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Impact of India-Malaysia CECA on the Edible Oil Value Chain

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Impact of India-Malaysia CECA on the Edible Oil Value Chain

ABSTRACT

This paper formulates an analytical framework to assess the impacts of India's Free Trade Agreements (FTAs) on commodity value chains. Existing academic literature have relied on examining Balance of Payments (BoP) to assess the impact of FTAs. This paper views such methodology as reductionist, and instead offers alternative lenses of the impacts on the commodity value chain. This paper brings into fold the concerns for the well-being of various stakeholders in the value chain. Using an economic model, this study analyses the impact of tariff changes on the well-being of consumers through consumer surplus, processors through producer surplus, labour through wage-bill, farmers through farmers' surplus, and government through revenue generated. The sum of the changes of all the above is considered, and the change in total social surplus from the change in the tariff regimes is examined. The paper presents a best possible scenario of a five-percent decline in tariff from the 2010-11 base case, with minimum harm causing the various stakeholders.

I. INTRODUCTION

Globalisation has increased the flow of trade across many parts of the world and, with it, carries a more contemporary framework for prosperity. Free-trade policies open up previously closed areas to competition and innovation, helping pave the way for more jobs, newer markets and increased investment. Cooperation in international trade through free trade between nations is deemed to be "Pareto Improving"[1] for the participating nations. This concept has been prevalent in the writings of classical political economists like Adam Smith; David Ricardo, in particular, introduced the idea of 'comparative advantage' in international trade.

In India, self-sufficiency through domestic production was for a long time viewed as the appropriate economic strategy, as increased imports were perceived to put a strain on the trade balance and the national exchequer. It is with this idea that initiatives like the *Technology Mission on Oilseeds* and market intervention operations of National Dairy Development Board (NDDB) were initiated.[2] However, economic liberalisation in the 1990s pushed India towards becoming a more integral player in the international market.

Eventually, East Asia began emerging as India's principal trade partner, leaving traditional partners like the US and Europe far behind. India has since signed six Free Trade Agreements (FTAs) with the East and Southeast Asian regions. FTAs generally entail arrangements between two or more countries or trading blocs to reduce or eliminate customs tariffs and non-tariff barriers. Amongst these agreements, deserving of particular mention are India's Comprehensive Economic Partnership Agreement (CEPA) with South Korea, and the India-Japan Comprehensive Economic Partnership Agreement (IJCEPA).[3] Similarly, the Association of Southeast Asian Nations (ASEAN)-India Free Trade Agreement (AIFTA) has ushered India along the path of greater integration with East and Southeast Asia.[4] (See Appendix for Definitions of the various trade pacts.)

Does India benefit from these FTAs? Viewed through the prism of balance of payment/trade (BoP/T), the answer is quite unequivocal: India has not benefitted from the FTAs, or in trade of commodities where tariff regimes have been too liberal. Available data suggest that in case of most of the FTAs with the east and southeast Asian nations, India's bilateral BoP/T deteriorated after signing of the FTAs, as Indian imports increased faster than exports with the corresponding counterpart economy. From a macroeconomic perspective, this has been perceived as a negative development by many.

Negative BoP/T numbers, however, should not be the only metric of social welfare to be examined by policy-makers. In the context of FTAs, adverse BoP/T figures could be the result of higher elasticity in import demand which, in India, in fact helped increase the consumer surplus. This in turn implies that consumers might have benefited from the FTAs, or a liberalised tariff and non-tariff barrier regime.

There is substantial literature on India's FTAs with other nations. Most of the studies are concerned with impacts on broad macro-variables. In 2013 the Federation of Indian Chambers of Commerce (FICCI) conducted a survey, titled *Business Beyond Barriers*,[5] to ascertain factors impacting trade and investments between India and ASEAN, and determine the effect of India-ASEAN FTA on the Indian industry. The survey showed that half of the respondents feel that the FTA in goods has had either no impact or an adverse impact on the trade balance.

Many other analysts perceive FTAs positively from other dimensions. Babu (2012),[6] for one, discusses the India-Japanese CEPA and sees it as a tool of strengthening bilateral trade relations. Das (2014)[7] calls the CEPA between India and Japan a 'negotiating template', and Mehta (2005)[8] discusses the various kinds of non-tariff barriers imposed by Japan on non-agricultural products. Yet most of these studies are limited to understanding the trade balance of India vis-à-vis its trading partner. Sen (2013),[9] while exploring the trade pact with South Korea, states that the India-Korea FTA helped India increase its presence in the region. Similarly, Wignaraja (2014)[10] examines the gains for South Asian economies from integrating with East Asia and India's role in the process, and proposes a case for further integration. At a global level, Toledo (2004)[11] uses specific factors (SF) model of productivity and trade to examine the potent impact of FTAA on Peru's output and wages. This leads us to analysing some of the research questions of the present paper on the impact of FTAs on commodity value chain such as those of farmers, consumers, labour and producers.

In line with Toledo's work, Pal and Dasgupta (2008)[12] argue that though India might not benefit in the short run from the FTA with ASEAN, the agreement may make strategic sense in the long run especially if India wishes to become a hub for services' exports. Contrary to what is posited by Pal and Dasgupta (2008), Asher and Sen (2008)[13] argue that India's unilateral liberalisation policies since the early 1990s, and its purposeful and strategic pursuit of its Look East Policy, have resulted in integration with the rest of Asia more considerable than is commonly acknowledged.

There are several *ex post* empirical studies of FTAs. A popular class of models in this literature, using international trade flows, are the gravity models developed by Tinbergen (1962)[14] and Poyhonen (1963).[15] The basic idea—borrowed from Newton's laws of universal gravitation—is that the flow of ideas, information, trade, and people between two locations is directly proportional to their size (GDP of the individual country) and inversely proportional to the distance. A multiplicative model can be linearised easily by taking the natural logarithms and is amenable to standard econometric estimation techniques. These papers use a dummy variable to estimate the impact of FTAs and the resultant trade creation. For instance, Aitken (1973)[16] uses variables like gross trade creation (GTC), trade diversion (TD), and external trade creation (ETC) as measures of economic integration-induced trade between member countries utilising a cross-sectional trade flow model. Ghosh and Yamarik (2004)[17] used extreme bounds analysis and tested the robustness of the coefficient estimates, and found the coefficients estimating the effects of RTAs on trade creation to be 'fragile'.

As the literature survey in the previous paragraph reveals, most of the analyses of the impacts of FTAs have been conducted looking at the macro-level impacts, and there hardly exists any study that has looked at sectoral impacts, barring one by Srinivasan (2012)[18] that considers a computable general equilibrium (CGE) framework.

There is a clear gap in the literature in the context of the impacts of FTA or tariff liberalisation (or removal of non-tariff barriers) on the commodity value chain. The need is to assess their aggregate impacts considering the entire value chain, beginning from the consumer, entrepreneur, primary producer, processor, intermediaries, distributors, retailers and the government (as a zero-tariff regime impacts government's revenue). This implies a need to take a holistic view for the impact assessment of tariff regime changes, as the trade regime moves from high tariffs to zero tariff. This framework will allow for a better assessment and more informed decision-making on tariff regime changes.

This paper is an attempt to proffer the notion that there are alternative metrics, other than BoP/T, that need to be evaluated to calculate the well-being of various stakeholders. This methodology can be gainfully employed in assessing other FTAs involving different commodities. This paper carries out a disaggregated analysis of how the various stakeholders' benefits are affected by changes in tariff regime. Of course, removal of non-tariff barriers is also associated with FTAs. However, in this paper, the concern is with the tariffs, and a proposal is made for a framework that can be extended for evaluation of removal of non-tariff barriers as well.

This paper takes a close look, in particular, at the edible oil sector and considers the major links of edible oil value chain in the context of the India-Malaysia CECA. The India-Malaysia CECA is chosen for analysis as Malaysia is the largest producer and exporter of palm oil in the world. Ever since India opted for zero-tariff for crude palm oil (CPO) and reduced the tariff to 7.5 percent for refined palm oil, imports of palm oil to India from Malaysia increased manifold (See Figure 7). More importantly, palm oil imported from Malaysia now constitutes around 45-50 percent of the total edible oil consumption in India in this decade, having grown from seven percent in 1994. This massive change is envisaged to have tremendous impact on the edible oil value chain participants—positively on some, and negatively on others. This paper attempts to conduct a systematic analysis of these impacts on the commodity value-chain. However, it is pertinent to state that the zero-tariff regime reduces the price of the imported edible oil for the consumers, and prove to be competitive for the domestically produced edible oil. As such, import duty on all crude and refined edible oils were reduced to zero percent and 7.5 percent, respectively, in April 2008, before the India-Malaysia CECA was signed in June 2011. Hence, the tariff impact (as is prevalent for FTAs) was already perceptible when the India-Malaysia CECA was signed.

In its endeavour to track impact, this study uses a mathematical economic model (to provide the theoretical explanation of welfare changes of various stakeholders), an econometric framework through a simultaneous equation system to obtain tariff elasticities of various variables, and a counter-factual framework or a scenario analysis through hypothetical tariff structures to present the sensitivity of the various variables to tariff changes. A partial equilibrium framework is propounded to link the edible oil sector with the oilseed sector, and examine the impact of tariff reduction (or increase) on the well-being of various stakeholders of the value chain, namely, consumers (through consumer surplus), processors (through producer surplus), labour or employment (through wage-bill), farmers (through farmers' surplus), and government (through revenue generated). The sum of the changes in consumer surplus is considered, as well as producer surplus, farm income from the supply of oil seeds, wage bill and government revenue. The change in this total amount (social surplus) because of changes in the tariff regime, is also studied. This provides a better metric of social welfare, as it concerns all the important participants in the value chain—from the consumers, and producers in the output market to the suppliers in the factor market, labour, and lastly the government which has the authority to impose the tariff, and to potentially redistribute the revenue earnings for the overall benefit of society. The paper therefore attempts to contribute to the existing studies evaluating the outcomes of the FTAs particularly for a single commodity import dominant trade basket. While this paper offers an analysis that considers the edible oil value chain, it also creates a replicable value chain impact study for other commodities.

Section II of this paper presents a brief picture of India's various FTAs with East and Southeast Asia, and their consequent impacts on the balance of trade for India in the bilateral framework. Section III describes the state of India's edible oil economy and relates the changes occurring there with the tariff liberalisation policies. Section IV provides for the mathematical economic model to create the theoretical basis for this paper. In the process, this paper also talks of a comparative static framework, to understand how the tariff (or domestic price) changes of edible oils percolate across various other sectors including processing industry, and oilseed farmers. Section V presents the econometric methodology, estimates, scenario analysis, and a discussion of the results. The paper concludes with Section VI, examining the policy and academic significance of this study and raising relevant policy questions.

II. INDIA'S FTAS WITH SOUTH AND SOUTHEAST ASIA

India has so far signed FTAs with 20 countries and is in the process of negotiating more of such agreements, including with Australia, New Zealand, Canada and the European Union (EU). The Government of India's take on these agreements, as revealed in the reports of the joint working groups preceding the signing of the agreements, is that trade expansions as a result of tariff reduction will benefit all the signatories. In East and Southeast Asia, India has signed six FTAs/CEPAs/CECAs. (See Table 1)

The India-Thailand FTA was the first one in the region that was signed in 2004, followed by the CECA between India and Singapore that became operational in 2005. The AIFTA and the India-Korea CEPA came into existence in 2010, while the CECA with Malaysia and the CEPA with Japan both became operational in 2011. The last column in Table (1) reflects the goods traded; the balance of trade is driven by these commodities.

TABLE 1: INDIA'S FTAS IN EAST AND SOUTHEAST ASIA

Name	Signatories	Date Signed	Date Effective	Trade Deficit Situation	Salient Features	Major Commodities Traded
India-Thailand Free Trade Agreement	India and Thailand	9 October 2003	1 September 2004	Trade deficit increased (Fig 1)	Trade in goods, services, investment, rules of origin, other areas of economic cooperation (conformity assessment, accreditation procedures etc.), removal of non-tariff barriers, customs cooperation, business visa and travel facilitation, early harvest scheme.	**Thai Exports to India:** Palm Oils **Indian Exports to Thailand:** Food Items
India-Singapore Comprehen-sive Economic Cooperation Agreement	India and Singapore	29 June 2005	1 August 2005	Trade deficit increased (Fig 2)	Trade in goods, services, investment, movement of natural persons, E-Commerce, intellectual property cooperation, science and technology, education, media, rules of origin	**Singaporean Exports to India:** Electronic Goods **Indian Exports to Singapore:** Petroleum including crude and products
India-ASEAN Free Trade Agreement	India and ASEAN	13 August 2009	1 January 2010	Trade deficit increased (Fig 3)	Trade in goods, services, investment, movement of business persons, rules of origin, removal of non-tariff measures	**ASEAN exports to India:** Coal, coke, briquettes **Indian Exports to ASEAN:** Petroleum products
Malaysia-India Comprehen-sive Economic Cooperation Agreement	India and Malaysia	24 September 2010	1 July 2011	Trade deficit increased (Fig 4)	Trade in goods, services and investment, infrastructure development, human resources' development, science and technology, creative industries, tourism, SMEs and finance	**Malaysian exports to India:** Palm Oil and Crude Petroleum **Indian Exports to Malaysia:** Meat, meat preparations, sugar, rice (other than Basmati)
India-Korea Comprehen-sive Economic Partnership Agreement	India and Korea	7 August 2009	1 January 2010	Trade deficit increased (Fig 5)	Trade in goods, services, investment, rules of origin, customs cooperation, telecommunications, audio visual cooperation, movement of professionals, intellectual property rights and cooperation	**Korean Exports to India:** Iron and Steel, Auto parts **Indian Exports to Korea:** Mineral fuels, oil distillates (mainly Naptha) and cereals
India-Japan Comprehen-sive Economic Partnership Agreement	India and Japan	16 February 2011	1 August 2011	Trade deficit increased (Fig 6)	Trade in goods, services, investment, cooperation in intellectual property, rules of origin, movement of natural persons, telecommunications, financial services, government procurement, sanitary and phytosanitary measures, customs procedures	**Japanese Exports to India:** Machinery, transport equipment, iron and steel, electronic goods, Organic chemicals and machine tools **Indian Exports to Japan:** Petroleum Products, iron ore and gems

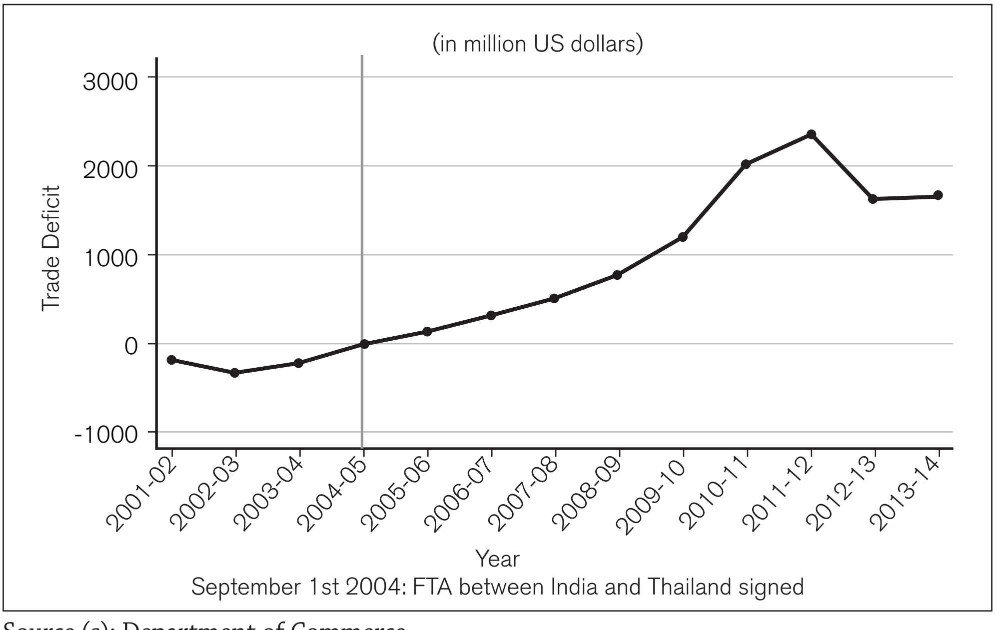
INDIA'S TRADE BALANCE WITH ITS EAST AND SOUTHEAST ASIAN TRADING PARTNERS

This section presents India's trade balance with its various East and Southeast Asian trading partners, with whom it has signed FTAs. Figure 1 shows the trade deficit between India and Thailand: the balance of trade is tilted in Thailand's favour. Negative trade balance before the FTA in 2003-04 was $1.22 billion. In 2013-14 it deteriorated to $1.63 billion.

