



Policy Paper

Distributional Consequences of U.S. Tariff Shocks on India's Economy: Insights from a Computable General Equilibrium Model



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FOREWORD

The trade policies and tariff regimes in the increasingly interconnected global economy play a critical role in shaping domestic economic structures, sectoral performance, and livelihood outcomes. The assessment of implications of recent U.S. tariff shocks on India's economy offers valuable insights into their distributional consequences across sectors and income groups. The evidence-based analyses are vital to understand how external policy shocks transmit through domestic markets, influencing agricultural trade, rural employment, and overall economic welfare.

The present Policy Paper "**Distributional Consequences of US Tariff Shocks on India's Economy Insights from a Computable General Equilibrium Model**" holds special significance in the context of evolving global trade dynamics, particularly for developing economies like India that are deeply integrated with global value chain. I am confident that this policy paper will serve as a valuable reference for policymakers, researchers, and development professionals working at the intersection of trade, agriculture, and rural livelihoods.

I congratulate the authors for their analytical rigor and collaborative efforts in developing this policy paper.

(D. K. Yadava)

Dated: November 19, 2025
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Abstract

Trade policy shocks, such as retaliatory tariffs, can cause broad economic effects that go beyond the directly affected sectors, particularly in developing economies with large rural and informal labor markets. This study measures the short-term impacts of a simulated 50% U.S. tariff on Indian exports using a single-country Computable General Equilibrium (CGE) model calibrated to India's 2019 Social Accounting Matrix (SAM), developed by the International Food Policy Research Institute (IFPRI). Sectoral exposure to the U.S. market is included through detailed trade share data, capturing both direct and indirect transmission channels.

Results show that while real GDP could decrease by 0.45%, export volumes shrink by 3.6%, and investment declines by 2.0%. Export-focused manufacturing and agriculture-related sectors, such as textiles, marine products, sea-processed foods, cotton, and handicrafts, experience the largest output losses, with spillover effects into trade-related services. Welfare impacts are highly uneven: rural non-farm households and low-income urban groups face the greatest declines in income and consumption, due to their reliance on agro-processing and labor-intensive manufacturing tied to U.S. demand.

The findings show that aggregate macroeconomic stability can hide substantial distributional disparities, emphasizing the need for targeted policy responses. Short-term measures such as income support and skill retraining for vulnerable groups, alongside long-term strategies for export diversification, import substitution, and domestic value chain strengthening, are essential to enhance resilience against external trade shocks.

Keywords: U.S. tariffs, India, CGE model, farm households, distributional impacts, export diversification.

1. Introduction

Trade policies such as tariffs of the large economy like United States have deep and multifaceted impacts on the economies of exporting countries, extending well beyond the immediate effects on trade volumes and specific sectors. Empirical evidence shows that tariffs raise the prices of exported goods, reduce export competitiveness, and contract output and trade flows in affected economies (Rani et al., 2014; Clarissa, 2025; McKinsey & Company, 2025). The use of reciprocal tariffs by the United States as retaliatory measures has drawn particular attention to their broader economic repercussions on partner nations such as India (Sainath et al., 2025). While the primary intent is to target specific export sectors, tariff impacts often propagate through interconnected value chains, leading to wider distortions in production, prices, and household welfare (Altenburg, 2006; Dong & Kouvelis, 2020).

The distributional consequences of tariffs are increasingly recognized as a significant policy concern. Vulnerable socio-economic groups, especially lower-income households and rural non-farm populations, often lack formal social protection and rely heavily on jobs linked to export-driven industries (Carroll & Hur, 2023; Engel et al., 2021). As noted by Fajgelbaum and Khandelwal (2016) and Topalova (2010), tariffs typically result in regressive welfare effects by reducing labor demand in affected industries and lowering real household incomes. In India, sectors with high U.S. export exposure, including textiles, marine products, pharmaceuticals, and agricultural commodities, are particularly susceptible to such shocks, resulting in indirect welfare losses for rural households tied to these value chains.

India's bilateral trade relationship with the U.S. is substantial, encompassing goods that sustain a wide range of livelihoods, including

those in rural and informal sectors. In 2024-25, the U.S. accounted for a large share of India's exports across several key sectors: nearly 60% of carpet exports, 38% of electronic goods, about one-third of marine products and pharmaceuticals, and significant proportions of ready-made garments and gems & jewellery. Agricultural commodities such as spices, tea, and processed cereals also show substantial exposure to the U.S. market. These figures highlight the dependency of Indian industries and rural livelihoods on U.S. demand, underscoring India's vulnerability to U.S. trade policy shifts (NIRYAT, 2025).

