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This study evaluates the economic implications of recent US tariff escalations, centered on the "7th and 27th August Tariff Shock", and examines India's strategic options in responding through unilateral reforms and prospective bilateral trade agreements with the United States. Using the Global Trade Analysis Project (GTAP) model, the paper simulates ten scenarios encompassing tariff shocks, India's unilateral tariff cuts of different intensity, and various designs of an India–US Free Trade Agreement (FTA). The results reveal that while unilateral tariff reductions yield moderate gains by improving input efficiency and competitiveness, the most substantial increases in India's GDP and welfare occur under reciprocal liberalization with the US. The Full FTA scenario delivers the highest overall benefits, driven by strong expansion in manufacturing, pharmaceuticals, and technology-intensive sectors. However, agricultural liberalization introduces volatility and welfare losses, underscoring the sector's political and economic sensitivity. A selective FTA excluding agriculture emerges as an optimal pathway—achieving welfare and output gains comparable to a full and comprehensive FTA while safeguarding India's rural economy.

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1 Introduction

Since President Donald Trump's second term began, India has adopted a conciliatory approach to trade with the US, slashing tariffs on items like high-end bikes and bourbon whiskey in February this year to ease U.S. concerns ahead of Prime Minister Modi's visit. Their meeting in February led to the launch of 'Mission 500', a joint goal to boost bilateral trade to $500 billion by 2030, and initiated talks on a bilateral/free trade agreement (BTA/FTA), with an interim or mini deal expected to happen soon. A BTA is a logical step forward, given that the U.S. has been India's top trading partner for four years, with trade reaching $132 billion in 2024–25. However, the full potential remains untapped due to high Indian tariffs and restrictive U.S. non-tariff measures. To succeed, the deal must address both tariff and non-tariff barriers and be built on mutual concessions, not one-sided compromises.

In a sharp turn, on 31st July, President Trump signed a new executive order announcing a rise in tariff rate for India from 10% to 25% to be effective from 7th August, and also an additional 25% as a penalty rate because of India's purchase of Russian oil. The penalty rates came into effect from 27th August, raising duties on Indian exports to more than 50%, making India the highest tariff-laden US partner. This was unexpected and surprising, as both parties were still negotiating for a comprehensive trade deal. This is even more surprising because India's stand against the US tariff overreach was conciliatory and not retaliatory. The sudden announcement of 25% tariff and the subsequent targeting of India with a further penal 25% tariff have affected the confidence of India in continuing with trade negotiations. After five rounds of talks had already taken place, the next round of negotiations scheduled to occur in India between the 25th and 29th of August was called off. Recently, however, leaders of both countries have announced that trade negotiations are continuing.

Without delving into the political aspects of the India-US trade negotiations, purely from an economic perspective, prima facie a Free Trade Agreement (FTA) between the two countries seems a logical step forward, given that the U.S. has been India's top trading partner for four years, with bilateral trade reaching $132 billion in 2024–25. The FTA may also significantly boost bilateral trade to $500 billion by 2030 as agreed upon between the two nations under 'Mission 500'. Though an FTA is one of the promising trade policy instruments, it may not always be beneficial for the contracting parties as its utility depends upon several

factors, including the severity of Rules of Origin, the number of preferential commodities, preferential tariff margins, and awareness of the traders etc. In the India-US context, several concerns arise that could affect the final outcome even if a deal fructifies.

The first one is the FTA modality. Trade negotiations are complex and time-consuming agreements, requiring enormous discussions on several issues to get a favourable and balanced deal for all contracting parties. But the recent US approach in this regard resembles a quick-food recipe. The recent trade agreements of the US with Japan, Korea, the EU, the Philippines, Vietnam, and Indonesia, mockingly called as 'Napkin Deal', have all been negotiated in a very short time without going into details. All these agreements are asymmetric, in which the US offered a flat tariff rate ranging between 15% and 20% and got full and absolute market access to the FTA partner's country in exchange.

The second pressing issue in the India-US trade negotiations is the arbitrary and forcible demands from the US. One of the pressing demands by the US is full market access for its agriculture and dairy products, which India is not comfortable with. India's stand in trade negotiations, both in bilateral and multilateral fora, has been protective of these sectors because of several economic, socio-cultural, and political factors, including food security, rural economy, employment of a large workforce in these sectors, inefficiency, and low incomes etc. A major concern for India is the high levels of agricultural subsidies in US (and in other developed countries), which makes it difficult for Indian farmers to compete against. India fears that such highly subsidized agricultural commodities from the US may bring higher price volatility and usurp the Indian market, which may become detrimental for the Indian agriculture sector. India's protective stand on its agriculture is also evident in the recently concluded FTA with the UK, wherein it has not provided market access to commodities such as dairy, apples, oats, and edible oils.

The third issue is the invisible presence of non-tariff barriers that may not allow Indian exporters to penetrate the US market. An FTA does trade liberalization on the tariff front, but it may not be effective on the non-tariff side. One such example in recent times is the rejection of 15 mango shipments over paperwork issues, costing Indian exporters nearly $500,000. To succeed, the deal must address both tariff and non-tariff barriers and be built on mutual concessions, not one-sided compromises.

Since the negotiations with the US are still on, and new tariff rates for In-

dian exports are in force, it is worthwhile to analyse the repercussions of these additional tariffs on the Indian economy. What should India do to safeguard its economic benefits? One obvious concern is the design of the India-U.S. trade agreement itself. An asymmetric agreement similar to the so-called Napkin Deals could undermine India's position, offering disproportionate benefits to the U.S. at India's expense. With the US looking aggressively for market access for its agricultural products, it becomes even more important for the policy makers and the negotiators to look at this issue very closely. Given India's socio-economic sensitivities in agriculture, will it benefit both countries to bypass agriculture in the ongoing trade negotiations?

Against this backdrop, the present study evaluates the implications of the U.S. tariff shocks and explores potential strategic responses for India. Using the Global Trade Analysis Project (GTAP) framework, it models three broad sets of scenarios: (i) the impact of US tariff escalation; (ii) the outcomes of India's unilateral tariff rationalization; and (iii) some alternative designs of a prospective India–US trade agreement. The analysis aims to provide evidence-based insights into how India can balance competitiveness, welfare gains, and sectoral sensitivities, particularly in agriculture, while negotiating a durable and mutually beneficial trade framework with the United States. In analysing these questions, the study considers the prevailing global turmoil in international trade following US tariffs that started on April 2nd, and the subsequent Napkin Deals that several countries have entered into with the US.

2 Research Questions and Objectives

The study investigates how the evolving structure of US tariff actions and India's policy responses, ranging from unilateral liberalization to full and selective trade deals, affect India's economic welfare, output, and sectoral dynamics. The analysis is anchored around the "27th August Tariff Shock", which is an additional 50% on India, and the subsequent design of potential India–US trade arrangements. The overarching objective of this study is to evaluate the economic implications of US tariff shocks and to identify an optimal trade strategy for India through quantitative scenario analysis using the GTAP model. Several research questions have been addressed in this study, which are as follows.

- How do US tariff shocks and retaliatory measures impact India's economy at both the aggregate and sectoral levels?

- Can India's unilateral tariff rationalization mitigate external shocks and strengthen its competitiveness?
- What are the economic outcomes of alternative India–US trade agreement designs, ranging from partial to full FTAs?
- How does the inclusion or exclusion of agriculture alter the distribution of benefits and political feasibility of an India–US trade deal?
- Which strategic pathway maximizes India's long-term welfare and GDP gains while preserving domestic policy space?

3 Data and Methodology

To analyze the impact of the trade escalation and the India-US trade deal on India, and bilateral trade relations with China, we use the standard Global Trade Analysis Project (GTAP) model and GEMPACK software suite. The GTAP model, which is a computable general equilibrium model, is a comparative-static, multi-region, and multi-sector model. The assumptions for this model include perfect competition and constant returns to scale. The bilateral trade is determined by the Armington assumption, which means that the imports are distinguished by their source as well.

The GTAP model is based on the concept of a circular economy, where a regional household represents a country; this household sells factor endowments to firms and receives income in lieu of this. Then, this household's income is spent according to the Cobb-Douglas function. Firms get revenue by selling their products in the domestic market and foreign market, and they pay returns to primary factors, import taxes, and domestic taxes. Each region is then linked to the other by international trade and investment flows. Since the firms use domestically produced and imported intermediate products as determined by the Armington function, a shock or a change in any part of the economy will affect the whole world economy. Some regions and sectors will have a direct impact, while others will experience it due to the economies' inter-sectoral linkages. After the shock, the world economy will again reach an equilibrium where, for each region, the difference between savings and net investment will equal the trade balance, and as a whole, the total exports of the world economy will be equal to total imports.

The GTAP model assumes full employment conditions of factors, as its default standard closure, but in this exercise, we've relaxed the full employment condition for skilled and unskilled workers as well as for capital to make this model more realistic. In other words, the labor and capital supply have been made endogenous in the model. This closure has been called unemployment closure in Burfisher (2021). We carry out several experiments by shocking product-specific bilateral tariff rates, involving India, the US, and other economies as well. All these experiments in our study use the Unemployment closure only.

