

# The Welfare Impact of Intermediate Goods Tariffs in the US-China Trade War

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**Abstract.** This paper examines the welfare impact of intermediate goods tariffs imposed during the U.S.-China trade war (2018-2020) on consumers, producers, and employment in both economies. Combining qualitative and quantitative analysis, we utilize government reports, corporate case studies (e.g., Apple, BYD, Whirlpool), and industry data (washing machine prices, soybean exports, employment trends) to trace tariff transmission through global value chains (GVCs). U.S. consumers bore 108–225% tariff pass-through costs, with washing machine prices rising 12% (86/unit), reducing real incomes by 1.4B monthly. U.S. producers saw short-term gains in protected sectors (e.g., steel output ↑1.9%), but net losses prevailed due to input cost surges (3.5B downstream damage) and inefficient reshoring (820K per job created). Chinese SMEs suffered profit margin declines (0.35% per 1% tariff rise), triggering 10–20% workforce reductions and supply chain relocations to Southeast Asia, exacerbating hidden unemployment. Tariffs targeting intermediate goods—deeply embedded in GVCs—impose multi-stakeholder welfare losses. Policymakers should prioritize supply chain diversification and critical intermediate goods tariff exemptions over decoupling. By focusing on intermediate goods as the core transmission channel, this study pioneers a systematic analysis of their multi-dimensional welfare impacts across economies, revealing the trade war's true costs beyond gross trade statistics.

**Keywords:** Intermediate Goods Trade; U.S.-China Trade War; Welfare Effects; Global Value Chains (GVCs).

## 1. Introduction

The deepening of the global value chain has made cross-border trade in intermediate goods the lifeline of the modern world economy, but its high interconnectivity also makes it vulnerable to geopolitical conflicts [1]. The outbreak of the China US trade war in 2018 was a stress test of this vulnerability. Unlike traditional protectionist disputes, this conflict not only targets the final product, but also the intermediate inputs that support the global production network, amplifying cross industry costs and disturbances.

Existing research has mostly focused on the welfare effects of macro trade volume or final goods tariffs, and has not fully revealed the transmission mechanism of intermediate goods tariffs in the value chain. For example, Borusyak & Jaravel empirically showed that American consumers bear the majority of tariff costs, but their analysis is mainly based on the final product level; Zheng et al. pointed out the trend of global value chain (GVC) restructuring under geopolitics, but did not systematically track how intermediate goods tariffs affect micro welfare of enterprises and labor markets.

This article aims to fill this research gap by systematically analyzing how intermediate goods tariffs are transmitted through GVCs and quantifying their multidimensional welfare impacts on different economic entities (consumers, businesses, workers) in China and the United States.

Specifically, this article empirically tests the welfare effects of the intermediate goods tariffs imposed on China during the Trump administration on the following two countries: 1) Changes in consumer prices and purchasing power. 2) Fluctuations in corporate profits and competitiveness. 3) Employment market and labor adjustment costs

The structure of the paper is as follows: Part One, theoretical overview. The second part defines intermediate goods trade and its key role in GVC. The third part briefly describes the outbreak and evolution of the China US trade war. The fourth part analyzes the core driving forces that affect

bilateral trade relations. The fifth part, as the core analysis, examines in detail the welfare transmission mechanism of intermediate goods tariffs in the United States and China; The conclusion section summarizes the research findings and proposes policy implications.

## 2. Intermediate goods trade

Intermediate goods are products used as inputs in producing other goods or services, rather than being sold directly to consumers. These encompass raw materials, components, and semi-finished items that undergo further processing [2]. For instance, steel used in automobile manufacturing serves as an intermediate good—transformed into final vehicles sold to end-users.

The pivotal role of intermediate goods trade in global value chains (GVCs) stems from three core economic theories. 1) Comparative Advantage: Countries specialize in producing specific intermediates where they hold efficiency gains, fostering cross-border trade. 2) Economies of Scale: Concentration of intermediate production lowers unit costs, incentivizing geographic clustering. 3) Product Fragmentation: Production processes split across borders, with intermediates linking specialized stages.