Macroeconomic studies also indicate that tariffs lead to declines in GDP, employment, and productivity within the affected economies, along with negative distributional outcomes (Furceri et al., 2018). Although aggregate GDP decline may appear relatively small, substantial heterogeneity exists across sectors and household groups, highlighting the need for integrated policy responses that include targeted support for the most adversely affected populations. These insights underscore the importance of examining tariffs not only for their direct trade effects but also for their broader distributional consequences across socio-economic groups, a central motivation for this study's analysis of U.S. reciprocal tariffs and their implications for India's agriculture-linked economy.

This study addresses these issues by employing a Computable General Equilibrium (CGE) model based on India's 2019 Social Accounting Matrix (SAM) to simulate a 50% retaliation tariff from the U.S. on Indian exports. The model captures short-run equilibrium impacts, allowing for a comprehensive assessment of macroeconomic aggregates, sectoral changes, and effects on income distribution among different household groups. The analysis uniquely highlights the indirect transmission channels that can amplify adverse welfare outcomes for

rural non-farm households, an aspect largely neglected in existing trade policy research.

The novelty of this work lies in its detailed focus on trade policy-induced distributional impacts within India, combining an established CGE modeling framework with recent and comprehensive data. While previous literature has focused on aggregate effects of tariff shocks (Pelikan & Brockmeier, 2008), fewer studies have systematically examined intra-country inequalities, particularly in developing economies facing escalating trade tensions (Topalova, 2010; Fajgelbaum & Khandelwal, 2016). This paper also contributes by emphasizing the welfare implications for rural non-farm households, a demographic significant to India's socio-economic fabric.

The relevance of this research is based on the ongoing global trade uncertainties and the need for evidence-based policy responses. Quantifying the magnitude and pathways of tariff shocks equips policymakers with actionable insights to design targeted support mechanisms, such as income subsidies or input assistance for the most affected groups

The specific objectives of this study are:

- To quantify the macroeconomic consequences of a 50% tariff imposition by the U.S.
- To identify sectoral vulnerabilities and the industries most affected by the tariff shock.
- To analyze the distribution of income impacts across rural and urban households

By leveraging the International Food Policy Research Institute's (IFPRI) CGE model, this paper offers a robust and policy-relevant assessment of the broader socio-economic ramifications of U.S. trade retaliation on India.

2. Literature Review

Several studies have explored the distributional effects of trade shocks using microdata and modelling approaches. Davis (2004) describe the complex transmission channels by which external shocks influence welfare distribution, emphasizing that impacts are contingent on local labor markets and consumption patterns. In the Indian context, Topalova (2010) and Fajgelbaum and Khandelwal (2016) document uneven benefits and costs from trade liberalization, showing that poorer and rural households often bear disproportionate burdens due to limited mobility and safety nets.

Computable General Equilibrium (CGE) models have become a preferred tool to analyze such mechanisms because they integrate micro-level household data with macroeconomic structures, capturing feedback effects across sectors and income groups. Several CGE studies on India have examined trade policy impacts, modelling scenarios such as tariff reductions or global price shifts.

The rural non-farm economy (RNFE) in India is increasingly recognized as a vital component of rural livelihoods and structural transformation. While agriculture remains important, non-farm activities contribute significantly to rural income and employment, accounting for a growing share of rural production. Diversification into non-farm sectors is uneven and influenced by regional agricultural development. However, rural non-farm households often remain vulnerable due to low returns and limited formal protections (Reardon et al., 1998; Imai et al., 2015). Hence, trade shocks that affect agricultural value chains can indirectly impact these households

through disrupted labor and input markets.

Despite this, few studies have focused on the interplay between trade policy shocks and rural non-farm household welfare in India. This paper fills that gap by leveraging a CGE modelling approach grounded in recent Social Accounting Matrix data to simulate U.S. tariff retaliation and its differentiated impacts, with special attention to rural non-farm groups. The detailed treatment of household heterogeneity and sectoral linkages in this framework enables a nuanced understanding of welfare implications crucial for designing targeted policy responses.

3. Methods

3.1 Data Source

The analysis is based on the 2019 Social Accounting Matrix (SAM) for India (IFPRI, 2024; Pal et al., 2020), which offers a consistent representation of the economy, including production activities, commodities, factors of production, institutions (households, government, and the rest of the world), and trade flows.

Households are disaggregated by location (urban/rural) and income quintile, including rural non-farm categories. This granularity is crucial for measuring the distributional consequences of trade shocks.

