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CROSS-SECTORAL ECONOMIC IMPACTS OF THE 2025 U.S. TARIFF PACKAGE AND RETALIATORY MEASURES

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Abstract: This paper systematically assesses the cross-sectoral effects of the 2025 U.S. tariff policy package and related retaliatory measures. A multidimensional framework integrates trade substitution, supply-chain optimization, semiconductor tiering policies, dynamic tariff revenue, and a simplified CGE module. Under the stated parameters and scenario assumptions, simulations suggest that China's increase in the retaliatory tariff on U.S. soybeans from 7.5% to 25% reduces modeled U.S. soybean exports to China by 23.5%, while a 25% U.S. import tariff on Japanese automobiles reallocates production toward U.S. and Mexican channels. The semiconductor module evaluates U.S. tariff-subsidy combinations by technology tier, and Monte Carlo simulations quantify the trade-off between U.S. tariff revenue and import contraction. The scenario results indicate that targeted subsidies are more effective than tariffs for overcoming high-end semiconductor technology barriers, whereas broad high tariffs provide only limited manufacturing-reshoring gains and increase inflation and welfare risks. The findings provide a conditional quantitative basis for comparing tariff, subsidy, and supply-chain strategies.
Keywords: U.S. tariff policy package; Retaliatory tariff; Supply chain; CES model; Laffer curve; Manufacturing reshoring

1 INTRODUCTION

The multilateral trading system centered on the World Trade Organization supported continued growth in global trade, but recent protectionism has increased uncertainty and disrupted established industrial divisions of labor. In April 2025, the United States introduced a reciprocal-tariff measure with a 10% base tariff and additional rates of 11%-50% for economies with which it recorded trade deficits. In this study, that measure is treated as one component of a broader policy setting that also includes China's retaliatory tariff on U.S. soybeans, a U.S. import tariff on Japanese automobiles, and U.S. tariff-subsidy instruments for semiconductor production. The weighted average U.S. tariff rate consequently rose to 20.11%, prompting retaliation and accelerating the reconfiguration of global industrial and supply chains.
Empirical analyses of the 2018-2019 tariff shocks show that much of the tariff burden was borne by U.S. importers and consumers, while trade was diverted across partners and U.S. welfare declined [1-2]. Agricultural evidence shows that retaliatory tariffs sharply reduced U.S. soybean exports and market share, while Brazil and Argentina captured displaced sales and total Chinese soybean imports changed only modestly [3-5]. Research on North American automobile production emphasizes the reallocation of output along tightly integrated cross-border value chains [6]. Semiconductor policy studies indicate that advanced-node fabrication responds more strongly to subsidies and research support than to tariffs [7]. Trade-policy modeling supports the use of CES demand systems, sectoral equilibrium frameworks, and tariff-revenue curves [8-10].

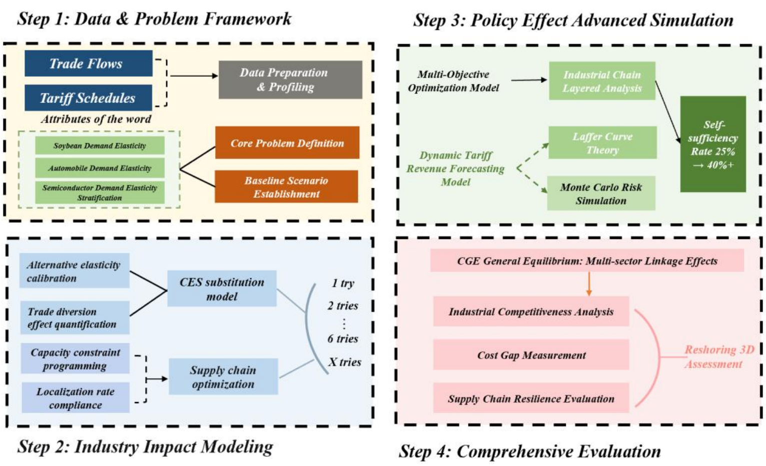

Figure 1 Integrated Framework for Assessing the 2025 U.S. Tariff Policy Package and Related Retaliatory Measures

The study evaluates the 2025 U.S. tariff policy package and related retaliatory measures through five linked channels: China's retaliatory tariff on U.S. soybeans, U.S. automobile import tariffs, U.S. semiconductor tariffs and subsidies, U.S. tariff revenue, and economy-wide manufacturing reshoring. The models use calibrated tariff, trade, production-capacity, cost, self-sufficiency, GDP, CPI, and employment data. The integrated framework distinguishes short-term adjustment from medium-term structural change and compares pure high tariffs with combinations of tariffs, subsidies, and supply-chain restructuring. The relationships among the five modules and the overall assessment sequence are illustrated in Figure 1.

2 DATA AND MODEL FRAMEWORK

2.1 Data Preparation and Baseline Characteristics

Tariff observations for 2015-2025 are processed by removing rule-based outliers, interpolating missing monthly trade values, converting compound duties into equivalent ad valorem rates, and calculating trade-weighted average tariffs. The principal product groups are soybeans, automobiles, and semiconductors. Their 2024 baseline characteristics are summarized in Table 1.