Figure 2 captures the trade deficit of India with ASEAN countries. In the case of this particular AIFTA, which has been operational since 2010, India's negative trade balance with ASEAN stood at $7.68 billion in 2009-10 and increased to $8.144 billion in 2013-14, representing a change of 5.99 percent.

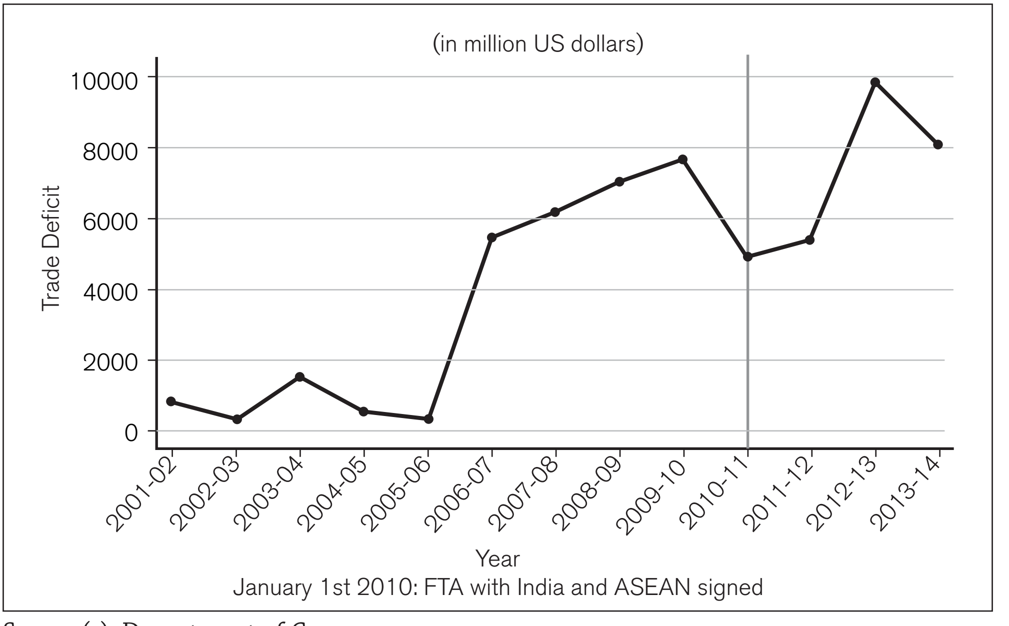
Figure 3 considers the Malaysia-India CECA and presents the trade deficit of India with Malaysia. Again, the balance tilts in favour of India's trading partner. Negative trade balance in 2009-10 was $2.34 billion, while in 2013-14, it was $5031.95 billion, marking a huge change of 114.91 percent.

FIGURE 1: TRADE DEFICIT OF INDIA WITH THAILAND



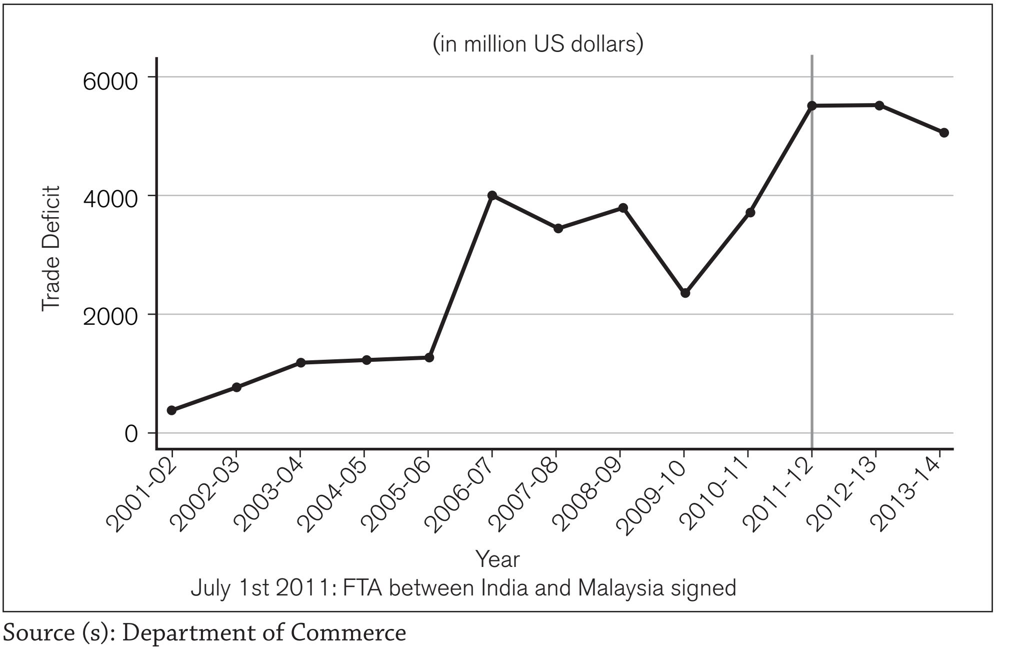
Source (s): Department of Commerce

FIGURE 2: TRADE DEFICIT OF INDIA WITH ASEAN



Source (s): Department of Commerce

FIGURE 3: TRADE DEFICIT OF INDIA WITH MALAYSIA



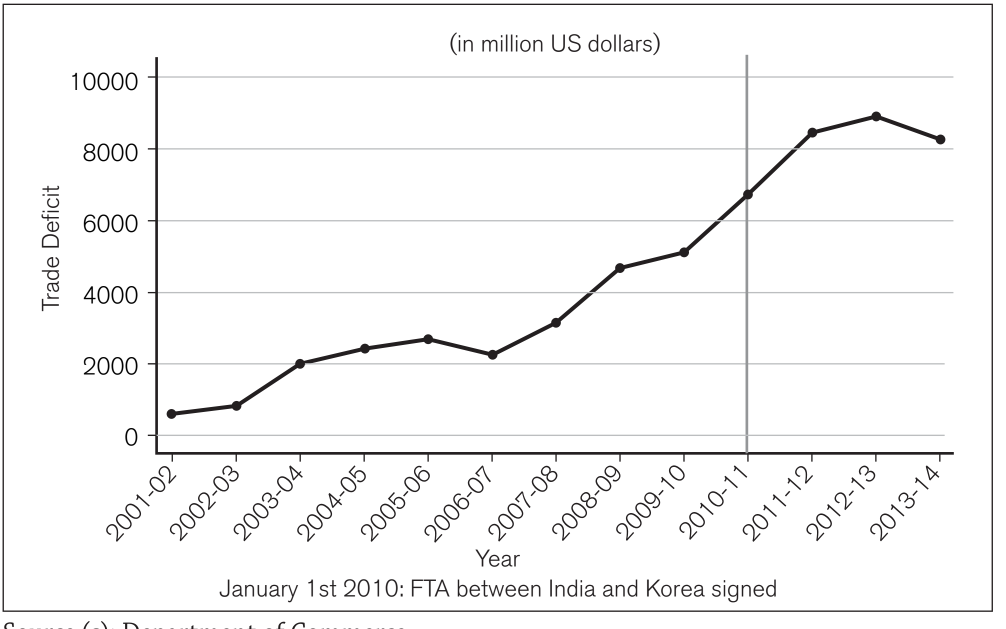
Source (s): Department of Commerce

Figure 4 , meanwhile, encapsulates the trade deficit of India with Korea. Here, the negative balance of trade for India was $5155.02 million in 2009-10. This increased to $8261.91 million in 2013-14, representing a deterioration of 60.26 percent.

The trade deficit of India vis-à-vis Japan is presented in Figure 5. In 2009-10, the negative balance of trade was $3.10 billion, which declined in 2013-14 to $2.66 billion. However, despite a reduction in the negative balance, the balance of trade is still not in India's favour.

The interesting case to look at is that of India's trade balance with respect to Singapore. Figure 6 presents the trade *surplus* of India vis-à-vis Singapore. It is only in this case that India has a surplus beginning from 2003-04.

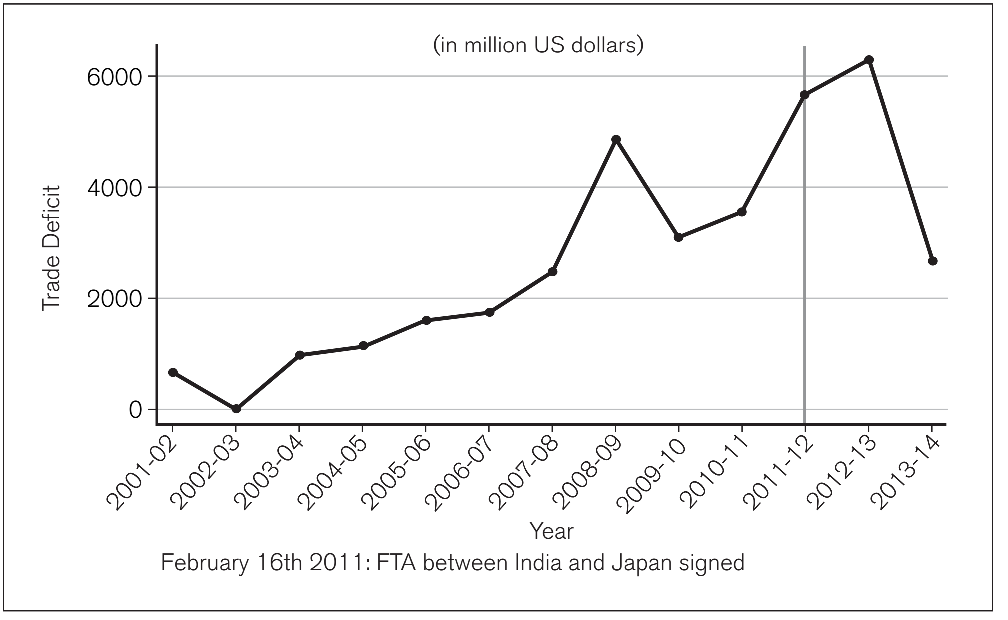
FIGURE 4: TRADE DEFICIT OF INDIA WITH KOREA



Source (s): Department of Commerce

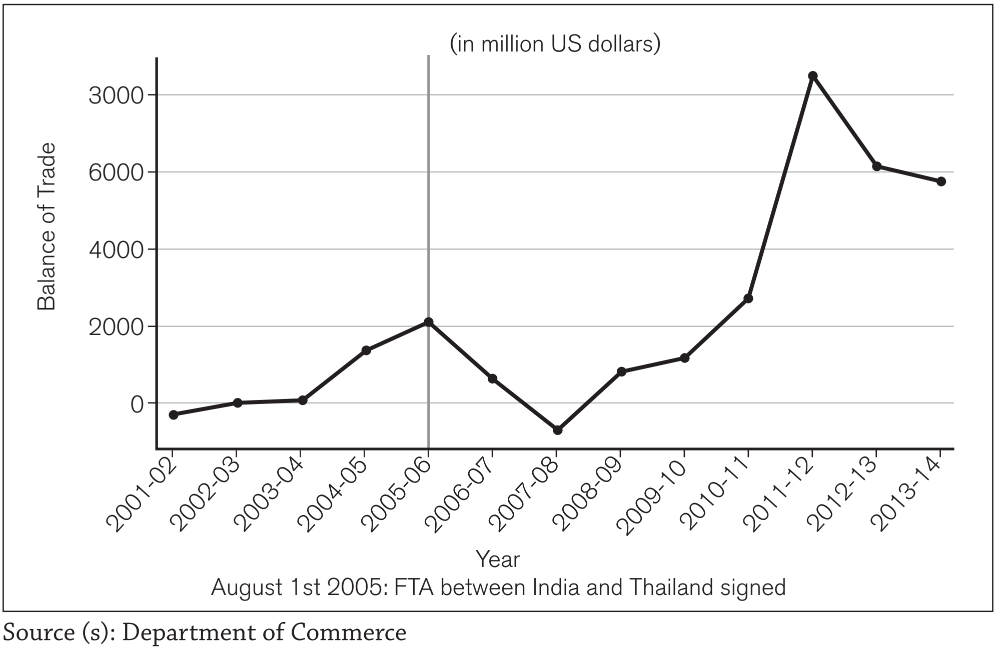
Overall, in most of the FTAs that India has signed in the region, the partner countries—or ASEAN, in other words—have had a positive balance of trade over India. The total trade deficit with the countries of this region stood at $170049.40 million in 2013-14.

FIGURE 5: TRADE DEFICIT OF INDIA WITH JAPAN



Source (s): Department of Commerce

FIGURE 6: TRADE SURPLUS OF INDIA WITH SINGAPORE



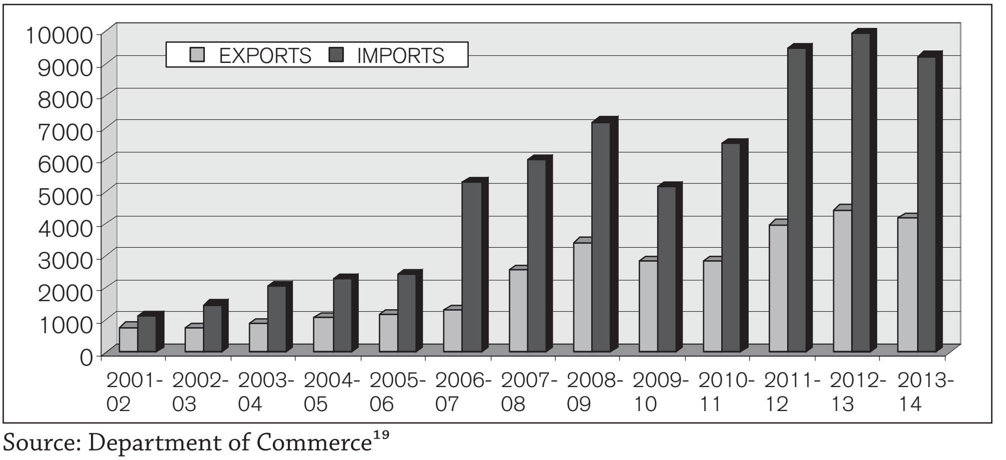
Source (s): Department of Commerce

III. INDIA-MALAYSIA CECA: THE CHANGING FACE OF INDIA'S EDIBLE OIL ECONOMY

The India-Malaysia CECA came into effect on 1 July 2011, and is the fourth such bilateral agreement following similar ones with Singapore, South Korea and Japan. The CECA envisions the liberalisation of trade in goods, trade in services, investments, and other areas of economic cooperation. Bilateral trade between India and Malaysia reached $10 billion in 2010-11, marking an increase of 26 percent from the previous year, and through the signing of the CECA the bilateral trade between the two is envisaged to rise to $15 billion by 2015.