We use the latest GTAP v11B dataset created by Aguiar et al. (2022), which takes 2017 as the base year. In this GTAP dataset, there are a total of 160 regions and 65 sectors, which have been aggregated initially into 20 regions and 15 sectors, respectively. The aggregation of the countries and sectors has been presented in Table 1 and 2. The five production factors are retained here as they are.

3.1 Scenario Description

Here, we describe the scenarios undertaken for this study. All scenarios have been grouped into three sets. The first set of scenarios evaluates the US tariff implications for India. The second set is about the impact assessment for India's unilateral policy actions. The last set examines the best negotiation strategy for the India-US trade agreement. The detailed description of all the scenarios has been provided below. Also, Table 3 tabulates the scenarios.

3.1.1 Set 1:

This set of simulations analyzes the impact of the US tariffs on the Indian economy, while considering the tariffs imposed by the US on other countries too.

- **S1 (2^{nd} April):** The impact of the 2nd April tariffs, which include a baseline tariff of 10% except metals, and 50% tariffs for metals for all countries, has been analyzed.
- **S2 (7^{th} August):** This is the '7th August' scenario, which takes into account the actual tariffs imposed by the US, effective from 7th August. India faces a 25% US tariffs. For other countries, Table 3 describes the tariff rates. Apart from the differentiated tariffs, this scenario considers the trade deals

of the US with Japan, Korea, the EU, the Philippines, the UK, Vietnam, and Indonesia. Metal tariffs of 50% for all countries are also in effect in this scenario.

- **S3 (7^{th} August + Penalty):** This simulation is the '7th August plus penalty' scenario, where the US imposes an additional 25% tariff on India, making India-specific tariffs to 50%. All other shocks are the same as in S2.

3.1.2 Set 2:

In this set of simulations, we propose two unilateral trade policy options for India to deal with tariff threats. These simulations are designed to evaluate the potential of unilateral tariff reforms by India on improving its trade competitiveness and overall welfare.

- **S4 (UTL-25):** In this unilateral tariff liberalization (UTL), India cuts import duties by 25% for all products and countries. All other trade shocks are the same as those mentioned in scenario S3, including a 50% US tariff on India.
- **S5 (UTL-50):** In this scenario, India cuts import duties by 50% for all products and countries. All other trade shocks are the same as those mentioned in scenario S4.

3.1.3 Set 3:

This set of simulations explores the design of the prospective India-US trade agreement. Since, in FTA, the point of friction between India and the US is the inclusion/exclusion of agri-products, therefore, we investigate this issue in detail here.

- **S6 (Napkin Deal):** We explore the option of a napkin deal (or an asymmetric trade agreement) where the US applies 15% tariffs on Indian products while India provides full market access to the US at zero duty. Apart from India, the tariff shocks related to other countries are the same as mentioned in S2.
- **S7 (Full FTA):** Instead of having a napkin trade deal, both India and the US agree to accord a full bilateral comprehensive trade agreement for all products at zero duty. Rest is the same as mentioned in scenario S2.

- **S8 (Full FTA excluding US Agriculture):** In this experiment, all Indian goods, including agri-goods, get zero duty treatment by the US, whereas the US agri-goods are excluded from the tariff liberalization by India; and the non-agricultural goods of the US are provided preferential treatment by India. India maintains MFN tariff rates for the US agricultural goods. Rest is the same as mentioned in scenario S2.
- **S9 (Full FTA excluding Indian Agriculture):** In this trade deal scenario, the US products, including agricultural goods, are allowed preferential market access in India, meaning all the US commodities, including agri-goods, are negotiated and provided zero tariff treatment by India. On the other hand, India gets zero duty treatment by the US on all goods except the agri-goods. India's agri-goods still face 50% import duty by the US. Rest is the same as mentioned in scenario S2.
- **S10 (Full FTA excluding Agriculture):** In this trade deal scenario, both sides agree not to include agricultural goods in negotiations. India applies the MFN duties on the US agri-goods while the US applies 50% tariffs on Indian agri-goods. And the rest is the same as mentioned in scenario S2.

4 Results and Discussion

In this section, we discuss the results of the simulations mentioned above. Several macro variables, such as Sectoral output, endowment change, total exports and imports, bilateral exports and imports, agricultural exports and imports, welfare, and change in GDP, have been taken. We provide a detailed discussion of each variable as follows.

4.1 Sectoral Output

The first set of Table 4 captures the global tariff escalation initiated by the United States. In scenario S1, which applies a uniform 10% baseline tariff across almost all countries and a higher 50% tariff on metals, India's output remains broadly neutral. There are minor positive effects in manufacturing sectors such as metals, machinery and electronics, and transport equipment. Since the tariff burden is evenly distributed across trading partners, India does not lose its competitiveness altogether; in fact, uniform tariffs across all countries benefit India by 0.6% overall.

In scenario S2, where the US imposes differentiated rates and India faces a 25% tariff, most Indian manufacturing and agro-processing sectors contract, particularly textiles and leather, pharmaceuticals, and processed food. The adverse effects intensify in scenario S3 when an additional 25% penalty is applied on Indian exports, with export-oriented sectors showing larger output losses. Overall, India's total output declines by about one percentage point under S2 and 0.6% under S3, indicating moderate but uneven vulnerability across sectors.

The second set of Table 4 explores India's possible response through unilateral tariff cuts of 25% and 50%, respectively, in S4 and S5. Both scenarios generate output recovery across all sectors with respect to scenario S3, suggesting that lower input costs and improved access to intermediates may help offset external shocks. Gains are more visible in manufacturing industries, especially textiles and leather, chemicals, pharmaceuticals, and machinery and electronics, where output increases by more than 3% under a 50% unilateral tariff cut (S5). The overall economy-wide output rises by 1.2% in S4, and 2.6% in S5, showing that unilateral liberalization can be an effective counter-strategy to deal with the external trade restrictions.

Set 3 represents different designs of the India–US trade agreements, ranging from limited deals to comprehensive free trade agreements (FTAs). In the 'Napkin Deal' (S6), where the US cuts tariffs on Indian goods to 15% and India grants full duty-free access, manufacturing output rises sharply, especially in metals, textiles and leather, chemicals, and pharmaceuticals. The overall output growth in this scenario is around 2% compared to what was under S3.

Under the 'Full FTA' (S7), complete tariff elimination produces strong positive effects across all major sectors. The largest gains occur in pharmaceuticals (20.8%), textiles and leather (13.2%), and metals (9.3%), reflecting India's comparative advantage in these industries. Also, a strong aggregate rebound of 6% is observed in the full FTA scenario.

Though both S8 and S9 are output-enhancing scenarios, S9 outweighs S8 in terms of total output expansion. When Indian agriculture is provided free market access in the US, the agri-sector output expands because of enhanced demand in the US. The grain-crops, meat and livestock, and processed food all expand because of zero duty in the US (S8). When the US agricultural commodities are allowed in India, with Indian agriculture facing high tariffs (S9), the agri-sector output declines as the domestic consumers may switch to the US commodities, while the Indian exports may also face tough restrictions in the US market, lead-

ing to low output. The processed food sector may suffer more in comparison to other sectors.

One interesting pattern is observed with respect to S8 and S9. The total output, as well as the manufacturing sector growth, is higher in S9 than in S8. When the US gets full market access, it provides cheaper intermediate inputs, lowering costs for the manufacturing industry and stimulating output. At the same time, a 50% tariff treatment of Indian agriculture (50%) in the US reduces incentives to expand the low-productivity farming sector; labour and capital might shift toward manufacturing and services where returns and export opportunities are larger. This reallocation raises aggregate productivity and non-agricultural output.

Though the scenario S10 does not include the agri-sector from either side, still provides better results than a Napkin Deal. A growth of 5.5% in total output surpasses the output in scenario S8, and inches towards S7, the scenario of full FTA.

4.2 Employment

In scenario S1 of Table 5, India gains because of the symmetry of tariff imposition across the US partners, but it loses in S2 and S3. In S2, India loses in both labour and capital compared to the April 2nd tariffs, by around 1%. When India faces another 25% tariff in S3, it further loses around 0.6% both in capital and labour, with respect to scenario S2. The reason behind this contraction is straightforward. A high tariff barrier in the US will stifle the demand for Indian commodities from US consumers and industries, leading to contraction in output (as evident in Table 4). The loss in output will force the firms in India to operate at a suboptimal level, leading to a loss in capital and labour employment. Since land and natural resources are fixed in the model, there are no changes observed here.

All the factors, except land and natural resources, show a positive growth in set 2 scenarios in Table 5. Scenario S4 shows that India may gain a positive demand in the factor endowment when it cuts tariffs unilaterally by 25% for all trading partners. And, when the tariff cut is deeper, like 50% as shown in S5, India gains more. Reducing tariffs across the products will provide a cheaper intermediate and raw input range for the industries in India, and also it will benefit the end-users, as the finished products will also be cheaper for them.

