Impact of US-China Trade War on Indian External Trade *

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Abstract

The recent US-China trade war refreshed the memory of trade protectionism in the era of global integration. In this context, this paper analyzes the impact of higher trade tariffs imposed by the US and China on each other, on India, a large country having significant trade ties with both the US and China, yet not directly involved in the tariff war. Using product level data on exports and imports, the paper analyzes the implication of the tariff war on India in short run through the lens of trade diversion and identifies the differential effect of trade diversion across different product types. The analysis reveals a significant trade diversion to India from China at an aggregate level with trade elasticity of 0.5-0.7 due to US tariffs on China which points towards a substitution effect in products targeted by the US-China tariffs. Further, the paper observes a heterogeneous impact of the trade diversion across different product classifications. Particularly, India's export of easily substituted products like final goods, homogeneous goods and high elastic goods, intensified plausibly driven by higher tariffs imposed by the US on China. However the effect on these tariffs on India's import intensity remains mixed.

Keywords: US-China Trade War, Trade Cost, Product Heterogeneity, Comparative Advantages
JEL Classification: F1,F12,F13,F14

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The views expressed in the paper are those of the author and not the institutions to which he belongs. Data used in this paper is available in the public domain.

Introduction

The recent tariff war between the US and China unveiled a new era of protectionism in international trade. Starting in 2018, the US increased average tariffs on imported products from China through different tranches of announcements. Specifically, the average tariff on imported products increased from 2.6% to 20.6% [1] . According to Fajgelbaum etl. al. (2020), tariffs of around 11000 products increased under the US action. These protectionist measures resulted in similar retaliation from major trading partners of the United States (US) including China, European Union, Mexico, Russia and Turkey. Among these nations, China lead the retaliation by imposing tariffs of similar magnitude on the products imported from the US. The impact of trade war was felt immediately on the US and China as trade volume plummeted significantly after the tariffs (Amiti et. al. (2020), Fajgelbaum et. al. (2020), Cavallo et. al. (2019)). Further, the impact of higher tariffs were found to reduce consumption growth which leads to welfare loss for the United States (Waugh, 2019). The impact of trade war also affected export growth of the US through supply chain due to higher trade tariffs (Handley et. al. (2020)). On the other hand, higher tariffs imposed by the US, marginalized the profit margin of the firms in China (Wang et. al. (2020)).

Beyond the direct impact of the higher tariffs on the US and other major trading partners, the tariff war highlights the possibility of trade diversion to other trading partners. Comparative advantage along with changes in tariffs resulting from the trade war often lead to a greater substitution of commodities from other trade partners having access to targeted country's markets and this may provide a positive benefit to outsiders in selling to markets directly impacted by the tariff war (Bekker & Schroeter (2020),Bolt et. al.

[1] Tariffs representing weighted average tariffs imposed at HS-8 level

(2019)). India, being a major common trading partner to both US and China, is an ideal case study for analyzing possible trade diversion resulting from the US-China tariff war. With this background, the paper analyses the short term impact of the US-China tariff war on India's external trade at aggregate level and across different product categories.

Using product-level export and import data, the paper documents that the tariff war by the US and subsequent retaliation by China, impacted India's export growth significantly at the aggregate level. The effect is found to be more prominently driven by US tariffs, rather than China's retaliatory tariffs. US tariffs influenced trade diversion from China to India as Chinese manufacturers face higher tariffs from the US. The insignificant impact of retaliatory tariffs underlines the fact that the retaliatory tariff by China was targeted towards mainly agricultural commodities. Beyond the aggregate effect, the paper extends the trade diversion analysis across different product classifications. We use three different types of classifications namely intermediate vs final goods, homogeneous vs differentiated goods and high vs low elastic goods. The trade diversion effect was found to be more pronounced on final goods and insignificant in case of intermediate goods. The final goods are considered to easily substituted whereas the intermediate goods are used in the production process and thereby it takes longer time to replace the intermediate goods. The concentration of trade diversion on final goods emphasises the short term impact of substitution effect on the easily replaceable products. Next, we use the differentiated and homogeneous product classification proposed by Rauch et al. (2006) to check any heterogeneity in trade diversion. The exports increased for homogeneous goods and not significantly for differentiated goods. The findings corroborates with the rigidity of replacing non-homogeneous goods global value chains at least in the short run. Finally, the effect on export intensity is found to be higher in case of high elastic products (using Broda ad Weinstein (2006) estimates). On imported goods, the impact of the tariff war is found to be significant on the aggregate level. However, the impact of tariffs on heterogeneous product classes reveals that the import of final goods increased significantly from China, whereas imports from the US were unaffected. Import of homogeneous goods increased due to the tariffs, and a similar effect is observed in high elastic goods. In short, the US-China trade war increased Indian exports to the US, especially in substitutable product classes namely final goods, homogeneous (Rauch) goods and highly elastic goods. Lastly, the paper attempts to identify the underlying mechanism of trade diversion using revealed comparative advantages (RCA) of Indian manufacturers. Following Ricardian model, countries trade in products where they have comparative advantages. Hence RCA provides one explanation of trade diversion. Using panel regression, the paper observes that Indian firms have higher revealed comparative advantages in final goods and highly elastic goods where the trade diversion effect was found to be significantly higher.

The paper contributes to mainly three strand of literature on trade war namely the implications of trade protectionism on trade partners, trade diversion and finally, pass through impact of tariffs. First, the paper analyzes the effect of trade war and its implications on neutral trade partner like India. In that way, it contributes to the recent literature on implications of trade protectionism. Fajgelbaum et al. (2020) observed that US tariff on imports and corresponding retaliatory tariff imposed by other major trading partners on US export resulted in a moderation of imports and exports. Waugh (2019) analyzed the impact of the tariffs imposed due to US-China trade war on the consumption pattern. Using new car sales data as proxy of consumption, he observed that the retaliatory tariffs imposed by China, caused a significant decline in the aggregate consumption. Carter & Steinbach (2020) observed significant decline in trade of agriculture and food exports by the US and realignment of trade pattern across countries. Particularly, the South American countries and Europe were found to be benefited due to this reorientation of the trade flows. Analyzing the impact of retaliatory tariffs on investment pattern, Amiti et. al. (2020) observed that the announcement of tariffs is expected to reduce the investment growth of the exposed firms by 1.9% by end of 2020. Handley et. al. (2020) analyzed the impact of higher tariffs on export pattern of the US using supply chain linkages and they observed that high retaliatory tariff impacted on the imported goods and increased the exposure of the products further due to their supply chain linkages. The moderation of exports of highly exposed products were found to be more severe than a typical product [2].

The paper also contributes to the trade diversion literature. Following the trade war and higher tariffs barriers imposed by the US and China, the paper observes significant trade diversion happening to India, a trade partner which remained neutral in the trade war. A large portion of trade diversion literature concentrated on the trade creation and trade diversion due to North American Free Trade Agreement (NAFTA). Krueger (1999) analyzed the early impact of NAFTA on Mexico. Using micro level data on bilateral trade and other country specific controls, Krueger observed that Mexico's trade with the US and Canada increased after NAFTA which was contributed by reduction of tariffs and Mexico's policy on exchange rate among other factors. On similar lines, Fukao et. al. (2002) used trade data across major industry sectors at HS-2 digit level and empirically tested the hypothesis of trade diversion using partial equilibrium model with differentiated goods. They observed significant estimate of the tariff coefficient in 15 specifications out of 70 specifications, implying that the moderation of tariff and easy

[2] Another strand of literature analyzes the impact of tariff using ex-post analysis across industry segments, regions and firms. Attanasio et al. (2003) identified three primary channels through which tariff reduction impacted welfare and inequality. These three channels, namely increasing return to college education, changes in relative industry wages and informality in industry, impacted the labour market widely depending upon the specialization and job types. Topalova (2010) commented that the impact of trade liberalization was more pronounced across sectors in rural areas, resulting in a slower decline in poverty and lower consumption growth

access contribute to the trade diversion after the implementation of NAFTA. Caliendo & Parro (2012) analyzed the impact of NAFTA on the welfare implications for the US, Canada and Mexico. The paper observed that the welfare of Mexico increased by 1.31% whereas welfare of the US increased by 0.08%. However Canada faced a decline of welfare around (-0.06%). Apart from NAFTA impact, trade diversion literature also focus on the trade diversion and trade creation in the context of Free Trade Agreement (FTA). Clausing (2001) analyzed the impact of tariff liberalization on trade pattern between the US and Canada. The empirical analysis observed significant trade creation happening due to FTA with very little evidence towards trade diversion. Magee (2008) observed a significant effect on trade creation due to FTA whereas the impact on trade diversion as found to be muted. Dai et al. (2014), however, observed significant trade diversion from non-participating countries due to FTA. Mattoo et al. (2017) corroborated the strong trade diversion hypothesis due to FTA. The impact of recent trade war has been analyzed through the aspects of trade diversion. Meinen et al. (2019) analyze the impact of US-China tariff on 30 countries using product-level observations. Using a difference-in-difference approach, they conclude that higher tariffs did not result in trade diversion significantly. Balistreri et al. (2018), Bellora & Fontagne (2019) highlighted the long term positive impact to third trading partner due US-China trade war as trade diversion to other trading partners increases. Bolt et al. (2019) proposed similar findings using a simulation-based approach. IMF (2018) expected similar effects of trade diversion to other trading partners in the short term. Bekker and Schroeter (2020) contradict the findings of trade diversion in the context of US-China trade war, and they observed significant trade diversion across trading partners using ex-post and simulation-based approaches. However, the trade diversion impact was found to be more effective after the initial waves of tariff imposition. Bekker & Schroeter (2020) highlights that the impact of the first phase of tariff increases had limited effects on global trade due to US importers' commitment to buy Chinese products. Apart from trade diversion, the indirect effect of tariff war was found to be a drag on Japanese multilateral companies as the demand of Chinese goods reduced significantly due to US tariff (Chang et al. (2020)). Compared to the existing literature, this paper undertakes an extensive analysis of trade war impact on India by analyzing the overall impact and product heterogeneity in the trade diversion.

Finally, the paper analyzes the impact of higher tariffs on the unit value of exports and imports of India. We calculate the duty excluded unit value of export and imports at HS-6 product level using the trade value and trade quantity data. Using difference in difference regression, this paper observes statistically significant impact of US tariffs on India's unit value of exports. The pass through impact of higher tariffs came up in recent papers like Cavallo et.al. (2019), Amiti et. al. (2019) and Flaan et. al. (2020). Cavallo et al. (2019) analyzed the impact of tariffs on the domestic import price and retail price due to tariffs imposed by the US during the trade war. They observed complete pass-through of tariffs on prices paid by importers, thereby affecting the US economy. The exporters, on the other hand, reduced their prices of exported goods given the retaliatory tariffs imposed by other trading partners of the US. Further, they found that the impact of the tariffs on final consumer goods is muted since the price difference between affected and unaffected products is muted. Justifying the pass-through asymmetry, Cavallo et al. (2019) highlighted possible procurement through imports by retailers before implementing the tariff burden. Amiti et al. (2019) observed complete pass-through of higher tariff burden on domestic prices of imported goods. They further observed that tariffs hurt consumption demand across countries. Flaan et al. (2019) corroborated the high pass-through of tariffs on washing machine in the US. These findings corroborates pass-through argument proposed by Feentra (1989) and Goldberg & Knetter (1997). This paper observes price elasticity of 0.5 on unit value of export driven by US tariffs which is comparable with the estimates from Cavallo et. al. (2019) and Amiti et. al. (2019).

Apart from the overall impact of trade war, the paper also analyzes the heterogeneous impact of trade war on various product categories. In that way, the paper contributes the large literature of firm and product heterogeneity. Melitz (2003) introduced firm heterogeneity in Krugman's model. Extending the framework, Arkolakis (2010) established the broader response of low tariff goods during trade liberalization through the lens of lower marketing cost. Spearot (2012), on the other hand, extended Melitz and Ottaviano (2008) framework and observed the impact of trade liberalization significantly higher in case of high elastic goods. Feenstra and Weinstein (2010) postulated similar observations of trade liberalization on differentiated products categories. On the product level heterogeneity, Rauch (1996) identified three different types of products namely exchange traded products, referenced price products and differentiated products. In his paper, Rauch observed that the proximity and common language as two main factors for matching buyers and sellers in the differentiated goods market. Broda & Weinstein (2006) observed significant welfare implications due to product variety. They estimated the elasticity of substitution at SITC 5 classifications and observed an upward bias in price index estimate.

The effects of trade war on neutral trade partners like India, can happen through different channels e.g trade channel, labor market implications, price transmission etc. The trade diversion observed in this paper, indicates greater export intensity in response to higher tariffs structure. However the net impact of trade war on India remains unclear. Following Handley et. al. (2020), the impact of supply chain linkages can provide important insight about the resulting impact of export growth on import intensity. For instance, higher demand for imported inputs is likely to increase import intensity and thereby can result in higher trade deficit. One need to perform a comprehensive analysis of supply chain linkages and resulting trade pattern due to trade diversion before drawing any conclusion on the welfare implications of trade war on neutral trade partner.