Table 1 Baseline Characteristics of the Principal Product Groups in 2024

Product	Baseline U.S. import tariff	Import value ($B)	Main sources	Analytical role
Soybeans	0%	13.32	Brazil, Argentina	Trade diversion
Automobiles	2.5%	187.60	Japan, Germany	Supply-chain allocation
Semiconductors	0%	245.00	Taiwan region, South Korea	Industrial security

With the corrected decimal scale, the three product categories represent USD 445.92 billion, or 13.9% of total U.S. imports. Table 1 reports baseline U.S. import tariffs; by contrast, the soybean module varies China's retaliatory tariff on U.S.-origin soybeans. U.S. tariffs remained near 2.4%-2.5% in 2015-2017, rose during 2018-2021, declined to 2.8%-3.2% in 2022-2024, and then surged in 2025. The sectoral models share assumptions of rational firms and consumers, short-run market clearing, stable non-tariff conditions, product comparability within segments, and scenario-specific but otherwise stable elasticities and capacity constraints.

2.2 Multi-Source Soybean Demand

Soybeans from the United States, Brazil, and Argentina are treated as imperfect substitutes. Chinese importers allocate demand by origin according to a CES utility function, where preference weights, origin quantities, and substitution elasticity determine the aggregate. In this module, the tariff on U.S.-origin soybeans denotes China's retaliatory import tariff, while the tariff settings for Brazilian and Argentine soybeans remain at their baseline values.

$$U = \left[\sum_{i=1}^{3} \alpha_i Q_i^{\frac{\sigma-1}{\sigma}}\right]^{\frac{\sigma}{\sigma-1}} \tag{1}$$

$$Q_i = \alpha_i^{\sigma} \cdot P_i(1+\tau_i)^{-\sigma} \cdot P^{\sigma-1} \cdot Q_{\text{total}} \tag{2}$$

$$s_i = \frac{\alpha_i^{\sigma} P_i(1+\tau_i)^{-\sigma}}{\sum_{j=1}^{3} \alpha_j^{\sigma} P_j(1+\tau_j)^{-\sigma}} \tag{3}$$

The demand equation links tariff-inclusive prices to imports from each origin, while the market-share equation isolates trade diversion. Aggregate demand responds to the CES price index with a separate price elasticity, allowing market shares to change strongly even when total soybean imports remain rigid.

2.3 Industrial and Fiscal Models

Japanese automobiles enter the U.S. market through direct exports from Japan, U.S. production, and Mexican production for re-export. The allocation minimizes tariff-inclusive cost and penalizes deviations from baseline demand. In this module, the 25% policy shock is a U.S. import tariff applied to automobiles shipped directly from Japan.

$$\min Z = \sum_{i\in\{J,U,M\}} Q_i \cdot C_i \cdot (1+\tau_i) + \lambda(Q_{\text{total}} - Q_0)^2 \tag{4}$$

$$Q_{\text{total}} = Q_J + Q_U + Q_M;\ Q_i \le K_i;\ Q_i \ge 0 \tag{5}$$

The semiconductor module evaluates U.S. tariff and subsidy instruments by technology tier, maximizing economic benefit and national security while subtracting total policy cost. Its tiered response functions assign lower tariff sensitivity and higher subsidy effectiveness to high-end chips, reflecting technological barriers.

$$\mathrm{SR}_i' = \mathrm{SR}_i^0 + \beta_i \cdot T_i \cdot (1 - \mathrm{SR}_i^0) + \gamma_i \cdot \ln\left(1 + \frac{S_i}{M_i \cdot \mathrm{SR}_i^0}\right) \tag{6}$$

$$\mathrm{NS} = \sum_{i=1}^{3} \alpha_i \cdot \mathrm{SR}_i' \tag{7}$$

U.S. tariff revenue is modeled as a nonlinear function of the average U.S. import tariff rate and the tariff-sensitive import base. Short-run and medium-run elasticities distinguish delayed substitution from immediate responses.

$$R_t = \tau_t \cdot M_t \cdot P_t \quad (8)$$

$$M_t = M_0 \cdot \frac{1+\tau_t}{1+\tau_0}^{\varepsilon_t} \quad (9)$$

The macroeconomic module uses CES sectoral supply, imperfect substitution between domestic and imported products, and a deadweight-loss adjustment to evaluate GDP, prices, employment, trade, and welfare. Manufacturing reshoring potential combines strategic importance, automation, the cost gap, and policy support.

Table 2 summarizes the principal numerical settings recoverable from the original competition manuscript. Parameters that are not numerically reported in the supplied source, particularly the automobile channel unit costs, are identified as unavailable rather than reconstructed.