3.2 CGE Model Structure

We apply the *single-country CGE framework of the International Food Policy Research Institute (IFPRI)*, a static model capturing short-run equilibrium effects (Breisinger et al., 2010; Lofgren et al., 2002). The key building blocks of the model are:

3.2.1. Production

Producers combine intermediate inputs and primary factors in a nesting structure:

- CES technology – Activity production function

$$QA_a = \alpha_a^a \cdot \left[\delta_a^a \cdot QVA_a^{-\rho_a^a} + (1 - \delta_a^a) \cdot QINTA_a^{-\rho_a^a} \right]^{1/\rho_a^a}$$

[activity level] = CES [quantity of aggregate value added, quantity of aggregate intermediate input]

CES technology: Value-added intermediate-input quantity ratio:

$$\frac{QVA_a}{QINTA_a} = \left[\frac{PINTA_a}{PVA_a} \cdot \frac{\delta_a^a}{1 - \delta_a^a} \right]^{1/1+\rho_a^a}$$

$$\begin{aligned} & [\text{value} - \text{added} - \text{intermediate input quantity ratio}] \\ & = f[\text{Intermediate} - \text{input value} - \text{added price ratio}] \end{aligned}$$

3.2.2. Commodity Supply and Trade

Output allocation between exports and domestic sales follows a Constant Elasticity of Transformation (CET) specification:

$$QX_c = \alpha_c^t \left[\delta_c^t \cdot QE_c^{\rho_c^t} + 1 - \delta_c^t \cdot QD_c^{\rho_c^t} \right]^{1/\rho_c^t}$$

$$\begin{aligned} & [\text{Aggregate marketed domestic output}] \\ & = \text{CET} [\text{export quantity, domestic sales of domestic output}] \end{aligned}$$

Domestically consumed commodities are an Armington CES composite of imports and domestic goods:

$$QQ_c = \alpha_c^q \cdot \left(\delta_c^q \cdot QM_c^{-\rho_c^q} + (1 - \delta_c^q) \cdot QD_c^{-\rho_c^q} \right)^{\frac{1}{\rho_c^q}}$$

$$[\text{Composite Supply}] = f[\text{import quantity, domestic use of domestic output}]$$

3.2.3. Price Linkages

Export prices in local currency are:

$$PE_c = pwe_c \cdot (1 - te_c) \cdot EXR - \sum_{c' \in CT} ic_{ec,c'} \cdot PQ_{c'}$$

[Export Price (LCU)] = [Export price (FCU)] · [tariff adjustment] · [exchange rate (LCU per FCU)] + [cost of trade inputs per export unit]

Import prices are:

$$PM_c = pwm_c \cdot (1 - tm_c) \cdot EXR - \sum_{c' \in CT} ic_{mc,c'} \cdot PQ_{c'}$$

[Import Price (LCU)] = [import price (FCU)] · [tariff adjustment] · [exchange rate (LCU per FCU)] + [cost of trade inputs per import unit]

Here: t_{ec} = export tax rate ; t_{mc} = import tariff rate; EXR = exchange rate (LCU per FCU);

PQ_c = composite commodity price

3.2.4. Household Incomes and Demand

Disposable income of household hh net of savings and taxes:

$$EH_h = (1 - MPS_h) \cdot (YI_h - TINS_h)$$

[household income disposable for consumption] = [household income, net of direct taxes, savings, and transfers to other non-government institutions]

Household consumption follows a Linear Expenditure System (LES):

$$QH_{c,h} = Y_{ch} + \beta_{ch} \frac{EH_h - \sum_{c'} \gamma_{c'h} \cdot PQ_{c'}}{PQ_c}$$

3.2.5 Shock Specification

To simulate the effect of U.S. reciprocal tariffs, we first identified India's sector-wise export exposure to the U.S., using the latest trade data (FY 2024–25). The trade exposure data used to compute sector-specific export weights and effective tariff shocks was obtained from NIRYAT (National Import-Export Record for Yearly Analysis of Trade), India's official trade analytics portal (Figure 2). This values to the United States. This sectoral mapping ensured that tariff shocks were accurately aligned with real trade flows, thus improving the policy relevance of the simulation. For example, 59.8% in carpets, 38% in electronic goods, 36.3% in marine products, 34.6% in pharmaceuticals, and over 30% in garments and jewellery. Agricultural exports like spices (14.7%), tea (10%), and cereal preparations (19%) also show significant exposure (Figure 1).

$$\text{India's Export to US (R)} = \frac{\text{Exports to US}}{\text{Total Exports of India}}$$

Assuming a full 50% tariff applies only to the portion of exports sent to the U.S., the effective price shock for each sector is calculated as (Figure 2.)