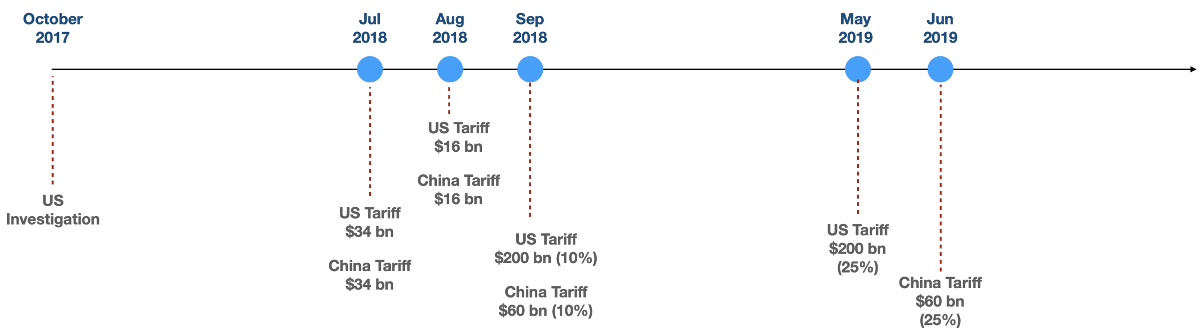
Remaining of the paper is organized as follows: brief count of US-China tariff war is illustrated in Section 2. Section 3 highlights compelling facts about Indian tariff scenario during the trade war timeline. Section 4 documents data description and stylized facts. The overall impact of US-China trade war on India's trade is illustrated in Section 5. Product level heterogeneity in impact assessment is covered in Section 6. The paper ends with a brief discussion about relative comparative advantages of Indian manufacturers in different product categories in Section 7, followed by concluding remarks in Section 8.

2. US-China Trade War

The United States (US) imposed higher tariffs on Chinese imports on the ground of alleged unfair trade practice. To begin, US International Trade Commission started investigation of global safeguard restrictions on solar panels and washing machines in October and November 2017. The safeguard tariff was imposed on these industries on January 22, 2018. Possible retaliation started against US tariff imposition when Chinese government initiated a probe into anti-dumping duties and countervailing duties on US export of sorghum during February 2018, resulting imposition of anti-dumping duties of 178.6% on sorghum imports from the US. Next, the US imposed a tariff of 10% and 25% on steel and aluminium respectively, on all trading partners during March 2018. The retaliatory tariff was imposed by China up to 25% on 128 US products on April 2, 2018. The US responded with a 25% tariff on Chinese imports worth $50 billion on

April 3, 2018. Waves of higher tariffs were imposed by US and China in subsequent moves between April - September 2018. During this time, the average tariff increased from 10% to 25% on various categories of products by US and China (Source: Reuters [3]). The timeline of US-China trade war is illustrated in Figure 1

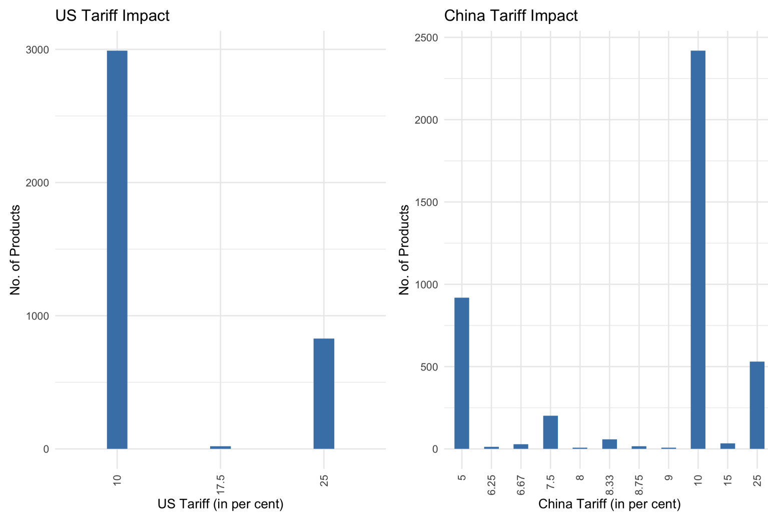
Figure 1. US-China Trade War timeline



Before the tariff war (i.e. in 2017), China exported around 4573 different products to the US at HS-6 digit level. These products can be classified into 11 unique HS-1 categories, 97 unique HS-2 categories, 174 unique HS-3 categories and 1153 unique HS-4 categories. The tariffs imposed by the US were organized in three tariff brackets, namely 10%, 17.5% and 25%. A majority of the HS - 6 digit products, targeted under the US tariff, experienced 10% tariff. China tariffs, on the other hand, were designed at different levels. Majority of products, impacted by China tariff, had tariffs of 10% or below (refer to Figure 2).

[3] Timeline: Key dates in the U.S.-China trade war https://www.reuters.com/article/us-usa-trade-china-timeline/timeline-key-dates-in-the-u-s-china-trade-war-idUSKBN1ZE1AA

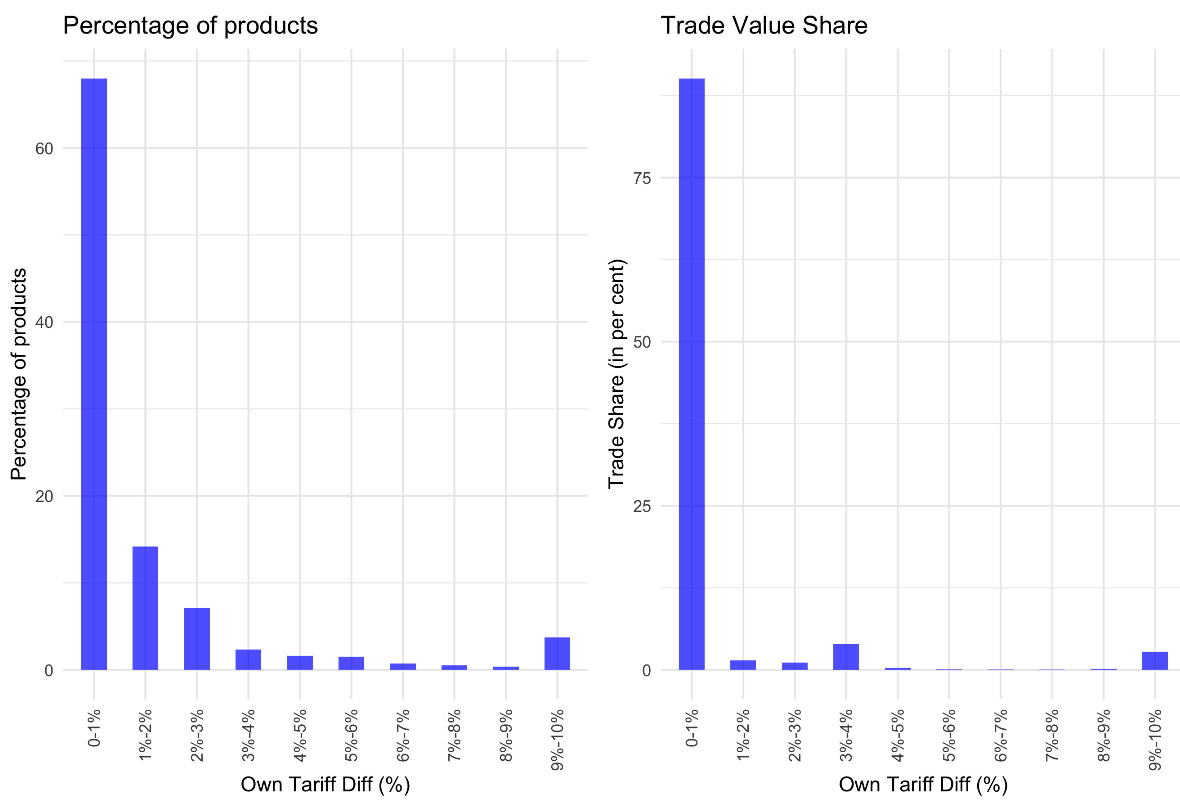
Figure 2. US-China Tariff Impact on HS-6 products



India's Tariff scenario

In order to analyze the impact of trade war, one should also evaluate India's tariff scenario during the trade war timeline. While the trade protectionism measures mostly focused on the US and China, the US government terminated India's designated position in the Generalized System of Preferences (GSP) effective June 5, 2018. GSP was designed by the US as duty free avenue for the goods coming from beneficiary countries and to promote economic development. Founded in 1974, GSP reduced US import tariffs on imported goods from 119 developing countries. India's exit from GSP, therefore, underlines regime change in terms of higher import tariffs on goods exported by Indian firms to the US. The impact of losing GSP status is analyzed across different industry sectors. Mukhopadhyay & Sharma (2020) and Chauhan (2020) observed varying impacts of GSP loss on different industry segments in India. Further they highlighted that among all sectors, there was a significant impact of higher import tariffs on sectors like organic chemical, nuclear reactor, vehicle and parts, iron and steel, plastic and products, electrical machinery, leather, rubber and rubber products etc. In order to analyze the magnitude of tariff changes under GSP, the tariff difference is calculated across products at HS-6 digit level [4] between 2019 and 2017. From the histogram of tariff difference, we observe that the maximum increase of tariffs is found to be around 10% in the post GSP period. Further majority of products traded by Indian manufacturers, are found to have no change or small change (less than 5%) in tariff level during post the GSP period. Also the impact of these tariffs is appears to be largely unaffected in terms of trade value share (refer to Fig. 3).

Figure 3. Summary of trade value share and products across own tariff difference



[4] Tariffs of each year are expressed as iceberg cost

Data used and Stylized facts

The primary data used in this paper is sourced from the Directorate General of Foreign Trade for Indian External Trade data. The data is collected at HS-6 digit and HS-8 digit level. HS-6 digit level information is used to map the tariff details across products due to international comparability of product definitions. The data is collected at an annual frequency [5] to smooth out monthly variation in exports and imports. The data is collected at the product - destination level and it represents an unbalanced panel due to products which are exclusively traded to any particular destination. The analyses use data spanning over 2012 till 2020 [6].

The products impacted by US tariffs are defined at the HS6 digit level whereas China tariffs can be mapped at HS - 8 digit. The US tariffs were imposed in different waves over time. Further, the tariff rates were altered over time. Hence the effective tariff [7] is used for empirical analysis. US Tariff data is collected from USITC data web using the information on estimated tariff and dutiable value across products. The tariffs are calculated as a ratio of duties collected and dutiable value. Information on China's retaliatory tariff is sourced from Fajgelbaum et. al. (2020) at HS-8 digit level. Average tariffs across the HS-6 digit level is used as proxy of retaliatory tariff at HS-6 digit level. For the sake of simplicity, the simple average is used to estimate tariff rate at HS - 6 products. However the tariff estimated using this approach, does not necessarily imply the tariff shock, rather it factors in any existing tariff placed on the products. Hence the tariff shock

[5] The annual data on India's external trade corresponds to the financial year i.e. April to March for every year

[6] Financial year 2020 ends by March 2020 when the COVID impact was still in nascent stage in India. We restrict our analysis till March 2020 to avoid any overlap with COVID lockdown restrictions across countries

[7] Effective tariff refers to the tariff after rounds of tariff wave imposed by the US on China

has been estimated by removing the MFN[8] tariff across destination countries at product level. MFN data is sourced from WTO database. India's tariff data (i.e tariffs imposed on India's exports and tariffs charged by India) are collected from WTO database to verify any change in tariff structure during US-China trade war timeline in order to assess the robustness of trade diversion findings by factoring the effect of India's exit from GSP.

In the analysis that follows, products will be further classified into product classes to understand any differential impact of tariff across product categories. These products are classified into mutually exclusive categories, namely (i) intermediate goods vs final goods (ii) differentiated goods vs Homogeneous goods and (iii) High elastic goods vs low elastic goods. Intermediate goods refer to those used as inputs for manufacturing. The intermediate goods are identified based on the broad economic classification (BEC) using the mapping between HS codes and BEC code (Source: UN Stat and Comtrade) [9]. Beyond the usage of products, another aspect of trade diversion can be studied based on the substitutability of products. The substitutability is studied in two dimensions: homogeneous vs differentiated, and different elasticities of substitution. Differentiated goods classification is drawn from Rauch et al. (1996). The manufactured products have been classified into three major categories depending upon their trading pattern. These categories, namely (1) products traded in organized exchange (2) reference prices and (3) differentiated goods. The differentiated goods are not substituted easily due to the uniqueness of these products. Traded products and reference priced products can be easily substituted (Rauch, 1996). Accordingly, any trade diversion due to the US-China

[8] MFN stands for Most Favored Nation tariff

[9] BEC Codes were introduced in 1961 to classify the products into industrial supplies, food, capital equipment, consumer durables and consumer non-durables. Following revision 5, BEC codes 111 (Primary for the industry), 121 (Processed for the industry), 21 & 22 (Industrial supplies), 31 & 322 (fuel & lubricants), 41 (Capital Goods), 42 (Parts and accessories), 53 (Transport equipment) have been considered as intermediate goods (Source: Classification by Broad Economic Categories, UN)

trade war can be expected to be more dominantly felt across non-differentiated [10] goods and less prevalent for differentiated goods in the short run [11]. The last product category, i.e. the elasticity of substitution, provides a different aspect of substitutability. The elasticity of substitution is sourced from Broda & Winstein (2006). Following Feenstra (1994), the elasticity of substitution has been calculated across products at SITC level for 1972-1988 and 1990-2001. The elasticity estimates are drawn from 1990-2001 estimates.