Table 2 Principal Model Parameters and Calibration Basis

Parameter	Value used or tested	Calibration/data basis
Soybean CES substitution elasticity, σ	Calibrated from 2024 shares; sensitivity range 2.5-5.0	Original competition manuscript, soybean sensitivity analysis
Soybean aggregate-demand elasticity, ε	|ε| = 0.2-0.5 in sensitivity testing	Original competition manuscript, aggregate-demand test
Automobile benchmark channel capacities	Japan/U.S./Mexico = 2.00/3.70/1.50 million vehicles	Original competition manuscript, benchmark supply configuration
Automobile demand elasticity	ε = -0.4 to -1.2 in sensitivity testing	Original competition manuscript, supply-chain sensitivity analysis
Automobile channel unit costs, C_J, C_U, C_M	Problem-data inputs; exact numerical values are not restated	Not recoverable from the supplied source PDF; no values inferred
Employment conversion coefficient	≈0.301 job per additional vehicle	Implied by 1.42 million additional vehicles and 427,000 modeled jobs
Semiconductor objective weights, (ω1, ω2, ω3)	(0.30, 0.20, 0.50): economic benefit, policy cost, security	Original competition manuscript, multi-objective calibration
Semiconductor tariff sensitivities, β	High/mid/low = 0.35/0.65/0.85	Tier-specific tariff-response assumptions
Semiconductor subsidy efficiencies, γ	High/mid/low = 0.45/0.35/0.25	Tier-specific subsidy-response assumptions
Semiconductor strategic weights, α	High/mid/low = 0.95/0.70/0.40	National-security index calibration
Tariff-revenue import elasticities	Short run = -0.6; medium run = -1.2	Dynamic tariff-revenue module
CGE scenario settings	Average tariff = 15/25/35%; retaliatory tariff = 15/25/35%; manufacturing elasticity = 3.0/2.5/2.0; agricultural elasticity = 2.5/2.0/1.5; subsidy = USD 80/50/30B	Optimistic/baseline/pessimistic scenarios in the original competition manuscript

$$Q_i = [\alpha_i \cdot M_i{}^{\rho} + (1-\alpha_i) \cdot D_i{}^{\rho}]^{\frac{1}{\rho}} \quad (10)$$

3 CROSS-SECTOR RESULTS

Unless otherwise stated, all quantitative outcomes in Sections 3-5 are scenario-simulation results conditional on the calibrated parameters, data, and assumptions in Section 2; they should not be interpreted as realized causal effects.

3.1 Soybean Trade Diversion

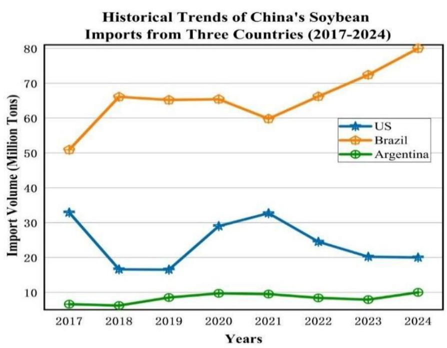

Figure 2 Historical Trends in China's Soybean Imports by Origin

Historical imports in Figure 2 show that after the 2018 trade conflict, China's soybean imports from the United States fell from approximately 32 million tons to 20 million tons and did not recover, whereas imports from Brazil increased from about 50 million tons to 80 million tons. The resulting supplier reallocation displays persistent characteristics.

Table 3 Soybean-Market Response When China Raises Its Retaliatory Tariff on U.S. Soybeans from 7.5% to 25%

Origin	Baseline qty.	New qty.	Change	New share	Share change
United States	20.0	15.3	-23.5%	14.0%	-4.2 pp
Brazil	80.0	83.5	+4.4%	76.4%	+3.7 pp
Argentina	10.0	10.4	+4.4%	9.6%	+0.5 pp
Total	110.0	109.3	-0.7%	100.0%	-

Table 3 shows that, when China raises its retaliatory tariff on U.S. soybeans from 7.5% to 25%, modeled U.S. exports to China fall by 4.7 million tons, or 23.5%. Brazil and Argentina absorb most of the displaced demand, and China's total imports decline by only 0.7%. Across the broader tariff range, the U.S. share falls from 18.2% to 8.2%, while Brazil's share rises from 72.7% to 81.8%. The sensitivity results in Figure 3 suggest that higher substitution elasticity strengthens trade diversion, whereas demand elasticity mainly affects aggregate imports.

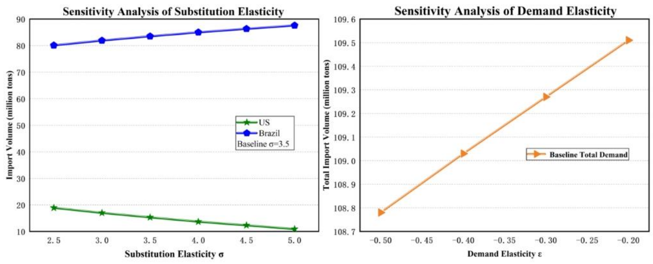

Figure 3 Sensitivity of Soybean Trade to Substitution and Demand Elasticities

The substitution-elasticity test covers values from 2.5 to 5.0. Over this range, modeled U.S. exports decline from 18.9 million tons to 11.0 million tons, while Brazilian exports rise from 80.2 million tons to 87.1 million tons. The total-import response is much smaller: when demand elasticity increases in absolute magnitude, total imports decline from 109.5 million tons to 108.8 million tons. This separation between strong origin substitution and weak aggregate-demand adjustment explains why tariffs reshape supplier shares without materially changing China's total soybean requirement.