Figure 7 shows the bilateral trade between the two sides before and after the signing of the CECA. Even before the agreement came into force, India's imports from Malaysia have always been higher than its exports. The gap between imports and exports only continued to increase after CECA. In 1996-97 the trade deficit for India stood at $572.15 million. This increased to $4984 million in 2014-15. An analysis of the goods traded between India and Malaysia reveals that palm oil is the main driver of trade between the two. As per the data from India's Ministry of Commerce and Industry, about 80 percent of India's imports from Malaysia constitute palm oil. From 2009-10, i.e., before the signing of the CECA, palm oil constituted a significant proportion of imports, and has been driving the import bill. Post-CECA, along with total imports, palm oil increased as a constituent element of the total imports of India with Malaysia.

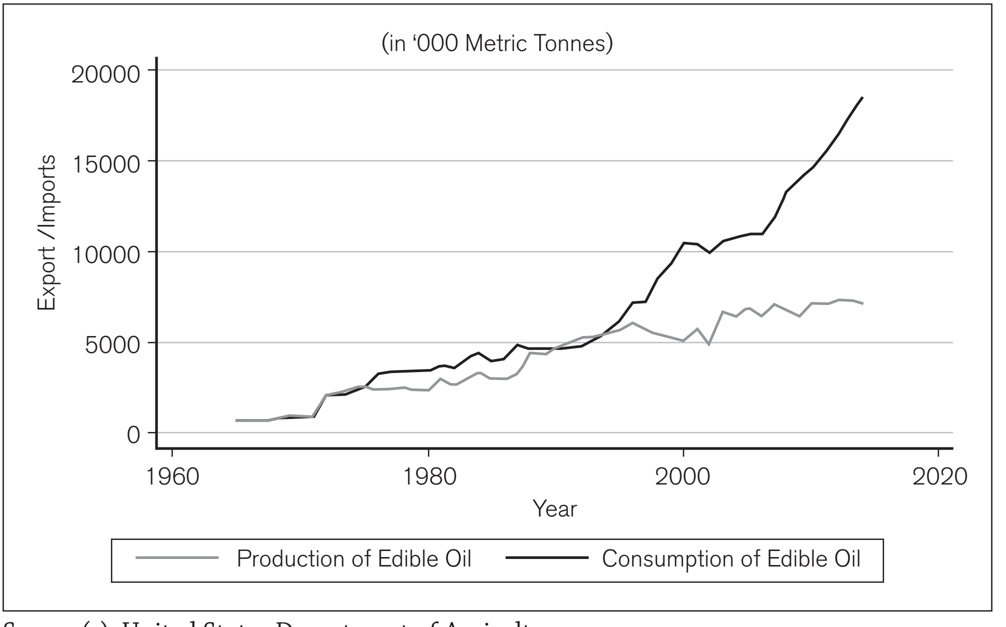
FIGURE 7: BILATERAL TRADE BETWEEN INDIA AND MALAYSIA (US$ MILLION)



Source: Department of Commerce[19]

India is a leading importer and consumer of edible oils in the world. In 2014, of the total 18.47 million tonnes of edible oil consumption in the country, 12.66 million tonnes were imported. Imports thus account for 68.5 percent of total consumption, as domestic production is unable to cope with domestic demand which has grown, over the last two decades, on average, at an annual rate of six percent. As shown in Figure 8, the divergence between production and consumption of edible oil has been increasing since the mid-90s, thereby revealing the increasing reliance of consumption on imports.

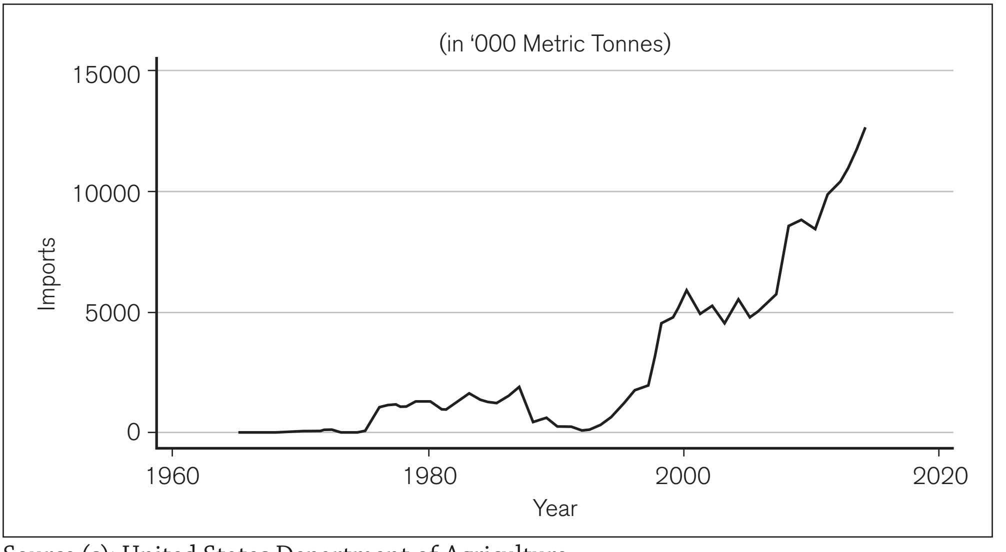
FIGURE 8: PRODUCTION AND CONSUMPTION OF EDIBLE OIL



Source (s): United States Department of Agriculture

Figures 9 to 12 indicate the increasing importance of palm oil in India's external and internal economies. Clearly, from the early 1990s, consumption overshoots production, which is met with imports. Ever since trade liberalisation measures were put in place—culminating with the zero-tariff regime and CECA between Malaysia and India—palm oil consumption and import increased simultaneously, and by 2015, palm oil constituted 48 percent of the total edible oil consumption basket, increasing from a mere two percent in the 1970s (Figure 12). As shown in Figures 11 and 12, consumption of palm oil, and percentage of palm oil in Indian edible oil consumption basket spiked from 2009 onwards, with the zero-tariff regime setting in. Palm oil, almost in its entirety, is imported from Malaysia. The major factors responsible for the high consumption and import of edible oil in India are increase in per capita income and population, change in tastes and preferences, low productivity in the domestic oilseed sector, and liberal policies for edible oil imports. With a constant rise in demand, it is projected that imports would rise further in the coming years.[20]

FIGURE 9: TOTAL IMPORT OF EDIBLE OIL

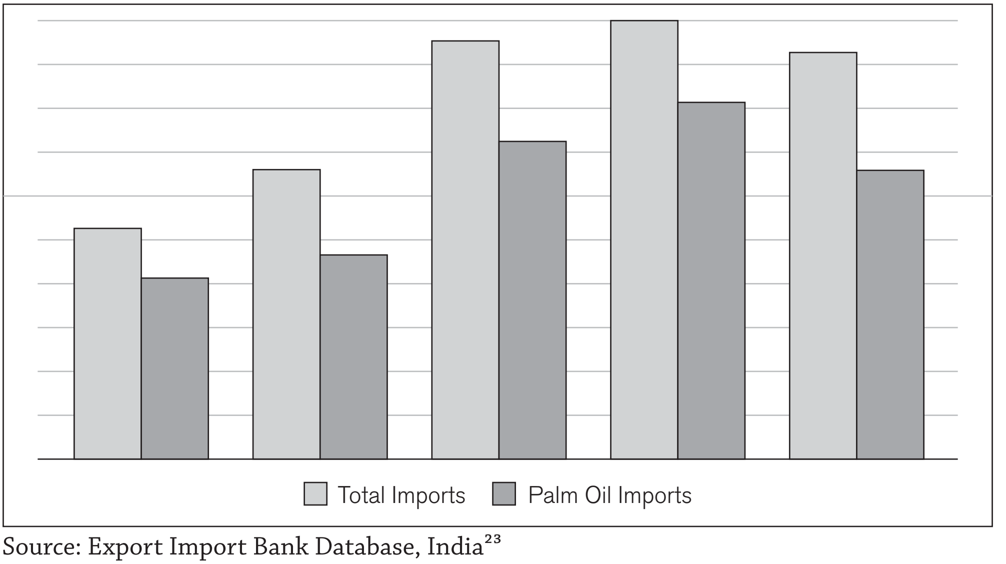


Source (s): United States Department of Agriculture

On the input front, oilseed yields in India are among the lowest in the world. The demand for oilseeds is a derived one that emerges from edible oil and oil meal production. However, oilseed cultivation has become increasingly unattractive due to low and unstable yields, as well as decreasing edible oil prices. The area under oilseed cultivation has stagnated at 26-28 million hectares over the last several years, with total production hovering between 26-30 million tonnes. The much acclaimed success of the technology mission on oilseeds—a programme launched in 1986—has been questioned by various quarters. Serious concerns are emerging over the future of oilseed production because of this stagnation, and also because food grains are likely to get prioritised in government policies as shortages persist. On the other hand, while edible oil trade liberalisation has led to low demand for oilseeds, the resultant low prices have led to poor supply response. Again, high import tariffs and non-tariff barriers, such as sanitary and phyto-sanitary restrictions, have made oilseed imports unattractive.[21] Low domestic output of raw material, combined with restricted import of oilseeds, has also been responsible for high degree of underutilisation of the processing capacity. On the other hand, as explained by Srinivasan (2012),[22] the government has attempted to help oilseed growers by providing minimum support prices (MSP) through its stocking policy and by imposing customs duties on imports of edible oils and oilseeds. However, he reports that MSP does not appear to have worked as well for oilseeds as it has for wheat and rice.

Quite in contrast, the situation was different up to the early 1990s with near self-sufficiency in edible oils. But as the domestic production of edible oils started falling short of demand, edible vegetable palmolein was placed under open general licence (OGL) in April 1994 with an import duty of 65 percent, in conformity with World Trade Organization (WTO) principles. This move led to domestic demand being met, to a substantial degree, by imports. Prior to that, edible oil was on the negative list of imports.

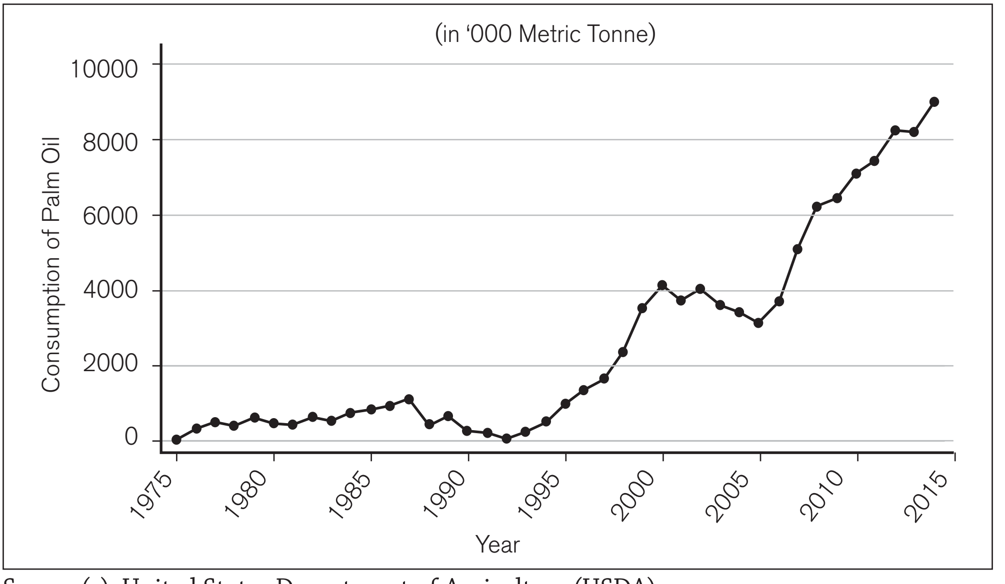
FIGURE 10: PALM OIL IMPORTS AS COMPONENT OF TOTAL IMPORTS (US$ MILLION)



Source: Export Import Bank Database, India[23]

Beginning in 1994, tariff liberalisation in edible oils occurred in phases. Subsequently, other edible oil imports were also placed under OGL. From 1994 two distinct phases are discernible: the first between 1994 and 1998, when customs duty on edible oils progressively came down to reach a low of 15 percent in July 1998; and the second after 1999, when such duties witnessed an upward trend, touching a high of 92.2 percent for refined palm oil in April 2005. Between 1994 and 2005, import duties were revised 17 times (See Table 2), creating apprehension and uncertainty for both edible oil producers and importers.