$$\text{Effective Tariff Shock} = R \times 50\%$$

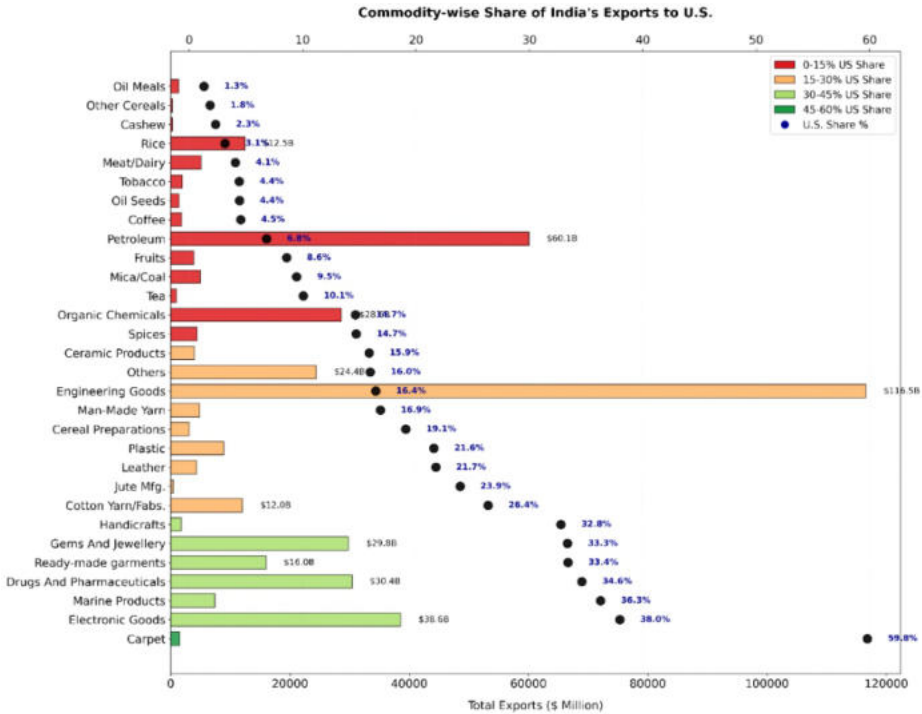


Figure 1: Commodity-wise Share of Exports from India to the U.S.

This reduces the world export prices received for those commodities. Based on this, we calculated a weighted average tariff shock on India's exports, reflecting the share of each sector in total exports to the U.S. The tariff shock is modeled in the CGE framework as a reduction in the world price of Indian exports for sectors with U.S. exposure, proportionally applied to their trade weights. For all other model

sectors not directly exporting to the U.S., prices are held constant to isolate the retaliation effect.

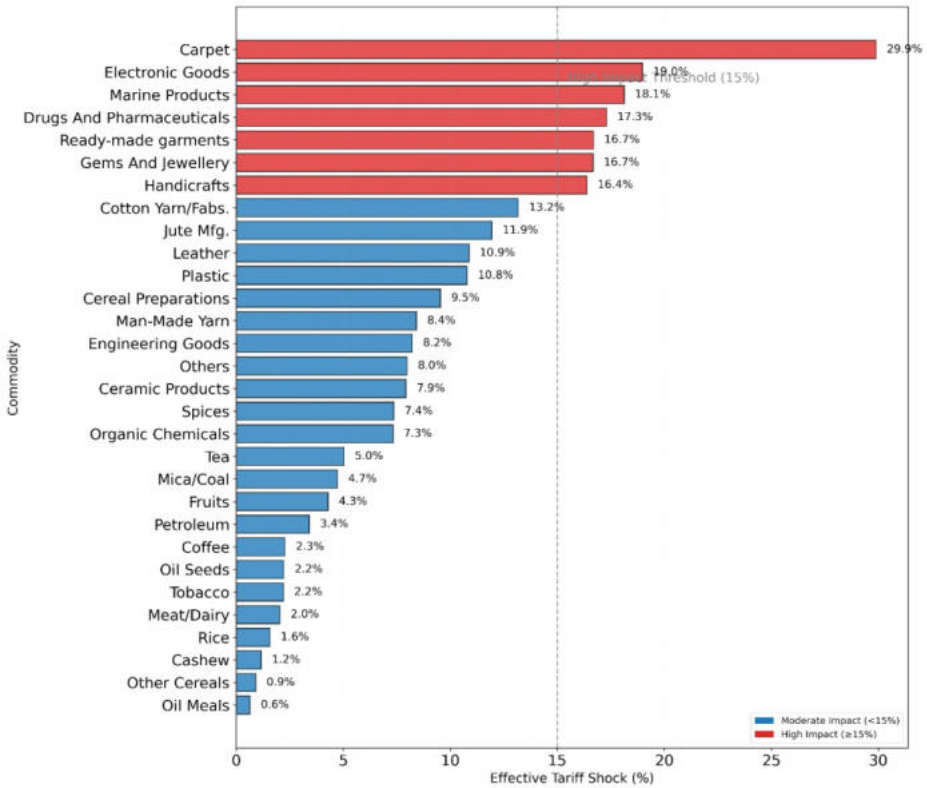


Figure 2: Effective tariff shock on the commodities exported to the U.S.