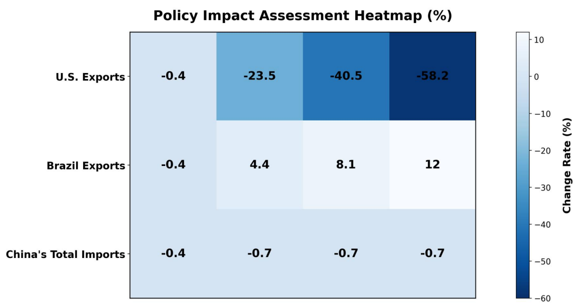

Figure 4 Policy-Impact Heatmap for Soybean Trade under Alternative Chinese Retaliatory Tariffs on U.S. Soybeans

Under the specified elasticities, Figure 4 summarizes the progressive scenario effects. Modeled U.S. exports show negative growth at every higher Chinese retaliatory tariff level, reaching a decline of 58.2% in the most restrictive scenario. Brazilian exports rise by as much as 12%, while China's total imports decline by only about 0.7%. The simulation results indicate that tariff escalation primarily changes the geographic composition of supply and does not resolve the underlying rigidity of import demand.

3.2 Automobile Supply-Chain Reallocation

A 25% U.S. import tariff on automobiles shipped directly from Japan eliminates the modeled cost advantage of that channel. U.S. and Mexican channels absorb the reallocated production, and the medium-term structure develops into a U.S.-Mexico dual-base configuration. Figure 5 compares benchmark shares and channel allocation under alternative U.S. tariff scenarios. The corresponding supply and industrial-effect indicators are summarized in Table 4.

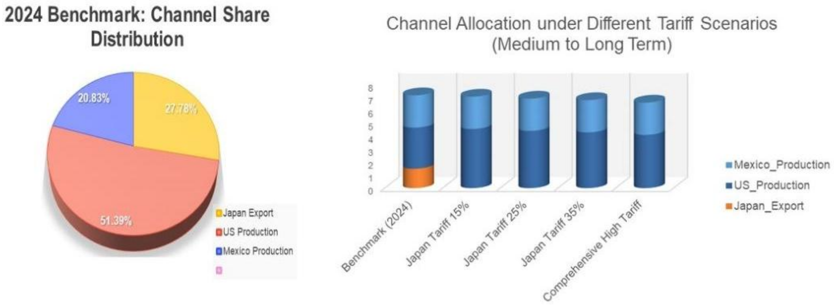

Figure 5 Automobile-Channel Shares and Supply Allocation under Tariff Scenarios

Table 4 Automobile Supply and Industrial Effects under a 25% U.S. Import Tariff on Japanese Automobiles

Indicator	Baseline	Short term (1-2 years)	Medium term (3-5 years)
Japan exports (M units)	2.00	0.00	0.00
U.S. production (M units)	3.70	5.12 (+38.5%)	4.42 (+19.6%)
Mexico production (M units)	1.50	1.80 (+20.0%)	2.50 (+66.7%)
Total supply (M units)	7.20	6.92 (-3.8%)	6.92 (-3.8%)
New U.S. jobs	-	+427,000	+217,000
Vehicle price change	-	+\$238 (+0.9%)	-\$548 (-2.1%)

Under the modeled capacity and demand assumptions, short-term U.S. production rises by 38.5%, creating an estimated 427,000 jobs, while total demand contracts by 3.8%. In the medium term, Mexican production expands by 66.7% and U.S. production remains 19.6% above baseline. Average vehicle prices initially rise by 0.9% but fall 2.1% below baseline after capacity adjustment. The simulation suggests partial localization but also indicates dependence on Japanese investment and the stability of the United States-Mexico-Canada Agreement.

$$\Delta E = \Delta Q_U \cdot \rho_{\text{emp}} \cdot \alpha \tag{11}$$

The employment estimate in Equation (11) converts the change in U.S. production into new jobs by using the calibrated unit-output employment coefficient and production conversion factor. The implied combined conversion coefficient is approximately 0.301 job per additional vehicle, based on 1.42 million additional vehicles and 427,000 modeled jobs. The employment gain is therefore a consequence of channel reallocation within the scenario rather than an economy-wide net-job estimate. Consumer expenditure is affected simultaneously by the change in total sales and the difference between scenario and baseline average costs.