Even after collecting trade data and other ancillary information, the broad question remains - Why is India a potential case study for analyzing the impact of the US-China tariff war? The US-China trade war impacted the trade volume of the United States and China directly through higher tariff rates. However, countries like India were not directly impacted by tariffs [12]. Further, India's external trade share with the US and China is at higher level in recent times which signifies the market access of Indian exporters in both the countries (refer to Fig 4). Also, the import share of the US with China decreased drastically since 2018 and remained at a lower level in 2020. On the other hand, US import share with India increased marginally during the same time which supports trade diversion towards India (refer to Fig. 5).

[10] Traded and referenced price

[11] Both conservative and liberal classification of differentiated goods are used in this paper for robustness

[12] except for Aluminum and Steel

Figure 4. India's trade share in percentage

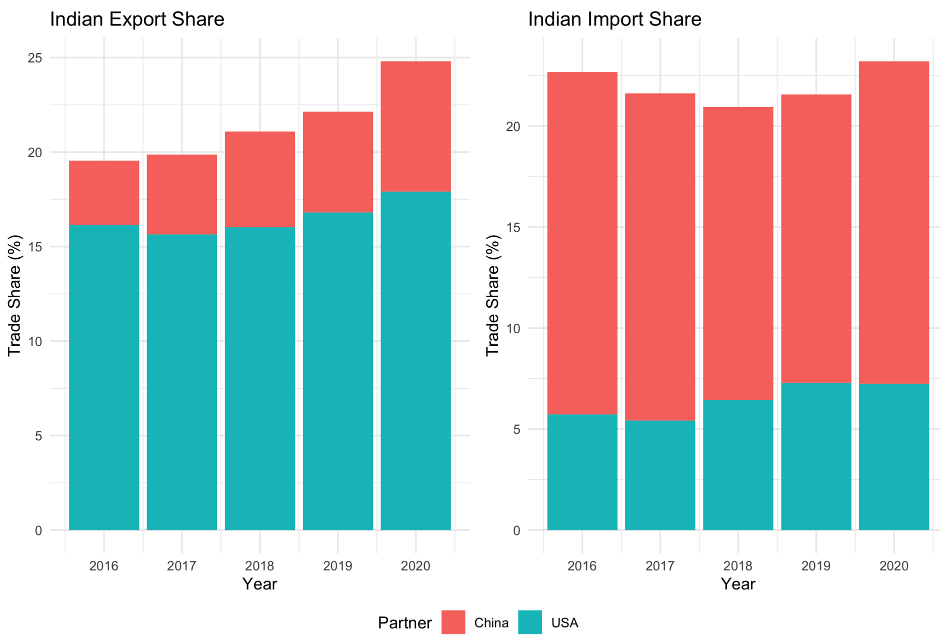
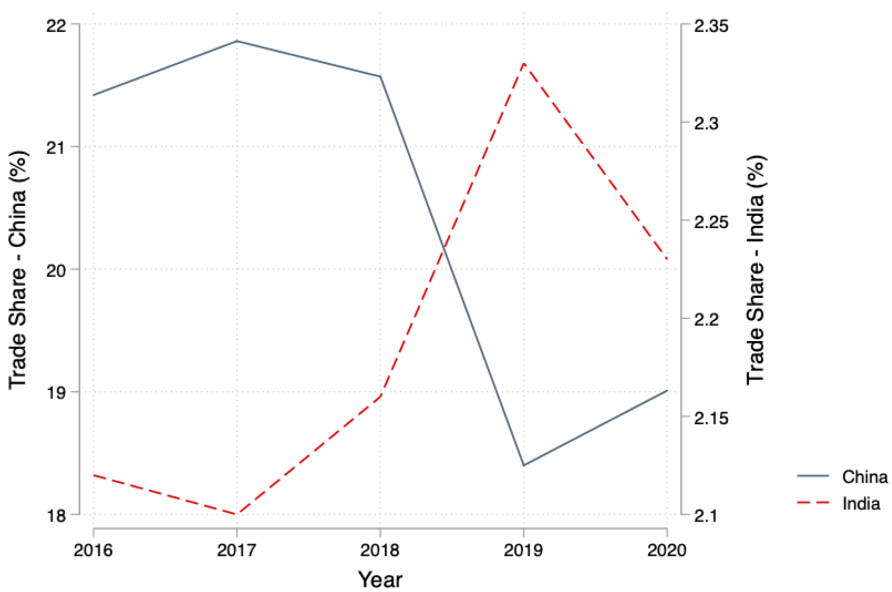


Figure 5. US Import share in percentage



Apart from the market access, Indian firms are often compared with China in terms of comparative advantage. Bagaria, Santra & Kumar (2014) argued that the comparative advantage of Indian firms is estimated to be similar to that of Chinese firms across different product categories. Wei & Balasubramanyam (2015) compared the relative comparative advantages of Indian and Chinese manufacturers on capital and labor intensity. In general, trade diversion happens when trade moves to other countries in response to externalities like higher trade tariff. Higher tariff rates imposes strict entry criteria for firms with relatively lower comparative advantages (Melitz, 2003). Hence higher US tariffs on China are likely to drive off Chinese firms with relatively lower comparative advantages and may provide favourable entry condition for Indian manufacturers. Following market access and comparative advantages, India appears to be suitable for trade diversion case study due to higher tariffs imposed due to US-China trade war.

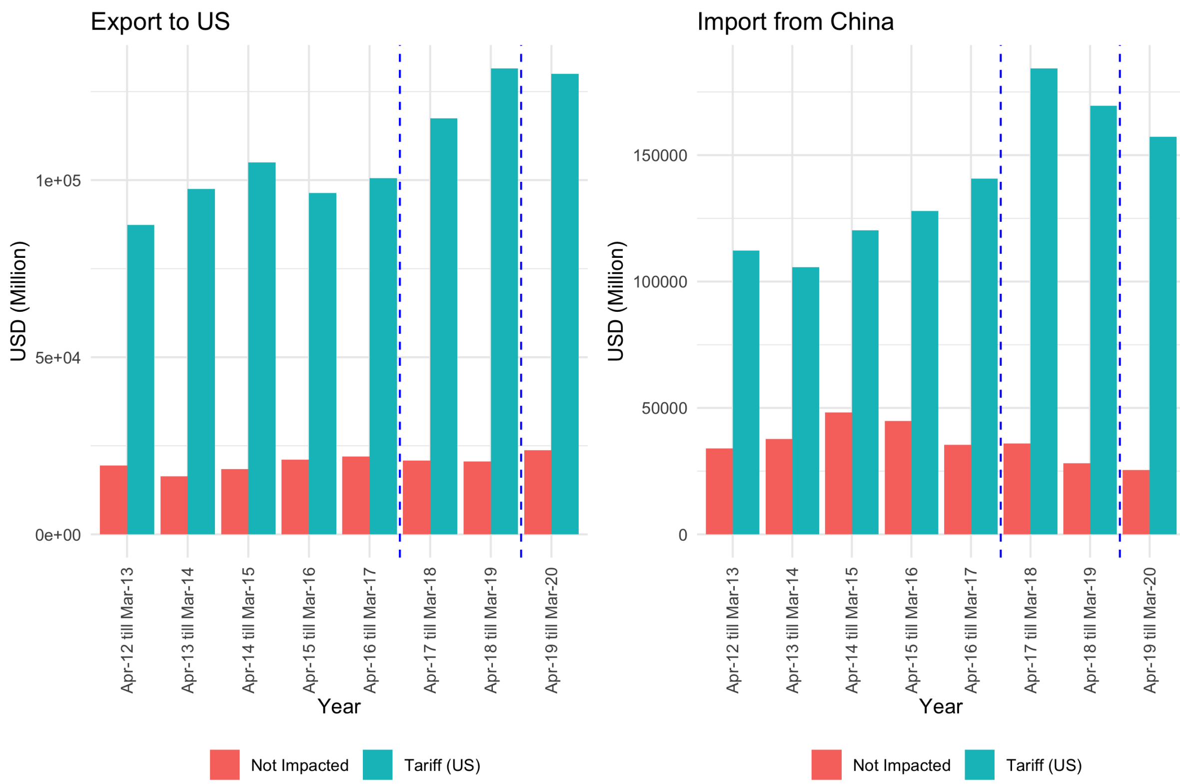
Among the targeted products at HS - 6 level, Indian export growth to the US increased in more than 50% products, whereas 32% products experienced a decline in exports. A similar pattern is observed for products imported from China. Among 1930 products under the purview of US tariff, import intensity [13] increased for 63% of products. On the contrary, the tariff imposed by China is found to be less traded by Indian firms. At HS - 6 digit level, only 283 products that are currently exported to China were impacted, and 341 impacted products are imported from the US.

While the above paragraph focuses mainly on the impact on the extensive margin, the impact of US-China tariffs is examined on trade value. The export value of products targeted under US tariffs and those not targeted by tariffs can be traced over time. Similarly, the export value of products subject to tariff war have been plotted since 2014. Figure 6 illustrates the time plot of India's export to the US and India's export to China. Ignoring any spillover effects from US tariffs on exports to China, the time plot demonstrates a distinctive pattern. The exports of products subject to tariffs applied by

[13] Measured in terms of import growth between 2019 vs 2017

the US against China, increased after the imposition of these tariffs. Such differentiated pattern of export intensity indicates that Indian exporters started exporting the targeted products to the US as higher tariffs increases the price of Chinese products and thereby points towards possible trade diversion. A similar pattern is also observed for products targeted under China retaliatory tariffs. However the export intensity of products under China's retaliatory tariffs (towards the US) started decreasing visibly since end of 2019.

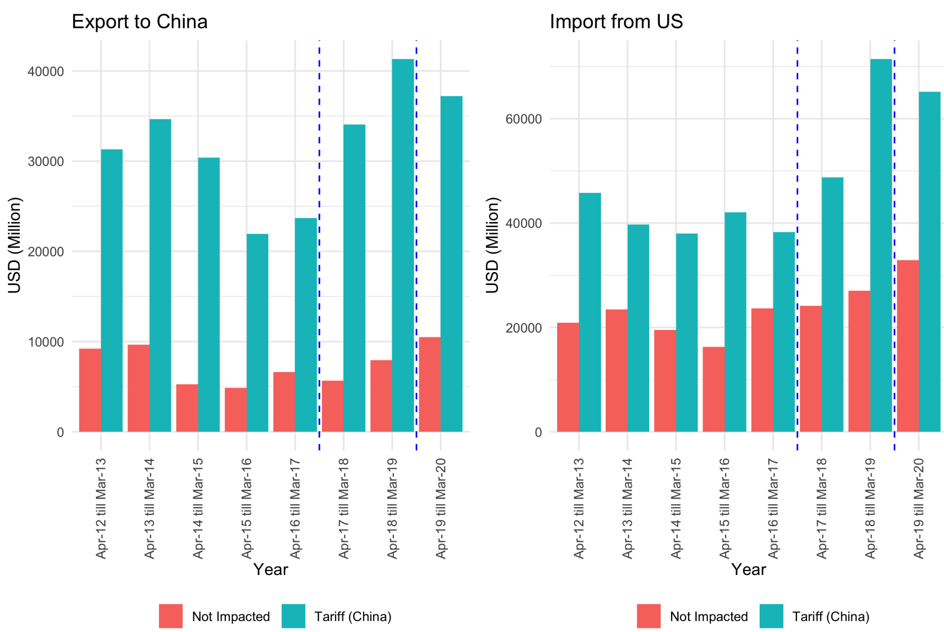
Figure 6. Impact of US Tariff on exports



Note: Tariffs increased in between the two dotted lines

On the flip side, imports from the US increased sharply for products subject to higher tariff imposed by China due to the tariff war. US manufacturers increased exporting products to India following higher tariffs imposed by Chinese authorities. The left panel of Figure 7 illustrates a sharp increase of imports from the US for products impacted by China tariffs. A similar scenario appears in case of Chinese exporters as well.The right panel of Figure 7 showcases the import value of targeted products impacted by higher US tariffs vis-vis non-impacted products over time. Higher tariffs imposed by US authorities, forced Chinese manufacturers to redirect their trade flow to India as India's import of these products registered sharp increase during 2018 and remained at elevated level in 2019.

