

Trade Response of Armington-Krugman-Melitz Encompassing Module in a CGE Model: Case of the Trans Pacific Partnership Agreement

Ken Itakura¹

Kazuhiko Oyamada²

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Computable General Equilibrium (CGE) models have been widely used for quantifying economic impacts of free trade agreements and economic partnership agreements. Trans-Pacific Partnership (TPP) Agreement is the most recent case as it reached final agreement in October 2015 among the twelve countries: United States; Japan; Singapore; Brunei; Malaysia; Vietnam; Australia; New Zealand; Canada; Mexico; Chile; and Peru. There are number of studies assessing the potential economic impact of TPP by applying CGE models. For example prior to the final agreement of TPP, Cabinet Secretariat (2013) in Japan estimated that TPP would increase Japanese real GDP by 0.66%. Pacific Economic Cooperation Council (2012) also estimated that the impact of TPP on Japanese real GDP would be 2.00% higher by 2020. Those estimates were based on simulation results obtained by global CGE model: the former utilized the GTAP model (Hertel, (1997), and McDougall (2003)) while the latter developed their own model (Zhai (2008), and Petri *et al.* (2012)). The differences in their estimated economic effects are not small, but it is not surprising because the components of trade liberalization taken into their TPP simulations are different. Petri *et al.* (2012) considered exhaustive components of liberalization, such as removing tariffs, reducing non-tariff barriers, liberalizing trade in services and foreign direct investment. On the other hand, Cabinet Secretariat (2013) estimated only the impact of removing tariffs, thereby resulted in the smaller estimate. More recently, Cabinet Secretariat (2015) updated their estimate by expanding the trade liberalization components and channels that the real GDP of Japan is estimated to increase by 2.6%, while the World Bank (2016) reported that due to TPP Japanese real GDP would be higher 2.7% by 2030.

Beside the difference in the components of liberalization, it is more interesting for us to

¹ Graduate School of Economics, Nagoya City University; 1 Yamanohata, Mizuho, Nagoya, 467-8501, Japan; Email: itakura@econ.nagoya-cu.ac.jp.

² Institute of Developing Economies, Japan External Trade Organization.

ponder the difference in trade specification used in their global CGE model. Zhai (2008) and Petri *et al.* (2012) defined their trade module by following Melitz (2003) based on the firm-level product differentiation while the GTAP model has been adopting the conventional Armington (1969) specification based on the differentiation at the country level. Thus, we are interested in comparing different trade specifications and its implications for resulting estimates of economic impacts of trade liberalization in a global CGE model.

Dixon and Rimmer (2012) proposed an encompassing model of different trade specifications, overarching those by Armington (1969), Krugman (1980), and Melitz (2003), hereinafter referred to as the AKME module. Stimulated by their work, Oyamada (2013) developed a prototype global CGE model incorporating the AKME module. It also explained how the necessary parameters for the AKME module can be calibrated. More recently, Dixon *et al.* (2015) conducted thorough analysis on their AKME module. One of their most important findings is that it is possible to have equivalent economic effects of liberalization on trade and welfare both in the Armington- and in the Melitz-type specifications, once the substitution elasticity satisfies a certain condition. Oyamada (2014a) investigated properties in a global CGE model with the AKME module by running a set of simulations, targeting at preference parameter on product variety. It identifies that the preference parameter significantly influences the welfare effect of trade liberalization. Depending on the value of the preference parameter, welfare gains from trade liberalization can be larger in the Melitz-type specification than in the Krugman-type, or vice versa. Dixon *et al.* (2015) and Oyamada (2014a) are among a few studies comparing Armington, Krugman, and Melitz trade specifications in CGE model, except for Balistreri and Rutherford (2012).

This paper introduces the AKME module to the standard GTAP model (Hertel, 1997) following the modeling strategy in Dixon and Rimmer (2012) and Oyamada (2013), because our primary interests are in comparing simulation results and their implications for trade policies obtained by different trade specifications. In those exercises, the calibration procedure proposed by Oyamada (2013) and Oyamada (2014a) is applied. Taking the TPP case as an example, we ran experimental simulations to draw comparisons between the Armington-, Krugman-, and Melitz-type trade specifications. Since debates on the values of key parameters, especially on the values of import substitution elasticity in different trade specifications, have been active these years and uniform consensus is yet to be reached, we also examined how the simulation results change when the values of key parameters, such as preference for variety and fixed exporting cost as well as import substitution elasticity,

vary, instead of pursuing specific values of those parameters. Since there exists only a handful of attempts to compare the trade effects by examining the AKME module, we believe it must be informative and useful to know how the model behaves when different values are given to those key parameters.

For this purpose, we firstly performed the base-line simulations with three trade specifications by Armington, Krugman, and Melitz considering the trade liberalization based on the TPP. In this simulation, average applied tariffs are removed for the member countries. The result is that the trade responses in the Melitz-type specification will be the largest, followed by the Krugman-type, and then the Armington-type, given the same values for import substitution elasticity when the preference for variety is relatively strong. Then, we carried out three kinds of experiment: (1) changing values of selected import substitution elasticity; (2) changing strength of the preference for variety; and (3) changing values of fixed exporting cost.

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