These theories explain why intermediates act as the "adhesive" binding GVCs: By enabling countries to focus on discrete tasks (e.g., chip fabrication in Taiwan, assembly in Vietnam), intermediates facilitate efficiency gains. However, this specialization creates structural vulnerabilities. 1) Multi-Border Crossings: A typical intermediate crosses borders 2.7 times before final sale [3], amplifying tariff impacts through cumulative cost layers. 2) Dependency Risks: Disruptions in one node (e.g., rare earth exports from China) cascade globally.

This vulnerability materialized starkly during the 2018 Sino-US trade war. When the U.S. imposed tariffs on Chinese semiconductors—a critical input for electronics—Apple responded by raising iPhone prices by 10-15% [4], directly transferring costs to consumers. This exemplifies how trade policies targeting intermediates trigger welfare losses through GVC transmission channels.

This section establishes an analytical framework focusing on. 1) The function of intermediates in GVC integration. 2) Their inherent sensitivity to trade barriers due to multi-jurisdictional flows. 3) The mechanism translating policy shocks into welfare outcomes—laying groundwork for Welfare Effects of Intermediate Goods Tariffs's empirical analysis.

## 3. The US-China Trade War

The US-China trade war formally erupted on July 6, 2018, when the Trump administration imposed 25% tariffs on \$34 billion of Chinese imports—specifically targeting aerospace, robotics, and industrial machinery components [5]. This marked a strategic shift from conventional trade disputes by directly attacking intermediate goods within global value chains (GVCs). The conflict's roots, however, lay in China's industrial policy ambitions.

The core trigger was China's "Made in China 2025" initiative, which aimed to achieve 70% self-sufficiency in critical intermediate goods like semiconductors, advanced batteries, and precision machinery by 2025 [6]. As USTR Robert Lighthizer testified, "China's state-led efforts to dominate high-tech intermediates threaten U.S. technological leadership and national security—this isn't about trade deficits, but about controlling the building blocks of future industries." [7]

This technological rivalry crystallized in the sanctions against Huawei. In May 2019, the U.S. Commerce Department barred Huawei from purchasing American-origin semiconductors and EDA software—essential intermediates for 5G equipment [8]. This move exemplified the weaponization of intermediate goods access.

China responded with precision retaliation. Tariffs targeting U.S. agricultural intermediates (soybeans, pork) and automotive parts [9]. Export restrictions on rare earth minerals vital for electronics manufacturing [10].

**Table 1.** U.S.-China Trade Dynamics Before and During Trade War

Presidency	Year	Imports from China (Billion \$)	Exports to China (Billion \$)	Trade Balance (Billion \$)
Obama (End)	2016	462.4	115.6	-346.8
Trump (Start)	2017	505.2	130.0	-375.2
<b>Tariffs Begin</b>	<b>2018</b>	<b>538.5</b>	<b>120.3</b>	<b>-418.2</b>
Trump	2019	449.1	106.5	-342.6
Trump (End)	2020	432.5	124.6	-307.9

Source: U.S. Census Bureau (2023), values in nominal billions USD

As Table 1 shows, bilateral trade peaked in 2018 due to front-loading before tariffs, then contracted sharply—especially in intermediate-intensive sectors. The 13.7% drop in U.S. imports from China between 2018–2020 coincided with a 45% surge in Vietnamese semiconductor exports to America [11], signaling GVC restructuring.

Ultimately, this conflict redefined trade warfare. It shifted from taxing finished goods (e.g., Obama-era tire tariffs) to targeting intermediate goods and technologies that underpin strategic industries—a transformation with profound welfare implications explored in Welfare Effects of Intermediate Goods Tariffs.

## 4. Core Drivers of US-China Trade Tensions

Three interconnected factors explain the escalation of US-China trade conflict, with intermediate goods at their core.

### 4.1. Trade Imbalances and Statistical Distortions

The U.S. trade deficit with China surged from 6 billion in 1985 (USITC1990) to 382 billion in 2022 (U.S. Census Bureau 2023), falling to \$279 billion in 2023 yet remaining structurally persistent [10]. This imbalance fueled perceptions of unfair trade. Crucially, gross trade statistics exaggerate the deficit by ignoring value-added contributions. Consider iPhone trade.

The U.S. recorded a \$9.65 billion deficit with China for iPhones in 2018[12].