In the short run, the model assumes the Consumer Price Index (CPI) as the numeraire, with flexible domestic prices. Investment is savings-driven with adjustable saving rates, and government savings vary while direct tax rates remain fixed. Foreign savings are fixed, and the exchange rate is flexible. Unskilled labor is unemployed but mobile across sectors, skilled labor is fully employed, crop land is mobile between crops, and capital is fixed within each activity.

4. Results and Discussion

The simulation of a 50% U.S. tariff on Indian exports presents a detailed picture of how trade retaliation affects India's economy both at the aggregate and distributional levels. Although the overall GDP contraction is moderate, approximately 0.45%, the microeconomic shifts across sectors and households reveal a far more nuanced story of economic adjustment and welfare challenges.

4.1 Macroeconomic Adjustments

The economy experiences a comprehensive reduction in total demand by about 0.9%, driven by lower household consumption and sharply reduced investment. Exports decline by around 3.6%, reflecting the loss of competitiveness for Indian products in U.S. markets due to tariff barriers. Imports fall even more steeply, by over 5%, as reduced foreign exchange earnings constrain India's ability to buy foreign goods (Table 1). This pattern of trade contraction and demand reduction aligns with established evidence that tariffs depress trade volumes and economic activity in exporting countries (Kawasaki, 2018; Furceri et al., 2018).

Price adjustments further complicate the economic dynamics. The real exchange rate appreciates, indicating that Indian goods become relatively more expensive internationally, thereby exacerbating export challenges. Concurrently, the nominal exchange rate depreciates, a typical response to capital outflows and reduced trade surpluses. The terms of trade worsen by about 4.4%, meaning India receives less revenue per unit of

exports relative to its import costs, which dampens national income and investment prospects (Panagariya, 2004; Oxford Economics, 2023). Importantly, inflationary pressures remain limited in the short term, with only a marginal increase in consumer prices, reflecting that domestic price adjustments cushion consumers to some extent.

4.2 Growth, Investment, and Fiscal Effects

The real GDP decline at market prices and factor costs indicates that production and income generation are both adversely affected, though taxes and subsidies modulate observed market-level effects. Investment and private savings as shares of GDP decrease slightly, signaling that economic agents curtail capital formation cautiously rather than abruptly in response to trade shocks. The marginal improvement in India's trade deficit ratio reflects a sharper reduction in imports than exports, but this balance sheet improvement comes at the cost of constricted economic activity and welfare.

Public savings decrease at a modest rate, driven partly by losses in import tax revenues due to lower import volumes. Such fiscal impacts highlight potential government budgetary pressures amid trade disruptions, complicating the capacity for counter cyclical policy interventions.

Table 1: Estimated macroeconomic effects of the 50% U.S. Tariff on India's exports

Variable	Description	Initial Value (Rs. Lakh crore)	Change from Base (%)
i. Quantities			
Aggregate Demand	Total domestic and foreign demand in the economy	204.64	-0.9
Household Consumption	Spending by households	122.97	-0.52
Investment	Total capital formation	59.61	-1.99
Exports	Goods and services sold abroad	37.14	-3.57
Imports	Goods and services purchased from abroad	42.41	-5.31
ii. Prices			
Real Exchange Rate Index	Competitiveness of domestic goods vs. foreign	100	1.28
Nominal Exchange Rate Index	Currency value in nominal terms	100	3.42
World Export Price Index	Average prices of exports globally	100	-4.42
Global Price Index	Overall world price level	100	-2.07
Consumer Price Index	General cost of living	100	0.13
Terms of Trade Index	Ratio of export to import prices	100	-4.42
iii. GDP (Real)			
GDP at Market Prices	Gross Domestic Product at Market Prices	200.72	-0.45
GDP at Factor Cost	Gross Domestic Product at Factor	184.27	-0.22
iv. Shares (% of GDP)			
Investment to GDP Ratio	Share of investment in GDP	29.7	-0.16
Private Savings to GDP	Household and corporate savings share	33.57	-0.03
Foreign Savings to GDP	Net capital inflow share	0.85	0.04
Trade Deficit to GDP	Imports minus exports as % of GDP	8.3	-0.24
Public Savings to GDP	Government fiscal balance share	-4.06	-0.16
Import Tax Revenue to GDP	Taxes collected on imports	1.04	-0.02

Note: Percentage changes represent deviations from the baseline scenario reflecting the tariff shock.