Figure 7. Impact of US Tariff on imports



Note: Tariffs increased in between the two dotted lines

In Figure 8 and Figure 9, the total value of export and import is plotted for products across different tariff brackets. The period is segregated into two intervals - the 'Pre' period represents one year before tariff (i.e. FY 2017) and the Post period is one year after the tariff (FY 2020). The trade value has been aggregated across different tariff brackets for US tariffs and China tariffs separately. The left panel of Figure 8 represents India's export to the US across different brackets of US tariff. The right panel represents the value of import from China across these tariff brackets. The height of the bars represents the total value of trade in USD millions. Comparing the height of bars, it is observed that the export intensity increased during the post tariff period to the US. A similar impact was visible in the case of imports from China also. These findings support the hypothesis that the trade diversion happened during post tariff period. Similar effects were observed for products affected by China tariff also (refer to Figure 9)

Figure 8. Impact of US Tariff on trade value

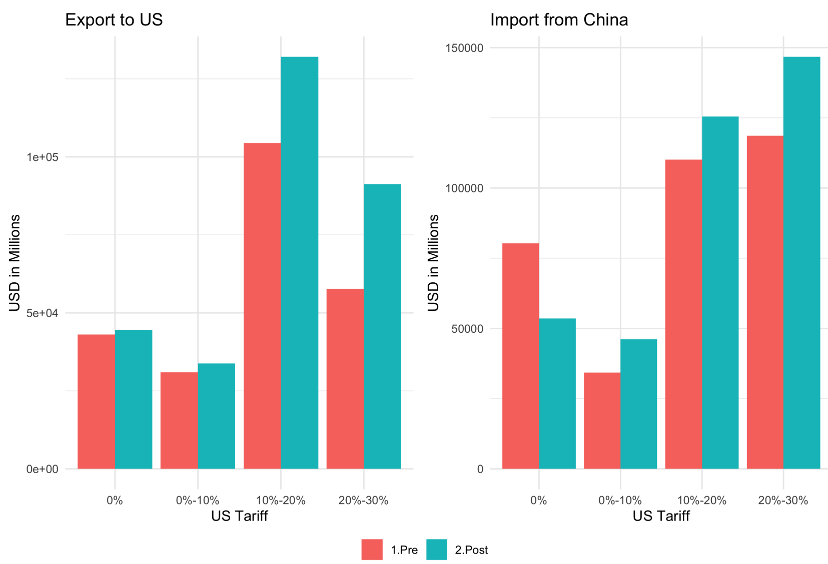
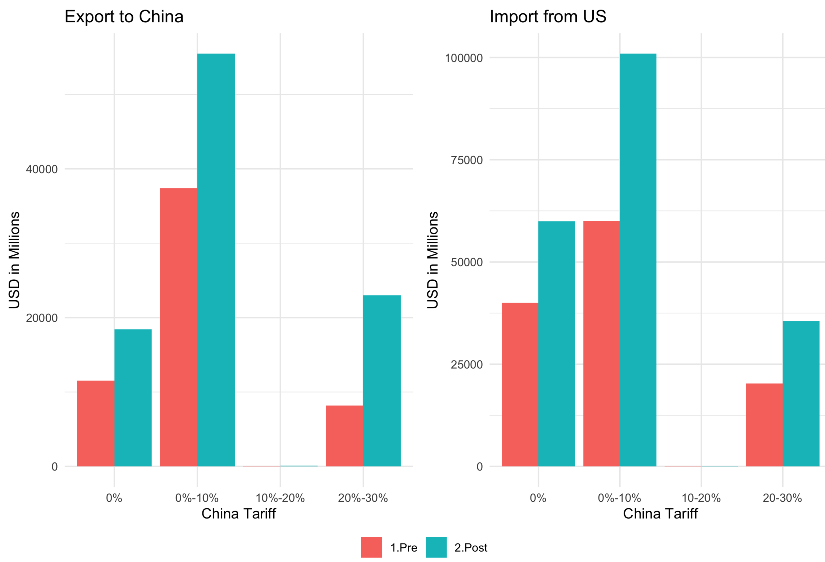


Figure 9. Impact of China Tariff on trade value



Overall Impact of US-China Tariffs on India's external trade

Empirical Framework

The impact of US-China tariffs is analyzed using a short and long difference-in-difference approach. The short difference is calculated as the difference of trade value between FY 2020 [14] and FY 2017 [15]. It implies that the short difference calculates the changes in the trade value between financial year ending in March 2020 and financial year ending in March 2017. Similarly, the long difference is derived as the difference between FY 2020 and the average trade value of the last five years before the tariff war (i.e. April 2012 till March 2017). Both short and long difference is calculated across HS6 products. Finally, the difference is calculated using log inverse hyperbolic transformation as due to the presence of zero trade values across products [16]. The primary difference-in-difference

[14] FY stands for financial year i.e. April to March. FY 2020 implies April 2019 till March 2020

[15] FY 2017 implies April 2016 till March 2017

[16] Aihounton & Henningsen (2019) highlighted the sensitivity of inverse hyperbolic transformation on the units of measurement. Hence robustness checks are done using log-transformation on the trade

specification is presented in equation 1

$$\begin{aligned}\Delta Y_{ij} = \alpha_0 + \beta_i + \gamma_1^{US}\mathbf{1}_{US} + \gamma_2^{US}Duty_i + \gamma_3^{US}\mathbf{1}_{US} \times Duty_i + \gamma_4^{US}\mathbf{1}_{US} \times ReDuty_i \\ + \gamma_1^{China}\mathbf{1}_{China} + \gamma_2^{China}ReDuty_i + \gamma_3^{China}\mathbf{1}_{China} \times ReDuty_i \\ + \gamma_4^{China}\mathbf{1}_{China} \times Duty_i + \epsilon_{ij}\end{aligned} \tag{1}$$

where i stands for products and j stands for destinations (i.e US, China and Rest of the World). Further ΔY_{ij} is the difference in export (import) of goods, β_i represents some level of product or industry fixed effects, $\mathbf{1}_{US}$ is the indicator variable with value of 1 for trade with the US [17] and 0 otherwise, $\mathbf{1}_{China}$ is the indicator variable with value of 1 for trade with China and 0 otherwise, $Duty_i$ is the tariff levied by the US against China [18] on product i, $ReDuty_i$ is the tariff levied by China against the US. Tariffs for the US and China have been transformed to iceberg cost using transformation $Duty_i = \log(1 + Tariff_i)$ and $ReDuty_i = \log(1 + ReTariff_i)$. As indicated earlier, the change in export (and import), i.e. ΔY_{ij} has been derived using inverse hyperbolic sign transformation on trade data at product level. This is to interpret the effects as logs, but to include zeros (due to no trading in any particular year) within the analysis. The difference of export (or import) has been calculated using short and long difference measures of product level export (and import) data.

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value. The results were found to be robust using log-transformation. A separate appendix (*Not included in this document*) is prepared with the robustness results

[17] i.e. export to the US or import from the US

[18] i.e. export to China or import from China

The effects estimated by Eq. 1 can be represented as

$$\Delta\hat{Y}_i = \begin{cases} \hat{\alpha}_0 & \text{(Other products)} \\ \hat{\alpha}_0 + \hat{\gamma}_2^{US} \times Duty_i + \hat{\gamma}_2^{China} \times ReDuty_i & \text{(Traded with others)} \\ (\hat{\alpha}_0 + \hat{\gamma}_1^{US}) + (\hat{\gamma}_2^{US} + \hat{\gamma}_3^{US}) \times Duty_i + (\hat{\gamma}_2^{China} + \hat{\gamma}_4^{US}) \times ReDuty_i & \text{(Traded with the US)} \\ (\hat{\alpha}_0 + \hat{\gamma}_1^{China}) + (\hat{\gamma}_2^{US} + \hat{\gamma}_4^{China}) \times Duty_i + (\hat{\gamma}_2^{China} + \hat{\gamma}_3^{China}) \times ReDuty_i & \text{(Traded with China)} \end{cases} \tag{2}$$

In Eq. 1, α_0 indicates average growth of trade value and β_i represents product fixed effects at HS levels 1,2,3 and 4. The impact of the US-China Trade war tariffs are assessed through direct impact and indirect impact. Following Eq. 2, the direct impact of tariff (US or China) is expected to influence trade value of commodities impacted by tariff. γ_1^{US} and γ_1^{China} represent average change in growth rate of India's trade value of products traded with the US and China. The trade value of targeted products are also likely to get impacted. The average direct impact of US tariff is estimated from estimated value of γ_2^{US} and impact of China's tariffs is estimated from γ_2^{China}. The average effect captures the overall impact of trade diversion on India's export and import to (or from) all destinations. Positive and significant estimates of γ_2^{US} in export equation, will indicate higher growth in export values due to tariffs. However the impact of US tariffs and China tariffs are expected to have additional impact when the destination country is the US or China. Such additional direct effect is estimated by $\hat{\gamma}_3^{US}$ and $\hat{\gamma}_3^{China}$ [19] i.e. $\hat{\gamma}_3$ represents the difference-in-difference estimate. Hence positive and significant estimates of γ_3^{US} imply that export (or import) of products impacted by US tariffs, increased further to the US. Following trade diversion theory, tariff imposition is expected to increase imports of

[19] $\hat{\alpha}$ represents estimated value of parameter α

tariff products from common trade partner and hence positive value of γ_3^{US} and γ_3^{China} supports the hypothesis of trade diversion from countries involved in tariff war whereas positive value of γ_2^{US} and γ_2^{China} represents the average effect of trade diversion across all destination countries.

The indirect effect of US-China tariffs have been estimated using additional interaction term γ_4^{US} and γ_4^{China}. The indirect effect targets any spillover impact of US tariffs and China tariffs on China and the US respectively. Such spillover effects are particularly interesting given the nature and timing of tariff imposition by the US and China on similar products over 2018. One can interpret the estimates of γ_4^{US} as effect of China tariffs on India's export (or import) with the US. Hence positive and significant value of γ_4^{US} will imply higher than average growth in India's export (or import) to the US driven by China's retaliatory tariffs. Equation 1 is estimated at HS-1,2,3 and 4 digit level using product fixed effect and robust standard error at HS - 1,2,3 and 4 level. Robust standard errors are used in all regressions

The effect estimates from difference-in-difference regression specification in eq. 1 is only valid under the assumption of no pre-existing trend in the trade value. Any pre-existing trend in the trade value [20] makes result in biased estimate of the parameters. Hence a placebo test is performed to validate the presence of any pre-existing trends in the data. The placebo regression was carried out using US tariffs and China retaliatory tariffs separately for product level exports and imports to the US, China and rest of the world.

[20] i.e. significant impact of tariffs before tariffs were introduced

The placebo regression is expressed in following way

$$
\begin{aligned}
\Delta Y_{ij}^{P} &= \alpha_0 + \beta_i + \gamma_1^{US}\mathbf{1}_{US} + \gamma_2^{US}Duty_i + \gamma_3^{US}\mathbf{1}_{US}\times Duty_i + \gamma_4^{US}\mathbf{1}_{US}\times ReDuty_i \\
&+ \gamma_1^{China}\mathbf{1}_{China} + \gamma_2^{China}ReDuty_i + \gamma_3^{China}\mathbf{1}_{China}\times ReDuty_i \\
&+ \gamma_4^{China}\mathbf{1}_{China}\times Duty_i + \epsilon_{ij}
\end{aligned} \tag{3}
$$

where subscript i stands for product and j represents trade destinations namely 'US','China' and 'Rest of the world'. ΔY_{ij}^{P} is the log difference of trade value between FY 2013 [21] and FY 2015 [22]. β_{ij} is the product fixed effect, designed at HS -1,2,3 and 4 digit level. The parameter of interest, in this specification, is γ_2^{US} and γ_2^{China}. A statically significant value of γ_2^{US} and γ_2^{China} imply significant impact of tariffs on Indian trade value before the tariff was introduced and thereby identifies a pre-existing trend effect of tariffs on India's trade value. Equation 3 is estimated separately for products traded with the US, China and rest of the world. These panel regressions were estimated HS - 1,2,3 and 4 digit level with robust standard error assumption at these product category levels.

Empirical Findings

Impact on India's exports

The estimated coefficients are reported in Table 1 across different specifications. The first four columns report the estimated coefficients using short difference and the last four columns use long differences as dependent variables. Among the first four columns, the estimation methodology uses product fixed effects at HS -1,2,3 and 4 level and ro-

[21]FY 2013 represents April 2012 to March 2013

[22]FY 2015 represents April 2014 to March 2015

bust standard error is also defined for same product clusters. The direct effect of US tariffs and China tariffs demonstrate skewed substitution effect on Indian exports to different destinations. The average impact of US tariffs (on China) on Indian exports to all destinations, is found to be insignificant across all specifications. This implies that the tariffs imposed by US authority on products during the US-China trade war, does not influence India's export value to other destinations. However the impact is found to be significant when the destination country is the US. This implies that the impact of higher US tariffs during US-China tariff war, boasts Indian export to the US but not to other destinations. The increase in export value to US, therefore, supports the trade diversion hypothesis, highlighting the substitution effect of US tariffs in form of short term substitution of Chinese imports by Indian imports. As higher tariffs imposed by the US, makes Chinese export costly, Indian manufacturers are able to reap the benefit of higher tariffs by increasing higher export value to the US. The substitution effect is found to be robust across all specifications. The difference-in-difference estimates, translated into differential impact across different tariff brackets, indicate an increase of 12%-16% in India's export of products under 25% tariff bracket [23]. However the negative and significant coefficient of the intercept (i.e $\mathbf{1}_{US}$) estimates an average decline in India's export to the US, implying that the products which were not impacted by tariffs, faced a contraction in exports to US, compared to those impacted by tariffs [24].

