Appendix 2. Non-Tariff Barriers in IDE/ERIA-GSM

As depicted in Figure 7A, the transport costs in IDE/ERIA-GSM comprise direct costs such as freight rates and tariffs, and indirect costs such as time costs, social and cultural barriers, and non-tariff barriers (NTBs). The freight rates are a function of distance travelled, travel speed per hour, physical travel cost per kilometre, and holding cost for domestic/international trans-shipment at border crossings, stations, ports, or airports. Time costs depend on travel distance, travel speed per hour, time cost per hour, holding time for domestic/international trans-shipment at border crossings, stations, ports, or airports.

The sum of tariffs and NTBs (TNTBs) is estimated by employing the log odds ratio approach initiated by Head and Mayer (2000); namely, we estimate industry-level border barriers for each country. Our explanatory variables include the above-calculated sum of physical transport and time costs and the ratio of a country's per capita GDP to its domestic per capita GDP. We also introduce the ratio of geographical distance with a country to domestic distance, defined as two-third times the radius of the domestic country concerned. To control for the effect of cultural disparity on differences in imports/consumption, we introduce a border-sharing dummy, a linguistic commonality dummy, and a colonial relationship dummy.
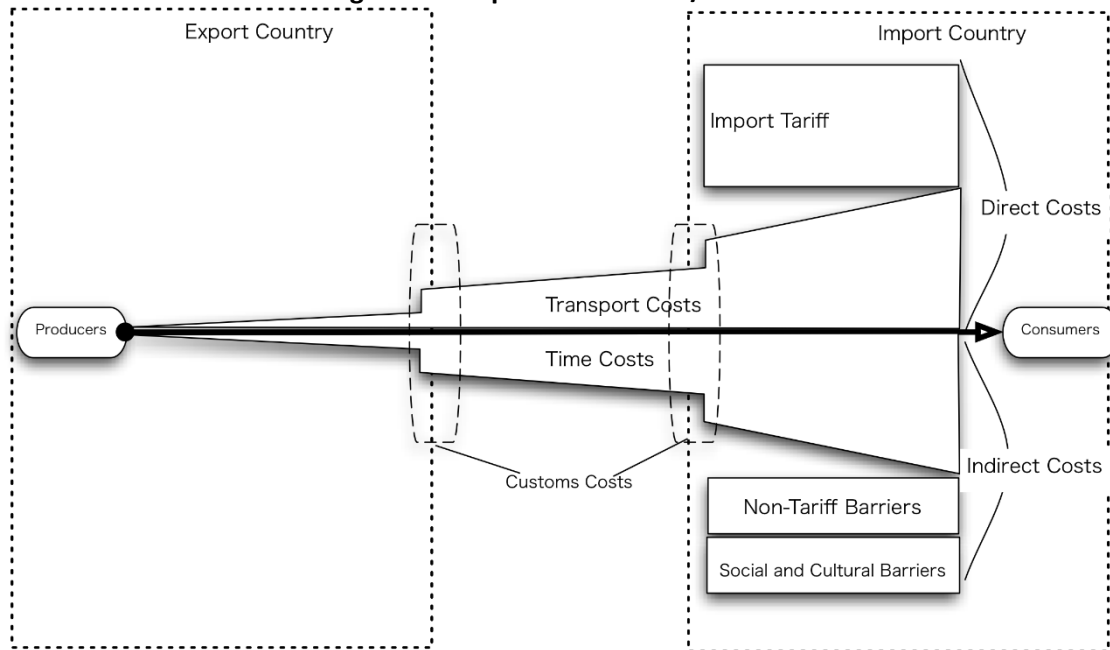
With this methodology, we estimate industry-level TNTBs for 69 countries. TNTBs for the remaining sampled countries is obtained by prorating their TNTBs according to each country's per capita GDP. Then, we obtain NTBs by subtracting tariff rates from TNTBs.

Another important setting on transport cost is the 'cumulation rule' in multilateral free trade agreements/areas (FTAs), particularly ASEAN + 1 FTAs and AFTA. Based on the estimate in Hayakawa (2014), we formalise the effect of the diagonal cumulation rule among ASEAN + 1 FTAs as 3 percent below NTBs in trading among members after each FTA's entry into force, in addition to the effects of ordinary FTAs, i.e. member countries enjoy 6 percent below NTBs in trading among members, based on the estimation in Hayakawa and Kimura (2015). This means that the trade among multilateral FTAs enjoys 9 percent reduction in NTBs.

In the simulation process, we first obtain the optimum routes and mode by each

origin–destination and industry according to Warshall-Floyd Algorithm, considering freight rates and time costs. Once the transport costs along the optimum route and mode are calculated, we add the tariffs, the costs of social and cultural barriers, and NTBs to it, if the origin and the destination cities are in different countries.

Figure: Transport Costs in IDE/ERIA-GSM

Source: Authors.