Across all scenarios of trade deals in set 3, the demand for factors is positive

and generally higher than the set 2 scenarios. Though the napkin deal (S6) also registers a positive growth, it is the least of all other deals. The gains of scenario S9, deal without Indian agri, surpass those of scenario S7, which is full FTA. On the same lines, S10 is comparable to S8, where the Indian agri-sector has been negotiated. This pattern, similar to what has been observed for Output (Table 4), shows the persisting inefficiencies in the Indian agricultural sector. A deal without the Indian agri-sector (S9, S10) is better than a deal including this sector.

4.3 Aggregate Exports

In the first set of scenarios (S1–S3) of Table 6, representing the US tariff shocks, India's aggregate exports decline moderately, with particularly sharp contractions in primary sectors such as extraction (–17% in S1) and agro-based products. These losses are driven by reduced external demand following the imposition of the US tariffs and a general slowdown in global demand and trade volumes. In S2, taking S1 as the base scenario, the aggregate exports even further decline by 2.3%, and again go down by 1.3% when another 25% (total 50%) tariff is imposed on India. However, some improvement is observed in S2 and S3 in particular sectors such as agrifood, extraction, metals, and services. These improvements are attributed to the supply chain effects arising from the limited trade deals of the US with its partners. When the US strikes a deal with any country, the US will enhance its demand from that country, which will subsequently increase India's exports of raw and intermediate materials.

In Set 2 scenarios (S4–S5), where India responds through unilateral tariff reductions, export performance improves markedly across all sectors. Lower import duties reduce input costs and enhance competitiveness, allowing exports to rise by 3.1% in S4 and 6.7% in S5 overall. The benefits are particularly visible in manufacturing industries such as chemicals, textiles and leather, machinery and electronics, and metals, which register export growth between 8% and 12% in S5. This demonstrates that even one-sided liberalization by India can offset some of the losses arising from external tariff shocks by stimulating domestic production and competitiveness.

The most pronounced export gains occur in the third set of scenarios (S6–S10), which capture various configurations of bilateral trade agreements between India and the US. The 'Napkin Deal' (S6), involving partial tariff reduction by the US, boosts aggregate exports by 5.2%, with processed food, textiles, metals, and

pharmaceuticals showing double-digit increases. The 'Full FTA' (S7) produces the second strongest overall response, with total exports surging by 13.2%. Sectors with a strong comparative advantage, such as pharmaceuticals (58.6%), textiles and leather (43.6%), and metals (37.4%), drive these gains, reflecting India's export specialization in skill- and technology-intensive industries that benefit from reciprocal zero-tariff access and expanded market access.

Scenarios S8 and S9, related to the asymmetric FTA variant, of Table 6 provide some insights about how the inclusion of the agricultural sector in trade negotiations between the two countries will determine the economic outcomes. In S8, where Indian agricultural products enjoy duty-free access to the US but US agriculture remains subject to MFN tariffs, total exports rise by 11.5%, with processed food, pharmaceuticals, metals, and textiles performing strongly due to expanded agricultural export linkages. In contrast, S9, which grants the US full market access while Indian agriculture faces higher tariffs, delivers an even larger aggregate export increase of 13.4%. Although agricultural exports decline sharply in this scenario (e.g., Grain_Crops –15.3%, Meat and Livestock –23.4%), non-agricultural sectors expand far more robustly: pharmaceuticals (60.7%), metals (39%), machinery (14.7%), and other manufactures (25.1%).

This pattern suggests that a comprehensive liberalization is fundamental for higher growth. In S9, which provides full market access for the US commodities in India, agricultural products also get cheaper and more accessible, lowering input costs for several manufacturing industries. Hence, just by including the US agricultural products in the negotiations, India's competitiveness rises, and so do the exports. But this does not happen in S8 suggesting that India will not gain much from greater market access to the US for its agricultural products. Even the scenario S10, which does not include the agri-sector from either side, registers a higher total export growth than the scenario S8.

4.3.1 Exports of India to the US

The bilateral export results, shown in Table 7, highlight a clear trade dynamics across policy phases. Under the initial tariff shocks (S1–S3), India's exports to the US contract sharply across almost all sectors, with the steepest declines in extraction, metals, and labour-intensive manufacturing such as textiles and machinery. These outcomes reflect the direct impact of higher US tariffs, reduced competitiveness, and a general slowdown in bilateral trade. When India undertakes unilateral tariff cuts (S4–S5) in Set 2, export flows begin to recover

modestly, driven by cheaper imported inputs and improved production efficiency. The 'Napkin Deal' (S6), featuring partial tariff reductions by the US and full access granted by India, delivers exceptionally large percentage increases in several sectors—most notably textiles, machinery, transport equipment, and pharmaceuticals, due to a strong rebound effect from previously suppressed and low trade volumes.

The Full FTA (S7) produces the highest and most broad-based expansion, with technology- and capital-intensive sectors such as pharmaceuticals, machinery, and textiles recording exponential growth as reciprocal zero tariffs remove market-entry barriers. In the asymmetric cases, the outcomes diverge: S8, which grants Indian agriculture duty-free access to the US while keeping US farm goods at MFN rates, results in a concentrated agricultural export boom, especially in grains, meat, and processed food. Conversely, S9, where agriculture remains penalized but non-agricultural trade is fully liberalized, shifts the gains decisively toward manufacturing, while agricultural exports fall. Overall, the results confirm that the composition of liberalization matters greatly. Agricultural preferences create narrow, sector-specific benefits, whereas comprehensive non-agricultural liberalization delivers broader, sustained growth across India's high-value and technology-driven export sectors. S10, which does not include the agri-sector at all, also produces modest results for bilateral exports.

4.4 Aggregate Import

In the first set of simulations (S1–S3) of Table 8, India's total imports contract slightly by around 2% on average. The contraction is broad-based across all sectors, reflecting weakened export activity due to subdued US and global demand as observed in Table 6, and hence, reduced production exhibited in Table 4, which drives lower input requirements. Primary and manufacturing sectors such as textiles, chemicals, and extraction record small declines, while import-sensitive sectors like machinery and processed food experience moderate drops. These outcomes reflect subdued domestic industrial demand during the trade shock period, with reduced access to imported intermediates and consumer goods.

In Set 2 of Table 8, where India undertakes unilateral tariff liberalization, the import response turns sharply positive with reference to the scenario S3. Lower import duties stimulate demand for intermediate goods and capital equipment, boosting aggregate imports by 1.8% under a 25% tariff cut (S4) and by 3.8%

under a 50% cut (S5). This expansion is most visible in intermediate and consumption goods such as processed food (9.4%), textiles (8.9%), and rubber and plastics (8.0%). These results indicate that domestic producers respond positively and strongly to cheaper imported inputs, using them to enhance competitiveness and support the export recovery observed in the same scenarios in Table 6.

The third set of scenarios (S6–S10) shows the most pronounced increases in India's imports. Under the 'Napkin Deal' (S6), aggregate imports rise by 4.2%, led by large inflows of processed food (10.1%), and pharmaceuticals (4.5%). The 'Full FTA' (S7) exhibits the strongest import surge of approximately 14%, as complete bilateral tariff elimination allows broad-based market access for US and third-country products. Import growth is particularly strong in high-demand sectors such as pharmaceuticals (16.4%), machinery and electronics (15.9%), and processed food (20.1%), reflecting cheaper intermediate inputs and consumer products under full trade liberalization.

The asymmetric FTA variants (S8–S10) maintain high import growth but exhibit subtle differences depending on agricultural treatment. In S9, agricultural imports rise significantly, Grains_Crops (20.6%), Meat and Livestock (25.6%), and processed food (19%), driving total imports up by 13.7%, which is slightly higher than the scenario S8. In contrast, the 'FTA without Agriculture' (S10) moderates total import growth slightly (13.2%) as both partners retain protection on agricultural trade.

4.4.1 Imports of India from the US

Table 9 shows India's aggregate bilateral imports from the US under different scenarios. India's imports from the US decline sharply across all categories, with the steepest drops in metals (–43.7%), textiles (–32.6%), and machinery (–40.7%). These reductions stem from the tariff-induced contraction in bilateral trade, which subdued India's bilateral exports to the US and weakened domestic industrial demand for US goods. As the US tariffs intensified and India faced additional penalties, import volumes fell further, particularly in intermediate and capital goods, reflecting the slowdown in production linkages between the two economies.

India's unilateral tariff cuts in the second set of scenarios (S4–S5) reverse this trend. Imports begin to rise modestly, with total bilateral imports increasing by 3.3% in S4 and 7.0% in S5. Sectors such as processed food, textiles, and

chemicals show stronger growth as lower domestic tariffs reduce input costs and expand sourcing from the US. This phase highlights India's reliance on US intermediate and technology-intensive goods, especially when domestic trade liberalization happens.

The effects become far more pronounced under the bilateral deal scenarios (S6–S10), where market access deepens and reciprocity expands. The partial 'Napkin Deal' (S6) leads to a dramatic 46.3% increase in total imports, with massive surges in food-related categories such as processed food (614.7%), meat and livestock (218.3%), and grain_crops (67.8%) as India grants full duty-free access to US products. The Full FTA (S7) amplifies this trend, pushing aggregate imports up by 63.6% as trade liberalization across all sectors allows US exporters to fully penetrate India's market. Manufacturing sectors like machinery (107%), metals (97.3%), and chemicals (75.5%) experience the largest gains, reflecting supply-chain integration.