On the other hand, the impact of Chinese retaliatory tariffs is found to have a muted impact on Indian exporters. The average impact on India's exports is found to have

[23]Calculated based on estimated coefficient of tariffs impact to India's export to the US and tariff bracket

[24]The average negative impact on the other products (i.e. not targeted products) may be explained in terms of relative change in export share of targeted and other products. As tariffs increased the export value of targeted products, export value share of other products declined with respect to the targeted products

insignificant impact resulting from China's tariffs on the US. Further India's exports to China also remained unaffected by China's retaliatory tariff. Such muted impact supports the fact that the substitution effect is more prominently felt between Indian and Chinese manufacturers in exports to the US. However, a similar substitution effect between US and India is found to be muted in case of exporting to China. Such observations corroborate the fact that the comparative advantage of Indian firms is comparable with Chinese manufacturing in products affected by US tariffs. Further China's retaliatory tariff targeted products where Indian manufacturers don't have any comparative advantages which resulted in muted impact of China tariff on Indian exports. On the other hand, the indirect impact is found to be insignificant across all destinations (except for one specification using short difference and HS4 classification). The insignificant indirect effect of tariffs and retaliatory tariffs supports the fact that the spillover impact of the tariffs was limited in nature.

Table 1: DiD Estimates for tariff impact on India's exports

VARIABLES	(1) Short	(2) Short	(3) Short	(4) Short	(5) Long	(6) Long	(7) Long	(8) Long
$\mathbf{1}_{US}$	-0.217***	-0.217***	-0.217***	-0.217***	-0.186**	-0.186***	-0.186***	-0.186***
	(0.063)	(0.053)	(0.049)	(0.046)	(0.073)	(0.053)	(0.049)	(0.048)
$\mathbf{1}_{China}$	-0.165*	-0.165***	-0.165***	-0.165***	-0.186**	-0.186***	-0.186***	-0.186***
	(0.080)	(0.058)	(0.061)	(0.052)	(0.072)	(0.048)	(0.044)	(0.043)
Tariff	0.263	0.248	0.222	0.110	0.069	0.035	0.025	-0.102
	(0.224)	(0.203)	(0.243)	(0.223)	(0.292)	(0.235)	(0.229)	(0.207)
Re. Tariff	0.560	0.594**	0.617**	1.042***	0.217	0.228	0.228	0.624**
	(0.424)	(0.287)	(0.270)	(0.270)	(0.555)	(0.314)	(0.301)	(0.278)
Tariff x $\mathbf{1}_{US}$	0.677*	0.677**	0.677**	0.677**	0.869*	0.869**	0.869***	0.869***
	(0.312)	(0.307)	(0.290)	(0.270)	(0.443)	(0.345)	(0.301)	(0.281)
Re. Tariff x $\mathbf{1}_{China}$	-0.644	-0.644	-0.644	-0.644	-0.293	-0.293	-0.293	-0.293
	(0.860)	(0.503)	(0.460)	(0.432)	(0.858)	(0.440)	(0.440)	(0.367)
Re. Tariff x $\mathbf{1}_{US}$	-0.229	-0.229	-0.229	-0.229	0.207	0.207	0.207	0.207
	(0.607)	(0.347)	(0.327)	(0.273)	(0.829)	(0.400)	(0.390)	(0.319)
Tariff x $\mathbf{1}_{China}$	0.135	0.135	0.135	0.135	0.216	0.216	0.216	0.216
	(0.491)	(0.397)	(0.432)	(0.372)	(0.473)	(0.370)	(0.331)	(0.281)
Observations	14,364	14,364	14,364	14,364	14,364	14,364	14,364	14,364
Number of HS	10	98	175	1,202	10	98	175	1,202
Fixed Effect	HS1	HS2	HS3	HS4	HS1	HS2	HS3	HS4
Cluster SE	HS1	HS2	HS3	HS4	HS1	HS2	HS3	HS4

Next, the placebo effect is estimated using estimated coefficients from Eq. 3. As indicated in earlier section, the placebo effect has been analyzed separately for exports to the US, exports to China and exports to other destinations. Table 2 represents the estimated coefficients using different product classifications. The estimated impact of US tariffs and China's retaliatory tariffs are found to be insignificant which supports the fact that US tariffs and China's retaliatory tariffs did not have any impact on India's exports before March 2017.

Table 2: Placebo Effect on Export

VARIABLES	(1) placebo	(2) placebo	(3) placebo	(4) placebo
$\mathbf{1}_{US}$	0.028	0.028	0.028	0.028
	(0.016)	(0.025)	(0.023)	(0.020)
$\mathbf{1}_{China}$	0.020**	0.020	0.020	0.020
	(0.007)	(0.019)	(0.020)	(0.019)
Tariff	0.042	-0.015	-0.013	-0.061
	(0.101)	(0.105)	(0.111)	(0.124)
Re. Tariff	-0.046	-0.129	-0.156	0.170
	(0.144)	(0.177)	(0.178)	(0.208)
Tariff x $\mathbf{1}_{US}$	-0.080	-0.080	-0.080	-0.080
	(0.123)	(0.124)	(0.143)	(0.136)
Re. Tariff x $\mathbf{1}_{China}$	0.203	0.203	0.203	0.203
	(0.117)	(0.197)	(0.172)	(0.168)
Re. Tariff x $\mathbf{1}_{US}$	0.178	0.178	0.178	0.178
	(0.157)	(0.230)	(0.218)	(0.195)
Tariff x $\mathbf{1}_{China}$	-0.054	-0.054	-0.054	-0.054
	(0.098)	(0.112)	(0.126)	(0.130)
Observations	14,364	14,364	14,364	14,364
Number of HS	10	98	175	1,202
Fixed Effect	HS1	HS2	HS3	HS4
Cluster SE	HS1	HS2	HS3	HS4

Including Impact of India's exit from GSP

The impact of India's exit from GSP countries increased tariff rate imposed by the US on Indian exports in selected sectors. Accordingly, the panel regression framework is modified by incorporating the change in US tariff on India. The difference of tariffs between 2017 and 2019 is considered as an additional control in the difference in difference regression to evaluate the trade diversion effect. The revised panel regression is given as follows

$$
\begin{aligned}
\Delta Y_i = \alpha_0 + \beta_i + \gamma_1^{US}\mathbf{1}_{US} + \gamma_2^{US} Duty_i + \gamma_3^{US}\mathbf{1}_{US} \times Duty_i + \gamma_4^{US}\mathbf{1}_{US} \times ReDuty_i \\
+ \gamma_1^{China}\mathbf{1}_{China} + \gamma_2^{China} ReDuty_i + \gamma_3^{China}\mathbf{1}_{China} \times ReDuty_i \\
+ \gamma_4^{China}\mathbf{1}_{China} \times Duty_i + \gamma_5 Tariff(GSP) \\
+ \gamma_6\mathbf{1}_{US} \times Tariff(GSP) + \mathbf{1}_{China} \times Tariff(GSP) + \epsilon_i
\end{aligned}
\tag{4}
$$

where $Tariff(GSP)$ is log difference of tariffs imposed by the US on Indian exported goods between 2019 and 2017. More specifically, $Tariff(own) = \log(1 + Duty_{2019}^{India}) - \log(1 + Duty_{2017}^{India})$.

The correlation between own tariffs (i.e. tariffs on India's export to US after GSP exit) is found to be uncorrelated with US Tariff on China and China's tariff on the US [25]. The panel regression estimates indicates significant trade diversion between India and China to the US in response to the US tariffs imposed on China. Further, a significant moderation in India's export is observed due to change in tariff structure due to India's exit from GSP countries. The findings further strengthens the trade diversion hypothesis and also highlights the decline in India's export due to US decision towards excluding India from GSP country group (refer to Table 3).

[25]Correlation between own tariff and US tariffs on China is 0.11 and correlation between own tariff and China's tariff on the US is 0.05

Table 3: Fixed Effect Estimate with GSP impact

VARIABLES	(1) Short	(2) Short	(3) Short	(4) Short	(5) Long	(6) Long	(7) Long	(8) Long
$\mathbf{1}_{US}$	-0.215***	-0.215***	-0.215***	-0.215***	-0.181**	-0.181***	-0.181***	-0.181***
	(0.064)	(0.054)	(0.049)	(0.046)	(0.074)	(0.054)	(0.049)	(0.048)
$\mathbf{1}_{China}$	-0.163*	-0.163***	-0.163***	-0.163***	-0.184**	-0.184***	-0.184***	-0.184***
	(0.079)	(0.058)	(0.062)	(0.052)	(0.073)	(0.048)	(0.045)	(0.043)
Tariff	0.275	0.253	0.216	0.100	0.057	0.016	0.000	-0.129
	(0.233)	(0.206)	(0.244)	(0.224)	(0.294)	(0.241)	(0.230)	(0.207)
Re. Tariff	0.555	0.592**	0.616**	1.044***	0.210	0.224	0.225	0.624**
	(0.425)	(0.288)	(0.271)	(0.270)	(0.561)	(0.317)	(0.302)	(0.279)
Tariff x $\mathbf{1}_{US}$	0.700**	0.700**	0.700**	0.700***	0.939*	0.939***	0.939***	0.939***
	(0.304)	(0.300)	(0.289)	(0.270)	(0.427)	(0.339)	(0.300)	(0.277)
Re. Tariff x $\mathbf{1}_{China}$	-0.641	-0.641	-0.641	-0.641	-0.289	-0.289	-0.289	-0.289
	(0.866)	(0.504)	(0.460)	(0.432)	(0.865)	(0.443)	(0.441)	(0.367)
Re. Tariff x $\mathbf{1}_{US}$	-0.225	-0.225	-0.225	-0.225	0.217	0.217	0.217	0.217
	(0.614)	(0.352)	(0.330)	(0.274)	(0.843)	(0.410)	(0.397)	(0.322)
Tariff x $\mathbf{1}_{China}$	0.158	0.158	0.158	0.158	0.245	0.245	0.245	0.245
	(0.500)	(0.400)	(0.432)	(0.373)	(0.474)	(0.376)	(0.333)	(0.281)
Tariff(US GSP)	-0.702	-0.219	0.175	0.028	0.992	1.413	1.560	1.250
	(0.595)	(0.819)	(1.048)	(1.092)	(0.645)	(0.887)	(1.060)	(1.218)
$\mathbf{1}_{US}$ x Tariff(US GSP)	-1.670	-1.670	-1.670	-1.670	-4.967**	-4.967***	-4.967***	-4.967**
	(1.384)	(1.389)	(1.051)	(1.620)	(1.963)	(1.697)	(1.603)	(2.401)
$\mathbf{1}_{China}$ x Tariff(US GSP)	-1.629	-1.629	-1.629	-1.629	-2.015*	-2.015*	-2.015	-2.015
	(1.489)	(2.119)	(2.248)	(2.287)	(0.980)	(1.054)	(1.681)	(1.700)
Observations	14,364	14,364	14,364	14,364	14,364	14,364	14,364	14,364
Number of HS	10	98	175	1,202	10	98	175	1,202
Fixed Effect	HS1	HS2	HS3	HS4	HS1	HS2	HS3	HS4
Cluster SE	HS1	HS2	HS3	HS4	HS1	HS2	HS3	HS4

Following similar specification, the placebo regression is also estimated. The estimated coefficients indicate no statistically significant effect of trade war tariffs on India's export prior to 2017 (refer to Table 4)

