectively absorb shocks from "tariff asymmetry" or "tariff policy intensity" and transmit them to export performance. Additionally, issues such as "effect loss caused by overly long pathways" and "weak correlation between TRA and preceding/following variables" disrupt the stable transmission chain centered on EXP, ultimately preventing the manifestation of mediating effects(CHEN Hongjie,2019;CuiC,LiLSZ,2023).

The analysis reveals that export performance serves as the "core transmission node" through which tariff policies influence economic outcomes. Trade flows, however, prove inadequate to act as effective intermediaries in this process. This limitation may even reduce overall transmission efficiency, primarily due to their weak

correlation with export performance and limited capacity to absorb policy shocks(Albornozf,PardoHFC,CorcosG,etal,2023)

## RESULTS AND DISCUSSION

### Pathway mechanism by which tariff policy affects trade performance of SMEs

#### The "core hub" role of Export Performance (EXP): Short chain conveys higher efficiency

Empirical analysis demonstrates that export performance plays an irreplaceable central role in the transmission process from tariff policy to economic performance. Both the "tariff policy→export performance→economic performance" (TAR→EXP→ECO) pathway (with an indirect effect of 0.338 [95% CI excluding 0]) and the "tariff asymmetry→export performance→economic performance" [ASY→EXP→ECO] pathway [-0.271 [95% CI excluding 0]] passed significance tests as the most potent mediators. This finding aligns closely with Quan Jiawei's (2023) proposition that tariffs influence export performance through cost transmission mechanisms, thereby exerting a drag effect on economic performance(FengL,Li,SwensonDL,2017).

This study further reveals that the key reason for the "high efficiency" of this short-chain transmission lies in export performance's "strong absorption attribute" to policy shocks. The economic performance of small and medium-sized enterprises (SMEs) is directly linked to export volume and profit margins(HandleyK,LimaoN,2017). The impact of tariff policies on export order quantities and profit margins can be rapidly translated into fluctuations in corporate revenue without requiring other variables for "secondary transmission". Consequently, this pathway stands as the most stable component within the entire transmission system.

#### "Weakened transmission function" of Trade Flow (TRA): Capacity shortfalls under asymmetric game constraints

Contrary to initial research expectations, trade flows exhibited "weak transmission capacity" across most mediating pathways. Notably, the significant tests for pathways such as "tariff asymmetry→trade flows→export performance" (ASY→TRA→EXP) and "tariff policy→trade flows→export performance" (TAR→TRA→EXP) failed to pass significance tests. Furthermore, multistage transmission paths incorporating trade flow variables-like the "tariff policy→tariff asymmetry→trade flows→export performance→economic performance" (TAR→AS→TRA→EXP→ECO) pathway-became entirely ineffective due to progressive attenuation of effects during multi-stage transmission.

The fundamental cause behind this outcome lies in the "insufficient supply chain resilience" faced by small and medium-sized enterprises (SMEs) within the asymmetric strategic competition framework between China and the United States. On one hand, SMEs maintain high export dependence on the U.S. market (with some sample companies accounting for over 50% of their exports to America)(Lily Wang,2021;Guo Yan,2021;Audrey Guo,2021). The tariff hikes have reduced export frequency and increased logistics costs-both observable variables in trade flows. However, lacking alternative overseas markets and diversified logistics channels, these enterprises cannot mitigate impacts through "re-routing trade flows"(Erokhin Vasili, Tianming Gao, Ivolga Anna, etal,2021). On the other hand, the "non-precipitous" nature of U.S. tariff policies (corresponding to observed variables ASY1 and ASY2) makes it difficult for companies to optimize customs clearance procedures or stabilize order volumes in advance. This further weakens trade flows' capacity to "buffer and transmit" policy shocks, ultimately preventing them from fulfilling their role as an "intermediary relay".

#### The impact of "two-way differentiation" of tariff asymmetry (ASY): the amplification effect of policy uncertainty is highlighted

The negative mediating effect of tariff asymmetry on export performance was statistically significant (indirect effect value: -0.381 under the "Tariff Policy→Tariff Asymmetry→Export Performance" pathway, with a 95% confidence interval excluding zero), while its impact on trade flows remained negligible (indirect effect value: only 0.011 under the "Tariff Policy→Tariff Asymmetry→Trade Flow" pathway, with a 95% confidence interval including zero). This "bidirectional divergence" phenomenon validates the "policy uncertainty amplification mechanism" in asymmetric bargaining scenarios.

Specifically, the U.S. tariff policy's "frequent adjustments" and "complex exemption application procedures" (corresponding to observed variables ASY3 and ASY4) directly exacerbate SMEs' "expectation confusion". Unable to accurately predict future tax rate trends, enterprises hesitate to expand export capacity or sign long-term export contracts, leading to a direct decline in export performance (EXP). Meanwhile, trade flows (TRA), constrained by "rigid demand" (such as stable customer bases for traditional industries exporting to the U.S.), remain unlikely to experience significant short-term fluctuations due to policy uncertainty. Consequently, the transmission of tariff asymmetry to trade flows becomes disrupted(Kyle handley Nuno-Limao,2017). This research complements Chen Hongjie's (2019) findings, demonstrating that tariff asymmetry impacts are not "comprehensive" but rather concentrated in the "performance side" sensitive to policy expectations.

#### Impact differences under asymmetric game: ability heterogeneity of SMEs

The comparative analysis of technology-driven enterprises (including electronics and machinery sectors) versus traditional industries (textile and furniture manufacturing) in this study further validates the core principle of "capability-level determination of impact intensity" in asymmetric game theory. Although multi-group analysis was not employed, the sample characteristics reveal that tech firms—due to their heavy reliance on imported core

components (with some companies importing over 50% of such products)—face dual pressures of "rising export costs" and "increasing import expenses" during tariff escalation. This dynamic significantly weakens the potential positive correlation between tariff policies and export performance (TAR-EXP), which may stem from short-term cost-shifting through price adjustments, particularly among tech enterprises.

In contrast, traditional enterprises primarily rely on domestic markets for raw material supply. This characteristic enables them to maintain export volumes through strategies of "reducing unit profits and expanding sales scale," thereby demonstrating greater "short-term tolerance" to tariff policies. The response differences between these types of enterprises indicate that the entity list has a more significant impact on technology enterprises, and further indicates that in the asymmetric game scenario, the "supply chain autonomy and control ability" and "market substitution choice ability" of small and medium-sized enterprises themselves are the key factors that directly determine their tolerance to the impact of tariff policies (Meredith Crowley Ning Meng-Huasheng Song, 2018).

## CONCLUSION

Based on the framework of asymmetric game theory, this study conducts empirical tests on the latent path mechanism using partial least squares structural equation modeling (PLS-SEM), ultimately clarifying the "differentiated transmission pathways" through which U.S. tariff policies affect the trade performance of small and medium-sized enterprises in China.

In later studies, the data samples of export enterprises in central and western regions were expanded, while a more reasonable industry distribution was established to ensure that the sample data covers the main export industries of Chinese SMEs to the United States. The sample size meets the requirements for large-sample SEM analysis to enhance the robustness of conclusions. Meanwhile, the rationality and objectivity of analytical data were improved to reduce subjective biases and strengthen the credibility of empirical results. The study incorporates moderating variables into the model to examine their regulatory effects, thereby enriching the analysis of response mechanisms under asymmetric games. Through constructing short-term, medium-term, and long-term data phases, the research compares the differential impacts of tariff policy shocks, ultimately revealing the temporal evolution patterns of transmission pathways.

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