Yet China's assembly value-added constituted less than 10% of the final price [13], with core components (e.g., Korean displays, Japanese sensors) dominating costs.

This illustrates how intermediate goods trade inflates nominal deficits, masking the multinational nature of production. The Trump administration's tariffs partly aimed to reshore such intermediate-dependent manufacturing.

### 4.2. Technology Competition: "Made in China 2025" and Intermediate Goods Dominance

China's MIC2025 strategy explicitly targeted self-sufficiency in critical intermediates. Semiconductors (70% domestic market share by 2025) [14]. EV batteries (85% global cathode material capacity by 2024) [15]. BYD's rise exemplifies this: Its 2024 revenue reached 107 billion (BYD Annual Report, p.119), surpassing Tesla (97.7 billion, SEC 10-K) [16]. BYD's vertical integration—controlling battery production from raw materials (lithium, cathodes) to cell assembly—demonstrates China's strategy to leverage intermediate goods for industrial dominance. This threatens U.S. technological leadership and enables supply chain coercion (e.g., rare earth export controls).

### 4.3. National Security: The Semiconductor Battleground

U.S. sanctions against Huawei centered on denying access to advanced semiconductors—quintessential intermediate goods powering 5G and AI. By blocking sales of U.S.-origin chips and chip-design tools (e.g., Cadence EDA software) [17], the U.S. weaponized high-tech intermediate supply chains. As Commerce Secretary Gina Raimondo stated: "Semiconductors are the new oil. Controlling their flow is existential for national security." [18]

These factors converged to make intermediate goods the flashpoint: Trade deficits justified tariffs, technological rivalry drove export controls, and security concerns triggered semiconductor sanctions—all targeting intermediates that bind global value chains.

## 5. Welfare Effects of Intermediate Goods Tariffs

The welfare impacts of intermediate goods tariffs operate through three distinct yet interconnected transmission channels, each affecting consumers, producers, and employment differently across the U.S. and China.

### 5.1. Consumer Welfare Channels: Price Transmission and Purchasing Power Erosion

Intermediate tariffs first push up the cost of imported raw materials and components (such as Chinese semiconductors and American steel), forcing downstream manufacturers to pass on the cost to the final product. This transfer has an "amplification effect" - as intermediate goods often need to cross borders multiple times (such as an average of 2.7 times for iPhone parts), tariff costs accumulate layer by layer along the industry chain, ultimately leading to terminal price increases far exceeding the tariff rate itself.

Empirical evidence from the United States: After imposing 20-50% tariffs on Chinese washing machine parts in 2018, the retail price at the end skyrocketed by 12% (\$86 per unit). It is worth noting that the cost transfer rate is as high as 108% -225% [19], far exceeding the tariff rate. The main reason is the hoarding behavior caused by supply chain disruptions and retailers' price increases. Imposing a 25% tariff on Chinese electronic modules and special steel has led to a 5.5% increase in the average price of American cars. Ford has been forced to reduce its discount efforts due to its dependence on the Chinese brake disc supply chain, which has increased the cost of bicycles by \$200.

According to the Consumer Price Index (CPI), American households lose \$1.4 billion in real income per month due to intermediate goods tariffs, totaling \$1.92 billion over 11 months. Low-income families suffer the most - with imported goods accounting for 32% of their consumption budget, far exceeding the 9% of affluent families.

Empirical evidence from China: China imposed a retaliatory tariff of 150% on American cherries, causing the price of imported cherries in Shanghai supermarkets to soar to 498 yuan/kg; The tariffs on American made cars have been raised by 40%, resulting in a price increase of 80000 yuan for Tesla Model Y. But these shocks did not trigger widespread inflation - as domestic overcapacity in agricultural products (such as a 30% increase in cherry production in Shandong) buffered import dependence. Consumers are turning to domestic alternatives (such as BYD replacing Tesla), but there is a "downgrade consumption" in the low-end market: Guangdong worker families are reducing their beef intake and instead buying low-priced frozen chicken wings.

The US tariffs attempt to protect the manufacturing industry, but ultimately end up being paid for by consumers due to the complexity of GVC; China partially mitigates the impact through local production capacity and consumption substitution, but low-income groups still bear the hidden costs of the trade war.