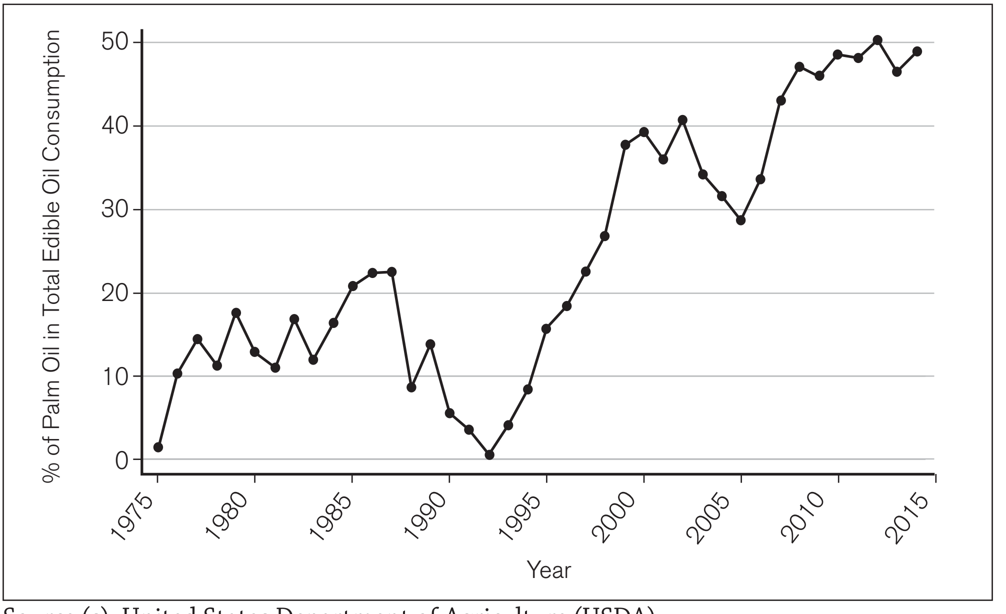
FIGURE 11: CONSUMPTION OF PALM OIL IN INDIA



Source (s): United States Department of Agriculture (USDA)

In January 2006 the *Report of the Committee on Rationalisation of Customs and Excise Duties on Edible Oils and Oilseeds* was released and based on these recommendations, the government announced a cut in the import duties of palm oil and sunflower oil. The customs duty on refined palm oil was cut by 12.5 percentage points, and on crude palm oil by 10 percentage points. Import duty on soya bean oil remained unchanged at 45 percent. The cut in import duty, however, was accompanied by a freeze in base import prices on which the duty is being calculated. Starting in April 2008, import duty on all crude and refined edible oils were reduced to zero percent and 7.5 percent, respectively. This has proved to be a major boost for the imports of edible oil. Though subsequently, some small changes have been brought about through imposition of 2.5 percent tariff by the Ministry of Finance on crude vegetable oils in 2013, and some impositions of education cess, the import scenario does not change. (See Table 2)

FIGURE 12: PERCENTAGE OF PALM OIL IN TOTAL EDIBLE OIL CONSUMPTION



Source (s): United States Department of Agriculture (USDA)

TABLE 2

Time Period	Tariff and trade policy on edible oils (1994 to 2015)
April 1994	Import of RBD palmolein placed on OGL with 65% import duty.
March 1995	Import of all edible oils (except coconut oil, palm kernel oil, RBD palm oil, RBD palm stearin) placed on OGL with 30% import duty.
1996-97 (in regular budget)	Reduction in import duty to 20%. With 2% special customs duty, the total duty was 22%. Another special customs duty of 3% was later imposed, bringing the total duty to 25%.
July 1998	Import duty further reduced to 15%.
1999-2000 (Budget)	Import duty raised to 15% (basic) plus 10% (surcharge), bringing the total import duty to 16.5%.
December 1999	Import duty on refined oils raised to 25% (basic) plus 10% (surcharge) that is 27.5%. In addition, a levy of 4% of special additional duty (SAD) was imposed on refined oils.
June 2000	Import duty on crude oils raised to 25% (basic) plus 10% (surcharge), that is, 27.5%, and on refined oils to 35% (basic) plus 10% (surcharge) plus 4% (SAD), that is, 44.04%. Import duty on crude palm oil (CPO) for manufacture of vanaspati retained at 15% (basic) plus 10% (surcharge), that is, 16.5%.
November 2000	Import duty on CPO for manufacture of vanaspati raised to 25% and on crude vegetable oils to 35%. Import duty on CPO for manufacture, other than of vanaspati, raised to 55%. Import duty on refined vegetable oils raised to 45% (basic) plus 4% SAD that is 50.8%. Import duty on refined palm oil and RBD palmolein raised to 65% basic plus 4% SAD that is 71.6%.

Continued on next page

March 2001 (As amended on April 26, 2001)	Import duty on crude oils for manufacture of vanaspati/refined oils by importers registered with Directorate of VVO&F raised to 75% (for others, duty at 85%) except on soya bean oil, rapeseed oil, and CPO, at 45%, 75%, and 75% respectively. Import duty on refined oils, including RBD palmolein, raised to 85% (basic) except for soya bean and mustard oil where it was placed at 45% (basic) and 75% (basic) respectively due to the WTO binding. A 4% SAD was also levied on refined oils.
October 2001	Import duty on CPO and its fractions of edible grade, in loose or bulk form, reduced from 75% to 65%.
November 2001	Import duty on crude sunflower oil or safflower oil reduced to 50% up to an aggregate of 1,50,000 tonnes tariff rate quota (TRQ) of total imports of such goods in a financial year subject to certain conditions. Import duty on refined rape, colza, or mustard oil reduced to 45% up to an aggregate of 1,50,000 tonnes TRQ of total imports of such goods in a financial year subject to certain conditions.
March 2002	Status quo on import duty structure maintained. Import of vanaspati from Nepal brought under SAD of 4%.
August 2002	SAD made non-applicable on vanaspati imported from Nepal under TRQ.
March 2003	Status quo on import duty structure of vegetable oils/edible oils maintained.
April 2003	Import duty on refined palm oil and RBD palmolein reduced from 85% to 70% and SAD made non-applicable on edible oils.
January 2004	SAD was abolished for all edible oils and oilseeds.
July 2004	Import duty on refined palm oil and RBD palmolein raised from 70% to 75%
February 2005	Import duty on crude palm oil and RBD palmolein raised from 65% to 80%, and that on refined palm oil and RBD palmolein from 75% to 90%.
February 2007	An additional educational cess of 1% was levied to fund education.
July 2007	The duty (basic) on refined soya oil was reduced to 40%
April 2008	Import duty on all crude and refined edible oils were reduced to 0% and 7.5%, respectively
January 2013	The Ministry of Finance imposed 2.5% import duty on crude edible vegetable oils
March 2013	The Ministry of Finance withdraws the exemption from education cess on import of soya oil as duty had been reduced to below WTO bound rate.
January 2014	Refined soya oil - 10%. (With education cess of 3%) effective 10.3%. Degummed soya oil 2.5% (Effective 2.58%)

Source: Compiled by authors and updated from the Lahiri Committee Report (2006)

Edible oil tariff liberalisation seems to have played a significant role in determining the fate of the domestic industry, consumption patterns, and the oilseed producers.[24] There is serious concern about the potential impact of tariff on the domestic edible oil economy. The conservative left wing, as well as the domestic extraction industry group, is against tariff liberalisation on the plea that such a move will destroy the domestic industry and have a negative impact on farmers. Quite a few studies have contributed to this view (e.g. Chand 2002,[25] Chand et al. 2004,[26] and Hashim 2008).[27] As recently as 18 September 2015, the Government of India hiked customs or import duty on edible oil in all categories by five percent points, duty on crude edible oil from 7.5 percent to 12.5 percent, and on refined edible oil from 15 to 20 percent to protect domestic industries.[28] On the other hand, practitioners and exponents of free trade, as well as multilaterals, are convinced of the lack of competitive cost advantage in such production processes and state that import liberalisation in edible oils will be beneficial for the economy (e.g. World Bank 1997,[29] Gulati and Kelley 1999).[30]

IV. ECONOMIC MODEL, EQUILIBRIUM AND COMPARATIVE STATICS

This study entails a simple economic model which considers the demand and supply of edible oil (the output market), the import function, and considers demand and supply of oilseeds , which is the factor market. Tariff is explicitly considered to be a policy variable, which percolates through the model via the price mechanism changing equilibrium conditions in the various markets. This framework then allows the study to *ex ante* change the tariff rates as a thought exercise and look at the various scenarios, computing social surplus for each of the scenarios, and explore objectively what might be the best case policy for India.

THE MODEL

In theoretical mode, demand and supply of edible oil are considered—along with the value chain, comprising demand and supply of oil seeds. This means the study can look at how any change in tariff propagates through the system, allowing a view of its effects across the whole value chain.

It is assumed, for simplicity, that both the product and the factor markets are competitive. The implication of this assumption is that in both markets, consumers and producers are price takers. The assumption of competitive markets allows the study to draw the familiar diagrams of demand and supply, and carry out efficiency gain/loss analysis. It is a static model which presumes equilibria for prices and quantities, and carries out comparative statics for changes in exogenous variables.

The quantity of aggregate demand of edible oil is assumed to be a function of own price P, and gross income Y: nothing but a sum of individual demands for edible oil at the given price level and individual incomes. At the aggregate level, then, the sectoral demand for edible oil depends on the own price of edible oil, and some measure of gross income, say Gross Domestic Product (GDP). The quantity demanded of edible oil can then be represented as in equation (1).

$$Q_D = \phi\,(P, Y), \quad \phi_P < 0,\ \phi_Y > 0 \qquad (1)$$

The demand function is assumed to be well behaved; i.e., the first derivative with respect to price is negative (satisfies law of demand), and the first derivative with respect to income is positive (income effect).

Domestic supply of edible oil is, as before, the sum of individual quantities supplied by the producers. The aggregate domestic supply, then, depends on the two inputs, viz., labour L and oilseed S, as well the own price P. The domestic supply function can be written as equation (2).

$$Q_S = \psi\,(L, S, P), \quad \psi_L > 0,\ \psi_S > 0,\ \psi_P > 0 \qquad (2)$$

Increase in inputs results in an increased supply, hence the first derivative with respect to the inputs labour L, and oilseed S are both positive. An increase in the own price results in an increased supply of the good (supply curve is positively sloped).

First consider a situation under autarky, as depicted in Figure 13. The equilibrium price under autarky, also called the autarky price, P_A, and equilibrium quantity are determined by the equality of domestic demand and the domestic supply.

Now consider a situation where the domestic country imports. This happens only when the prevailing domestic price is below the autarky price, and demand at the prevailing domestic price is lower than the autarky price. In such a situation, as depicted in Figure 14, the domestic demand at the prevailing price outstrips the domestic supply, and the difference is met with imports. Hence a necessary condition for imports is that the world price P^W is less than the autarky price P^A. The prevailing price in the domestic market P^{Dom} is the same as the world price P^W in the absence of tariffs.

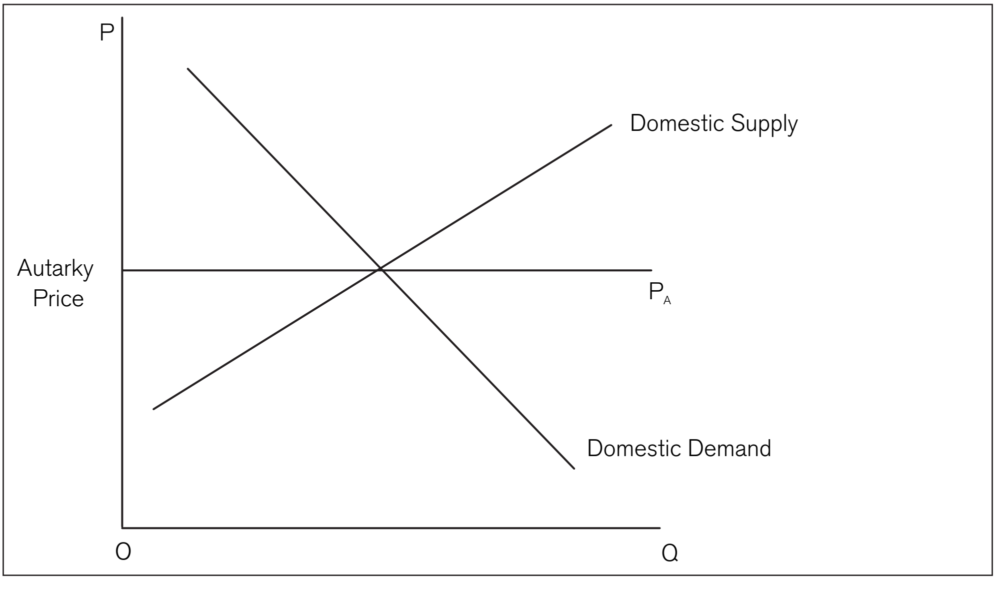
Assume now, that a rate of tariff, τ imposed on the imports. Then the prevailing price, can be written as in equation (3).

$$P^{\tau} = P^W + \delta\,\tau, \quad \delta \leq 1 \qquad (3)$$

If the importing country is a small country (whose amount of imports do not affect the world price), then $\delta = 1$. The implication for a small country is that any change in the tariff structure is reflected in the domestic prevailing price fully. Thus, in this paper's model, changes in tariff propagates as a price mechanism, by changing the prevailing domestic price, which affects demand and supply of the commodity in question.

Figure 15 depicts the situation when a domestic country has imposed a tariff τ. As a result of the imposition of this tariff the prevailing price in the domestic market increases to $P\tau$, and the new amount of imports has gone down from $Q_D – Q_S$ to $Q^{\tau}_S – Q^{\tau}_D – Q^{\tau}_S$. It is, therefore, clear from the diagram that any increase in the tariff rate τ pushes the prevailing domestic price higher driving the imports of the commodity down.

FIGURE 13: EQUILIBRIUM UNDER AUTARKY



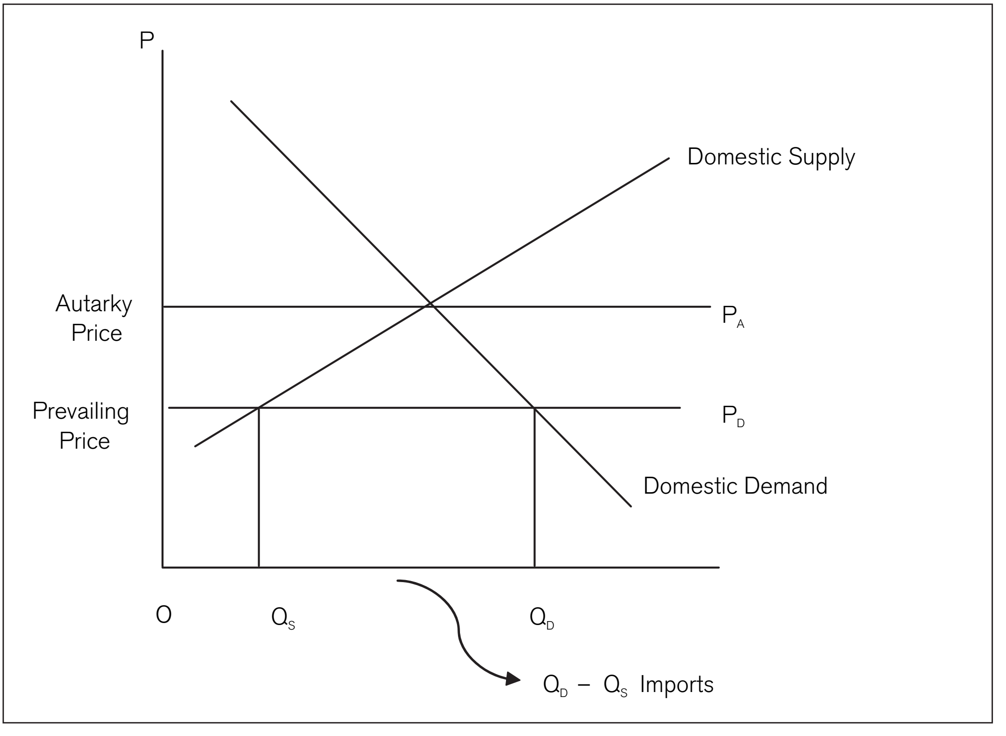
We define the *Net/Nominal Protection Coefficient (NPC)* as the ratio of the prevailing domestic price and the world price:

$$NPC = \frac{P_{Dom}}{P_{World}} = 1 + \frac{\delta\tau}{P_{World}} \qquad (4)$$

A bigger value of tariff, τ, i.e. a higher NPC implies that the amount of imports for the domestic country goes down, as demonstrated in figure (15).

