Inverted Duty Structure and Effective Rate of Protection: Theoretical and Empirical Analyses

Export-Import Bank of India (India Exim Bank) instituted the International Economic Research Annual (IERA) Award in 1989. The objective of the award is to promote research in international economics, trade, development and related financing, by Indian nationals at universities and academic institutions in India and abroad. The study titled '*Inverted Duty Structure and Effective Rate of Protection: Theoretical and Empirical Analyses*' is based on the IERA Award 2021 winning thesis by Dr. Kanika Pathania, who received doctorate from Delhi School of Economics, University of Delhi, New Delhi in 2021.

Recently, various sections of Indian industry have been expressing concerns about the impact of an **'inverted duty structure' (hereafter IDS)**. IDS is a situation in which the tariffs on the import of raw materials/intermediate inputs for a product exceed the tariffs imposed on the import of the final product. The typical complaint raised by Indian industrialists is that customs duties on the import of some products, have fallen below the duties on the intermediate inputs required for their production. This has squeezed the profitability of the downstream producers by keeping their input costs high while exposing them to more intense foreign competition for their outputs. Cases of IDS continue to persist.

The traditional trade theory explains that when countries start integrating at different levels of production, then one should consider looking at what is referred to as the *effective rate of protection (i.e., ERP)*. The concept of ERP, due to Corden (1971) and Balassa (1965), shows how protection of downstream industries can be eroded or even reversed by tariff inversion (IDS). If ERP for an industry remains positive despite IDS, then the latter may not affect that industry too adversely, because the tariff structure is still giving it protection. But it is a different matter if ERP for a sector is negative due to IDS. Thus, it is important to establish a link between the two.

Against this backdrop, this study is the first attempt to study whether there exists any rationale for the existence of inverted duty structure under imperfectly competitive market environment? In other words, are there any specific conditions which make tariff rates supporting IDS as an optimal policy solution while maximizing a country's social welfare? If yes, do these conditions hold only if the industries under consideration are positively protected (i.e., when ERP > 0)? Or, does IDS always imply negative ERP? This study attempts to answer these questions both theoretically and empirically.

The study outlines a theoretical model with two countries (home and foreign) and two vertically related goods (a final good and an intermediate input), where the domestic government and firms interact in a three-stage game as represented in the schematic diagram **(Figure 1)**. The game structure closely follows the work done by Ishikawa and Spencer (1999) and others. The purpose is to examine the determinants of tariff structure in an open economy, while specifically trying to derive the conditions under which IDS turns out to be an optimal policy for a country's government. Thus, in the first stage, the government of an economy decides on the optimal tariff policies. In the second stage, the home and foreign intermediate input producing firms play in quantities and hence, given their demand functions, equilibrium input prices are determined in the markets. In the last stage, the final output producers decide on the quantities of output to be produced and sold in different markets. Thus, the game structure enables to understand how tariff rates play a crucially important role in influencing decision making of different economic agents of a country.