4.3 Distributional Effects and Vulnerable Groups

Beyond aggregate metrics, the simulation underscores significant heterogeneity in welfare impacts. Rural non-farm households suffer the largest relative welfare losses due to their reliance on labor and incomes linked indirectly to export-oriented agricultural and agro-industrial sectors. These households often lack formal social protections and safety nets, making them particularly vulnerable to external shocks transmitted through complex value chains. Rural farm households and urban low-income groups also experience sizeable welfare declines, reflecting interconnected labor and product market adjustments (Topalova, 2010; Fajgelbaum & Khandelwal, 2016).

The findings mirror established literature emphasizing that trade-induced shocks can exacerbate income inequality and poverty in developing countries by disproportionately impacting lower-skilled workers and rural populations (Goldberg & Pavcnik, 2007; Engel et al., 2021). The study thus suggests that macroeconomic aggregates can mask profound social and economic vulnerabilities that merit targeted policy attention.

4.4 Sector-Wise Impact

Sector-wise GDP impact of U.S. tariffs on India's exports reveals important variation across key industries, reflecting the differential exposure to the U.S. market and the interlinked nature of the Indian economy. While aggregate GDP is projected to contract moderately by approximately 0.4% to 0.5% depending on the simulation scenario, the

burden is unevenly borne by specific sectors, many of which are integral to rural employment and value chains.

Sectors most directly hit include labor-intensive and export-oriented industries such as textiles, gems and jewellery, leather and footwear, marine products, and agro-processing (Figure 3). For example, textiles, garments, and leather exports to the U.S. constitute substantial shares of their total output, making these sectors highly vulnerable to tariff shocks. In seafood and marine products, where as much as 36% of exports go to the U.S., output and incomes can sharply decline. Similarly, cotton-related products, spices, and processed food sectors face significant contraction in output, linking the tariff shock directly to agricultural value chains. Engineering goods and electronic goods also encounter reduced demand and output losses, though some segments like pharmaceuticals and IT are less impacted due to tariff exemptions.

Industry estimates suggest output declines of 3% to over 5% in these exposed sectors, consistent with export reductions of similar magnitudes, which in turn drives the observed GDP loss. Investment and employment in affected sectors fall as firms adjust to diminished demand. Price and cost changes propagate through sectors, causing real exchange rate appreciation and terms of trade deterioration by about 4%. The ripple effects extend to services closely connected to trade, such as transport and wholesale trade, which contract moderately.

The overall macroeconomic impact, while appearing modest at the aggregate GDP level, masks significant structural adjustments:

labor-intensive and rural-linked sectors face disproportionate output and welfare losses, which translate into uneven income effects across household groups, particularly affecting rural non-farm households engaged in agro-processing, services, and value chain linkages.



Figure 3: Sector-wise GDP impact of U.S. tariffs

These findings are supported by recent empirical and modelling studies on India's trade exposure to U.S. tariffs (Aditya, 2025; ICRA Limited, 2025; Agarwal, 2025; Singh & Raman, 2025) and align with academic literature documenting the importance of sectoral

heterogeneity in trade shock impacts (Kawasaki, 2018; Topalova, 2010; Fajgelbaum & Khandelwal, 2016).

In sum, sector-wise GDP impact analysis highlights the vulnerability of key export sectors to U.S. tariff retaliation, with labor-intensive, agro-linked, and manufacturing industries facing the greatest strain. This underscores the importance of targeted policy measures to support affected sectors and vulnerable households, alongside strategies for export diversification to buffer against concentrated trade shocks.

4.5 Household Welfare Impact Tables

The simulation results presented in Table 2 quantify the short-run impacts of a 50% U.S. tariff on India's exports across different household categories, using percentage deviations from the baseline equilibrium in real income and real consumption as the primary welfare indicators. These findings reveal substantial heterogeneity in the distribution of welfare losses, which is consistent with established literature that trade shocks generate asymmetric effects within economies depending on sectoral linkages, factor endowments, and socio-economic characteristics of households (Fajgelbaum & Khandelwal, 2016; Topalova, 2010; Carroll & Hur, 2022).