This relationship between imports and the tariff, can be expressed as the following relation, following function, where the import is M.

FIGURE 14: STANDARD TRADE MODEL—EQUILIBRIUM IN DOMESTIC MARKET WITH IMPORTS



Equilibrium in an economy with imports is characterised by the equality of the domestic demand for the product with the domestic supply and the amount of imports, as in equation (5)

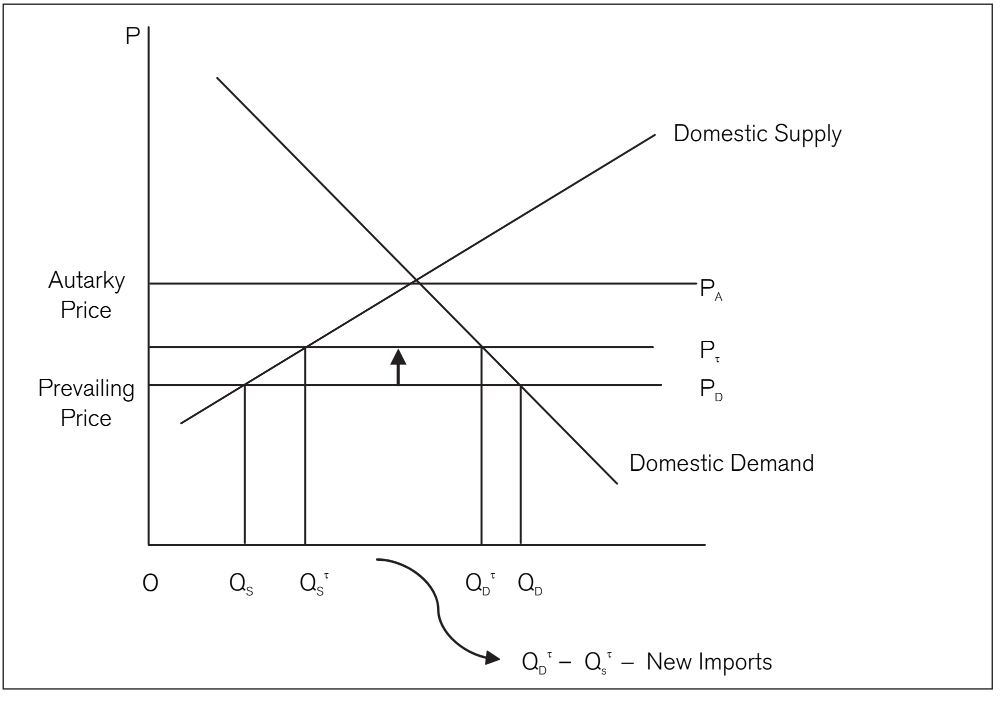
$$Q_D = Q_S + M \tag{5}$$

$$Q_D = Q_S + M \tag{6}$$

A representative processor, in our model, maximises a profit function, π, which is the difference between the total revenue earned and the total cost incurred for the production. The profit function can be written as in equation (7), where the two inputs used are labour L, and the amount of oil seeds S. The going wage rate is ω, and the price of the oilseed is p_s.

$$\pi = P\,Q_S - \omega\,L - p_S\,S \tag{7}$$

FIGURE 15: IMPOSITION OF TARIFF IN A STANDARD TRADE MODEL



Using equation (2), we can rewrite equation (7) as follows:

$$\pi = P\,\psi\,(L, S, P) - \omega\,L - p_S\,S \tag{8}$$

Input demand function is derived from the individual maximisation exercise of representative processors, which satisfies conditions in equation (9).

$$\frac{\partial \pi}{\partial L} = 0 \text{ and } \frac{\partial \pi}{\partial S} = 0 \tag{9}$$

The total labour demand function is derived by summing the individual labour demands from the processors, and similarly the total oilseed demand function is arrived at by summing the individual oilseed demands from the processors. The input demand is, then, a function of the own prices (ω and p_s.) and the output price P:

$$L_D = L\,(\omega, P) \tag{10}$$

$$S_D = (p_S\,, P) \tag{11}$$

On the input supply side, labour supply has already been taken as perfectly elastic, thereby making wages fixed and exogenous in the framework. However, prices of oilseeds are determined by the interaction between the demand and supply/production forces. Oilseed supply function is assumed to depend on the area, *A*, and oilseed prices, p_s, as in equation (12).

$$S_D = h\,(A, p_S),\ h_A > 0,\ h_{pS} > 0 \text{ and } \frac{\delta A}{\delta p_S} > 0 \tag{12}$$

As equation (12) indicates, an increase in the area leads to an increase in the oilseed supply, as does an increase in the price of oilseed p_s. The equilibrium in the oilseed market is given by the equality of oilseed demand and oilseed supply, as in equation (13).

$$S_D = S_S \tag{13}$$

The equations and identities presented from (1) to (13) present the edible oil value chain from edible oil consumption to price determination in the oilseed sector. The next section considers a hypothetical change in the tariff structure, and analyses, theoretically, how the effect of this tariff change propagates through the system.

EFFECT OF TARIFF CHANGE: COMPARATIVE STATICS IN THE EDIBLE OIL MARKET

This section is devoted to a comparative statics exercise, i.e., how equilibrium values of price, quantity in the product and the factor markets change due to a change in a policy variable, the tariff rate τ.

The exercise begins by noting that the equilibrium values of price and quantities in the product market (edible oil price and quantity), and the factor market (equilibrium quantities of labour, oilseed and price of oilseed) are co-determined in a system where a change in one affects all other values.

The equilibrium condition in the edible oil market, given by the equation (5), determines the equilibrium price of edible oil. The equilibrium price P^* can be expressed as a function of equilibrium labour input L^*oilseeds input in the production process S^* and tariff, τ, as in equation (14).

$$P^* = y\,(L^*, S^*, \tau) \tag{14}$$

Factor inputs L^* and S^* are determined by the demand and supply in the labour market and the oilseed market; where the price of the output, edible oil, P^* plays an important role in the determination of the equilibrium quantities of the factor inputs via the factor demand equations as shown in (10) and (11).

In the labour market, as noted earlier, supply is assumed to be elastic indicating that the prevailing price is a constant ω. In the oilseed market, the price of oilseed p_s^*, is determined via the interaction of demand and supply. The equilibrium quantities in the factor markets can thus be characterised by equations (15) and (16).

$$L^* = \rho\,(\omega, P^*) \tag{15}$$

$$S^* = \theta\,(p^*_S, P^*) \tag{16}$$

And finally, the equilibrium quantity of the output, edible oil, can now be written as a function of equilibrium quantities, as in equation (17).

$$Q^* = \psi (L^*, S^*, P^*) \tag{17}$$

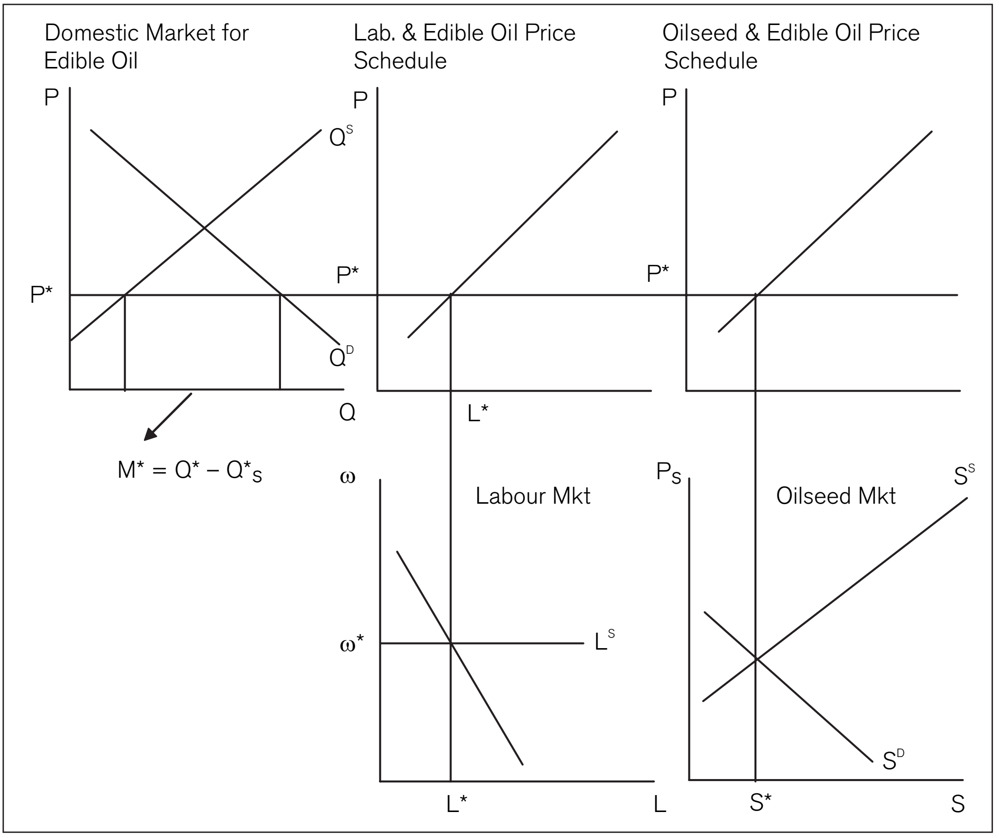
The system of equilibrium conditions depicted in equations (14) to (17) represent the interdependence of the prices and quantities of edible oil, labour market and oilseed. Any change in the policy variable τ changes the prevailing price in the output market, which then percolates through the system via the above system of equations.

Figure (16) depicts the determination of prices and quantities in the entire value chain of the edible oil industry. Let the initial prevailing equilibrium price of edible in the domestic market (with some existing tariff, could be no tariff, in which case the prevailing price is the world price) be P^*. The amount of imports M^* $Q^* - Q_s^*$ is the difference between the quantities demanded and supplied at the prevailing equilibrium price, with the discrepancy met via imports. This equilibrium price information is instantaneously transmitted to the factor markets.

The second panel in Figure 16 depicts the schedule of equilibrium labour quantities at different equilibrium prices of edible oil. At equilibrium edible oil price P^*, the equilibrium labour employed L^* is which is determined via the demand and supply forces in the labour market, as depicted in the fourth panel below the second panel in Figure 16. The labour supply L^s is infinitely elastic, while the labour demand L^D is negatively sloped, and the equilibrium labour employment is given by the intersection of demand and supply.

Similarly, the third panel in Figure 16 depicts the schedule of equilibrium oilseed quantities at different equilibrium prices of edible oil. At equilibrium edible oil price P^*, the equilibrium oilseed used is S^* which is determined via the demand and supply forces in the oilseed market, as depicted in the fifth panel below the third panel in figure (16). The oilseed supply $S^s$is positively sloped, while the oilseed demand S^D is negatively sloped, and the interaction of the two determines equilibrium oilseed quantity S^* and the equilibrium oilseed price p^*_S.

FIGURE 16: CO-DETERMINATION OF EQ. PRICES AND QUANTITIES IN OUTPUT AND FACTOR MKT.



Now consider a change in the tariff structure (increase), and suppose the resulting tariff being charged is τ. The resulting change in the price due to a change in the tariff is given by a total differentiation of P^* with respect to τ from equation (16). As noted earlier, L^* and S^* are also functions of P^*.

$$\frac{dP^*}{d\tau} = \frac{\delta y}{\delta L^*}\frac{\delta L^*}{\delta P^*}\frac{\delta P^*}{\delta \tau^*} + \frac{\delta y}{\delta S^*}\frac{\delta S^*}{\delta P^*}\frac{\delta P^*}{\delta \tau^*} + \frac{\delta P}{\delta \tau} \quad (18)$$

From equation (3), a partial differentiation of the prevailing price with respect to the tariff is $\frac{\delta P^*}{\delta \tau} = \delta$. Replacing this in equation (18) we get,

$$\frac{dP^*}{d\tau} = \left(\frac{\delta y}{\delta L^*}\frac{\delta L^*}{\delta P^*} + \frac{\delta y}{\delta S^*}\frac{\delta S^*}{\delta P^*} + 1\right) * \delta \quad (19)$$

Clearly from equation (19) a change in the tariff rate changes the prevailing price, not only via δ (the sole effect of tariff on price) but also via changes in the equilibrium amounts of labour and oilseed used in the production.

For a small country, in terms of trade, we have $\delta = 1$. In other words, any change in tariff is fully reflected in the prevailing price of the output instantaneously, without considering any other changes in the factor market (and its effects on the output market).Thus, the effect on price of the output for a unit change in tariff then becomes simply $(\frac{\delta y}{\delta L^*}\frac{\delta L^*}{\delta P^*} + \frac{\delta y}{\delta S^*}\frac{\delta S^*}{\delta P^*} + 1)$.

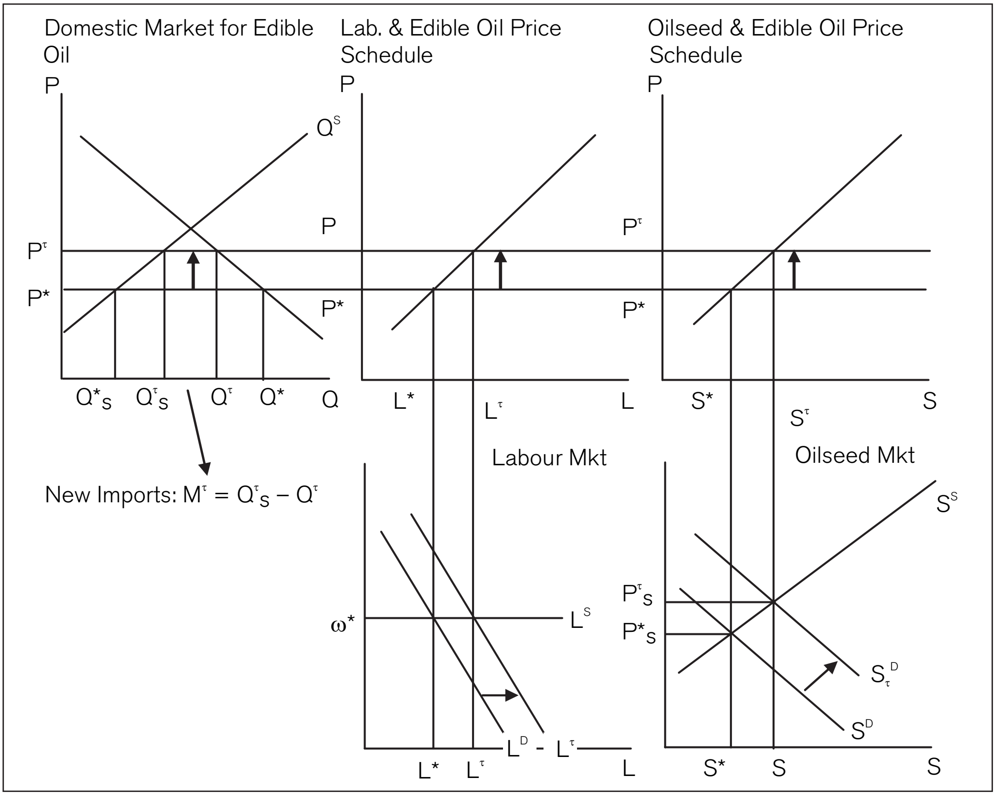
Let us consider an increase (analysis remains the same for decrease) in tariff. Because of the instantaneous increase (decrease) in the prevailing price, the amount of imports in the economy goes down (up), and there is a positive (negative) pressure on the supply side of the factor markets—resulting in an increased (decreased) demand in the factor inputs, thus putting a downward (upward) pressure on the price (because in this case both $\frac{\delta y}{\delta L^*}, \frac{\delta y}{\delta S^*} > 0$.