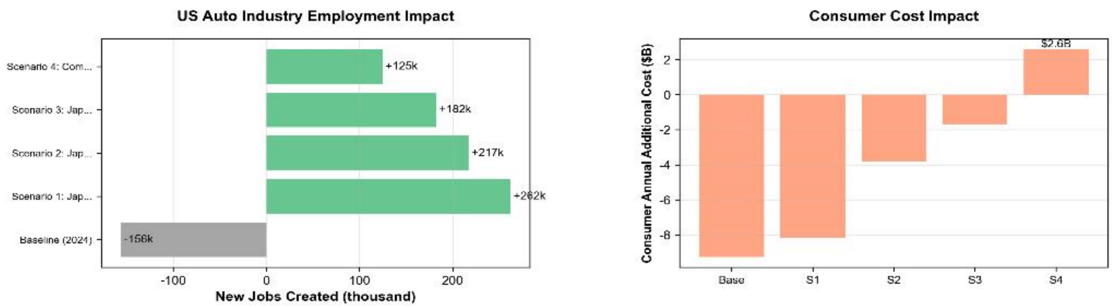

Figure 6 Employment and Consumer-Cost Effects of Automobile Tariffs

Figure 6 shows that stronger U.S. automobile import tariffs increase the modeled employment effect, but the associated consumer-cost path is non-monotonic. Costs rise during the initial capacity adjustment and decline after U.S. and Mexican production expand. Demand-elasticity testing keeps U.S. production within 4.29-4.56 million vehicles and Japanese exports at zero, indicating that the localization direction is stable within the tested parameter range while its magnitude remains dependent on capacity and demand assumptions.

3.3 Semiconductor Policy Differentiation

The 2024 semiconductor benchmark is characterized by high-end dependency: self-sufficiency is 10.0% for high-end chips, 30.0% for mid-range chips, and 35.7% for low-end chips. The model compares tariffs alone with tariff-subsidy combinations and assigns the greatest strategic weight to high-end capacity. The tier-specific policy settings and expected self-sufficiency outcomes are reported in Table 5.

Table 5 Differentiated U.S. Semiconductor Strategy and Expected Self-Sufficiency

Tier	Policy configuration	Tariff	Subsidy	Expected self-sufficiency
High-end	Subsidy-focused	50%	$60B	55.5%
Mid-range	Tariff and subsidy	40%	$25B	78.2%
Low-end	Tariff-focused	30%	$15B	87.6%

Under the differentiated scenario, overall self-sufficiency increases from 25.2% to 73.8% and the national-security score rises from 44.8 to 82.2. The national-security score is an unnormalized weighted index, NS = $\Sigma\alpha_i SR_i$, with self-sufficiency expressed in percentage points; its theoretical range is 0-205 and it is not a percentage. Under the stated response functions, high-end chips have a tariff sensitivity coefficient of 0.35, so subsidies are more effective than tariffs for overcoming technological barriers. Low-end chips have a coefficient of 0.85, making tariffs more cost-effective within the model. Figure 7 compares national-security and self-sufficiency outcomes across the policy scenarios.

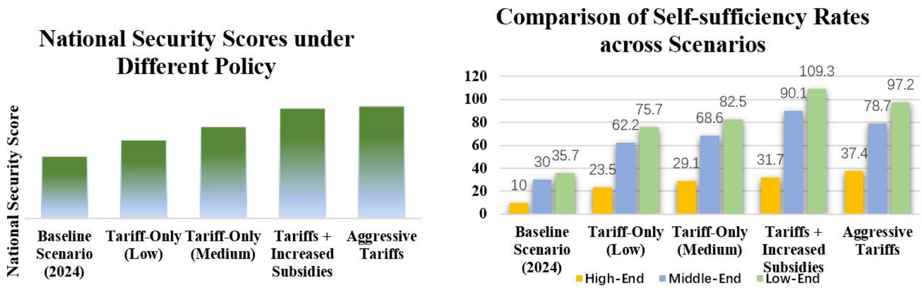

Figure 7 Semiconductor Security Scores and Self-Sufficiency across Policy Scenarios

Under the stated parameterization, tariffs alone raise the national-security index to 45.0. Combining tariffs with baseline subsidies raises it to 54.0, while optimized subsidies weighted toward high-end production raise it to 82.2. The high-end self-sufficiency rate increases from 10.0% to 55.5% under the differentiated strategy. Mid-range and low-end rates reach 78.2% and 87.6%, respectively. These simulation results reflect the assumption that subsidy efficiency is greatest for research-intensive high-end chips and tariff sensitivity is greatest for low-end chips.

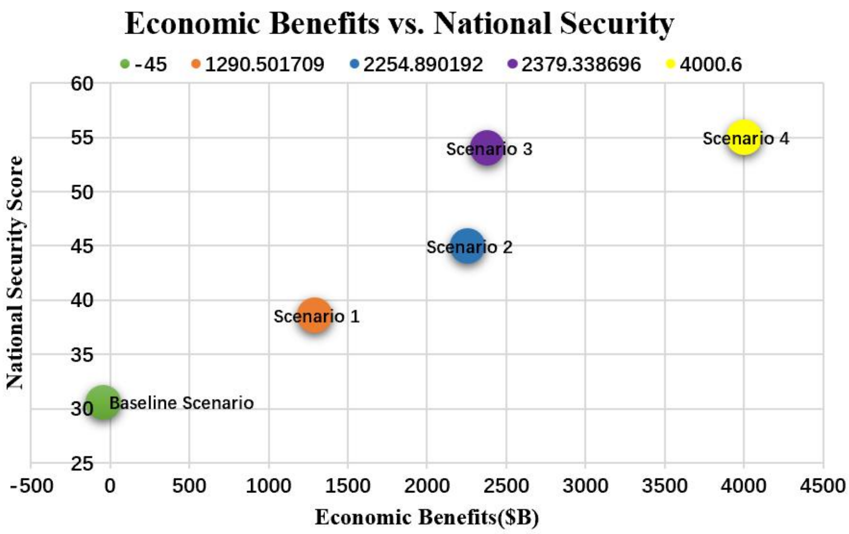

Figure 8 Economic-Benefit and National-Security Trade-Off across Semiconductor Scenarios