Table 2: Simulation results of the impact of U.S. tariffs on household welfare and economic outcomes

Household Type	Income Group	Real Income (%)	Real Consumption (%)
All Households	All	-0.53	-0.5
	Low-income	-0.64	-0.42
	Lower-middle	-0.67	-0.48
	Middle	-0.7	-0.56
	Upper-middle	-0.65	-0.58
	High-income	-0.4	-0.46
Rural	All	-0.61	-0.5
	Low-income	-0.57	-0.33
	Lower-middle	-0.61	-0.39
	Middle	-0.64	-0.47
	Upper-middle	-0.66	-0.56
	High-income	-0.58	-0.62
Rural Farm	All	-0.44	-0.34
	Low-income	-0.4	-0.18
	Lower-middle	-0.43	-0.24
	Middle	-0.49	-0.34
	Upper-middle	-0.49	-0.43
	High-income	-0.38	-0.46
Rural Non-farm	All	-0.78	-0.67
	Low-income	-0.82	-0.56
	Lower-middle	-0.85	-0.6
	Middle	-0.82	-0.63
	Upper-middle	-0.81	-0.69
	High-income	-0.7	-0.72
Urban	All	-0.45	-0.49
	Low-income	-1.24	-1.06
	Lower-middle	-1.04	-0.91
	Middle	-0.91	-0.81
	Upper-middle	-0.64	-0.6
	High-income	-0.34	-0.41

At the aggregate level, all households combined experience average declines of 0.53% in real income and 0.50% in real consumption. The disaggregated results demonstrate material variations across household types and locations, reflecting differences in exposure to export-oriented sectors and dependence on tariff-affected income streams.

The larger average decline in rural households (-0.61% real income) relative to urban households (-0.45% real income) reflects the high U.S. trade exposure of sectors embedded in rural value chains, such as cotton textiles, carpets, handicrafts, and processed agricultural products (Government of India, 2019). In CGE terms, the magnitude of these losses is determined by the degree of factor mobility, Armington elasticity assumptions, and the share of household factor income derived from affected sectors.

Rural non-farm households emerge as the most adversely affected group (-0.78% real income; -0.67% real consumption on average), with high losses across all income quintiles. These households are highly dependent on agro-processing, light manufacturing, and transport services closely tied to exports, sectors that contract sharply when external demand falls (Wilkinson & Rocha, 2009; Kapoor et al., 2021). In contrast, rural farm households may show smaller real income losses (-0.44%) due to partial insulation from export shocks in domestically consumed crops, although high-export crops like cotton and spices still transmit some losses through price and demand channels.

This divergence is consistent with dual-economy models and

empirical work (Davis & Bezemer, 2004), which argue that rural non-farm incomes are more sensitive to industrial linkages and less protected by subsistence or domestic market orientation. The welfare losses follow distinct patterns across income quintiles, showing progressive vulnerability in urban areas but across-the-board losses in rural non-farm areas.

In urban households, the largest proportional losses occur in low-income (-1.24%) and lower-middle (-1.04%) groups, reflecting the concentration of employment in labor-intensive, export-dependent manufacturing such as garments, leather goods, and marine products. It is to be noted that most of these workers are migrant workers with hands to mouth type of livelihoods. While in rural farm households, low-income groups experience smaller declines (-0.40%) relative to higher-income farm households (-0.49%), suggesting that commercialized farms linked to export value chains bear larger proportional losses. In rural non-farm households, losses remain high (~-0.8%) for all quintiles, underscoring structural dependence on affected sectors regardless of income level.

From a factor market perspective, lower-skilled labor earns a greater share of household income in the most affected sectors, consistent with the Stolper-Samuelson theorem which predicts that trade restrictions harm the abundant factor in an export sector (Hertel & Tsigas, 1997).

For most households, the drop in real consumption is slightly less than the drop in real income, implying partial smoothing via savings, dissaving, borrowing, or consumption of own production.

However, in urban low-income households, consumption falls almost proportionately to income (-1.06% vs. -1.24%), suggesting minimal coping capacity and greater immediate welfare stress (Engel et al., 2021). Conversely, urban high-income households show smaller consumption declines (-0.41%) than income losses (-0.34%), likely reflecting diversified assets and greater resilience.

These results align closely with prior Indian CGE simulations of external shocks which demonstrate that aggregate macroeconomic effects can be modest while rural and low-income urban groups experience larger proportional welfare losses (Parikh et al., 2015; Ghate, 2012). The pattern of urban low-income and rural non-farm vulnerability parallels findings in Topalova (2010) and Fajgelbaum & Khandelwal (2016) that exposure to trade policy changes without adequate mobility or safety nets worsens inequality.

Moreover, structural policies that diversify export markets and deepen domestic value chains could reduce vulnerability to concentrated trade shocks (Engel et al., 2021; Oxford Economics, 2023).

These results indicate that preserving fiscal space and designing targeted welfare programs are crucial to mitigate adverse effects on vulnerable households. Potential policy responses include direct income support for displaced or affected workers, skills training programs to facilitate labor mobility, and enhanced rural social protection mechanisms. Maintaining flexible and responsive monetary and exchange rate policies will also be critical to stabilize financial markets and control inflationary spillovers.