In S8, the surge in agri-food imports moderates overall growth to 44.2%. In contrast, S9 yields almost the same overall expansion (62.5%) as the full FTA, as it grants full market access to the US commodities, including the agri-sector. The S10 yields slightly lower import growth (45.1%), reflecting the dampening effect of excluding agricultural trade altogether. In other words, S10 may be a desirable deal design as it protects the Indian agricultural sector totally, and at the same time, the non-agri sector benefits. S10 records the lowest total import of all trade deal variants.

4.5 Agricultural Exports of India

India's aggregate agricultural exports exhibit a clear transition across the policy scenarios in Table 10. Under the first set (S1–S3), agricultural exports fall sharply across all sub-sectors. Total exports decline by about 5% in S1, driven by steep contractions in processed food and livestock products as global demand slowdown reduces demand for India's products. Even in S2 and S3, with some preferential adjustments of the US with its trading partners, the agricultural export of India remains subdued due to weak global demand and higher trade costs.

With India's unilateral tariff liberalization in the second set, agricultural exports show modest recovery. Lower input and production costs enhance competitiveness, pushing total exports up by 1.3% under a 25% cut and by 3% under a 50% cut. Gains are relatively broad-based, led by processed food and meat

exports, reflecting the positive spillover of lower import duties on production efficiency and export capacity.

Scenarios in Set 3 (S6–S10) highlight how the structure of trade agreement determines agricultural outcomes. Partial liberalization under the Napkin Deal (S6) boosts exports slightly (4%), mainly through processed food, while the Full FTA (S7) results in a marginal decline (–0.9%) as greater import competition offsets export gains. The asymmetric cases (S8–S10) amplify this effect: when India opens its market to US agriculture while its own exports face barriers, agri exports fall significantly, with losses deepening to –13.7% in S9. Since India enjoys agricultural market access in S8, its total agri exports moderate compared to S9 and S10. Overall, moderate liberalization benefits Indian agriculture, but full or unbalanced opening with the US reduces competitiveness and shifts resources toward more dynamic non-agricultural sectors.

4.5.1 Agricultural Exports of India to the US

As evident in Table 11, India's agri-exports to the US collapse across all categories in Set 1. Total exports fall by around 50% in S3, with particularly sharp declines in meat and processed food products. The contraction reflects the erosion of price competitiveness and the loss of market access under the US tariff regime, which significantly dampens bilateral agri trade.

In the second set (S4–S5), India's unilateral tariff reductions lead to a modest rebound in agricultural exports. Total exports rise by 1.7% in S4 and 3.8% in S5 as domestic cost reductions and efficiency gains enhance the competitiveness of Indian producers. Although these improvements are relatively small, they indicate that India's internal liberalization can partially offset external trade barriers, even without any reciprocity.

Under the partial Napkin Deal (S6), India's agri-exports to the US surge by 224% due to the low base effects of scenario S3. The Full FTA (S7) magnifies this expansion, increasing total agricultural exports by over 430%, with large gains in all three sectors. Scenario S8, confirms that preferential US market access is the main driver of India's agricultural export boom. In contrast, scenarios S9 and S10, where Indian agriculture faces tariff disadvantages or is excluded, result in steep declines (–10% to –11%). Overall, India's agri-export performance improves dramatically only under reciprocal or preferential liberalization.

4.6 Agricultural Imports of India

Set 1 of Table 12, representing the events of US tariff escalation, shows agricultural imports decline modestly across all categories. Total imports fall by about 1–3%, reflecting weaker bilateral trade flows and reduced domestic demand for imported grains, meat, and processed food. The contraction in imports during this phase largely mirrors the overall trade slowdown caused by higher global protection and disrupted supply chains.

In the second set (S4–S5), where India undertakes unilateral tariff reductions, agricultural imports rise sharply. With lower duties reducing consumer prices and input costs, total agricultural imports increase by 5.4% under a 25% tariff cut and by nearly 12% under a 50% cut. Imports expand most in grains and processed food, reflecting higher domestic demand and greater integration into global agri-supply chains. This phase indicates that even without reciprocal concessions, India's domestic liberalization substantially enhances agricultural import volumes.

The third set (S6–S10) of Table 12, which captures bilateral liberalization outcomes, leads to a significant surge in agricultural imports. Under the partial Napkin Deal (S6), total imports rise by 9.1% with a base of S3, while the Full FTA (S7) generates the strongest increase of over 21%, driven by large inflows of US grains, meat, and processed food. In the asymmetric scenarios, outcomes vary by the direction of agricultural concessions. When the US gains full market access in India, agricultural imports rise sharply (20%), while import growth moderates under S10, where agriculture remains excluded. Overall, India's agricultural imports grow consistently with greater market opening.

4.6.1 Agricultural Imports of India from the US

As shown in Table 13, bilateral imports fall by nearly 12% in S1 and remain subdued through S3, with grains, meat, and processed food all showing negative growth. The contraction reflects weaker bilateral trade flows and limited US market penetration under the protectionist phase.

In the second set (S4–S5), India's unilateral tariff reductions stimulate a significant rebound in agri-imports. Total imports rise by 12.9% in S4 and over 31% in S5, driven by strong growth in processed food and meat products. Lower domestic tariffs make US agricultural products more competitive, expanding India's import demand, especially for high-value food and livestock items. This

indicates that domestic liberalization alone can meaningfully strengthen agricultural trade links, even without reciprocal concessions.

Under the partial Napkin Deal (S6), imports skyrocket by 264%, while the Full FTA (S7) further amplifies them to over 300%, driven primarily by processed food (688%) and meat (280%). The asymmetric scenarios highlight how the direction of concessions shapes outcomes: when the US gains full market access in India, imports surge by 300%, whereas in S10, where agriculture is excluded from the FTA, import growth moderates to 16.6%. Overall, the results show that granting agricultural market access to the US leads to an immediate and substantial surge in imports, particularly in processed and high-value food products, underscoring the sensitivity of India's agri-market to reciprocal liberalization with the US. Hence, S10, a scenario without granting preferential access to the agri-sector on either side, may be a desirable trade deal design, as it would not hurt India's inefficient agricultural market.

4.7 Welfare Impacts

India's welfare trajectory, shown in the Table 14, across the scenarios reflects a clear shift from early losses under global tariff shocks to substantial gains under reciprocal trade liberalization. In the first set (S1–S3), India's welfare declines sharply, falling from a small positive balance ($10.1 billion) in S1 to deep losses of $25 billion in S2 and then further additional $14 billion in S3. These losses capture the combined effect of reduced export competitiveness, trade diversion away from Indian products, and higher input costs from disrupted supply chains. The results suggest that under a global protectionist environment, India suffers proportionally more than advanced economies, given its export dependence and relatively limited domestic protection against external shocks.

With the move to unilateral tariff reductions (S4–S5), India's welfare position improves dramatically. Welfare gains rise to $23.5 billion in S4 and nearly double to $49.7 billion in S5, showing that domestic liberalization stimulates efficiency and enhances consumer welfare even without reciprocal concessions. Cheaper intermediate imports, expanded output in manufacturing, and stronger export recovery together drive these positive outcomes. The gains are entirely market-led, indicating that unilateral reform can serve as a stabilizing domestic policy tool in response to global tariff shocks.

The most pronounced welfare improvements happen under the bilateral negotiation set. Partial liberalization under the Napkin Deal (S6) raises India's

welfare to $37.3 billion, while the Full FTA (S7) produces the largest welfare gain of $139.5 billion. These gains are sustained in S9 as well, where welfare remains at $140.8 billion, indicating that excluding Indian agricultural exports (while keeping non-agricultural sectors fully open) does not significantly reduce the aggregate benefit. Notably, S10, representing an FTA without agriculture, yields welfare gains of $127.3 billion, only slightly below the full FTA, suggesting that excluding agriculture helps avoid potential domestic distortions while still capturing the core benefits of trade liberalization. For the United States, welfare also improves sharply under the liberalization scenarios, rising from severe losses in S1–S3 to substantial gains in S6–S9 (peaking at $229.3 billion under S7), reflecting the mutual efficiency and liberalization and scale effects of reciprocal tariff elimination.

The same pattern has been depicted in the Figure 1.

4.8 Change in GDP

India's GDP trajectory closely mirrors its welfare pattern, as exhibited in the Table 15. In the first set (S1–S3), India's GDP falls from a marginal gain of 0.55% in S1 to further losses of 0.96% in S2 due to additional 25% US tariffs, and then additional loss of 0.56% in S3, reflecting the adverse effects of the US tariff hikes on the Indian economy.

Once India implements unilateral tariff cuts (S4–S5), the domestic economy rebounds sharply, with GDP rising by 1.24% in S4 and 2.64% in S5. Lower import duties improve input availability and production efficiency, supporting a faster recovery led by manufacturing and export-oriented sectors. The results reaffirm that even unilateral liberalization can enhance output by reducing domestic distortions and improving resource allocation.