Figure 8 places the combined-policy scenarios on the economic-benefit and national-security frontier. The sensitivity analysis identifies diminishing marginal returns to high-end subsidies, with an effective investment range near USD 60 billion. For high-end chips, modeled subsidy expenditure is lower than the consumer loss associated with equivalent tariffs; for low-end chips, the cost ranking is reversed. Within the stated assumptions, a uniform instrument is therefore less efficient than a tier-specific policy.

4 FISCAL REVENUE AND MACROECONOMIC EFFECTS

4.1 Dynamic Tariff Revenue

The revenue model adopts short-run import-demand elasticity of -0.6 and medium-run elasticity of -1.2. Four average tariff scenarios of 10%, 15%, 20%, and 30% are evaluated. Higher rates increase the revenue multiplier but progressively reduce the import base, creating an inverted-U relationship between the tariff rate and revenue. The tariff-revenue curve and the four scenario comparisons are presented in Figure 9 and Table 6.

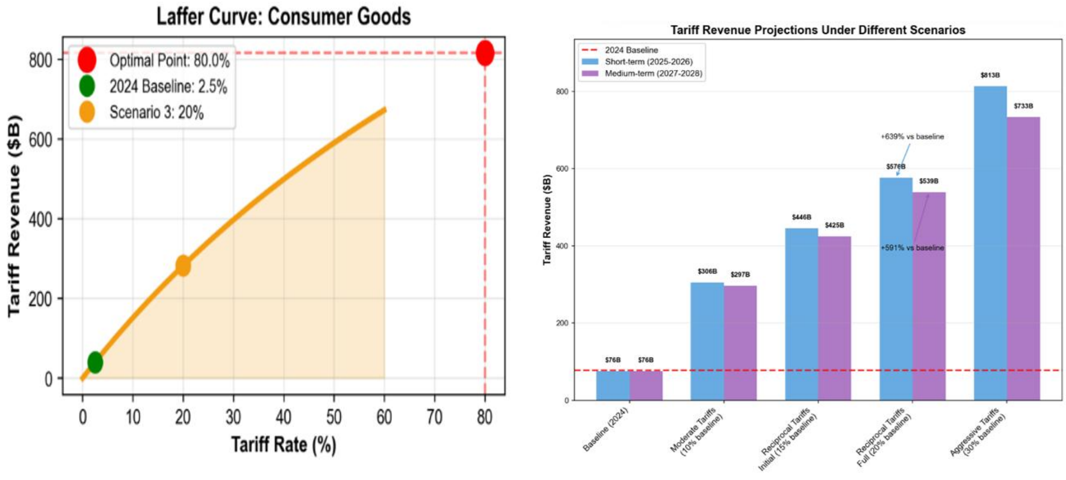

Figure 9 Tariff-Revenue Curve and Multi-Scenario Comparison

Table 6 U.S. Tariff-Revenue and Trade Effects by Scenario

Scenario	Rate	Short-term revenue ($B)	Mid-term revenue ($B)	5-year increase ($B)	Import decline
S1	10%	306	297	1,123	13.4%
S2	15%	446	425	1,787	21.2%
S3	20%	576	539	2,389	28.4%
S4	30%	813	733	3,445	41.0%

Scenario S3 raises short-term tariff revenue to USD 576 billion and medium-term revenue to USD 539 billion. Its modeled five-year cumulative increase is USD 2.389 trillion, but medium-term imports fall by 28.4%. A 10,000-run Monte Carlo simulation gives an expected cumulative increase of about USD 2.134 trillion with a reported 95% interval of approximately USD 1.8-2.6 trillion. Revenue growth therefore comes with substantial trade contraction and uncertainty. The Monte Carlo distribution of the five-year revenue increase is shown in Figure 10.

$$R^{(n)} = \tau \cdot {M_0}^{(n)} \cdot {P_0}^{(n)} \cdot \frac{1+\tau}{1+\tau_0}^{\varepsilon^{(n)}} \tag{12}$$