Furthermore, strategically diversifying India's export markets and strengthening trade-ties with non-U.S. destinations such as ASEAN and Europe can reduce exposure to unilateral trade measures. Policies promoting modernization and integration of agricultural value chains with processing and service sectors should be prioritized to increase resilience in rural labor markets and stimulate broader inclusive growth (Ghate, 2012; Engel et al., 2021).

5. Conclusion

The simulation of a 50% U.S. tariff on Indian exports shows that while the aggregate GDP decline is modest, the impacts are uneven and concentrated in export-oriented, labor-intensive, and agriculture-linked sectors. Rural non-farm and low-income urban households bear the largest welfare losses due to their dependence on employment and earnings from these sectors.

These results confirm that trade shocks can transmit well beyond directly targeted industries, disrupting interconnected value chains and amplifying income inequality. Macroeconomic stabilization alone will not be sufficient; targeted income support, skills retraining, and sector-specific relief are essential to protect the most vulnerable.

In the long term, export market diversification and strengthening of domestic value chains will be significant in reducing vulnerability to external trade disputes. Policymakers must, therefore, address both the short-term adjustment costs and the structural dependencies revealed by this analysis to build a more resilient and inclusive trade-driven growth path for India.

6. Limitations

This is a static CGE model; it does not capture dynamic effects such as capital accumulation, technological change, or gradual labor reallocation. Labor market frictions, wage rigidities, and partial factor immobility are not explicitly modeled. However, the model robustly describes the short-run equilibrium adjustments to a tariff shock, making it suitable for assessing immediate macroeconomic, sectoral, and welfare impacts.

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List of Publications

1. Reddy, Amarender A., Suresh, A., Praveen, K. V., Singh, D. R. and P. K. Rai. 2025. Profiling Biotic, Abiotic and Institutional Risks in Rainfed Farming and Coping Strategies (Policy Paper No. 01/2025). ICAR-National Institute of Biotic Stress Management (ICAR-NIBSM), Raipur. Pp. 1-37.
2. Amarender Reddy, A and Prasad Y.G. 2025. Two Decades of Bt Cotton in India: Impact and Policy Imperatives. ICAR-Central Institute for Cotton Research (CICR), Nagpur. Pp. 1-42.
3. Reddy, Amarender A., Kriti Arpana Minz, Priyanka Meena, K. C. Sharma and P. K. Rai. 2025. Atlas of Invasive Insect Species: Status of Geographical Distribution and Economic Losses in India. ICAR-National Institute of Biotic Stress Management (ICAR-NIBSM), Raipur-493225, Chhattisgarh, INDIA. Pp. 1-106.
4. Reddy, Amarender A., Minz, K. A., Tiwari, V. L. and Rai, P. K. 2025. Atlas of Invasive Plant Pathogens: Status of Geographical Distribution and Economic Losses in India. National Institute of Biotic Stress Management (ICAR-NIBSM), Raipur-493225, Chhattisgarh, INDIA. Pp. 1-87.
5. P. Mooventhan, Hem Prakash Verma, Suman Singh, Uttam Singh, K. C. Sharma, Priyanka Meena, A. Amarender Reddy, P. Venkatesan, S. Senthil Vinayagam, Gopal Lal and P. K. Rai. 2025. Enhancing Agricultural Productivity among Smallholder Farmers in India through Agricultural Drone Services (Policy Paper No. 2/2025-2), ICAR-National Institute of Biotic Stress Management, Raipur and ICAR-National Academy of Agricultural Research Management. Pp. 1-32.
6. Priyanka Meena, Kriti Arpana Minz, K. C. Sharma, P. Mooventhan, N. Sivaramane, S. Senthil Vinayagam, A. Amarender Reddy, Gopal Lal and P. K. Rai (2025). Climate Change Effects on Insect Pests and Economic Losses in India (Policy Paper No. 3/2025). ICAR-National Institute of Biotic Stress Management, Raipur and ICAR-National Academy of Agricultural Research Management. Pp. 1-66.
7. Banda Sainath, A. Amarender Reddy, Barun Deb Pal, Anjani Kumar, Ujjwal Kumar, Anup Das and P. K. Rai. 2025. Distributional Consequences of U.S. Tariff Shocks on India's Economy: Insights from a Computable General Equilibrium Model (Policy Paper No. 04/2025), pp. 1-29. ICAR-National Institute of Biotic Stress Management, Raipur. ICAR-Research Complex For Eastern Region, Patna, and International Food Policy Research Institute, New Delhi.



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