Figure 1: Schematic Representation of Model Structure and Three Stages of Decision
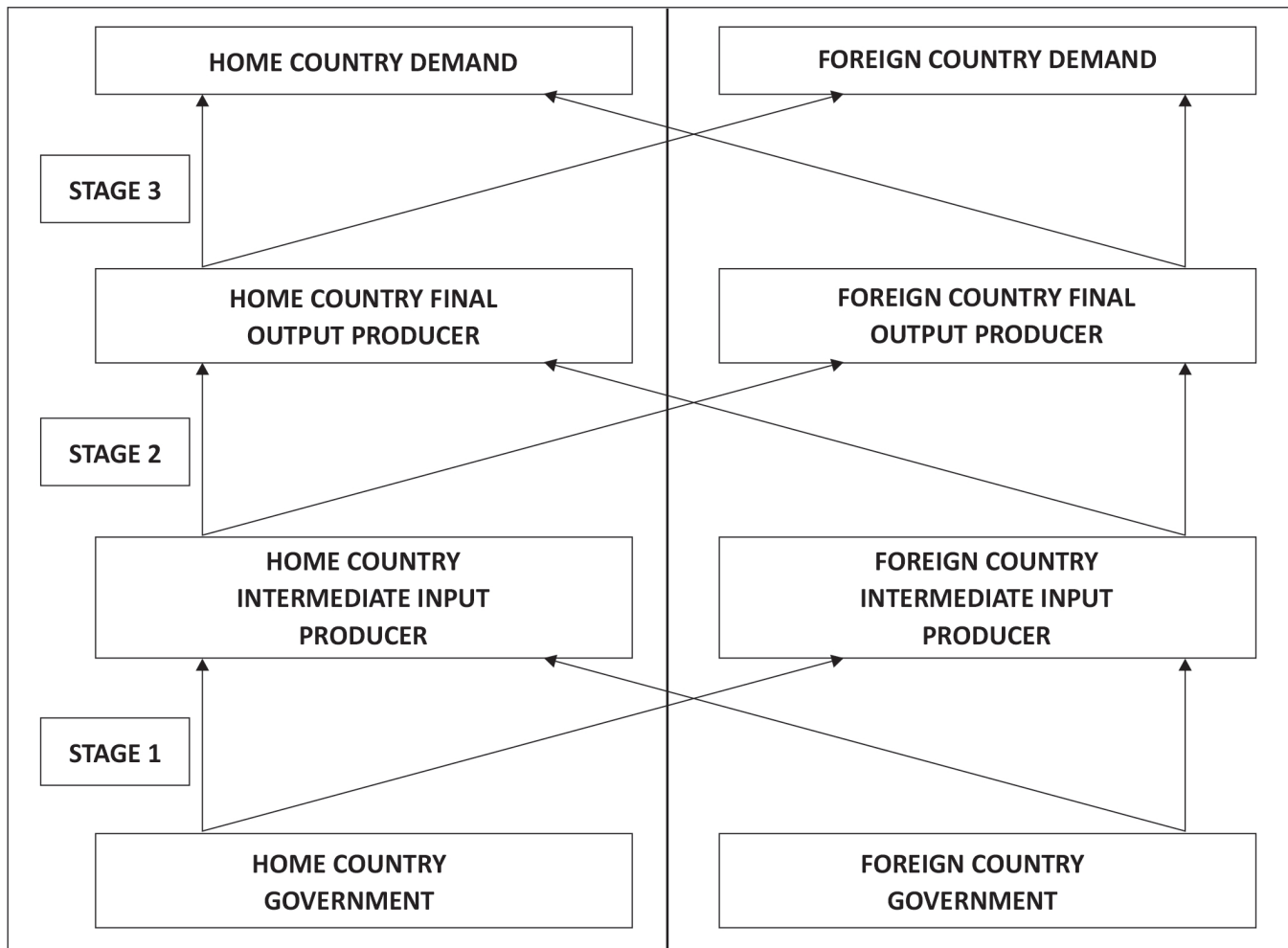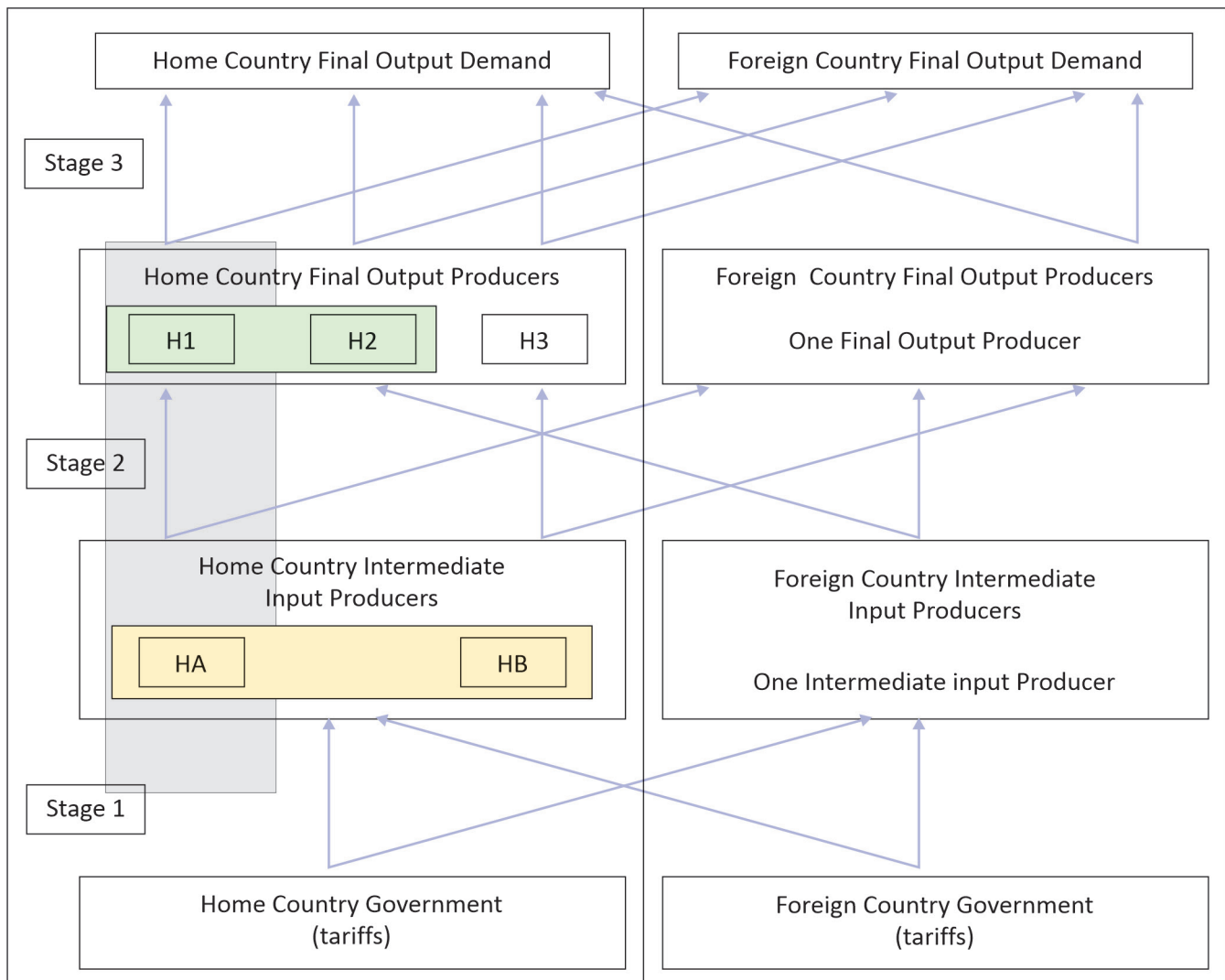