### 5.2. Producer Welfare Channels: Dual Pressure of Cost Impact and Industrial Chain Restructuring

The impact of intermediate goods tariffs on producers is not simply a cost transfer, but rather a reconstruction of the industrial ecology through a triple transmission chain of "cost compression - weakened competitiveness - passive adjustment". This impact presents significant differences between the United States and China: American companies gain breathing space due to tariff protection in their domestic markets, but face downstream demand contraction; Chinese companies are facing a survival crisis due to export barriers and are forced to accelerate capacity migration.

#### 5.2.1 Economic Logic of Transmission Mechanism

1) The dilemma of cost compression, when intermediate goods tariffs push up the cost of imported components (such as Chinese chips and American specialty steel), producers face a dilemma. Absorbing costs leads to a compression of profit margins, while transferring costs results in price increases for end products, weakening competitiveness. This dilemma is particularly prominent in

industries with long industrial chains and detailed division of labor, where tariff costs increase step by step with the production process.

2) Market competitiveness erodes the local market and affects the international market. Although tariffs weaken import competition, local enterprises that rely on imported intermediate goods are actually harmed. Export oriented enterprises lose their price advantage due to rising costs.

3) Passive adjustment of the supply chain forces enterprises to restructure their supply chain, but the adjustment process is accompanied by efficiency losses. Finding new suppliers leads to production interruption, resulting in a 15% -20% decrease in efficiency during the new supply chain integration period (such as the Vietnamese factory's yield rate only reaching 85% of the Chinese factory)

### **5.2.2 US China Empirical Study: Industry Differentiation and Survival Game**

#### **1) The United States - Protection and Cost Coexistence**

The steel industry is experiencing a brief spring. Cleveland Cliffs, under the protection of a 25% steel tariff, achieved a record breaking 7.5% increase in Q2 2025 shipments and a \$15/ton decrease in unit costs, but this came at the cost of the collapse of the downstream industry. Import dependent manufacturers are facing a survival crisis, with data from the National Association of Manufacturers showing an average profit decline of 4.2% for companies relying on Chinese components. Although home appliance companies are protected by tariffs, the cost of washing machines has increased by 18% due to the rise in Chinese controller prices. After the closure of Flex Ltd.'s Shenzhen factory, logistics costs for the new factory in Mexico have soared by 22%

#### **2) China - The Survival Battle of Export oriented Small and Medium sized Enterprises**

Guangdong electronics factories are facing a death spiral of "1% price increase devouring 0.35% profit", resulting in a sharp drop in profit margin from 8% to -6% for Dongguan circuit board factories, and 60% of production capacity for Shenzhen Bluetooth headphone contract factories being relocated to Cambodia. However, the capacity utilization rate of the new factory is only 50%, and companies in the Pearl River Delta generally lay off 10% -20% of employees.

The essence of intermediate goods tariffs is the redistribution of welfare within the industrial chain: the \$1.3 billion profit of American steel mills corresponds to a \$3.5 billion loss for downstream manufacturers; The relocation of Chinese electronics factories to Vietnam has created employment opportunities at the cost of 200000 workers losing their jobs in Dongguan. This allocation conflict confirms the findings of Cui Kun and Shi Jianhuai: the welfare losses caused by distorted prices of intermediate goods are 2.1 times higher than the final goods tariffs (2023). When policy makers attempt to "protect producers" with tariffs, they are actually accelerating the tearing and restructuring of the industrial chain.

### **5.3. Employment Channels: Labor Market Restructuring in the Broken Industry Chain**

The impact of intermediate goods tariffs on employment is not simply about increasing or decreasing job positions, but rather reshaping the employment ecosystem through the triple fission of "cost transmission, industrial migration, and labor reallocation". This reconstruction presents a stark contrast between the United States and China: The United States is characterized by explicit unemployment in agriculture and manufacturing, while China faces a complex dilemma of both the closure of export-oriented small and medium-sized enterprises and implicit unemployment.

#### **5.3.1 Transmission Logic of Employment Shock**

1) Cost pressure triggers junior layoffs. The soaring local costs have led to intermediate goods tariffs directly pushing up production costs for enterprises. The loss of international competitiveness has led to Chinese electronic foundries losing their price advantage due to US tariffs, and orders are being transferred to Vietnam.