Under the bilateral liberalization set (S6–S10), India's GDP gains strengthen substantially. The Napkin Deal (S6) lifts GDP only by 1.66%, while the Full FTA (S7) produces the highest increase at 5.8%, underscoring the strong growth effects of comprehensive reciprocal access. Similar results in S9 (5.94%) and S10 (5.23%) suggest that excluding agriculture from the agreement does not significantly diminish India's overall gains. For the United States, GDP follows a parallel pattern—contracting under tariff shocks and expanding strongly under liberalization. Overall, India's GDP results confirm that deep non-agricultural liberalization with the US maximizes growth potential, while an "FTA without agriculture" (S10) offers an optimal balance, delivering high GDP gains without

the volatility and adjustment pressures linked to agricultural trade exposure of the Indian market.

The same pattern has been depicted in the Figure 2.

5 Conclusion

The results from the GTAP simulations clearly demonstrate that India's trade and welfare outcomes are highly sensitive to the structure and depth of its trade relations with the United States. The analysis reveals three distinct patterns in India's economic response: contraction under protectionist shocks, moderate gains under unilateral reforms, and strong expansion under bilateral FTA with the US. Under global tariff escalation, India's economy and exports face substantial losses due to weakened global demand and market access, higher costs, and trade diversion. However, when India adopts unilateral tariff reductions, the economy rebounds, showing that domestic liberalization and improved access to intermediate goods can enhance efficiency, reduce production costs, and strengthen export competitiveness even when tariffs are high globally and there are no reciprocal concessions.

Despite these gains, unilateral liberalization alone has limitations in scope and sustainability. The study finds that the most significant increases in India's GDP, welfare, and trade flows occur under bilateral trade agreements with the United States, where reciprocal tariff elimination generates large-scale efficiency gains and export expansion. The 'Full FTA' scenario delivers the strongest results across almost all indicators, reflecting India's ability to leverage its comparative advantages in manufacturing, pharmaceuticals, machinery, and technology-driven industries. These sectors benefit most from expanded market access, reduced trade costs, and larger economies of scale. The welfare gains for both India and the United States under this arrangement confirm that deeper bilateral engagement can be mutually beneficial, fostering growth, innovation, and value-chain integration between the two economies.

However, the analysis also highlights that comprehensive liberalization brings structural challenges, especially for India's agricultural sector. Full agricultural market opening would expose Indian farmers and processors to intense competition from large-scale, subsidized US agribusinesses. Given the political and livelihood sensitivities surrounding Indian agriculture, such exposure could create social and economic adjustment pressures. This makes the 'FTA without

Agriculture' (S10) scenario particularly compelling. The results show that excluding agriculture from the deal does not significantly reduce India's overall welfare or GDP gains; both remain close to the full FTA outcomes. By focusing liberalization on non-agricultural sectors, this selective approach preserves India's domestic agricultural safeguards while capturing the majority of trade and efficiency benefits through industrial and services integration with the US.

The findings, therefore, suggest a nuanced strategy for India's trade diplomacy. While continuing gradual tariff rationalization can enhance competitiveness and signal reform intent, India's long-term economic interests are best served through a calibrated and comprehensive trade agreement with the United States. Such a deal should prioritise high-value, employment-intensive, and technologically advanced sectors, while maintaining flexibility in agriculture and other politically sensitive areas.

In essence, the study underscores that India's optimal path lies not in isolation or one-sided openness, but in strategic liberalization through a well-negotiated bilateral trade deal with its trading partners, including the US. A pragmatic FTA that excludes agriculture can achieve a "best of both worlds" outcome, stimulating industrial growth and welfare gains comparable to full liberalization, while safeguarding the rural economy. Such a strategy aligns economic opportunity with political feasibility, paving the way for a durable and mutually beneficial India–US economic partnership.

Tables

No.	New Code	Comprising regions
1	USA	United States of America.
2	Korea	Republic of Korea.
3	Japan	Japan.
4	EU	Austria; Belgium; Bulgaria; Croatia; Cyprus; Czechia; Denmark; Estonia; Finland; France; Germany; Greece; Hungary; Ireland; Italy; Latvia; Lithuania; Luxembourg; Malta; Netherlands; Poland; Portugal; Romania; Slovakia; Slovenia; Spain; Sweden.
5	China	China.
6	Canada	Canada.
7	Mexico	Mexico.
8	India	India.
9	Brazil	Brazil.
10	UK	United Kingdom of Great Britai.
11	SAfrica	South Africa.
12	Russia	Russian Federation.
13	Bangladesh	Bangladesh.
14	Thailand	Thailand.
15	Cambodia	Cambodia.
16	Malaysia	Malaysia.
17	Philippines	Philippines.
18	Vietnam	Viet Nam.
19	Indonesia	Indonesia.
20	RestofWorld	Australia; New Zealand; Rest of Oceania; China, Hong Kong SAR; Mongolia; Taiwan Province of China; Rest of East Asia; Brunei Darussalam; Lao People's Democratic Republ; Singapore; Rest of Southeast Asia; Afghanistan; Nepal; Pakistan; Sri Lanka; Rest of South Asia; Rest of North America; Argentina; Bolivia (Plurinational State o; Chile; Colombia; Ecuador; Paraguay; Peru; Uruguay; Venezuela (Bolivarian Republic; Rest of South America; Costa Rica; Guatemala; Honduras; Nicaragua; Panama; El Salvador; Rest of Central America; Dominican Republic; Haiti; Jamaica; Puerto Rico; Trinidad and Tobago; Caribbean; Switzerland; Norway; Rest of EFTA; Albania; Serbia; Belarus; Ukraine; Rest of Eastern Europe; Rest of Europe; Kazakhstan; Kyrgyzstan; Tajikistan; Uzbekistan; Rest of Former Soviet Union; Armenia; Azerbaijan; Georgia; Bahrain; Iran (Islamic Republic of); Iraq; Israel; Jordan; Kuwait; Lebanon; Oman; Palestine; Qatar; Saudi Arabia; Syrian Arab Republic; T rkiye; United Arab Emirates; Rest of Western Asia; Algeria; Egypt; Morocco; Tunisia; Rest of North Africa; Benin; Burkina Faso; Cameroon; C te d'Ivoire; Ghana; Guinea; Mali; Niger; Nigeria; Senegal; Togo; Rest of Western Africa; Central African Republic; Chad; Congo; Democratic Republic of the Con; Equatorial Guinea; Gabon; South-Central Africa; Comoros; Ethiopia; Kenya; Madagascar; Malawi; Mauritius; Mozambique; Rwanda; Sudan; United Republic of Tanzania; Uganda; Zambia; Zimbabwe; Rest of Eastern Africa; Botswana; Eswatini; Namibia; Rest of Southern African Custo; Rest of the World.

Source: Authors

Table 1: Aggregation of countries

No.	New Code	Description	Comprising Sectors
1	GrainsCrops	Grains and Crops	Paddy rice; Wheat; Cereal grains nec; Vegetables, fruit, nuts; Oil seeds; Sugar cane, sugar beet; Plant-based fibers; Crops nec; Processed rice.
2	MeatLstk	Livestock and Meat Products	Bovine cattle, sheep and goats; Animal products nec; Raw milk; Wool, silk-worm cocoons; Fishing; Bovine meat products; Meat products nec.
3	Extraction	Mining and Extraction	Forestry; Coal; Oil; Gas; Minerals nec.
4	ProcFood	Processed Food	Vegetable oils and fats; Dairy products; Sugar; Food products nec; Beverages and tobacco products.
5	Chemicals	Chemicals	Chemical products.
6	Tex_Lea	Textiles and Clothing and leat	Textiles; Wearing apparel; Leather products.
7	RubPlast	Rubber and Plastics	Rubber and plastic products.
8	Metals	Metals and Products	Ferrous metals; Metals nec; Metal products.
9	Pharma	Pharmaceuticals	Basic pharmaceutical products.
10	Mach_Elec	Machinery and Electrical	Electrical equipment; Machinery and equipment nec.
11	Trans_Equp	Transport equipments	Transport equipment nec.
12	Other_Mnf	Light Manufacturing	Wood products; Paper products, publishing; Petroleum, coal products; Mineral products nec; Computer, electronic and optic; Motor vehicles and parts; Manufactures nec.
13	Util_Cons	Utilities and Construction	Electricity; Gas manufacture, distribution; Water; Construction.
14	TransComm	Transport and Communication	Trade; Accommodation, Food and servic; Transport nec; Water transport; Air transport; Warehousing and support activi; Communication.
15	OthServices	Other Services	Financial services nec; Insurance; Real estate activities; Business services nec; Recreational and other service; Public Administration and defe; Education; Human health and social work a; Dwellings.

