



## Using CGE modelling for Thailand's policymaking in the context of regionalism and other trade policy options

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### 1. Introduction

Given the experience of Asia-Pacific economies it is difficult to deny the powerful transformative effect of integration into the global economy. Indeed, it is largely the success of the Asian Tigers that led to the emergence of the concept of *export-led growth*, and more recently, the growing prevalence of production through Global Value Chains has pointed towards a new paradigm for pursuing structural transformation through international integration. Thailand is finding itself in a unique position to take advantage of such sources of growth, given that it is advantageously located geographically at the centre of South-East Asia, and that it is already highly reliant on trade and investment with the rest of the world. According to ESCAP (2015) in 2013, trade in goods and services was 1.4 times larger than GDP, and the inward stock of FDI accounted for almost 44 per cent of GDP.

In order to select the right mix of domestic and international policies that can foster an environment where dynamic and innovative economic activity can flourish, policymakers must be able to analyse the current situation and evaluate the potential impact of policies. Analysing the current situation can largely be done with empirical methods, and there are many indices that have been constructed under the guidance of economic theory. For example, issues related to relative competitiveness of goods and services might be explored through a number of indicators developed specifically to track such

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movements. Revealed Comparative Advantage (RCA)<sup>1</sup> or Trade Specialization Index (TSI) both provide some interesting information as to why some items are traded and others are not. Further, the exchange of goods between two countries might be examined with a Trade Intensity Index (TII)<sup>2</sup>, and the potential scope for expansion of this relationship through a Trade Complementarity Index (TCI).<sup>3</sup> However, while indices are useful in providing a snapshot of the patterns or trends in trade flows, they do not give any insights into causes. Therefore, one is left without much evidence to help evaluate the potential impact of trade policy and instead such an analysis must be extrapolated intuitively. The ability to make predictions would provide an important advantage to policymakers in developing countries. For this task, statistical models can be useful to make quantitative predictions on the impact of trade policy. In recent decades the most frequently used model to analyse trade policy impacts retrospectively are so-called gravity model (see more details in Shepherd, 2013). However, these econometric models function in a partial equilibrium context, i.e. where the estimated coefficients will give the response of trade to various factors *ceteris paribus*. For example, one might find out that a dollar of increased investment in trade facilitation might increase exports by 2.3 dollars, but we do not know what will happen in other areas of economy, or, for example, how much will import increase. In the context of policy analysis this partial equilibrium approach can be problematic, because one is ignoring the impact a policy in one sector may have on other sectors or areas of economic activity what is commonly referred to as a *general equilibrium effect*.

Where policy changes are likely to have significant economy-wide effects, it is useful to evaluate the potential general equilibrium effects of proposed policies. For this task, policy-makers can turn to economic theory, which has characterized the economic relationships between the multitude of factors involved in an economy into various models that have essentially culminated in general equilibrium modelling. In particular, in the case of trade policy analyses the most widely used type of general equilibrium models are Computable General Equilibrium (CGE) Models,<sup>4</sup> especially the so-called Global Trade Analysis Project (GTAP) model.<sup>5</sup> Such models effectively allow infinitely complex economies to be simplified into a model framework where those relationships can be manipulated at will. In this framework policymakers can run hypothetical experiments without risking the livelihood of

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<sup>1</sup> RCA index is the ratio of two shares. The numerator is the share of a country's total exports of the commodity of interest in its total exports while the denominator is the share of world exports of the same commodity in total world exports. It takes value between 0 and  $+\infty$ . A country is said to have a revealed comparative advantage if the value is greater than unity (Mikic and Gilbert, 2007).

<sup>2</sup> TII is similar to RCA in that it tells us whether trade between two countries is larger or smaller than what is expected given the countries' importance in world trade.

<sup>3</sup> TCI measures what to extent two countries are natural trading partners. It tells that what one country exports overlaps with what the other country imports. The index takes values between 0 and 100. Also, concentration ratio is a measure of the degree of diversification of the international trade. The ratio will be higher if country trades with only a few other countries and vice versa.

<sup>4</sup> Sometimes also referred to as Applied General Equilibrium Models (AGE).

<sup>5</sup> GTAP (Global Trade Analysis Project) is a global network of researchers and policymakers who conduct quantitative analysis of international policy issues, especially trade. Its goal is to improve the quality of quantitative analysis using an economic framework. Also, it offers various kinds of products including data, model, and resources. See more [www.gtap.agecon.purdue.edu](http://www.gtap.agecon.purdue.edu).

their population. Of course this is under the constraint that the theoretical assumptions underlying the model are representative of the real world - some would say a rather unrealistic assumption. Nevertheless, the science of general equilibrium modelling is growing, and CGE models are already being widely used for the study of various issues including trade liberalization. This policy brief will provide an overview of some of the advantages and drawbacks of using these tools for the analysis of trade policy.

## 2. Advantages

The advantages of using global CGE models for the analysis of trade policy come from their flexibility and the range of possible analyses.<sup>6</sup> For example, they can be used to model any type of trade liberalization, i.e. either vis-à-vis one country as in bilateral trade agreement, vis-à-vis a group of countries such as in the case of the TPP agreement, or even vis-à-vis all countries such as the WTO-driven trade negotiations rounds. The analysis of trade policy is not limited to tariffs but can also include subsidies, quotas, embargoes, export restraints, etc., as long there is data on these measures. Furthermore, one can model changes in international prices, domestic taxes, or shocks to factor endowments and production as caused by droughts or floods. The possibility to modify bilateral tariffs in the model makes these global CGE models very suitable for analysing preferential trade agreements such as the TPP, where tariffs are reduced or eliminated with some trading partners, i.e. the TPP countries, but not others, i.e. the rest of the world.