The comparative statics is presented in Figure 17. As a result of the tariff increase, the price in the domestic market is now P^τ. Increase in the price from P^* to P^τ results in an increased amount of supply from the domestic market (an increase from Q^*_s to Q^τ_s) but a decrease in the domestic demand (a decrease from Q^* to Q^τ). As a result the new amount of imports in the domestic market goes down from $M^* = Q^* - Q^*_s$ *to* $M^\tau = Q^\tau_s - Q^\tau$.

The information of the new price is transmitted, as earlier, to the factor market instantaneously. As a result in the increase in the price of the output, edible oil, there is an increase in the supply of edible oil, which increases the demand for labour inputs. Labour supply continues to be elastic at the given wage rate ω, but the labour demand function shifts to the right from L^D to L^τ resulting in the increase in the equilibrium quantity of labour from L^* to L^τ in panel four of figure (13).

Similarly, the information of the new price is transmitted to the oilseed market instantaneously. As a result in the increase in the price of edible oil, there is an increase in the supply of edible oil, which increases the demand for oilseed inputs. Oilseed supply continues to be the same at S^S, but the oilseed demand function shifts to the right from S^D to S^τ resulting in the increase in the equilibrium quantity of labour from S^* to S^τ in panel five of figure (13).

FIGURE 17: CHANGES IN EQ. PRICES AND QUANTITIES DUE TO A TARIFF CHANGE



As tariffs increase, the imports contract and there is a decline in total availability of edible oils. This brings about a rise in edible oil prices. However, there remains a counteractive force that can again bring down the prices. This counteractive force emerges from domestic edible oil supply. As prices increase, there is greater incentive for the processor to produce more. To do that, the processor needs more labour and oilseed inputs. Hence, the demand for labour increases, though the nominal wage in our model does not increase because of perfect elasticity of labour supply. On the other hand, oilseed input increases; as with rise in edible oil prices, there is higher demand for oilseeds, which also pushes up oilseed prices.

WELFARE IMPACTS IN PARTIAL EQUILIBRIUM

The theoretical framework brings about a few things to the fore. An increase in tariff raises the prevailing domestic price, which means consumers now have to pay a higher price to buy the same amount of edible oil—clearly resulting in a decline in the consumer surplus; conversely, a decline in the tariff rate will result in an increase in the consumer surplus in the domestic market. While the consumption of edible oil will increase under free trade in India (due to substitution and income effects), the consumption of other consumables in the consumers' baskets too can increase if the positive income effect outweighs the negative substitution effect. In other words, the fall in the relative price of edible oil along with a rise in real income leads to an increase in the consumption of edible oil and in the consumption of other commodities. This is despite the increase in the relative price of the latter if the income effect outweighs the substitution effect. With a tariff rise, therefore, the price rise has been detrimental to the consumer from all angles.

However, in case the domestic industry receives protection due to an increase in tariff, there will not only be an increase in the producer surplus—emanating from the higher unit prices—but it might also lead to greater amount of revenue generation (it depends, because though the government now charges an amount on each unit of imports, the total imports will go down because the domestic supply goes up as well as domestic demand goes down because of the increase in the price). Yet, a higher protection to the edible oil sector can also make the sector more amenable to employment generation. Moreover, it can give a boost to farmers to produce more oilseeds at better prices. However, definitely, this is not conducive for the well-being of consumers, who have to pay more, thereby resulting in a decline in consumer surplus.

V. THE ECONOMETRIC FRAMEWORK: METHODOLOGICAL ISSUES, RATIONALE AND RESULTS

SOME METHODOLOGICAL ISSUES

The literature on empirical international trade is fraught with warnings about potential endogeneity issues, and indeed many papers demonstrate its existence. For example, Trefler (1993)[31] contends that trade protection is not an exogenous variable. Just as an increase in the imports leads to an increased pressure from the domestic lobby to put forth trade protection measures, so does an increase in the trade protection policies affects the amount of resulting imports—thus both trade protection and imports being simultaneously determined, the estimates turn out to be biased and inconsistent. Lee and Swagel (1997)[32] use disaggregated data on trade flows, production, and trade barriers to examine the determinants of non-tariff barriers (NTBs) as well as the impact of protection on trade flows. They use instrumental variable (IV) methods to show that the impact has been underestimated in Trefler (1993).[33]

Following this logic, it is assumed that FTAs could also be endogenous variables, and using them simply as dummies could result in biased and inconsistent results. Baier and Bergstrand (2007)[34] argue that the estimates of the effect of FTAs on trade flows in the standard cross-section gravity equations are biased downwards, by as much as 75-85 percent. They suggest the use of differenced panel data instead of the application of instrumental variables on cross-sectional data. Carrère (2006)[35] applies a general panel specification of a gravity model, checking for potential correlation of explanatory variables with the country-pair unobservable effects, uses instrumental variables to avoid biased estimates, and further corrects for selection in an unbalanced panel setting.

One common issue in gravity models is the fact that the left hand side is a logarithm of trade flows, and cannot admit a zero value. Dropping zero values could result in biases. Silva and Tenreyro (2006)[36] employed a Poisson Pseudo-Maximum-Likelihood (PPML) method to estimate a gravity equation that includes zero trade flows; Helpman et al. (2008)[37] employed a two-stage estimation, where the first stage estimates the firm's decision to trade or not and the second stage estimates the trade flow equations; and Soloaga and Winters (2001)[38] used a Tobit model for estimation with zero trade flows.

There is also literature which analyses the impact of FTAs *ex ante*. This often makes sense before an FTA is signed, or even to consider scenario analysis, by changing parameter values. Often employed, in the literature on the *ex ante* analysis, is a simulation exercise by computable general equilibrium (CGE) model, which allows the researcher to investigate the impact of an FTA on various aspects of the economy by changing the parameter values entering the model. So, in a CGE type model, implementation of an FTA would be brought about by changing the values of tariffs or various parameters of non-tariff barriers. However, CGE models are often fraught with impractical assumptions, and can hardly be customised as per need. This is the reason this study estimates the framework econometrically through simultaneous equation system.

DATA

The data sets, stretching from 1964 to 2014, have been compiled from two different sources: The United States Department of Agriculture (USDA) and the database of IndiaStat.com, which has collated data from various governmental sources. The data used are on total consumption (domestic demand), total production (domestic supply), imports and exports of edible oil. There are also data sets on domestic consumption, domestic production, imports and exports of palm, soy, rapeseed, peanut, sunflower, coconut and cottonseed.

Since the interest of this paper is in the movement of prices, rather than the actual prices, the wholesale price index of edible oil and oilseed (base year used is 1982) are utilised. Data on area of land under nine major oilseeds in India are also used, as well as Gross Domestic Product (GDP) per capita figures, serving as surrogate for income level.

ECONOMETRIC FRAMEWORK AND ESTIMATION

The econometric framework attempts to indicate the linkage between the edible oil and the oilseed sectors. The framework borrows its theoretical underpinning from what has been presented in the previous section. A simultaneous equation system (SES), which attempts to trace the value chain from the consumption of edible oils to the area and yield of oilseeds, has been estimated. The consideration of labour is omitted, for the time being, due to the unavailability of consistent data. While labour market equation in the SES has not been considered, the impact on employment in the processing industry is examined, while considering the wage-bill, through a different mode, as will be explained in latter sections of this paper.

A system of six equations is presented, which are estimated in a Seemingly Unrelated Regression (SUR) framework. The first is the demand function for edible oil. A log linearised version of the equations seen earlier is estimated. The log linearised demand equation is as follows:

$$\log (Q_D) = \beta^1_0 + \beta^1_1 \log (P_{Edible\ Oil}) + \beta^1_2 \log (GDP) + \beta^1_3\, time + \in^1 \tag{20}$$

The supply equation is given as follows:

$$\log (Q_S) = \beta^2_0 + \beta^2_1 \log (P_{Edible\ Oil}) + \in^2 \tag{21}$$

The import function that we estimate, is given as follows:

$$\log (M) = \beta^3_0 + \beta^3_1 \log (Q_S) + \beta^3_2\, time + \in^3 \tag{22}$$

The elasticity of price of edible oil on price of oilseed is estimated from the following equation:

$$\log (P_{Oilseed}) = \log (P_{Edible\ Oil}) + \in^4 \tag{23}$$

An equation of the natural logarithm of the area of the oilseed with price of oilseed is estimated.

$$\log (Area_{Oilseed}) = \log (P_{Oilseed}) + \in^5 \tag{24}$$

And finally, an equation for the logarithm of the yield of oilseed and the price of oilseed is estimated.

$$\log (Yield) = \log (P_{Oilseed}) + \in^6 \tag{25}$$

The SUR estimation requires this study to impose a few strong assumptions on the error structure. In a simultaneously equation system, the errors from the different equations in the system are presumed to be correlated. The structure of this correlation is imposed to be able to estimate and derive the results. If the errors are collected in a matrix, where each column would have the errors from each equation, with the *j* th rows admitting the error for *j* th time period for each column (equation). The error can then be written as follows:

$$\in = (\in^{1}\ \in^{2}\ \in^{3}\ \in^{4}\ \in^{5}\ \in^{6}) \qquad (26)$$

Let us denote the covariates in each equation from (20) to (25) as $X_1, X_2, \ldots, X_6$. Restrictions on the error structure are now imposed, given by equations (27) and (28):

$$E = (\in \mid X_1, X_2, X_3, X_4, X_5, X_6,) = 0 \qquad (27)$$

$$E = (\varepsilon \in^{T}) = \Omega \qquad (28)$$

This means that the errors have zero mean, and that the variance covariance matrix is a diagonal matrix, implying that although the errors are correlated, there is no serial correlation. The estimation is carried out in Stata and the results are presented in Table 3.

SCENARIO ANALYSIS

Alternative tariff regimes are now to be considered, and numbers are assigned to social welfare of the domestic country. This translates to a need to define how social welfare is measured. In this paper's model, the stakeholders are: the consumers of edible oil in the domestic market, who consume both the edible oil that is produced in the home market and those imported; the producers of edible oil; the producers of oilseeds supplying input to the edible oil market; and the government which charges the tariff on the amount imported to generate revenues. 'Social welfare' is defined as the sum of the consumer surplus, producer surplus, farm income and government revenue generated. Thus, to be accounted for are the changes in the consumer surplus, producer surplus, farm income, and government revenues, and to be calculated are by how much and in which direction the total social welfare is moving as a result of the tariff changes.

If, as a result of changes in tariff structure, the import increases (or decreases), then it must be the case that the prevailing price has gone down (or up), thus resulting in: (i) an increase (or decrease) in the consumer surplus;

(ii) a decrease in the producer surplus (or increase); (iii) a decrease (or increase) in the farm income resulting from the decrease (or increase) in the equilibrium amount of oilseeds; (iv) it could either increase or decrease the government revenue depending on whether the revenue generated from the increase in imports is greater than or less than the amount lost out due to the decrease in the tariff rate; and finally it could change the wage bill earned by farmers on account of the fact that they might shift out (or in) to (or from) a competing crop.

The year 2010-11 is considered to be the base year primarily because of the availability of data. The above mentioned exercise is carried out for the following scenarios: (i) a five-percent increase in tariff rate; (ii) a five-percent decrease in tariff rate; (iii) ten-percent increase in tariff rates; (iv) ten-percent decrease in tariff rates; (v) zero imports; (vi) a 50-percent increase in tariff rates;(vii) a 50-percent decrease in tariff rates; (viii) a 100-percent increase in tariff rates; and (ix) a 200-percent increase in tariff rates. The recent increase in tariff rates mentioned in Section 3 (see endnote [27]) amounts to an increase of around 150 percent in the tariff rate for edible oil. Looking at the simulation results of a 100-percent increase and a 200-percent increase thus gives a good understanding about the direction in movement of the consumer surplus, producer surplus, government revenue, wage bill or farm income. Even as it proves difficult to trust the exact magnitude of the numbers obtained, the direction of change in the values for the different variables should provide a good idea as to the social desirability of particular policies over others.

The elasticities of the various variables with respect to the tariff change, that is used for the scenario analysis is presented in Table 4. The elasticities of consumption of edible oil, production of edible oil, and import of edible oil, with respect to the price of edible oil is taken directly from the regression results shown in Table 3.

To calculate the change in the level of producer surplus, for each scenario estimates are done for edible oil production and the associated price, and oilseed production and its price. Assuming that all oilseed produced is going to the processor as input, the profit for the processor is estimated. As such, production of oil meal is a natural corollary of edible oil extraction, and oil meal has an export market. This is, however, beyond the scope of this analysis, and also assuming that this may not add up much to the existing argument. The reasonable assumption is made that the oil meal export market will not be as remunerative to keep a processing unit at break-even levels if edible oil prices go down by substantial levels. Eventually, on the base case, estimates are done on the change in the producer surplus in each scenario.

TABLE 3: ESTIMATES OF THE LOG-LINEAR MODEL

Variable	Coefficient	p-value
	DEMAND	
Log (P)	-0.149	0.157
Log(GDP per capita)	0.249**	0.05
Time dummy	Y	-
Observations	10	-
	SUPPLY	
Log (P)	0.246***	0.01
Observations	10	-
	IMPORTS	
Log (QS)	-0.51	0.838
Time dummy	Y	-
Observations	10	-
	OILSEED	
Log (P)	0.759***	0.00
Observations	10	-
	AREA	
Log (Poilseed)	0.044	0.458
Observations	10	-
	YIELD	
Log (Poilseed)	0.387***	0.00
Observations	10	-

To calculate the change in the consumer surplus, the following is carried out. Edible oil consumption and price have been estimated for each scenario with the help of the tariff elasticity of consumption. The total consumer expenditure in each scenario has been obtained as the product of consumption and price of edible oils. The difference between the expenditure in a scenario and the expenditure in the base case signifies the change in consumer surplus in relation to the base case.

TABLE 4: ELASTICITIES OF DIFFERENT VARIABLES w.r.t. TARIFF RATE

	Elasticities
Consumption of Edible Oils	-0.149
Production of Edible Oils	0.246
Import of Edible Oils	-0.51
Oilseed Prices	1.38
Area	0.044
Yield	0.2261
Production of Oilseeds	0.803

The impact on wage-bill has been estimated by considering that generally, around five percent of a viable firm's revenue goes to manpower cost. (This is a reasonable projection based on an examination of sample corporate annual reports.) Hence, as revenues decline, there will be a consequent decline in wage-bill, as many people will be rendered unemployed.