Source: Authors

Table 2: Aggregation of sectors

Code	Referece for comparison	Name	Description
S0	NA	BASE	Pre-Trump - GTAP Base
S1	BASE	2nd April	10% tariff (called baseline tariff) for all countries/regions except the metals sector. For the metals, 50% tariff has been imposed for all partner countries of the US. (Though the US had announced differential tariff rates for each country, but provided a moratorium and instead implemented the baseline tariff only for almost every country- US Executive Order no. 14257)
S2	2nd April	7th August	Deal rates for countries with a deal; Actual announced rates for all others. For India, 25% has been implemented. Others: CHN (10%), BRA (50%), ZAF (30%), RUS (15%), BGD (20%), THA (19%), KHM (19%), MYS (19%), RoW (15%). Deal countries: JPN (15%), KOR (15%), EU (15%), PHL (19%), UK (10%), VNM (20%), IDN (19%). Metal tariffs have been maintained at 50% for all countries as these tariffs under Section 232 are still active, even for the countries that have done a deal with the US. (https://www.whitehouse.gov/presidential-actions/2025/07/further-modifying-the-reciprocal-tariff-rates/)
S3	7th August	7th August + IND Penalty	7th August + 25% penalty on India. So in this scenario, India is facing (25%+25%=50%) tariff. Rest is the same as the S2 scenario.
S4	7th August + IND Penalty	UTL-25	(7th August + IND Penalty) + India announces unilateral 25% cut for all countries all products
S5	7th August + IND Penalty	UTL-50	(7th August + IND Penalty) + India announces unilateral 50% cut for all countries all products
S6	7th August + IND Penalty	Napkin deal	(7th August + IND Penalty) + Tariff reduction for IND to 15% by the US for all commodities, including metals; while India provides full market access to the US commodities at 0%.
S7	7th August + IND Penalty	Full FTA	(7th August + IND Penalty) + IND and US bilateral comprehensive trade agreement at 0% tariff for all products.
S8	7th August + IND Penalty	Full FTA excluding US Agriculture	(7th August + IND Penalty) + IND and US bilateral 0% tariff on all non-agri products; MFN tariff on US agri products while 0% on IND agri-goods by the US
S9	7th August + IND Penalty	Full FTA excluding Indian Agriculture	(7th August + IND Penalty) + IND and US bilateral 0% tariff on all non-agri products; 0% tariff on US agri products, but US maintains 50% tariff on IND agri
S10	7th August + IND Penalty	Full FTA excluding Agriculture	(7th August + IND Penalty) + IND and US bilateral 0% tariff on all non-agri products; MFN tariff on US agri products while the US levies 50% on IND agri-goods

Source: Authors

Table 3: Scenarios and their description

	Set 1			Set 2		Set 3				
Output	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
GrainsCrops	0.0	-0.4	-0.3	0.2	0.4	0.7	2.0	1.9	1.7	1.7
MeatLstk	0.3	-0.7	-0.4	0.7	1.6	0.9	3.5	3.2	3.4	3.1
Extraction	-1.6	0.2	0.1	0.7	1.5	0.5	0.1	-0.5	0.4	-0.2
ProcFood	-0.1	-0.8	-0.7	0.0	-0.1	0.3	2.2	3.3	0.2	1.4
Chemicals	1.0	-1.0	-0.6	1.3	3.0	3.2	4.9	3.4	5.7	4.3
Tex_Lea	-0.8	-2.2	-1.1	1.5	3.3	6.8	13.2	11.8	14.2	12.8
RubPlast	0.8	-1.2	-0.7	1.0	2.3	2.5	5.9	4.9	6.4	5.4
Metals	1.2	0.1	0.1	1.1	2.4	4.5	9.3	8.0	10.1	8.8
Pharma	-1.3	-4.8	-4.0	2.1	4.7	9.6	20.8	19.1	21.8	20.1
Mach_Elec	1.6	-1.2	-0.5	1.5	3.4	2.5	5.5	4.2	6.1	4.9
Trans_Equp	1.7	-0.5	-0.2	1.6	3.5	1.4	3.6	2.7	4.0	3.1
Other_Mnf	1.1	-1.5	-0.9	1.4	3.2	2.7	7.5	6.4	7.8	6.9
Util_Cons	0.9	-1.2	-0.7	1.3	2.8	2.0	7.2	6.8	7.3	6.8
TransComm	0.7	-0.8	-0.5	1.3	2.9	0.9	5.3	4.5	5.5	4.7
OthServices	0.8	-0.9	-0.6	1.3	2.8	1.3	6.0	5.2	6.2	5.4
Total	0.6	-1.0	-0.6	1.2	2.6	1.9	6.0	5.3	6.2	5.5

Source: Authors

Table 4: Sectoral Output for India in different scenarios

	Set 1			Set 2		Set 3				
Endowment	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
Land	0	0	0	0	0	0	0	0	0	0
UnSkLab	0.5	-0.9	-0.5	1.0	2.3	1.7	5.5	5.0	5.6	5.0
SkLab	0.8	-1.0	-0.6	1.3	2.8	1.4	6.2	5.5	6.4	5.6
Capital	0.6	-1.0	-0.6	1.3	2.7	1.7	6.0	5.2	6.2	5.4
NatRes	0	0	0	0	0	0	0	0	0	0

Source: Authors

Table 5: Employment Change for India in different scenarios

	Set 1		Set 2			Set 3				
Agg_Tot_Exp	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
1 GrainsCrops	-4.4	0.9	1.2	1.0	2.4	-1.3	-11.5	-12.4	-15.3	-16.1
2 MeatLstk	-3.4	2.1	3.3	1.1	2.6	-4.0	-21.5	-22.7	-23.4	-24.7
3 Extraction	-17.0	5.3	3.4	1.6	3.2	-6.6	-22.5	-22.7	-22.1	-22.2
4 ProcFood	-6.2	-4.9	-5.2	1.7	3.8	12.1	16.1	14.3	-9.8	-11.1
5 Chemicals	-0.8	-2.1	-1.2	3.8	8.1	5.9	6.4	4.7	7.7	6.0
6 Tex_Lea	-5.0	-7.2	-3.5	4.0	8.6	22.3	43.6	40.4	46.3	43.0
7 RubPlast	-2.9	-4.0	-2.2	3.6	7.8	7.5	10.6	8.7	12.0	10.1
8 Metals	-3.7	2.7	2.0	4.1	8.8	17.8	37.4	35.2	39.0	36.8
9 Pharma	-6.3	-12.4	-11.0	4.0	8.7	28.3	58.6	55.6	60.7	57.7
10 Mach_Elec	-0.8	-4.0	-1.3	5.7	12.3	7.5	12.8	10.2	14.7	12.1
11 Trans_Equp	3.4	0.8	1.1	5.9	12.8	1.7	-3.9	-5.9	-2.3	-4.4
12 Other_Mnf	-2.9	-6.2	-4.0	3.8	8.1	11.7	23.8	22	25.1	23.4
13 Util_Cons	-1.2	1.3	1.4	2.0	4.4	-1.9	-8.7	-9.7	-7.9	-8.9
14 TransComm	-1.0	2.1	1.3	1.8	3.8	-11.8	-7.7	-8.8	-6.9	-8.0
15 OthServices	-0.1	2.4	1.4	1.8	3.8	-10.2	-8.2	-9.4	-7.4	-8.5
Total	-2.8	-2.3	-1.3	3.1	6.7	5.2	13.2	11.5	13.4	11.6

Source: Authors

Table 6: Aggregate Exports of India

	Set 1			Set 2			Set 3			
Bil_Tot_Exp	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
1 GrainsCrops	-27.4	-43.1	-57.2	1.1	2.5	251.6	487.8	477.1	-14.3	-15.9
2 MeatLstk	-35.1	-47.6	-69.2	1.3	3.1	474.1	1032.4	1006.4	-24.5	-27.2
3 Extraction	-65.1	-71.2	9.9	-5.8	-10.9	128.8	1035.3	1024.2	1035.9	1028.5
4 ProcFood	-22.9	-35.0	-52.6	1.8	4.1	215.5	411.4	402.0	-9.3	-10.2
5 Chemicals	-26.6	-49.9	-67.9	3.8	8.1	491.4	1203.3	1179.7	1219.4	1195.8
6 Tex_Lea	-19.1	-56.1	-70.5	4.0	5.4	932.0	2245.9	2193.8	2287.0	2233.8
7 RubPlast	-26.6	-51.0	-68.4	3.6	7.8	462.4	1148.2	1124.8	1164.3	1140.8
8 Metals	-64.6	7.6	2.0	4.1	8.8	581.2	1474.3	1448.8	1490.5	1465.4
9 Pharma	-21.0	-47.2	-68.8	4.2	9.1	455.5	1078.8	1055.4	1094.2	1070.6
10 Mach_Elec	-27.3	-59.8	-77.1	5.2	11.4	801.6	2377.9	2316.8	2420.8	2359.1
11 Trans_Equp	-26.8	-58.1	-78.1	6.8	14.9	849.2	2610.8	2545.1	2657.2	2590.7
12 Other_Mnf	-27.3	-53.1	-70.3	3.8	8.1	531.9	1393.9	1369.5	1409.5	1385.8
13 Util_Cons	2.4	4.3	1.4	2.2	4.7	-47.1	-8.6	-9.9	-7.8	-9.1
14 TransComm	-3.4	2.7	1.1	1.7	3.7	-40.4	-6.9	-8.1	-6.1	-7.4
15 OthServices	-3.9	2.6	1.2	1.7	3.8	-40.8	-7.3	-8.6	-6.5	-7.9
Total	-18.6	-27.6	-24.8	2.1	4.5	73.1	258.2	251.8	248.7	242.6