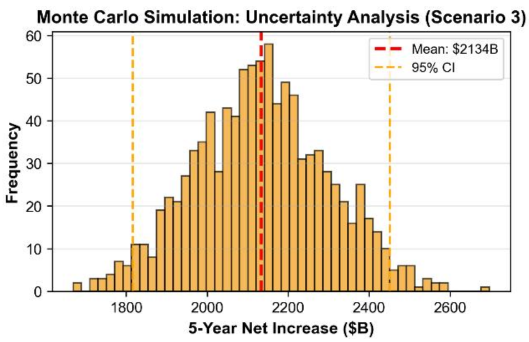

Figure 10 Monte Carlo Distribution of the Five-Year Tariff-Revenue Increase

Equation (12) perturbs import value, price, and elasticity for each Monte Carlo run. Figure 10 shows the resulting distribution for Scenario S3. The simulation yields a standard deviation of roughly USD 200 billion and a comprehensive risk score of 4.58. Scenario S4 produces higher nominal revenue but also a 41.0% import decline and a risk score of 6.65, so S3 is identified as the more balanced fiscal scenario under the stated risk metric.

4.2 Manufacturing Reshoring and Welfare

The simplified CGE evaluation compares optimistic, baseline, and pessimistic scenarios using five indicators: manufacturing share of GDP, manufacturing employment, trade-deficit reduction relative to the 2024 deficit of USD 1,000 billion, CPI inflation, and welfare loss. The optimistic scenario performs best on several output indicators but remains far below the stated reshoring targets. The resulting macroeconomic outcomes and target gaps are summarized in Table 7.

Table 7 Macroeconomic Outcomes under Alternative Tariff Scenarios

Indicator	2024 baseline	Optimistic	Baseline	Pessimistic	Target
Manufacturing share of GDP	11.0%	11.28%	11.17%	10.96%	15.0%
Manufacturing employment	12.9M	+0.74M	+0.52M	+0.21M	+2-3M
Trade-deficit reduction	0	USD 65B (6.5%)	USD 96B (9.6%)	USD 163B (16.3%)	USD 500B (50%)
CPI increase	-	3.08%	4.11%	6.17%	2-4%
Welfare loss (% GDP)	-	-1.54%	-2.06%	-3.08%	Minimize

Even in the optimistic scenario, the manufacturing share of GDP rises only from 11.0% to 11.28%, and employment gains remain below one million. Larger tariffs reduce the trade deficit but raise CPI and welfare losses. The manufacturing reshoring potential index is reported on a 0-100 scale and is not a probability. The model assigns index ranges of 60-80 points to high-value strategic industries, 30-40 points to automobiles and large machinery, and 5-10 points to labor-intensive industries. The fundamental constraints are the labor-cost gap, long adjustment periods for supply chains and human capital, retaliation, and the relocation of production to third countries.

$$S_k = w_1 \cdot W_k + w_2 \cdot A_k - w_3 \cdot C_k + w_4 \cdot G_k \tag{13}$$

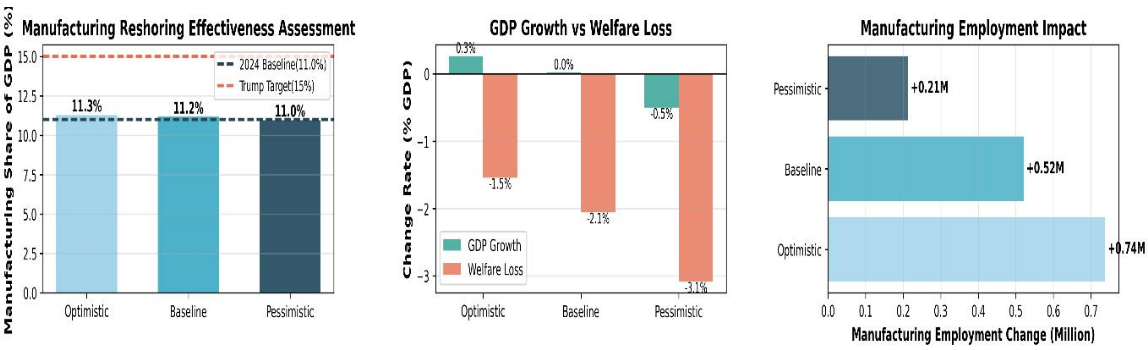

Figure 11 Manufacturing, GDP, and Welfare Outcomes across Macroeconomic Scenarios

Figure 11 shows the persistent gap between reshoring targets and modeled outcomes. Manufacturing employment gains remain below one million in all scenarios, while welfare losses increase as tariffs rise. The baseline scenario improves the trade deficit more than the optimistic scenario but produces higher inflation and a larger welfare loss. In the pessimistic scenario, GDP growth becomes negative, indicating recession risk.

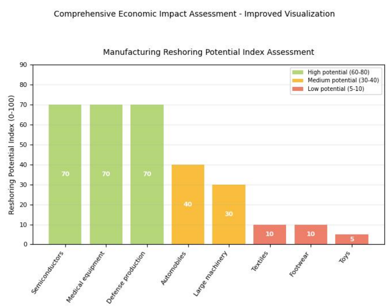

Figure 12 Manufacturing Reshoring Potential Index by Industry

The reshoring potential index in Equation (13) combines strategic importance, automation, cost disadvantage, and policy support and is rescaled to 0-100 index points rather than interpreted as a probability. Figure 12 assigns the highest potential to semiconductors, medical equipment, and defense production. Automobiles and large machinery occupy the middle tier. Textiles, footwear, and toys remain low-potential candidates because their labor-cost gaps would require tariffs of approximately 200%-300%, far above the evaluated range.