Also accounted for are the changes in the amount of farming income generated. As tariff increases and edible oil prices rise, oilseed prices also rise, the reason for which has been stated earlier in the discussion of the theoretical framework. In case of a higher oilseed price, the farmer is induced to bring in more land under oilseeds. The estimated change in production value of oilseeds has been estimated in each scenario from the base case, and then added up. Assuming that all costs of oilseed production remain constant, the sum of the changes in the value of production gives the change in farmer surplus in the concerned scenario, as compared with the base case.

The government revenue from the total tariff duties in each case has been estimated by multiplying the total value of imports by the effective tariff rates. The difference between the revenue in each scenario and the revenue in the base case gives the estimate of the change in government revenue.

The assumption is made that farmers receive farm-gate prices and not wholesale prices, while the processors procure oilseeds at wholesale prices. Wholesale prices have been taken as weighted averages of wholesale prices of individual oils and oilseeds. Farm-gate prices have been estimated in a similar manner. Furthermore, the assumption is made that farm-gate prices are moving in the same direction as the wholesale price index.

The important issue here is that it is assumed that farm-gate prices of oilseeds cannot drop below the minimum support prices (MSP). Hence, in this model of perfect information across the various markets, whenever farm-gate prices fall below the MSP, the procurement will beat only the MSP. Under such circumstances, by taking the proportional mark-up of wholesale prices over farm-gate prices in the base case, the wholesale prices of edible oils are estimated for these scenarios.

It is further assumed that whenever a farmer is forced to decrease its area of oilseeds, it moves to the production of competing crop wheat. It is plausible to assume that when faced with market pressure to decrease the area in the oilseed production, farmers who are forced out of oilseed production will try to move to a competing crop to recoup some of the income losses. This recoupment, depending on the elasticity, could potentially mean more income for the farmer who is moving out. Assuming farmers to be rational agents, faced with the event that moving out of oilseed production is more profitable and earns for the farmer more income, it can safely be said that farmers will do exactly that. Of course, it is also possible that farmers are forced to move out of oilseed production to a competing crop, and still end up losing money, only less than the losses they would have incurred if they did not produce the competing crop, which helps them to partly recoup some of the losses.

A simplified assumption is made that whenever a farmer is forced to move out of oilseed production, the choice of their competing crop is wheat, and the area which is lost to the production of oilseed is now added to the production of wheat. This assumption is made primarily due to limitations of data availability, and could be relaxed if and when more data become available. This paper acknowledges that wheat need not be taken as the sacrosanct substitute crop, as decisions about crop production are made depending on various factors including agro-climatic conditions, topography and water tables.

As such, there are other competing crops as well. While wheat might compete with rapeseed/mustard in Rajasthan, cotton may compete with groundnut in Gujarat, and *jowar* can compete with sunflower seed in Karnataka, and soya bean in Madhya Pradesh. But, as stated earlier, it is not the crop that is important in this examination, but the price mechanism, and wheat apparently has a very strong pricing mechanism to represent a range of competing crops.

The results of the elasticity of the production of wheat with respect to change in area of wheat production are shown in Table 5.

Table 6 presents the changes in the social surplus (in INR million) under different scenarios. Figure 18 graphs the changes in the social surplus represented in the above table.

TABLE 5: ELASTICITY OF PRODUCTION OF WHEAT w.r.t. AREA OF WHEAT

	Independent Variable: Log (Production of wheat)	
Variable	Coefficient	p-value
Log (Area of Wheat)	2.144***	0.00
Observations	22	

DISCUSSION

Ideally, policy-makers strive to achieve a Pareto superior social state, i.e., by changing policies, a state is achieved where everyone is at least as well off as before while some people are better off. Now consider an increase in prices due to imposition of higher tariffs. A rise in prices implies not only that the amount consumed goes down, but each unit is now consumed at a higher price, thus reducing consumer surplus. This is clearly evident from Table 6. But, an increase in price implies that producers enjoy a higher price for each unit sold, and hence supply a greater quantity, thus leading to a rise in producer surplus.

TABLE 6: CHANGE IN SOCIAL SURPLUS UNDER DIFFERENT SCENARIOS

	5% tariff	**5% – tariff**	**10% tariff**	**10% – tariff**	**Zero Imp.**	**50% tariff**	**50% – tariff**	**100%**	**200% tariff**
Δ Consumer Surplus	-43563.0	43888.7	-86800.2	88103.2	-678241.7	-420970.5	453546.2	-809365.2	-1488427.3
Δ Producer Surplus	27046.1	-26517.4	54621.0	-52506.0	514903.3	294255.4	-241379.7	641386.6	1494275.9
Δ Govt. Revenue	828.6	6859.2	1566.3	-1930.2	69161.9	4192.2	-13290.2	-19070.1	-36356.4
Δ Farm Income	167193.8	27488.9	242399.4	-37010.4	1737643.7	972519.0	-424530.2	2206355.8	5744653.7
Δ Wage Bill	28.1	-24.8	52.9	-59.6	960.4	445.3	-115.9	1317.7	4733.4
Δ Social Surplus	151533.7	51694.6	211839.5	-3403.0	1644427.5	850441.5	-225769.9	2020624.7	5718879.3

A change in government revenue depends on the elasticity. For instance, due to an increase in tariffs and the resulting increase in price, the domestic supply goes up, and the consumer demand goes down—hence the import goes down, too. The government now earns more from each unit of imports, because of the imposition of higher tariff, but the total amount of imports has gone down. Whether the government revenue earned increases or decreases will depend on whether the decrease in the amount of imports is more or less than the increase in the amount of the tariff.

While wage bill declines whenever there is a decrease in the amount of tariff that is imposed, farm income declines only when there is a decline in the tariff by ten percentage points or more. From the above scenario, it is evident, that however much the policy-maker wishes, a Pare to superior outcome is not possible to achieve. But, in case we are able to achieve an outcome where most of the parties involved are better off, and the government revenue has increased from the initial situation, then, in theory, it is possible for the state to compensate the party that is making the minimal losses. It is an unwanted situation to have the consumers or the farmers supplying oilseeds worse off. From this simple simulation exercise, it seems that a decrease in five percent tariff results in a minimal amount of losses in terms of the wage bill lost, and, predictably, the producer surplus goes down. The government enjoys an increase in revenue, which, though not enough to entirely offset the total social losses, still results in a situation where consumers and farmers are better off, and some part of the losses made by edible oil producers can be compensated by the government.

FIGURE 13: SOCIAL SURPLUS SCENARIOS (in INR million)