Source: Authors

Table 7: Exports of India to the US

	Set 1			Set 2		Set 3			
Agg_Tot_Imp	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
1 GrainsCrops	-1.4	-4.0	-2.3	7.5	16.0	7.5	22.6	19.5	20.6	17.7
2 MeatLstk	-0.9	-4.4	-2.7	3.9	8.1	8.7	27.5	23.5	25.6	21.9
3 Extraction	-1.2	-2.4	-1.3	1.5	3.3	4.1	12.6	11.5	12.9	11.9
4 ProcFood	-1.4	-2.5	-1.5	4.1	9.4	10.1	20.1	12.1	19.0	11.1
5 Chemicals	-2.0	-3.1	-1.8	1.5	3.2	4.9	14.3	13.9	14.2	13.9
6 Tex_Lea	-1.7	-4.0	-2.3	4.3	8.9	4.6	19.0	19.8	18.0	18.8
7 RubPlast	-2.0	-3.1	-1.9	3.9	8.0	4.5	16.0	16.3	15.5	15.7
8 Metals	-1.8	-2.4	-1.3	2.4	4.9	3.9	13.0	12.6	12.9	12.6
9 Pharma	-2.1	-3.5	-2.0	2.3	4.6	4.5	16.4	16.5	15.9	16.0
10 Mach_Elec	-1.7	-3.2	-1.9	2.2	4.5	3.5	15.9	16.5	15.1	15.7
11 Trans_Equp	-2.1	-2.9	-1.6	1.4	2.8	2.9	13.6	13.9	13.0	13.3
12 Other_Mnf	-2.7	-2.8	-1.5	1.4	2.8	3.9	13.9	14.0	13.5	13.6
13 Util_Cons	-1.4	-2.7	-1.6	0.0	0.0	2.6	13.1	13.5	12.4	12.9
14 TransComm	-1.9	-2.8	-1.5	0.2	0.3	2.6	12.6	12.6	12.1	12.2
15 OthServices	-2.4	-2.9	-1.5	0.1	0.3	2.5	12.6	12.8	12.1	12.3
Total	-1.9	-2.8	-1.5	1.8	3.8	4.2	14	13.4	13.7	13.2

Source: Authors

Table 8: Aggregate Imports of India

	Set 1			Set 2			Set 3			
Bil_Tot_Imp	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
1 GrainsCrops	-8.8	-9.5	-2.6	0.7	0.8	67.8	92.8	20.8	89.3	18.5
2 MeatLstk	-21.1	-13.2	-3.2	22.8	51.8	218.3	279.9	26.5	273	24.3
3 Extraction	-8.6	-11.3	-1.4	3.1	6.3	32.1	44.7	11.9	45.4	44.7
4 ProcFood	-16.6	-7.2	-1.9	34.4	86.4	614.7	688.1	14.2	679.2	12.8
5 Chemicals	-26.3	-10.2	-2.2	4.4	9.2	57.3	75.5	75.3	74.9	74.7
6 Tex_Lea	-32.6	-11.5	-2.9	4.8	9.7	96.2	130.2	132	127.4	129.3
7 RubPlast	-27.4	-10.4	-2.3	3.5	7.1	72.1	95.5	96.3	94.1	94.8
8 Metals	-43.7	-10.7	-1.7	3.9	8	75	97.3	97	96.6	96.2
9 Pharma	-27.2	-10.4	-2.6	4.3	8.8	65	87.9	88.4	86.7	87.1
10 Mach_Elec	-40.7	-12.8	-2.4	4.2	8.5	78.8	107	108.2	104.9	106.1
11 Trans_Equp	-38.6	-13.6	-2.1	2.6	5.2	57.7	79.7	80.4	78.1	78.8
12 Other_Mnf	-27.6	-10.1	-1.7	5.9	12.1	55	73.8	74.1	72.7	73
13 Util_Cons	-19.1	-7.7	-1.9	0	0	2.9	15.4	15.9	14.5	15
14 TransComm	-13.5	-6	-1.8	0.2	0.3	2.9	14.2	14.4	13.6	13.7
15 OthServices	-12.2	-5.6	-1.8	0.1	0.2	2.8	14	14.3	13.4	13.6
Total	-22.3	-8.4	-1.9	3.3	7	46.3	63.6	44.2	62.5	45.1

Source: Authors

Table 9: Imports of India from the US

	Set 1			Set 2		Set 3			
Agg_Agri_Exp	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
1 GrainsCrops	-4.4	0.9	1.2	1	2.4	-1.3	-11.5	-12.4	-15.3	-16.1
2 MeatLstk	-3.4	2.1	3.3	1.1	2.6	-4	-21.5	-22.7	-23.4	-24.7
3 ProcFood	-6.2	-4.9	-5.2	1.7	3.8	12.1	16.1	14.3	-9.8	-11.1
Total	-5.1	-1.6	-1.4	1.3	3	4	-0.9	-2.1	-13.7	-14.7

Source: Authors

Table 10: Agricultural Exports of India

	Set 1			Set 2		Set 3			
Bil_Agri_Exp	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
1 GrainsCrops	-27.4	-43.1	-57.2	1.1	2.5	251.6	487.8	477.1	-14.3	-15.9
2 MeatLstk	-35.1	-47.6	-69.2	1.3	3.1	474.1	1032.4	1006.4	-24.5	-27.2
3 ProcFood	-22.9	-35	-52.6	1.8	4.1	215.5	411.4	402	-9.3	-10.2
Total	-24.1	-36.8	-53.7	1.7	3.8	224	430.1	420.3	-10.3	-11.4

Source: Authors

Table 11: Agricultural Exports of India to the US

	Set 1			Set 2		Set 3			
Agg_Agri_Imp	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
1 GrainsCrops	-1.4	-4	-2.3	7.5	16	7.5	22.6	19.5	20.6	17.7
2 MeatLstk	-0.9	-4.4	-2.7	3.9	8.1	8.7	27.5	23.5	25.6	21.9
3 ProcFood	-1.4	-2.5	-1.5	4.1	9.4	10.1	20.1	12.1	19	11.1
Total	-1.4	-3.1	-1.8	5.4	11.9	9.1	21.1	15	19.7	13.8

Source: Authors

Table 12: Agricultural Imports of India

	Set 1			Set 2		Set 3			
Bil_Agri_Imp	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
1 GrainsCrops	-8.8	-9.5	-2.6	0.7	0.8	67.8	92.8	20.8	89.3	18.5
2 MeatLstk	-21.1	-13.2	-3.2	22.8	51.8	218.3	279.9	26.5	273	24.3
3 ProcFood	-16.6	-7.2	-1.9	34.4	86.4	614.7	688.1	14.2	679.2	12.8
Total	-11.8	-8.7	-2.3	12.9	31.7	263.8	306.4	18.5	300.9	16.6

Source: Authors

Table 13: Agricultural Imports of India from the US

	Set 1			Set 2		Set 3				
Welfare	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
USA	-2220.9	-236.6	-45.3	4.3	10.4	148.5	229.3	196.9	208.2	175.5
Korea	-25.8	0.2	0.6	-1.6	-3.2	-2.7	-6.1	-5.9	-6.5	-6.2
Japan	-132.3	154.5	2.5	-3.7	-7.7	-8.1	-24.2	-23.5	-26.0	-24.9
EU	-179.0	-29.0	11.0	-0.2	-0.5	-16.9	-80.3	-82.8	-80.2	-81.9
China	-76.8	57.6	4.5	-0.9	-2.3	-16.1	-40.2	-39.5	-41.8	-40.6
Canada	-85.2	11.2	0.2	0.5	1.2	1.3	-0.6	-1.4	-0.4	-1.3
Mexico	12.0	23.5	0.9	0.5	1.2	-0.4	-5.7	-6.4	-6.1	-7.0
India	10.1	-25.0	-14.1	23.5	49.7	37.3	139.5	127.2	140.8	127.3
Brazil	-64.0	-55.3	-1.0	3.2	8.2	-0.5	-3.6	-2.4	-3.7	-2.5
UK	-73.4	22.5	2.0	1.3	3.1	-0.0	-13.4	-14.5	-13.4	-14.4
SAfrica	-3.5	-2.4	0.1	0.4	0.8	-0.2	-1.1	-1.3	-1.1	-1.2
Russia	-11.3	-2.1	0.3	0.3	0.6	-0.7	-2.9	-3.1	-2.9	-3.1
Bangladesh	-1.5	-2.3	0.3	0.1	0.3	-0.5	-1.9	-2.0	-1.8	-1.9
Thailand	-4.0	-3.9	0.2	-0.2	-0.4	-0.4	-1.4	-1.4	-1.4	-1.4
Cambodia	-0.4	-0.5	0.0	-0.0	-0.0	-0.0	-0.1	-0.1	-0.1	-0.1
Malaysia	-5.1	-3.9	0.2	-0.1	-0.2	-0.3	-1.3	-1.4	-1.2	-1.4
Philippines	-4.4	1.1	0.1	-0.1	-0.1	-0.1	-1.0	-1.0	-1.0	-1.0
Vietnam	-6.1	3.3	0.4	-0.1	-0.1	-1.1	-3.0	-3.0	-3.0	-3.1
Indonesia	-3.3	2.0	0.3	-0.2	-0.4	-1.3	-3.0	-2.8	-3.1	-2.8
RestofWorld	-233.2	-43.6	3.9	8.3	17.5	-2.7	-30.8	-34.1	-30.2	-33.5