Table 4: Fixed Effect Estimate with GSP impact

VARIABLES	(1) placebo	(2) placebo	(3) placebo	(4) placebo
$\mathbf{1}_{US}$	0.031*	0.031	0.031	0.031
	(0.016)	(0.025)	(0.024)	(0.020)
$\mathbf{1}_{China}$	0.019**	0.019	0.019	0.019
	(0.007)	(0.019)	(0.020)	(0.019)
Tariff	0.054	-0.007	-0.011	-0.069
	(0.101)	(0.104)	(0.111)	(0.124)
Re. Tariff	-0.050	-0.130	-0.156	0.171
	(0.144)	(0.177)	(0.178)	(0.208)
Tariff x $\mathbf{1}_{US}$	-0.033	-0.033	-0.033	-0.033
	(0.105)	(0.118)	(0.134)	(0.132)
Re. Tariff x $\mathbf{1}_{China}$	0.201	0.201	0.201	0.201
	(0.118)	(0.197)	(0.172)	(0.168)
Re. Tariff x $\mathbf{1}_{US}$	0.184	0.184	0.184	0.184
	(0.164)	(0.231)	(0.219)	(0.194)
Tariff x $\mathbf{1}_{China}$	-0.067	-0.067	-0.067	-0.067
	(0.098)	(0.113)	(0.127)	(0.131)
Tariff(US GSP)	-0.733*	-0.494	-0.486	0.031
	(0.364)	(0.436)	(0.471)	(0.733)
$\mathbf{1}_{US}$ x Tariff(US GSP)	-3.354***	-3.354***	-3.354***	-3.354***
	(0.337)	(0.830)	(0.972)	(1.266)
$\mathbf{1}_{China}$ x Tariff(US GSP)	0.946**	0.946	0.946	0.946
	(0.336)	(0.868)	(0.874)	(0.731)
Observations	14,364	14,364	14,364	14,364
Fixed Effect	HS1	HS2	HS3	HS4
Cluster SE	HS1	HS2	HS3	HS4

Impact on India's Imports

The impact of the US-China trade war on India's import value, represents a different scenario compared to the exports. Following Table 5, the direct impact of the tariffs imposed by the US during US-China tariff war, is found to have increased India's import across all destinations on average. On the other hand, the direct impact of US tariffs on India's import from China, remains insignificant implying that Indian manufacturers started importing from elsewhere (other than China) for products affected by higher US tariffs. The direct impact from tariffs imposed by China in retaliation to US tariffs, is also found to be significant on India's total import. Higher retaliatory tariff induced higher imports by India. The effect was found to be significant and robust across all product fixed effect specifications. The effect of China's tariffs is found to be more effective on India's import compared to the impact of US tariffs. Unlike the average impact, the direct impact on import intensity appears to remained unchanged for imports from US and China respectively. This observations highlights the fact the higher tariffs induces higher imports but not necessarily from US and China. So US-China trade war appears to benefit manufacturers from other destinations. The indirect effect on India's import, on the contrary, has reduced imports from the US and China. The negative and significant coefficient of the interaction terms of US Tariffs and import to US, provides a compelling insight about the decline of India's import from US manufacturers. Such decline can be tagged with the degree of uncertainty created by the US-China trade war. As the trade war introduced higher tariff barriers, the impact of uncertain trade environment reduced domestic production of US manufacturers (Fajgelbaum et. al. (2020)), resulting in a decline of exports by domestic manufacturers. Similar observations can be extended for negative and significant indirect effect of retaliatory tariff and imports from China.

Summarizing the pattern observed in the effects of tariffs imposed by the US and China during the recent trade war, we conclude that trade diversion appeared to have helped manufacturers from other destination countries as manufacturers from the US and China face uncertain trade environment. The net impact of tariffs imposed by the US and China appears to have affected exports from respective countries but other countries have benefitted from trade diversion. Further, the increase in import intensity from other destinations are found to be robust across different product level fixed effects. While the direct effect of tariffs are found to have significant impact on import intensity, the indirect effects of tariffs are found to be insignificant which confirms no significant spillover impact from either tariffs.

Table 5: Fixed Effect Estimate

VARIABLES	(1) Short	(2) Short	(3) Short	(4) Short	(5) Long	(6) Long	(7) Long	(8) Long
$\mathbf{1}_{US}$	-0.019	-0.019	-0.019	-0.019	0.016	0.016	0.016	0.016
	(0.012)	(0.013)	(0.014)	(0.014)	(0.023)	(0.021)	(0.019)	(0.018)
$\mathbf{1}_{China}$	-0.054***	-0.054***	-0.054***	-0.054***	-0.036**	-0.036	-0.036*	-0.036**
	(0.016)	(0.017)	(0.016)	(0.015)	(0.016)	(0.022)	(0.019)	(0.018)
Tariff	0.343***	0.353***	0.338***	0.317**	0.793***	0.788***	0.800***	0.800***
	(0.100)	(0.092)	(0.103)	(0.123)	(0.112)	(0.149)	(0.140)	(0.174)
Re. Tariff	0.302	0.257	0.270	0.179	1.204***	1.210***	1.187***	1.347***
	(0.263)	(0.272)	(0.247)	(0.277)	(0.253)	(0.369)	(0.323)	(0.342)
Tariff x $\mathbf{1}_{US}$	-0.382***	-0.382***	-0.382***	-0.382***	-0.570***	-0.570***	-0.570***	-0.570***
	(0.073)	(0.120)	(0.120)	(0.124)	(0.113)	(0.156)	(0.152)	(0.149)
Re. Tariff x $\mathbf{1}_{China}$	-0.123	-0.123	-0.123	-0.123	-0.125	-0.125	-0.125	-0.125
	(0.273)	(0.347)	(0.304)	(0.330)	(0.289)	(0.399)	(0.363)	(0.361)
Re. Tariff x $\mathbf{1}_{US}$	-0.167	-0.167	-0.167	-0.167	-1.083***	-1.083***	-1.083***	-1.083***
	(0.217)	(0.332)	(0.283)	(0.285)	(0.278)	(0.356)	(0.333)	(0.314)
Tariff x $\mathbf{1}_{China}$	0.010	0.010	0.010	0.010	0.025	0.025	0.025	0.025
	(0.150)	(0.136)	(0.125)	(0.144)	(0.146)	(0.180)	(0.155)	(0.163)
Observations	17,961	17,961	17,961	17,961	17,961	17,961	17,961	17,961
Number of HS	10	98	175	1,261	10	98	175	1,261
Fixed Effect	HS1	HS2	HS3	HS4	HS1	HS2	HS3	HS4
Cluster SE	HS1	HS2	HS3	HS4	HS1	HS2	HS3	HS4

However the observations from Table 5 is only valid subject to the assumption of no pre-existing trend from the tariffs. Hence the placebo regression is run to validate any pre-existing trend in the import patterns. The placebo regression results indicate significant impact of tariffs on the import intensity prior to trade war. However the coefficients lack robustness and thereby nullifies any concern of pre-existing trend of India's import prior to imposition of tariffs (refer to Table 6).

Table 6: Placebo Effect

VARIABLES	(1) placebo	(2) placebo	(3) placebo	(4) placebo
$\mathbf{1}_{US}$	0.020	0.020	0.020	0.020
	(0.019)	(0.015)	(0.014)	(0.013)
$\mathbf{1}_{China}$	-0.005	-0.005	-0.005	-0.005
	(0.014)	(0.015)	(0.014)	(0.013)
Tariff	0.167**	0.150	0.157	0.132
	(0.055)	(0.094)	(0.107)	(0.103)
Re. Tariff	-0.508*	-0.434*	-0.452*	-0.368*
	(0.264)	(0.222)	(0.256)	(0.215)
Tariff x $\mathbf{1}_{US}$	-0.113	-0.113	-0.113	-0.113
	(0.131)	(0.120)	(0.115)	(0.115)
Re. Tariff x $\mathbf{1}_{China}$	0.457**	0.457**	0.457*	0.457*
	(0.177)	(0.198)	(0.247)	(0.253)
Re. Tariff x $\mathbf{1}_{US}$	0.019	0.019	0.019	0.019
	(0.456)	(0.293)	(0.289)	(0.249)
Tariff x $\mathbf{1}_{China}$	-0.071	-0.071	-0.071	-0.071
	(0.058)	(0.087)	(0.107)	(0.110)
Observations	17,961	17,961	17,961	17,961
Number of HS	10	98	175	1,261
Fixed Effect	HS1	HS2	HS3	HS4
Cluster SE	HS1	HS2	HS3	HS4

Heterogeneous impact of US-China Tariffs on India's external trade across product categories

Empirical Framework

The regression specification (represented in Eq. 1) assumes a uniform impact of tariffs across all product categories. However the assumption of uniform impact is restrictive in nature due to heterogeneity in the types of products. For instance, products used in production as specialized intermediate goods, cannot be replaced easily compared to those products which are used as final goods. Hence any Indian firm, producing intermediate goods, will not get benefits from the US China trade war whereas Indian firms producing final goods, may get benefited due to tariffs. Similarly, products which are traded on organized exchanges, can be replaced easily whereas differentiated products

(Rauch et. al., 2006) cannot be replaced that easily at least in the short run. The product level heterogeneity, therefore, can drive the short run impact of US-China tariffs on Indian exports [26]. With this background, Eq. 1 has been modified to introduce product level heterogeneity in the specification. The impact of tariffs is also estimated by different product classifications using a similar panel regression framework by introducing product classifications and corresponding interactions. These triple difference specifications are summarized in equation 5

$$
\begin{aligned}
\Delta Y_{ij} = {} & \alpha_0 + \beta_i + \gamma_1^{US}\mathbf{1}_{US} + \gamma_2^{US}Duty_i + \gamma_3^{US}\mathbf{1}_{US} \times Duty_i \\
& + \gamma_4^{US}\mathbf{1}_{US} \times ReDuty_i + \gamma_5^{US}\mathbf{1}_{US} \times C_i + \gamma_6^{US}Duty_i \times C_i \\
& + \gamma_7^{US}\mathbf{1}_{US} \times C_i \times Duty_i + \gamma_8^{US}\mathbf{1}_{US} \times C_i \times ReDuty_i \\
& + \gamma_1^{China}\mathbf{1}_{China} + \gamma_2^{China}ReDuty_i \\
& + \gamma_3^{China}\mathbf{1}_{China} \times ReDuty_i + \gamma_4^{China}\mathbf{1}_{China} \times Duty_i \\
& + \gamma_5^{China}\mathbf{1}_{China} \times C_i + \gamma_6^{China}ReDuty_i \times C_i \\
& + \gamma_7^{China}\mathbf{1}_{China} \times C_i \times ReDuty_i \\
& + \gamma_8^{China}\mathbf{1}_{China} \times C_i \times Duty_i + \epsilon_i
\end{aligned}
\tag{5}
$$

where C_i is a binary variable representing classification of product i. Hence $C_i = 1$ will represent those products falling under particular product category. As indicated in earlier section, these product categories can be (i) intermediate goods or (ii) differentiated goods or (iii) low elastic goods. Additional interaction terms involving C_i have been included in the specification to assess the differential impact across product categories. These additional terms (highlighted in blue) are targeted to estimate the direct and indirect

[26] Such heterogeneous impact was also observed by Bekker & Schroeter (2020) on the products targeted in phase 1 of the tariff war due to commitment of US firms to buy from Chinese firms

impact of tariffs across destinations. Eq. 5 is estimated using panel fixed effect at HS -1,2,3 and 4 categories with robust standard error at these product category levels [27]. The interaction terms in the form of triple difference, complicates the interpretation of the overall effect. Hence a simplified representation of eq. 2 has been proposed in table 7 to separate out the different source of impacts over product categories. Such a representation helps to understand both direct and indirect impacts and also helps to propose testing mechanism to understand the overall impact. Table 7 segregates the impact across four scenarios namely (i) other products which are not impacted by any tariffs (ii) products impacted by tariffs and are traded across all destinations (iii) products impacted by tariffs and are traded with the US and (iv) products impacted by tariffs and are traded with China. The highlighted coefficients (highlighted in blue) represents differential impact of tariffs on product classes and $\hat{\alpha}$ represents the estimated value of parameter α.