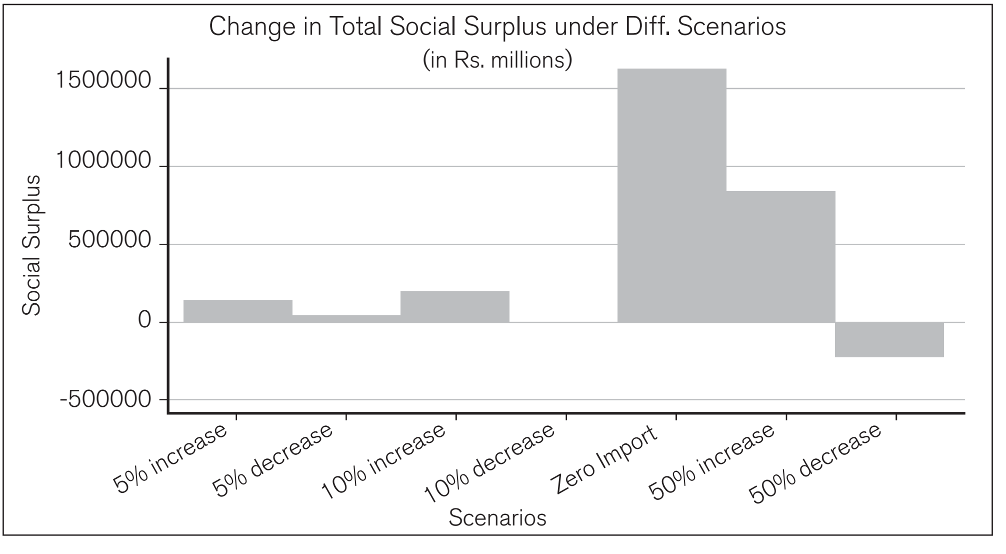


FIGURE 14: CONSUMER SURPLUS SCENARIOS

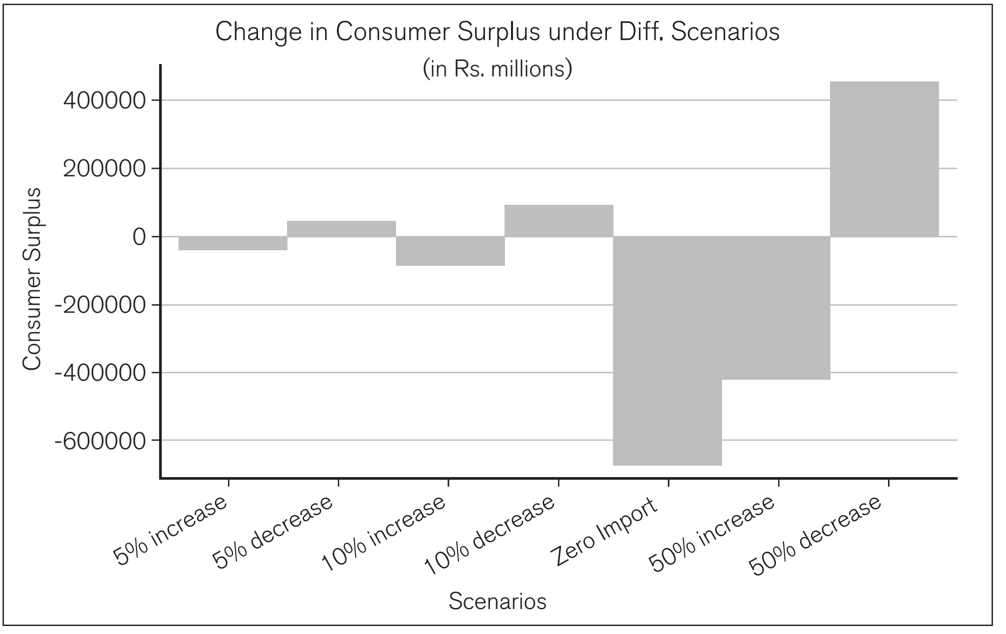


FIGURE 15: PRODUCER SURPLUS SCENARIOS

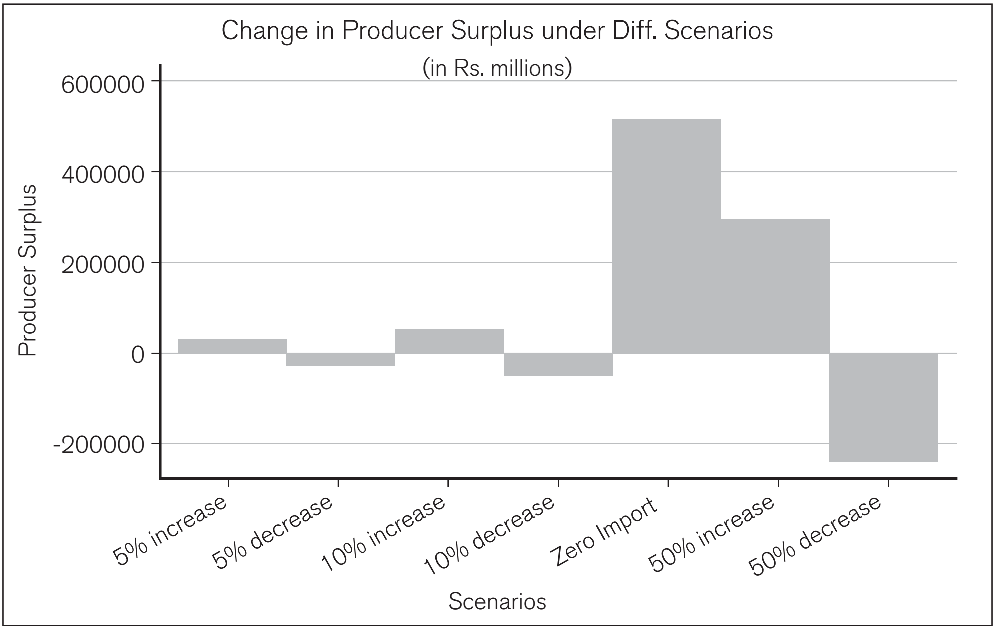


FIGURE 16: GOVT. REVENUES SCENARIOS

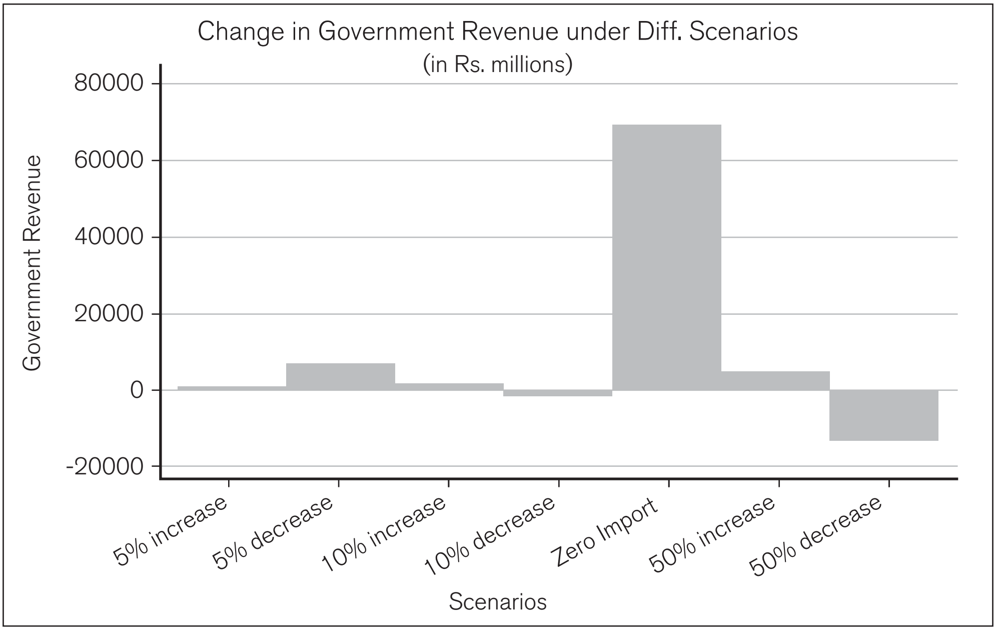


FIGURE 17: FARM INCOME SCENARIOS

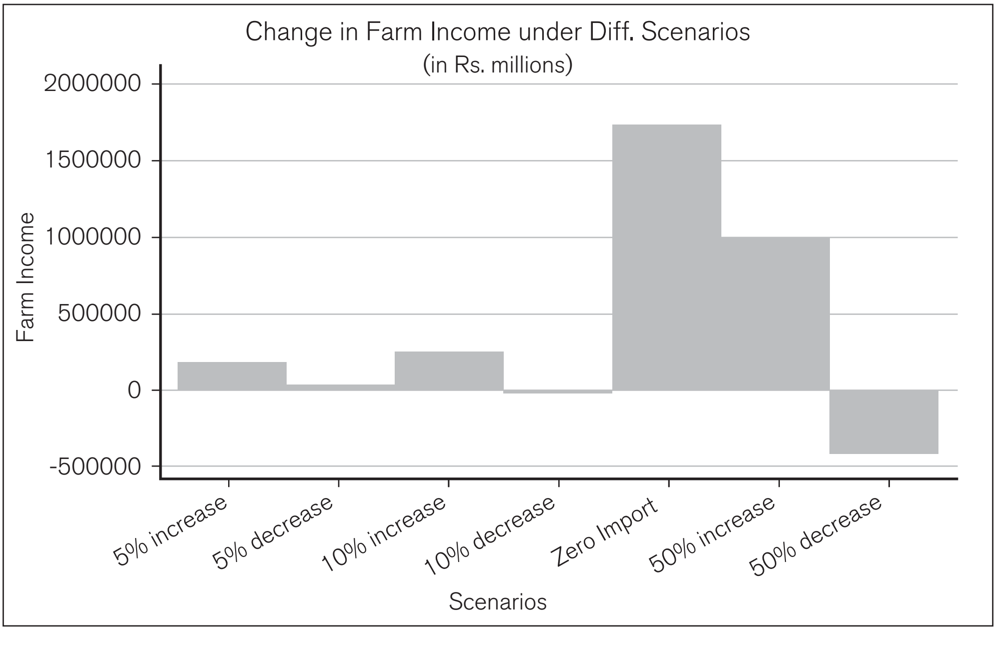
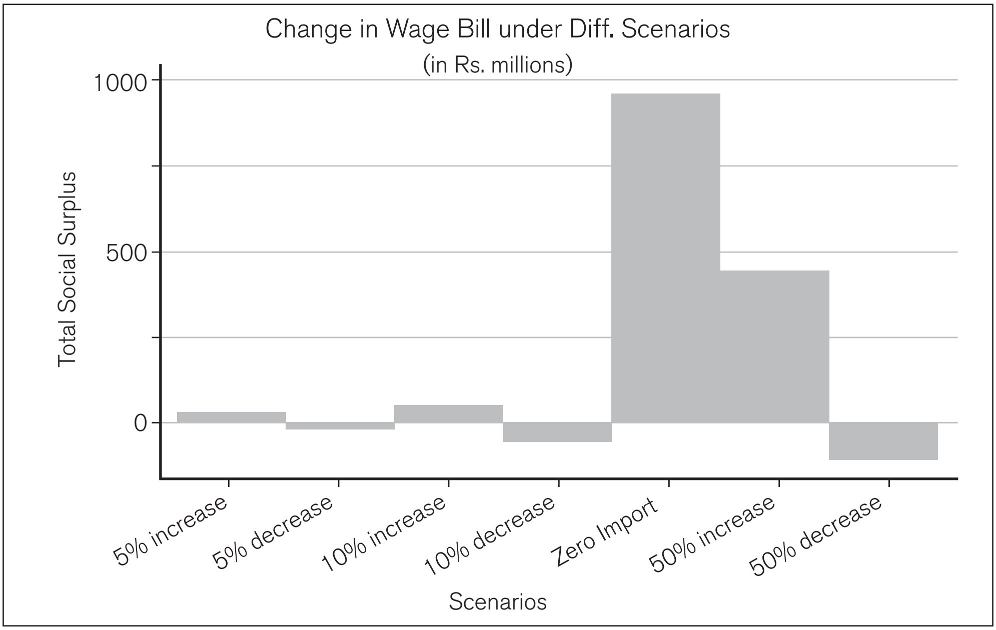


FIGURE 18: WAGE BILL SCENARIOS



It is evident that because of liberalisation and increase in FTAs, the domestic edible oil industry has been hurt: Liberalisation has led to the import of edible oil, pushing prices down, and resulting in domestic producers selling less and at a lower price. However, consumers always benefit from the increase in imports. They have more quantity supplied and can buy each unit at a lower price. It is plausible that from the perspective of a policy-maker, two of the most important stakeholders would be the consumers and farmers.

The results from the scenarios of the 100-percent and 200-percent increase in the tariff rates are being discussed with caution and a caveat is in order: The exact numbers generated may be different, but the direction of the change from an initial base case gives an idea whether there will be an increase or decline in the different metrics considered. Further research is needed to ascertain with greater accuracy the exact value, an endeavour crucially constrained by the lack of available data.

The tariff changes announced in September 2015 translate to a 150-percent increase in edible oil tariff rates. It is evident that with a 100-percent or a 200-percent increase in the tariff rates the consumers are going to be necessarily worse off (whatever be its exact magnitude). This is because of the reason discussed earlier, of an increase in the resulting price as an implication of the changed tariff. Similarly, the producers are going to be better off. Thus there seems to be a direct collision of interests between the consumers and producers. At risk of using the term in a sloppy manner, it can be said that it is a 'zero sum' situation—as in a situation where the benefit of one stakeholder happens necessarily to the detriment of the other stakeholder. Moreover, it is found that in both situations the predicted change in government revenue is negative, i.e., the state loses money. While one can raise a valid criticism as to how the state would go about the business of redistributing in case it has a positive revenue gain, such a position is not even on the horizon. Thus, if someone goes by the analysis presented in this paper, the recent announcements in the change in the tariff regimes are going to result in a situation where key stakeholders are going to lose out.

Policy-makers, while ideally wanting to achieve a Pare to superior state—or what can be called the 'first best alternative'—in reality often strive to attain the 'second best alternative': that which involves a surplus generation for the stakeholders that they consider as key, and minimum negative surplus for the other stakeholders involved. In the situation of a five-percent decrease in the tariff rate, for instance, both consumers and farmers producing the oilseeds are better off. A simplifying assumption has been made that farmers who are forced to vacate the area from oilseed production will necessarily move to wheat. This does not have to be true, and if the farmers are better able to adjust, the potential surplus could be higher. Moreover, there has been no assumption about any shifting for the producers of edible oil, which could potentially lead to unemployment issues, and the laid-off workers may not be easily substituted in a competing industry, at least not as easily as can be imagined in the agricultural sector. In any case, the numbers put forward in this paper are tentative; more research is needed on the topic to come up with better estimates. One thing that cannot be overemphasised, is that there has to be shift away from an analysis confined only to the amount of BoP/T, and rather consider the change in the social surplus generated from the change in the tariff structure.

VI. CONCLUSION

The importance of a detailed empirical assessment of the already existing FTAs cannot be overemphasised. In analysing the FTAs of India with other countries, existing literature have had a preponderant focus on the balance of trade situation of India vis-à-vis the partner country in question. While it is important to acknowledge the BoT situation, it should not be the sole metric of social welfare calculation as a result of trade. This study shows that any change in tariff structure propagates through the system via a price mechanism. There are adjustments of equilibrium price and quantity of edible oil, and as a result the equilibrium imports, which also changes the equilibrium factor use of oilseeds. Because of any tariff change, there is an associated change in the consumer surplus (whether they are consuming more/less of the product, at a lower/higher price), producer surplus of domestic edible oil market (whether the producers are getting to supply more/less of the output in the domestic market), farm income of oilseed producers (depending on the increased/decreased supply of oilseeds at a decreased/increased equilibrium oilseed prices), and government revenue generated from the tariffs imposed (increased/decreased tariff rate on a lower/higher amount of imports). Thus, depending on the elasticities, it is possible that overall, India's economy could be gaining even when the balance of trade is not in its favour.

This study proffers the following policy implication: While choosing the tariff regime or while entering into FTAs, governments need to consider the *ex ante* or *ex post* impacts on various stakeholders in the value chain. Undoubtedly, this is a tricky situation for the policy-makers, as there is always a 'zero-sum' condition that will arise: at least one stakeholder will be affected negatively in order to make others better off through tinkering of tariff regimes (or rates). At the same time, this analysis brings forward a way to look at FTAs' (through tariff regimes) impacts generally on the well-being of an economy through a disaggregated sectoral or value-chain level analysis.

While this is a contribution that bridges a critical gap in the academic literature, the limitation of the study lies on three counts. The first relates to the assumption that this study has looked at FTAs through the lens of only tariff liberalisation, and not explicitly through the non-tariff barrier (NTB) liberalisation. The impacts of NTBs are implicit in this framework, as FTA is a combination of liberalisation of both tariff and non-tariff barriers. There has been a rise in imports of edible oils after removal of the tariff and the non-tariff barriers, though imports seem to have been responding more to tariff rate changes. Here, the intent is to point out that in the mathematical and the econometric frameworks, a slight modification by considering time as a dummy variable can help in incorporating NTBs in the framework. However, that does not seem too necessary here, as that will hardly change the broad results and inferences. The idea of considering tariffs here is that this study was able to tinker it numerically (through percentage changes), and then arrive at a sensitivity analysis. While this framework can be extended further to take up NTBs, the same can be used in future studies where the perceived prominence of NTBs exists. The same is not true in the context of this study.

The second limitation of this exercise is that it has deliberately kept in abeyance the various social, political, and strategic factors affecting the value-chain, and concentrating instead on an attempt from the perspective of economic forces. This has rendered a more focussed approach to this analysis.

The third limitation is also related to its scope, and has been tacitly acknowledged in earlier sections. From the perspective of whether FTA is good or bad, a broader analysis will be needed, and the government needs to involve various think-tanks and research organisations to analyse the *ex ante* impacts on value chain by considering the commodity value-chain. As far as India-Malaysia FTA is concerned, there is a single commodity that has ruled the roost, i.e., palm oil. Palm oil comprises the largest component of the import basket and has been the prime mover of the trade balance. Thus, given the circumstances, any conclusion on the success or failure of the India-Malaysia FTA on the basis of palm oil imports can definitely be more indicative (if not definitive). However, this will not be true for other FTAs, where the trade situation is not confined to a single commodity import dominant trade basket. An immediate future extension of this framework therefore entails using this framework for the analysis of the impacts of other FTAs that India has signed. That will entail a further modification and customisation of this framework, as the situation with other FTAs are not as straightforward as it is with the India-Malaysia CECA. A better aggregative framework will be needed for FTAs where there might be multiple commodities in their respective value chains. It is hoped that this research is only the beginning of future work which will go beyond the framework used, and in the process increasing the dimension and complexity of the problem that has been analysed in this study.

Methodologically, however, this paper claims superiority in its framework over other models like Computable General Equilibrium (CGE) from the perspective of possible customisation rendered by the current framework. This method is also devoid of too many unrealistic assumptions that often plague CGE models. Still, it is acknowledged that this present analysis would not have been possible without the aid of various logical neoclassical economics-based assumptions in the framework. This framework is a critical attempt in Indian academic trade literature that arrives at figures of social surplus change, by aggregating the disaggregated surplus changes of the various important stakeholders.

While this study does not, definitively speaking, make any specific policy recommendation in terms of tariff rates, it does so, indicatively. The two key stakeholders, this study maintains, are the consumers and the farmers. There is only one scenario that has resulted in a positive change in surplus for both these stakeholders who are apparently "competing for the pie" in the scheme of things: a five-percent decline in tariff rates from the present. But this occurs at the cost of the domestic producers. Hence, it is for the government to choose whether to opt for the aggregate numbers of social surplus, or bring in the normative issues in policy-making with the disaggregated numbers, with the latter being the dominant global and national practice. This study reveals alternate policy options and brings to the fore the inherent policy dilemma in determining tariff regimes. On the other hand, though a five-percent tariff decline is the best possible scenario here (if the normative positions are accepted rather than the aggregate social surplus), it gives an indicative idea of the direction and range in which one may move with the tariff regimes. This number may not be treated as optimum, but definitely more than indicative. The optimum rate, however, may be arrived at through a proper constrained optimisation exercise, and it will be near about this figure. There is a broader policy question that this research indicates. From the policy perspective, one often needs to take normative positions which are value-judgmental. On the assumption of this normative position that the government might take, this study suggests that a five-percent decline in tariff may yet be the best possible scenario among those that have been considered, as it makes both farmer and consumer better off than the present situation, but further hurts the industry. It is here that a broader concern arises when one considers the fact that the Government of India has launched its 'Make in India' initiative to encourage multinational and domestic companies to manufacture their products in India. The processing industry also features in the list of the 25 sectors of the economy, on which focus has been given for job creation and skills enhancement. While certain fiscal impetus has been provided, FTA apparently seems to be a counteractive force impeding on the 'Make in India' dream, as it has negatively affected the domestic edible oil processing industry, as is evident from this paper. This inference is merely indicative at this stage. A deeper and more comprehensive analysis will be needed across various commodities and their value-chains to infer on whether FTAs are enablers of the 'Make in India' philosophy, or they are irreconcilable principles. This remains a critical policy research question.

APPENDIX: DEFINITIONS

Free Trade Agreements (FTAs) are arrangements between two or more countries or trading blocs which come together and agree to reduce or eliminate customs tariffs and non tariff barriers.[39] FTAs normally cover trade in goods (such as agricultural or industrial products) or trade in services (such as banking, construction and trading.). FTAs can also cover other areas such as intellectual property rights (IPRs), investment, government procurement and competition policy.

The specific conditions under Article XXIV of the GATT permitting FTAs, are:[40]

- FTA members shall not erect higher or more restrictive tariff or non-tariff barriers on trade with non-members than existed prior to the formation of the FTA.

- Elimination of tariffs and other trade restrictions be applied to "substantially all the trade between the constituent territories in products originating in such territories".

- Elimination of duties and other trade restrictions on trade within the FTA to be accomplished "within a reasonable length of time", meaning a period of no longer than 10 years.

In FTAs, tariffs on items covering substantial bilateral trade are eliminated between the partner countries. However each party maintains individual tariff structure for non-members. The FTA between India and Sri Lanka is an example. Such arrangements normally cover trade in goods or trade in services. Other areas include intellectual property rights, investment, government procurement, and competition policy.

There are various extensions of these arrangements in the form of preferential trade agreements (PTAs), Comprehensive Economic Partnership Agreement (CEPA), and Comprehensive Economic Cooperation Agreements (CECA). While these may have similar attributes, there are important differences between these.

Preferential Trade Agreements (PTAs): In a PTA for example, two or more partners agree to reduce tariffs on agreed number of tariff lines. The list of products in which an agreement has been reached for duty reduction is called the Positive List. In general, PTAs do not substantially cover all trade—example being that of MERCOSUR (Southern common market) - sub regional group comprising of Argentina, Brazil, Paraguay, Uruguay and Venezuela). Its associate countries are Chile, Bolivia, Columbia, Ecuador and Peru.

Regional Trade Agreements (RTAs): In the World Trade Organization (WTO), regional trade agreements (RTAs) are defined as reciprocal trade agreements between two or more partners. They include FTAs and customs unions.[41]

CECA and CEPA: The terms 'CECA' and 'CEPA' describe agreements which consist of an integrated package on goods, services and investment along with other areas including intellectual property rights (IPRs) and competition. Examples include the India-Korea CEPA and the India-Malaysia CECA.

ENDNOTES

1. A situation is "Pareto Efficient" when there is no way one entity can be made better off without making another entity worse off. If at least one agent can be made better off with the others remaining as well off as before, a "Pareto Improvement" has been made. An agent could be a person, a group, firms, industries or sectors.

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