Source: Authors

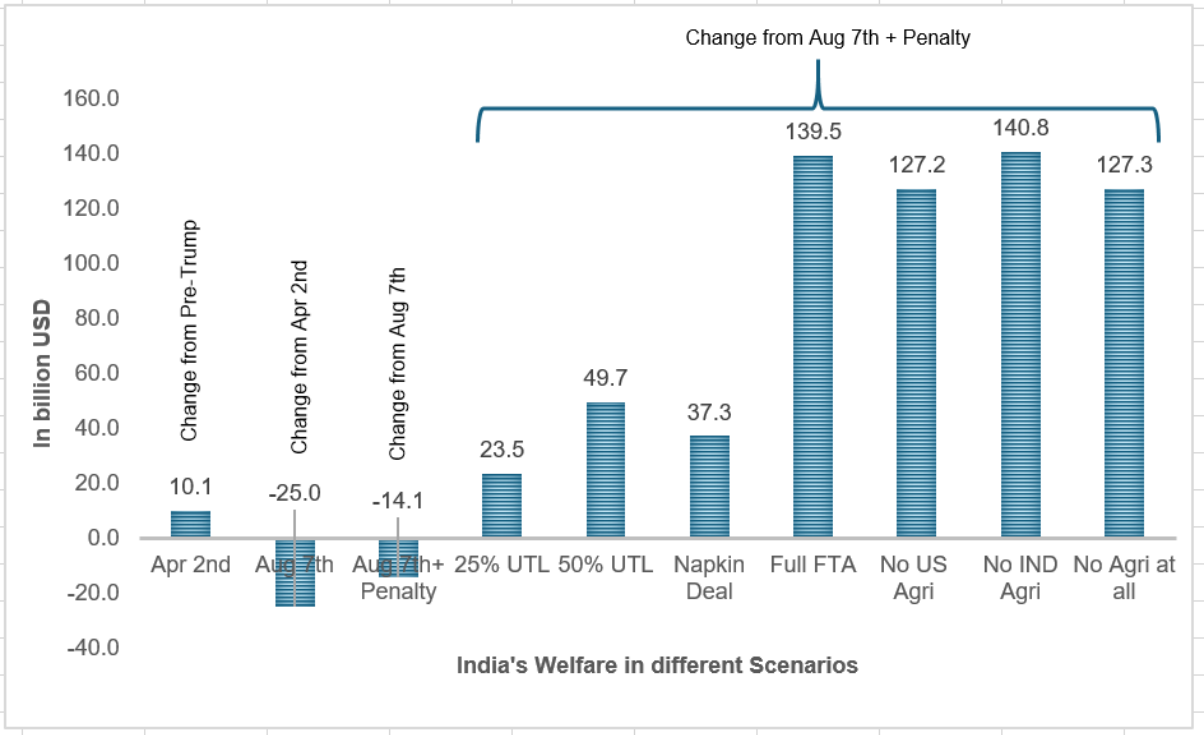
Table 14: Welfare for countries in different scenarios

	Set 1			Set 2		Set 3				
GDP	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
USA	-13.85	-1.79	-0.33	0.03	0.07	1.04	1.68	1.46	1.53	1.3
Korea	-1.8	0.14	0.04	-0.12	-0.25	-0.2	-0.46	-0.44	-0.49	-0.46
Japan	-3.2	4.21	0.06	-0.09	-0.19	-0.2	-0.59	-0.57	-0.63	-0.61
EU	-1.44	-0.21	0.1	0	-0.01	-0.15	-0.7	-0.72	-0.7	-0.71
China	-0.56	0.61	0.05	-0.01	-0.03	-0.16	-0.4	-0.39	-0.41	-0.4
Canada	-6.01	0.84	0.03	0.03	0.08	0.08	-0.11	-0.16	-0.08	-0.15
Mexico	1.48	2.35	0.09	0.05	0.11	-0.05	-0.58	-0.64	-0.63	-0.71
India	0.55	-0.96	-0.56	1.24	2.64	1.66	5.8	5.14	5.94	5.23
Brazil	-3.75	-3.57	0.01	0.21	0.54	-0.11	-0.32	-0.25	-0.33	-0.25
UK	-3.31	1.09	0.09	0.06	0.14	0	-0.63	-0.68	-0.63	-0.67
SAfrica	-0.69	-0.73	0.04	0.1	0.21	-0.07	-0.37	-0.4	-0.35	-0.38
Russia	-0.37	-0.14	0.02	0.01	0.01	-0.07	-0.25	-0.26	-0.24	-0.25
Bangladesh	-0.43	-0.8	0.1	0.04	0.09	-0.17	-0.69	-0.73	-0.65	-0.69
Thailand	-0.86	-0.92	0.04	-0.06	-0.12	-0.12	-0.37	-0.37	-0.37	-0.36
Cambodia	-1.46	-2.19	0.06	-0.05	-0.11	-0.19	-0.5	-0.5	-0.54	-0.54
Malaysia	-1.33	-1.35	0.07	-0.04	-0.07	-0.1	-0.49	-0.57	-0.47	-0.55
Philippines	-1.4	0.64	0.04	-0.02	-0.04	-0.03	-0.33	-0.35	-0.33	-0.35
Vietnam	-2.48	1.85	0.19	-0.05	-0.1	-0.54	-1.42	-1.44	-1.44	-1.46
Indonesia	-0.15	0.34	0.05	-0.03	-0.06	-0.14	-0.38	-0.38	-0.39	-0.39
RestofWorld	-1.58	-0.34	0.04	0.06	0.13	-0.04	-0.3	-0.33	-0.3	-0.32

Source: Authors

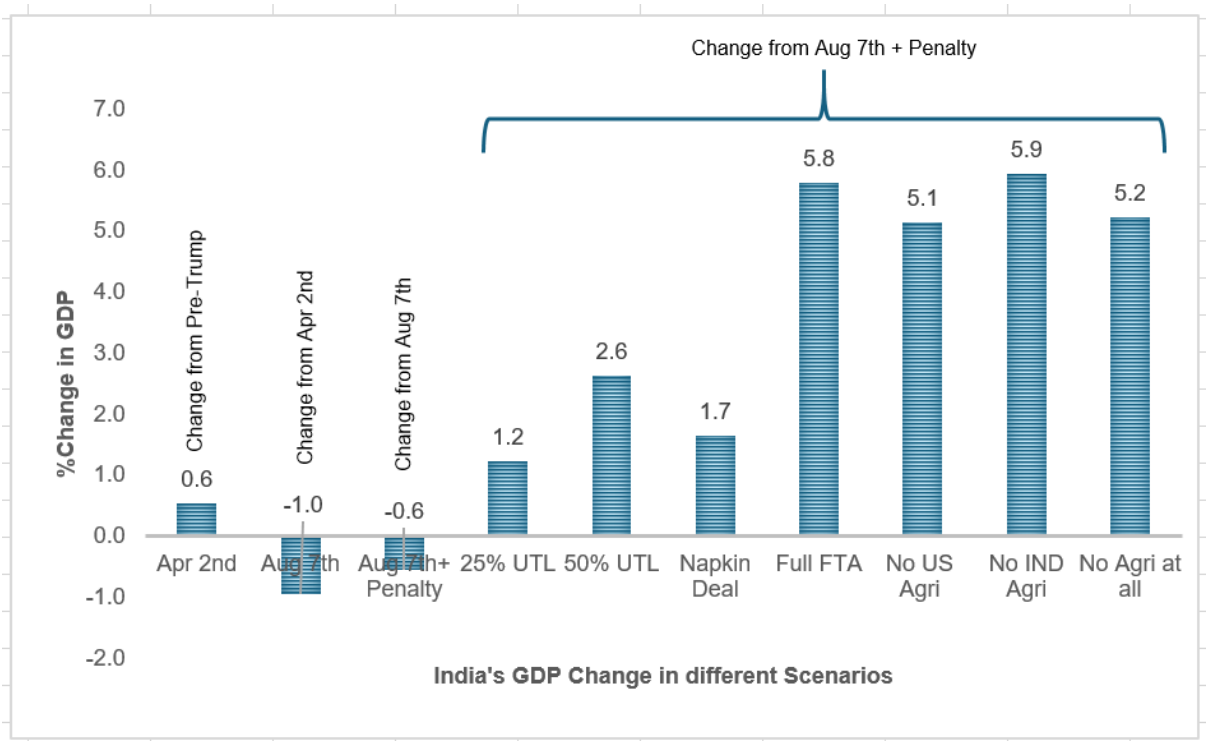
Table 15: Change in GDP for countries in different scenarios

Figures



Source: Authors

Figure 1: India's Welfare in different scenarios



Source: Authors

Figure 2: India's GDP Change in different scenarios

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