Table 7: Difference of specifications over product classification

	$C_i = 1$	$C_i = 0$
Other products	$\hat{\alpha}_0$	$\hat{\alpha}_0$
Products to other destinations	$\hat{\alpha}_0 + (\hat{\gamma}_2^{US} + \hat{\gamma}_6^{US}) \times Duty_i + (\hat{\gamma}_2^{China} + \hat{\gamma}_6^{China}) \times ReDuty_i$	$\hat{\alpha}_0 + \hat{\gamma}_2^{US} \times Duty_i + \hat{\gamma}_2^{China} \times ReDuty_i$
Products to the US	$(\hat{\alpha}_0 + \hat{\gamma}_1^{US} + \hat{\gamma}_5^{US}) + (\hat{\gamma}_2^{US} + \hat{\gamma}_3^{US} + \hat{\gamma}_6^{US} + \hat{\gamma}_7^{US}) \times Duty_i + (\hat{\gamma}_2^{China} + \hat{\gamma}_4^{US} + \hat{\gamma}_8^{US}) \times ReDuty_i$	$(\hat{\alpha}_0 + \hat{\gamma}_1^{US}) + (\hat{\gamma}_2^{US} + \hat{\gamma}_3^{US}) \times Duty_i + (\hat{\gamma}_2^{China} + \hat{\gamma}_4^{US}) \times ReDuty_i$
Products to China	$(\hat{\alpha}_0 + \hat{\gamma}_1^{China} + \hat{\gamma}_5^{China}) + (\hat{\gamma}_2^{US} + \hat{\gamma}_4^{China} + \hat{\gamma}_8^{China}) \times Duty_i + (\hat{\gamma}_2^{China} + \hat{\gamma}_3^{China} + \hat{\gamma}_6^{China} + \hat{\gamma}_7^{China}) \times ReDuty_i$	$(\hat{\alpha}_0 + \hat{\gamma}_1^{China}) + (\hat{\gamma}_2^{US} + \hat{\gamma}_4^{China}) \times Duty_i + (\hat{\gamma}_2^{China} + \hat{\gamma}_3^{China}) \times ReDuty_i$

Following Table 7, the differential impact of tariffs on any particular product category are segregated into direct impacts and indirect impacts. The direct differential impact is

[27] Further, we check the robustness of results by incorporating the own tariff change and its interaction effects in Eq. 5. The estimates are found to be robust under own tariff changes

expressed as linear combination of different coefficients representing average impact for the product class due to tariffs and specific tariff impact due to trade destinations. For instance, specific category products traded with US has two different sources of differential impact namely $\hat{\gamma}_6^{US}$ and $\hat{\gamma}_7^{US}$. The average differential impact i.e. $\hat{\gamma}_6^{US}$, represents the average change in export (or import) across all destinations. Such average and differential effects, if found to be statistically significant, points towards average trade diversion effect due to tariffs. The other component, i.e. $\hat{\gamma}_7^{US}$, is the differential impact of tariffs on products traded with the US and hence can be termed as specific trade diversion effect on product categories. However unlike Eq. 1 (or eq. 2), the presence of average trade diversion and specific trade diversion impact complicates the overall impact of tariffs on products falling under particular product category. For instance, the average trade diversion effect can be negative for intermediate goods category whereas the specific trade diversion impact can be positive. Hence the overall impact may be positive or negative. Hence the overall impact of US tariffs and China retaliatory tariffs is examined using hypothesis testing on sum of coefficients. Similarly the indirect differential impact involves additional coefficient $\hat{\gamma}_8^{US}$ which can be positive or negative. In general, the hypothesis testing framework can be illustrated as follows

$$\begin{aligned} &\Omega^C = \{i : C_i = 1\} \text{ Products within class} \\ &\Omega^N = \{i : C_i = 0\} \text{ Products not within class} \end{aligned} \tag{6}$$

Direct impact on Ω^C	
Trade with the US	$H_0 : \gamma_2^{US} + \gamma_3^{US} + \gamma_6^{US} + \gamma_7^{US} = 0$
Trade with China	$H_0 : \gamma_2^{China} + \gamma_3^{China} + \gamma_6^{China} + \gamma_7^{China} = 0$
Direct impact on Ω^N	
Trade with the US	$H_0 : \gamma_2^{US} + \gamma_3^{US} = 0$
Trade with China	$H_0 : \gamma_2^{China} + \gamma_3^{China} = 0$

Empirical Findings

Heterogeneous impact on India's Export

The heterogeneous impact of tariffs imposed by the US and China during the recent trade war has been estimated coefficients from Equation 5 using different product classifications. Table 8 represents the estimates from regression equation using annual data from 2013-2020. However it is very difficult to evaluate the net impact of US tariffs and China's retaliatory tariffs from Table 8. The net effects of tariff has been analyzed using sum of coefficients, as indicated in previous section. Table 9 represents the net impact of trade war on India's exports on Final goods and Input (or intermediate) goods. The net impact of US tariffs and China's tariff, calculated from 8, is represented in Table 9. The significance level of net impact, derived using standard error of estimates, is reported at 5 per cent level and statistically significant impact of the tariffs is indicated with ** in the coefficient estimates. The panel regression is separately carried out for three types of classification of products namely (i) intermediate goods vs consumption goods (ii) homogeneous goods vs differentiated goods and (iii) high elastic goods vs low elastic goods. The panel regression estimates for first classification of products (i.e. intermediate vs final goods) is presented in Table 8 whereas the other panel regression estimate for other classifications are represented in Annex. Only the summary table for each product classification is reported in Table 9, Table 10 and Table 11 respectively.

Table 9 provides the panel regression estimates for net effect of US tariffs and China tariffs. The estimated coefficient of final goods indicates positive and significant impact of the export of final consumption goods to US due to US tariffs. However the impact of

China retaliatory tariffs does not provide any significant change in India's export of final goods to China. The export of intermediate goods (or input goods) does not register any significant change to the US and to China due to the trade war. This finding corroborates with the fact that final goods are easily replaceable where intermediate goods, used in production process, is not easily replaceable. The impact of tariffs on export of final goods is also found to be robust in nature. Finally, India's export of final goods as well as intermediate goods to other destinations does not change significantly due to tariffs imposed by the US and China during the trade war.

Tariffs impact on exports has also been analyzed on homogeneous goods and differentiated goods. The net effect of US tariffs and China retaliatory tariffs, represented in Table 10, indicates that homogeneous goods export from India increased to US due to US tariffs whereas India's export of differentiated goods did not have any significant impact due to tariffs posed by the US during trade war. The impact of China's retaliatory tariff is found to be muted on export of homogeneous goods and differentiated goods.

A similar analysis was carried out on highly elastic goods and low elastic goods. The trade elasticity estimates are drawn from Broda & Winstein (2006) at HS6 digit level. High elastic goods are those goods which have a substitution elasticity higher than median trade elasticity. Using same specification, the net effect of the tariffs on India's export revealed that export of high elastic goods increased to US due to tariffs imposed by the US where the short term impact of the low elastic products were found to be insignificant. No significant impact was visible in case of India's export to China for high and low elastic products.

Summarizing the panel regression estimates across different classifications of products, we can infer that the export intensity of easily replaceable products increased to the US due to the tariffs imposed by the US during US-China tariff war. Products like specialized products, low elastic products cannot be easily replaced in short run which is reflected in the estimated net effect coefficients. The impact of retaliatory tariffs imposed by the Chinese authority during the trade war, does not have any significant impact on India's export intensity. Exports to other destinations did not register any significant changes due to US-China trade war. The findings broadly corroborates with the trade diversion mechanism in short term. Trade diversion appeared to have positive thrust due to higher export to the US and such strong positive effect underlines significant substitution happening with Chinese export being substituted by India's export to the US. The substitution effect is found to be strongly significant due to similar comparative advantage of producing targeted products by the Indian and Chinese firms. However the tariffs imposed by the Chinese Authorities are primarily agricultural commodities where India appears to have no comparative advantage, resulting in an insignificant impact.

Table 8: Intermediate Goods: Fixed Effect Estimate

VARIABLES	(1) Short	(2) Short	(3) Short	(4) Short	(5) Long	(6) Long	(7) Long	(8) Long
Class	0.048	0.055	0.049	0.109*	0.023	0.038	0.036	0.083*
	(0.048)	(0.043)	(0.051)	(0.057)	(0.041)	(0.044)	(0.047)	(0.048)
$\mathbf{1}_{US}$	-0.225**	-0.225***	-0.225***	-0.225***	-0.208**	-0.208***	-0.208***	-0.208***
	(0.080)	(0.063)	(0.065)	(0.061)	(0.088)	(0.069)	(0.067)	(0.065)
$\mathbf{1}_{China}$	-0.154*	-0.154***	-0.154***	-0.154***	-0.144*	-0.144***	-0.144***	-0.144***
	(0.078)	(0.053)	(0.057)	(0.051)	(0.073)	(0.050)	(0.046)	(0.044)
Tariff	0.121	0.075	0.026	-0.030	-0.159	-0.172	-0.194	-0.277
	(0.282)	(0.232)	(0.285)	(0.273)	(0.264)	(0.223)	(0.253)	(0.231)
Re. Tariff	0.377	0.363*	0.363	0.737***	0.119	0.166	0.150	0.520*
	(0.336)	(0.215)	(0.236)	(0.276)	(0.464)	(0.256)	(0.265)	(0.295)
Tariff x Input	0.102	0.129	0.171	-0.022	0.301**	0.259	0.277	0.122
	(0.183)	(0.208)	(0.233)	(0.258)	(0.122)	(0.171)	(0.217)	(0.222)
Re. Tariff x Input	0.291	0.318	0.365	0.303	0.050	-0.093	-0.058	-0.117
	(0.477)	(0.356)	(0.336)	(0.421)	(0.327)	(0.303)	(0.316)	(0.366)
$\mathbf{1}_{US}$ x Input	0.008	0.008	0.008	0.008	0.043	0.043	0.043	0.043
	(0.074)	(0.066)	(0.074)	(0.072)	(0.068)	(0.070)	(0.075)	(0.071)
$\mathbf{1}_{China}$ x Input	-0.030	-0.030	-0.030	-0.030	-0.139**	-0.139*	-0.139**	-0.139**
	(0.085)	(0.081)	(0.091)	(0.080)	(0.060)	(0.073)	(0.065)	(0.060)
Tariff x $\mathbf{1}_{US}$	1.123**	1.123***	1.123***	1.123***	1.463***	1.463***	1.463***	1.463***
	(0.418)	(0.347)	(0.371)	(0.359)	(0.422)	(0.374)	(0.388)	(0.364)
Re. Tariff x $\mathbf{1}_{US}$	-0.181	-0.181	-0.181	-0.181	0.230	0.230	0.230	0.230
	(0.563)	(0.326)	(0.315)	(0.264)	(0.746)	(0.357)	(0.362)	(0.303)
Re. Tariff x $\mathbf{1}_{China}$	-0.611	-0.611	-0.611	-0.611	-0.350	-0.350	-0.350	-0.350
	(0.664)	(0.406)	(0.433)	(0.382)	(0.704)	(0.376)	(0.376)	(0.334)
Tariff x $\mathbf{1}_{China}$	0.165	0.165	0.165	0.165	0.319	0.319	0.319	0.319
	(0.531)	(0.415)	(0.452)	(0.378)	(0.446)	(0.357)	(0.334)	(0.280)
$\mathbf{1}_{US}$ x Tariff x Input	-0.681	-0.681*	-0.681*	-0.681*	-0.958**	-0.958**	-0.958**	-0.958***
	(0.380)	(0.376)	(0.385)	(0.360)	(0.339)	(0.370)	(0.378)	(0.355)
$\mathbf{1}_{China}$ x Re. Tariff x Input	0.022	0.022	0.022	0.022	0.701	0.701	0.701	0.701
	(1.450)	(1.104)	(0.950)	(0.903)	(0.617)	(0.600)	(0.656)	(0.614)
Observations	14,364	14,364	14,364	14,364	14,364	14,364	14,364	14,364
Fixed Effect	HS1	HS2	HS3	HS4	HS1	HS2	HS3	HS4
Cluster SE	HS1	HS2	HS3	HS4	HS1	HS2	HS3	HS4

Table 9: Fixed Effect Estimate: Intermediate Goods and Final Goods

VARIABLES	(1) Short	(2) Short	(3) Short	(4) Short	(5) Long	(6) Long	(7) Long	(8) Long
Fixed Effect	HS1	HS2	HS3	HS4	HS1	HS2	HS3	HS4
Cluster SE	HS1	HS2	HS3	HS4	HS1	HS2	HS3	HS4
Export of Final Goods - US	1.051**	0.920**	0.868**	0.867**	1.112**	1.065**	1.035**	1.005**
Export of Final Goods - China	-0.010	0.351	0.391	0.447	-0.156	0.029	0.064	0.131
Export of Input Goods - US	-0.447	-0.334	-0.287	-0.515	-0.518**	-0.538	-0.508	-0.690
Export of Input Goods - China	0.343	0.114	0.056	0.334	-0.164**	-0.201	-0.275	-0.153

Table 10: Fixed Effect Estimate: Differentiated Good and Homogeneous Good

VARIABLES	(1) Short	(2) Short	(3) Short	(4) Short	(5) Long	(6) Long	(7) Long	(8) Long
Fixed Effect	HS1	HS2	HS3	HS4	HS1	HS2	HS3	HS4
Cluster SE	HS1	HS2	HS3	HS4	HS1	HS2	HS3	HS4
Export of Homogenous Goods - US	0.767**	0.739**	0.711**	0.571**	0.842**	0.757**	0.751**	0.578**
Export of Homogenous Goods - China	0.376	0.740	0.729	1.066**	-0.229	0.073	0.048	0.268
Export of Diff Goods - US	-0.144	-0.125	-0.130	-0.145	-0.216	-0.116	-0.139	-0.035
Export of Diff Goods - China	-0.257	-0.484	-0.502	-0.607	-0.324	-0.627	-0.628	-0.623

Table 11: Fixed Effect Estimate: High vs Low Elasticity

VARIABLES	(1) Short	(2) Short	(3) Short	(4) Short	(5) Long	(6) Long	(7) Long	(8) Long
Fixed Effect	HS1	HS2	HS3	HS4	HS1	HS2	HS3	HS4
Cluster SE	HS1	HS2	HS3	HS4	HS1	HS2	HS3	HS4
Export of High Elastic Goods - US	0.544**	0.498**	0.358	0.672**	0.551**	0.549**	0.449**	0.799**
Export of High Elastic Goods - China	-1.066	-0.671	-0.531	-0.716	-0.968	-0.777	-0.702	-1.082
Export of Low Elastic Goods - US	0.306	0.297	0.425	-0.017	0.321	0.266	0.367	-0.112
Export of Low Elastic Goods - China	1.377*	1.197	1.046	1.582**	.688	.656	.564	1.209**

Impact on India's Import

The impact of tariffs imposed by the US and China on India's import has been analyzed in similar fashion. The detailed panel regression results are reported in Annex for reference. The net effects, calculated using sum of coefficients, are reported in the summary table. The heterogeneous impact of tariffs is analyzed across three different classifications of products. Table 12, Table 13 and Table 14 reports the net effects of US tariffs and China tariffs for each type of classifications.