2) The transfer of the industrial chain has led to the destruction of secondary employment. The relocation of enterprises not only causes direct job losses, but also triggers regional unemployment

through industrial chain disruptions, such as the "rust belt" dilemma in the Midwest of the United States and the "domino effect" in the Yangtze River Delta of China.

3) Hidden unemployment. 90% of clothing workshops in Guangzhou have closed, forcing workers to switch to oversaturated industries such as food delivery and ride hailing, resulting in a decrease in daily income from 180 yuan to 90 yuan. 150000 manufacturing workers in Dongguan have switched to the "gig economy" and can only earn intermittent income.

### 5.3.2 US China Empirical Study: Structural Imbalance and Regional Differentiation

#### 1) The United States - Explicit Trauma in Agriculture and Manufacturing

Chinese tariffs caused a 23% drop in US soybean prices, directly resulting in 12.3% of workers (206000 people) losing their jobs. The Cooper family, a farmer in Iowa, was forced to sell their century old ancestral property, reflecting the intergenerational rupture caused by tariffs. Although the home appliance industry has added 1800 jobs, the cost is staggering - General Electric's Kentucky factory costs \$820000 in subsidies per job, and its efficiency is only 68% of that of its Mexico factory.

#### 2) China - Crisis of Small and Medium sized Enterprises and Regional Unemployment Wave

The gross profit margin of Dongguan Electronics Factory fell below 2%, and the closure of 90% of Guangzhou clothing workshops triggered the "hollowing out of urban village industries". Shenzhen Bluetooth earphone OEM companies have turned to robot assembly, with each robotic arm replacing 12 workers but only requiring 3 technicians for maintenance - highlighting the exacerbation of structural unemployment caused by "skill mismatch".

The empirical evidence from China and the United States confirms the core argument of this article: the multiple cross-border characteristics of intermediate goods amplify the tariff impact geometrically.

Intermediate goods tariffs are permanently changing the structure of the labor market. The Midwest of the United States has transformed from a "global granary" to a subsidy dependent area, and the intergenerational inheritance of agricultural communities has broken; Dongguan, China has transformed from a "world factory" to a cross-border e-commerce hub, but 55-year-old sewing worker Li Xiuying was abandoned by the times due to a skill gap. When policy makers are addicted to the deterrent power of tariff weapons, millions of ordinary workers are bearing the heaviest cost of this game - their livelihood difficulties, which more truly illustrate the cruel nature of trade wars than any macroeconomic indicators.

## 6. Conclusion

This article analyzes that the intermediate goods tariffs imposed on China during the Trump administration, transmitted through the global value chain, have caused extensive and far-reaching welfare losses to the economies of China and the United States: American consumers bear the main costs, overall competitiveness of enterprises is weakened, and net employment is reduced; China's export-oriented manufacturing industry, especially small and medium-sized enterprises, is facing declining profits, intensified unemployment, and forced relocation. The trade war presents a 'lose lose' pattern in the key link of 'intermediate goods'. Under deep GVC embedding, trade barriers targeting intermediate goods have unique destructive transmission mechanisms and amplification effects.

Seeking supply chain resilience should focus on diversified supply of key intermediate goods and inventory management, rather than comprehensive decoupling. In unavoidable trade frictions, consider establishing a tariff exemption mechanism for key intermediate goods (such as based on enterprise applications, proving irreplaceability or involving people's livelihoods) to alleviate welfare losses. Strengthen statistics and dialogue based on trade value added, more accurately reflect the distribution of bilateral trade benefits, and alleviate misunderstandings caused by differences in total value statistics. While controlling technological competition, China and the United States need to explore feasible paths to maintain stable trade relations in some non-sensitive intermediate goods links, creating space for broader cooperation.

This study is mainly based on macro and industry level data, and future research can further utilize micro level data at the enterprise level (such as customs declaration and financial reports) for more refined welfare accounting.

With the rise of trade protectionism and ongoing geopolitical tensions, understanding the welfare costs of intermediate goods trade barriers is crucial for countries to formulate rational and sustainable trade and industrial policies.

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