The cross-sector evidence therefore distinguishes selective capacity building from broad-based reshoring. Tariffs can redirect trade and create short-term domestic output in sectors with available capacity, but they cannot independently overcome technological barriers, skills shortages, or cost differences. High tariffs also transmit through consumer prices and reduce the import base that supports fiscal revenue.

4.3 Integrated Policy Assessment and Model Robustness

The integrated evaluation combines economic growth, manufacturing share, employment, trade, inflation, and welfare into a policy matrix. Under the calibrated scenarios, the optimistic case generates the strongest manufacturing and employment outcomes, but its gains remain limited relative to the targets. The baseline case produces a larger trade-deficit reduction at the cost of higher consumer prices, while the pessimistic case intensifies inflation and welfare losses.

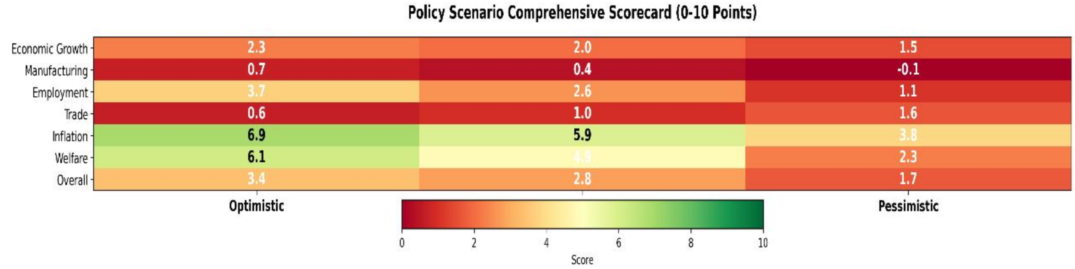

Figure 13 Comprehensive Policy-Scenario Assessment

Figure 13 suggests that no pure high-tariff scenario performs strongly across all evaluated dimensions. Policies that improve trade or selected domestic output indicators simultaneously worsen consumer costs, inflation, and welfare. The matrix also suggests sectoral asymmetry within the modeled scenarios: strategic and highly automated industries respond more favorably than labor-intensive industries, while agriculture and energy bear comparatively large negative effects.

The integrated framework has three practical strengths. The CES trade model, supply-chain optimization, tiered industrial-policy model, Laffer-curve model, and simplified CGE model correspond directly to the different economic mechanisms under study. Their key variables - tariffs, prices, capacity, localization, and self-sufficiency - are calibrated from the compiled data and have transparent interpretations. Most core models are linear, static, or low-dimensional nonlinear forms, so the scenario results can be reproduced and compared with a limited number of calibrated parameters.

The same structure also creates limitations. Cost coefficients and elasticities are treated as fixed within each scenario and do not fully capture economies of scale or changing expectations. Capacity adjustment, technological progress, and labor-force development are represented by stages rather than fully dynamic paths. The supplied source does not numerically restate the automobile channel unit costs, which limits full reproduction of that module. Exchange-rate and financial-market responses are outside the modeled system and are therefore not reported as quantitative outcomes. The sensitivity tests and Monte Carlo module reduce but do not eliminate the remaining sources of uncertainty.

5 CONCLUSIONS

Under the stated parameter values and scenario assumptions, the simulations suggest strong but uneven sectoral effects of the 2025 U.S. tariff policy package and related retaliatory measures. In the soybean module, higher Chinese retaliatory tariffs on U.S. soybeans mainly divert trade toward Brazil and Argentina because aggregate Chinese demand is inelastic. In the automobile module, a U.S. import tariff on Japanese vehicles produces a modeled short-term expansion of U.S. production and a medium-term shift toward Mexico. Semiconductor outcomes depend on technology tier: high-end capacity responds more strongly to subsidies, research investment, and talent development, whereas tariffs are more effective for low-end chips. U.S. tariff revenue rises sharply in the short term but is accompanied by import contraction and an eventual revenue trade-off. Economy-wide gains in manufacturing share and employment remain limited in the simulations, while inflation and welfare losses increase.

The scenario results favor a policy mix of moderate U.S. tariffs near 10%-15%, targeted subsidies, infrastructure investment, vocational education, and friend-shoring rather than uniform high tariffs. The framework is computationally and operationally feasible because its low-dimensional sectoral modules use transparent parameters that can be recalibrated and reproduced for alternative policy scenarios. Its principal limitation is the use of fixed parameters, stage-based adjustment, incomplete automobile cost reporting, and the omission of explicit exchange-rate and financial-market channels. Future research should introduce dynamic expectations, endogenous capacity and technology responses, updated sectoral observations, and exchange-rate, financial-market, and geopolitical modules, while extending the framework to additional agricultural, manufacturing, and high-technology industries.

COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

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