India's import intensity appears to remain unchanged across product classification when traded with the US and China. The import of final goods increased using long difference - in - difference. A similar pattern is observed in case of homogeneous goods and elastic goods also. However the robustness of estimates cannot be ensured as the impact changes sign across different product fixed effects. Also the difference-in-difference estimates using short difference show insignificant impact of tariffs. This corroborates with the fact that India's import from the US and China did not show any significant impact due to US-China tariff war. However the impact was found to be significant for imports from other destinations.

Table 12: Fixed Effect Estimate: Intermediate and Final Goods

VARIABLES	(1) Short	(2) Short	(3) Short	(4) Short	(5) Long	(6) Long	(7) Long	(8) Long
Fixed Effect	HS1	HS2	HS3	HS4	HS1	HS2	HS3	HS4
Cluster SE	HS1	HS2	HS3	HS4	HS1	HS2	HS3	HS4
Import of Final Goods - US	-0.071	-0.136	-0.156	-0.215	0.027	-0.084	-0.094	-0.107
Import of Final Goods - China	-0.107	0.151	0.129	-0.031	0.759**	1.120*	1.028**	1.064**
Import of Input Goods - US	-0.119	-0.054	-0.039	0.078	-0.040	0.012	0.015	0.051
Import of Input Goods - China	-0.131	-0.288	-0.297	-0.232	-0.628	-0.868	-0.805	-0.914

Table 13: Fixed Effect Estimate: Differentiated and Homogeneous Good

VARIABLES	(1) Short	(2) Short	(3) Short	(4) Short	(5) Long	(6) Long	(7) Long	(8) Long
Fixed Effect	HS1	HS2	HS3	HS4	HS1	HS2	HS3	HS4
Cluster SE	HS1	HS2	HS3	HS4	HS1	HS2	HS3	HS4
Import of Homogenous Goods - US	-0.180	-0.180	-0.175	-0.122	0.058	0.016	0.021	0.037
Import of Homogenous Goods - China	-0.151	-0.004	-0.032	-0.229	0.427	0.699*	0.677*	0.644*
Import of Diff Goods - US	0.130	0.069	0.023	-0.118	0.050	0.024	0.042	0.082
Import of Diff Goods - China	0.079	0.071	0.046	0.192	-0.025	-0.191	-0.233	-0.132

Table 14: Fixed Effect Estimate: High Elastic and Low Elastic Goods

VARIABLES	(1) Short	(2) Short	(3) Short	(4) Short	(5) Long	(6) Long	(7) Long	(8) Long
Fixed Effect	HS1	HS2	HS3	HS4	HS1	HS2	HS3	HS4
Cluster SE	HS1	HS2	HS3	HS4	HS1	HS2	HS3	HS4
Import of High Elastic Goods - US	0.158	0.225	0.269	0.190	0.471	0.536*	0.603*	0.205
Import of High Elastic Goods - China	-0.137	-0.051	-0.100	-0.482	0.450	0.564*	0.477	0.232
Import of Low Elastic Goods - US	-0.314	-0.421	-0.476	-0.398	-0.405	-0.541	-0.599	-0.153
Import of Low Elastic Goods - China	-0.009	0.051	0.074	0.316	0.035	0.143	0.195	0.476

Trade diversion and revealed comparative advantages

In this section, we focus on the revealed comparative advantages of products as possible channel of short run evidence of trade diversion. Following Ricardian and Heckscher-

Ohlin Models, countries tend to specialize in the comparative advantage products and trade with others so that all countries benefit. This section extends the analysis of short run impact of US-China tariffs on trade diversion and assess the revealed comparative advantage of the products which face trade diversion. Section 8.1 summarizes the different measures for estimating revealed comparative advantage and Section 8.2 presents stylized facts about India's comparative advantage in those products facing higher export intensity and higher import intensity.

Measuring revealed comparative advantages

Following Heckscher - Ohlin (HO) theory, comparative advantage of a country can be estimated from the relative factor endowment in that country with respect to the world. However Balassa (1989) highlighted that measuring comparative advantage and the validation of the HO theory pose challenge in absence of realized prices under autarky. To avoid this issue, Balassa (1965) suggested a mechanism to measure the revealed comparative advantage (RCA) of any country using trade data. Balassa's index has been modified across literature to improve the accuracy of the estimate. Before Balassa, Liesner (1958) provided a simple measure to estimate RCA using ratio of export share of any country in a particular product among a group of countries. More precisely, Liesner's measure for product j and country i, is defined in following manner

$$RCA_{ij} = \frac{X_{ij}}{X_{nj}} \tag{7}$$

where n stands for group of countries and X_{ij} is the export of product i by country j. Balassa (1965) proposed another measure of RCA as ratio of export share of any product

j in country i, normalized by export of group of countries i.e.

$$RCA_{ij}^{B} = \frac{X_{ij}/X_{it}}{X_{nj}/X_{nt}} \quad (8)$$

where X_{it} is the total export by country i. A country is said to have comparative advantage in product j in $RCA_{ij} > 1$. Following Balassa's measure, we define relative RCA measure between two countries as below

$$RCA_{ij}^{M} = \frac{X_{ij}/X_{it}}{X_{j}/X_{kt}} \forall i \neq k \quad (9)$$

However Greenaway & Milner (1993) found this measure of RCA to be biased due to omission of import intensity. Greenaway & Milner (1993) proposed another measure of RCA using net export as ratio of total trade value of the product j in country i. Their measure of RCA is given below

$$RCA_{ij}^{GM} = \frac{X_{ij} - M_{ij}}{X_{ij} + M_{ij}} \quad (10)$$

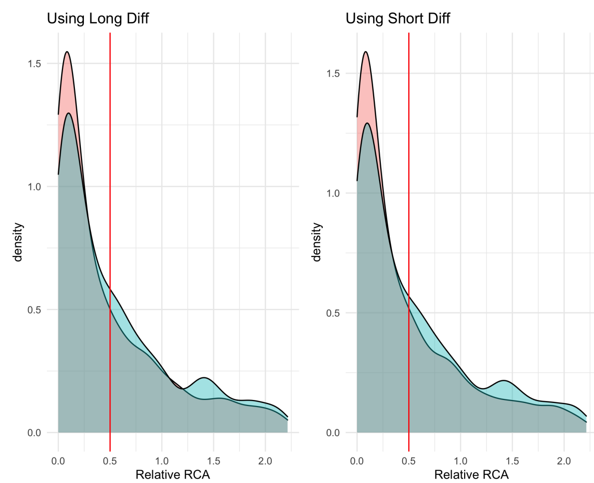
where M_{ij} is the import of product j in country i. RCA^{GM} is bounded between $[-1, +1]$. Following this measure, a country will have comparative advantage in product j if $RCA_{ij}^{GM} > 0$. However there is ambiguity in the interpretation of RCA_{ij}^{GM} when $RCA_{ij}^{GM} = 0$.

For our present analysis, we use RCA measures RCA_{ij}^{M} (following Eq. 9) and RCA^{GM} (following Eq. 10) for analyzing the comparative advantage and trade diversion across HS - 6 digit level for India and China using bilateral trade data from Comtrade. The time period of estimation is 2015-2017 (*i.e. immediately before the trade war* [28]) and the RCA estimates are represented in average value over this period.

Trade diversion and comparative advantage

We identify the products at HS -6 digit level which were targeted under the US tariff and experienced the trade diversion, using short and long difference [29] and map the relative RCA (*India with respect to China*) estimates (using RCA^{M}). The kernel density estimate of relative RCA demonstrate relatively greater proportion of trade diversion happening for products where Indian firms have relatively higher comparative advantages. Similar observations were drawn using RCA^{GM} approach (refer to Fig 10).

Figure 10. Kernel density of Relative RCA and trade diversion



(Products with negative export growth represented in red and products where trade diversion happened (measured in terms of positive export growth), is represented in green)

Next, we validate the distribution of revealed comparative advantages across product categories using panel regression using different product level fixed effects and robust

[28]Following placebo regression, we observed no statistically significant impact of US-China tariffs on India's trade value prior to 2017

[29]Here, we define a crude measure trade diversion in case the short difference and long difference are positive.

standard error. The panel regression framework is represented as follows

$$RCA_i = \alpha_0 + \beta_i + \gamma_1 \mathbf{1}_C + \epsilon_i \tag{11}$$

where β_i is the product level fixed effect capturing product features. $\mathbf{1}_C$ is the indicator variable having value 1 for products falling under category C. Here the parameter of interest is γ_1. Positive and statistically significant value of $\hat{\gamma}_1$ indicates relative difference of average RCA across product categories. Following panel regression estimates from Table 15 and Table 16, we observe significantly higher comparative advantages of Indian manufactures in final goods and highly elastic goods. Combing the findings of trade diversion, it may be inferred that the heterogeneous impact of trade diversion is likely to be driven by relatively higher comparative advantage of Indian firms in product categories, resulting in short term impact of trade diversion.

Table 15: Panel regression estimates for Final goods

	(1)	(2)	(3)	(4)
VARIABLES	log(RCA)	log(RCA)	log(RCA)	log(RCA)
Final	0.093	0.057	0.100***	0.149***
	(0.063)	(0.055)	(0.033)	(0.032)
Observations	4,788	4,788	4,788	4,788
Fixed	HS1	HS2	HS3	HS4
Cluster SE	HS1	HS2	HS3	HS4

Table 16: Panel regression estimates for High Elastic goods

VARIABLES	(1) log(RCA)	(2) log(RCA)	(3) log(RCA)	(4) log(RCA)
Elasticity (H)	0.211***	0.200***	0.192***	0.194***
	(0.041)	(0.042)	(0.048)	(0.068)
Observations	4,788	4,788	4,788	4,788
Fixed	HS1	HS2	HS3	HS4
Cluster SE	HS1	HS2	HS3	HS4

Concluding Remarks

The tariff war introduced a new era of protectionism in international trade. Higher tariff imposed by US was retaliated with high tariff barriers by China and other large trading partners on US Export. In this context, the paper looks at the implication of tariff war on neutral trading partner like India having access in US and China market. Using product level data of export and import, the paper tries to identify the impact of tariffs imposed by the US and retaliatory tariffs imposed by China on overall exports and imports. Further the paper introduces product classifications across different dimensions, to understand any product level heterogeneity in tariff impact. Lastly, the paper takes up the impact of tariffs on unit price of exports and imports along with volume impact to comment on the pricing power (or burden) of Indian firms.

Using product level export and import data at HS-6 digit level, the paper documents a skewed impact of the tariffs imposed by the US and the retaliatory tariff imposed by China on aggregate trade of India. The export data showcases strong substitution happening with substitution of Chinese exports by Indian exports for exports to the US. The impact of US tariffs appears to be the major driver behind the influx of exports to the US. The retaliatory tariffs, imposed by China, appears to have insignificant impact on India's export. The indirect impact of tariffs appears to be insignificant on Indian exports. The substitution effect from US tariffs highlights that Indian firms exhibit similar comparative advantage of producing tariff impacted products. The import pattern, on the other hand, is found to have differing impact across destinations. Unlike export impact, the impact of US tariffs and retaliatory tariffs by China are mainly contributed towards higher import value from other destinations. Such positive and significant impact on India's export to the US and India's import from other destinations follows trade diversion mechanism where neutral trade partner benefits from trade war due to diversion of trade from countries involved in trade war.

Further, the impact of US-China trade war appears to have significant impact on easily replaceable products in short term. The paper uses three different classifications of products to assess the heterogeneity in impact of US tariffs and China's retaliatory tariffs. India's final goods export appeared to have increased to the US due to trade war whereas the export of intermediate goods do not show similar effect from tariffs. Similar result follows using other product classifications namely homogeneous vs differentiated goods classification and highly elastic vs low elastic goods. In both the cases, export intensity increased for products which can be easily substituted. The effect of trade war appears to be similar in case of imports also. However unlike the exports, the import intensity appears to have increased for easily substituted products from other destinations.

Finally, the impact of tariffs imposed by the US and China influenced the unit value of exports. Tariffs imposed by the US improved the pricing power of Indian firms whereas the impact of China's retaliatory tariffs is found to have muted impact on export price. The quantity impact remains insignificant in case of Indian exports. On the other hand, the tariff appears to have significant impact on quantity of imports by Indian firms and households. The price burden from imports remained at same level as higher tariffs does not influence the unit value of imports.

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