Source: Author's Representation

Depending upon various parametric configurations, this study shows that there do exist such optimal rates of input and output tariffs that could lead to IDS in an economy, and negative ERP as well. However, this does not imply that IDS always coincides with negative ERP. In fact, the results suggest that ERP for an industry may remain positive despite IDS, meaning thereby the latter may not adversely affect that industry because the tariff structure is still giving it protection. Nonetheless, it cannot be ignored that under certain conditions, IDS does coincide with negative ERP, and it is important to assess those parametric configurations carefully. Further, the study shows that apart from a country's tariff structure, asymmetric wages and market sizes between the trading partners, also assume a critical role in determining the conditions leading to negative effective protection.

In the globalised world today, the very nature of competition policies and the associated benefits and costs, cannot be studied without considering their impact on a country's tariff policies. The study further builds on how various types of domestic mergers impact a country's tariff structure. In particular, it analyses how different forms of integration (merger), whether horizontal or vertical, affect optimal input and output tariffs, and hence, the existence of inverted duty structure and its association with negative ERP. It again employs a two-country model, but with more intermediate input and final goods producers in the home country. The schematic diagram is represented in **Figure 2**.

Figure 2: Diagrammatic Representation of the Model Structure, Three Stages of Decision, and Possible Merger Scenarios

Source: Author's Representation

The benchmark scenario ('Pre-Integration Case') is the one in which no pair of firms in either of the two countries is integrated. Next, the case of vertical integration was considered where one of the final output producers in home country, vertically integrates with a home country intermediate input producing firm (as highlighted by the grey coloured solid block in **Figure 2**). Thereafter, the two different cases of horizontal integration were analysed, starting with the horizontal integration between the two final output producers in the home country (as highlighted by the green coloured solid block in **Figure 2**). Next is the case of horizontal integration that takes place between two intermediate input producers in the home country (as represented by the yellow-coloured solid block in **Figure 2**). The policy outcomes of all four cases were compared

to assess how different forms of merger affect the tariff decision in general, and the link between IDS and negative ERP specifically.

The analysis is suggestive of various important policy considerations. First of all, the case of vertical integration between one of the final output producers and an intermediate input producer within the home economy represents a win-win scenario as it leads to an increase in both social welfare and profit of integrated firms. Further, in such type of integration, IDS always turns out to be an optimal policy. Unlike in the pre-integration case, duty inversion turns out to be a necessary but not sufficient condition for the existence of negative ERP. In the second case of horizontal integration at the intermediate input stage, the profits of the

integrated producers rise, social welfare decreases, vis-à-vis the pre-integration scenario. Moreover, horizontal integration at the intermediate input stage also leads to the existence of inverted duty structure (as an optimal tariff policy), and this duty inversion is necessary but not sufficient to ensure the existence of negative ERP. Thus, in line with the first assessment, the second part of this study makes all the more imperative for the policy makers to consider (a) the necessity of deriving ERP instead of just focusing on the cases of IDS, and (b) the interactions between trade and competition related policies before relooking or reformulating their tariff related policies to address the concerns raised by different Indian industrialists.

To verify some of the theoretical assertions, this study also offers a set of new estimates of ERP for 24 sectors of the Indian economy for the period 2000-2014. This has been done using the World Input-Output database (WIOD) that, unlike those used by earlier researchers, enables one to construct a time series on ERP for each sector, using different tariff rates applied by India on imports from different countries. These estimations suggest many instances of IDS in various Indian industries, but none of them results in negative ERP. In particular, IDS exists in electronics and optical products, paper and paper products, computer, pharmaceuticals, machinery and equipment, and other transport equipment for the majority of the years under consideration. The study also shows statistically and econometrically that ERPs are positively related to the degree of tariff escalation. Lastly, the findings show that in some of the Indian industries, and for some years under consideration, negative ERP does exist, but that is because of negative value added under free trade, and not because of inverted duty structure per se (Pathania and Bhattacharjea, 2020). Therefore, this empirical investigation makes an important attempt to address the issue of whether, and to what extent the Indian economy is suffering from the consequences of an IDS.

In a nutshell, the results of the study suggest that in line with the concerns raised by various Indian industrialists, duty inversion does exist in various sectors as suggested by the data. However, the question is – should governments be really concerned about IDS? The theoretical assertions clearly suggest that under certain conditions, IDS turns out to be an optimal policy for the government of an economy. This implies that such types of tariff structures are (at times) required to maximize a country's social welfare. But, how does that impact the industries under consideration? IDS is harmful if it leads to negative protection. And the present study shows, both theoretically and empirically, that existence of IDS does not necessarily imply that ERP is negative. Therefore, governments as well as industries should really be concerned about ERP, and not IDS in specific sectors.

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