Arguably the main advantage of CGE models is that they provide an economy-wide analysis disaggregated at the country sector level. For example, in the aforementioned case of Thailand potentially joining TPP, a CGE model would calculate a full set of results for every sector that include all changes in output, employment, wages, relative prices, exports, imports, etc. It would also include a full set of nationally aggregated results such as consumers' welfare, the trade balance, the terms of trade, etc. This is a unique characteristic of such economic modelling that can have important advantages for the task of policy analysis on a large scale. Furthermore, since a CGE model can be specified to include the entire world economy, the results would also take into account the agreement's potential changes in global trading patterns beyond the TPP region. The results may therefore be more accurate than simply estimating one country's, e.g. Thailand's, imports and exports goods' price elasticity of demand after a fall in tariffs in the TPP countries, which is what something like a gravity model would do.

## 3. Disadvantages

Such an analysis however does not come without its drawbacks, and there are at least three points that critics make with respect to use of CGE models. Firstly, practical concerns with CGE models are the

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<sup>6</sup> See more in Gilbert and Tower, 2013.

heavy data requirements, and the fact that the accuracy of their calibration requires data from Social Accounting Matrices (SAM) for each country, which are difficult to construct and maintain. Economists in developing countries are likely to encounter difficulties in using CGE models because their national statistical offices do not provide frequent updates of such data. Although GTAP, for example, provides some guidance as to how a researcher can carry out the task of building a SAM and Input-Output (I-O) tables. But even in a middle-income country such as Thailand - where the responsible organization is the Office of the National Economic and Social Development Board - the most recent version of its I-O table is from 2005. Thus, a CGE model in 2015 cannot be expected to provide completely accurate results because its core data is not up to date.

Second, and probably the most salient point, is that the results of the models critically hinge on the assumptions underlying their construction, and that these assumptions are sometimes unrealistic. Some particular examples of this point are the assumption of perfect competition, although this can be relaxed in a number of ways. Another problematic assumption is the treatment by CGE models of the Armington assumption, which dictates that the elasticity of consumption varies between domestic goods and imports from different countries.<sup>7</sup> However, this assumption is usually treated in CGE models only as distinguishing between foreign and domestic goods, irrespective of the imported goods' origin.

Thirdly, some additional points about the construction of the model are also that CGE models are built with a single representative consumer and a single representative firm in each sector to represent agents' behaviour, which implies that distributional concerns cannot be analysed.

Fourth, CGE models function in *real* terms, i.e. all prices are relative prices and therefore independent of nominal effects, meaning that there is no room in the model for financial markets or monetary policy, although international movements of capital or modelled according to the demand for capital. This nevertheless implies an endogenous response of financial markets to movements in production patterns or trade policies cannot be analysed.

Finally, CGE modelling requires a good technical background in economics. This is problematic especially in developing countries because not all available postgraduate programmes provide sufficiently good technical knowledge. This can nevertheless be addressed through the provision of additional training to analysts and their organizations while waiting for university curricula to improve. This complexity also reveals another potential issue, which is that the reporting of results can be politicized, especially as they are relayed to an audience that may not have the required training to understand exactly what it is about the model that produced such results. Trade policy is particularly sensitive to such politicization because trade policy changes always result in winners and losers. Thus,

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<sup>7</sup> The reason why this assumption may be problematic is that models cannot account for product quality, and whereas in the real world German cars will have a different elasticity of demand than Indian cars, in the model this can be problematic to imitate.

some policymakers might not be comfortable with revealing some of the results, especially the ones with a negative sign.

#### **4. CGE modeling in Thailand**

The use of CGE modelling is not entirely new to Thailand, but its application is not widespread. Some governmental organizations have used GTAP modelling in their work. For example, the Department of Trade Negotiation, under the Ministry of Commerce, commissioned a number of research papers in the form of feasibility studies of particular FTAs, including the FTA between Thailand and Turkey and between Thailand and Pakistan. However, CGE modelling is largely used internally and the results are seldom published. This is understandable given the political aspects of trade negotiations, but it unfortunately also hinders the popularisation of CGE modelling as a research tool, by removing a platform where its applications can be disseminated to a wider audience. Other governmental offices that make use of CGE models include The Office of Agricultural Economics, and in addition, leading Thai universities have specialists and experts in CGE modelling. These include Chulalongkorn University, Thammasat University, and Chiang Mai University. Nevertheless, it is still probable that there are not more than 100 Thais (and people living and working in Thailand)<sup>8</sup> who have a good understanding of this tool and who could engage in teaching it and do research using this tool. There is therefore still much potential for capacity building so that CGE modelling can become a more widely used tool for policy analysis in Thailand.

#### **5. Some recommended policies for the Asia-Pacific Research and Training Network**

- Organise comprehensive training programme on CGE modelling. Training sessions should target different levels of knowledge and skills, including specialists practitioners, academia, and governmental organizations. This would help bring CGE modelling to as many scholars and analysts as possible around Thailand and other developing countries. Use ARTNeT website to disseminate training materials and consider some online training.
- Establish a CGE association as part of ARTNeT. ARTNeT secretariat might be a host for the first year to help lift activities off the ground. ARTNeT can offer a workable mechanism for active collaboration with the national research institutions (many of whom are already ARTNeT institutional members) and think tanks, research universities, and various associations (such as the Federation of ASEAN Economic Associations or Association of Pacific Universities). Backed by this association, the suggestions and recommendations of researchers are likely to have more traction with policymakers.

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<sup>8</sup> According to GTAP member list, there are only 28 contributors from Thailand, while there are 366, 117, 108 contributors from each the United States, China, and Japan, respectively.

- Organize annual meeting among CGE modellers working in Asia. These meetings could include seminars or conferences where CGE modellers can present their applications of the models.

## 6. Conclusion

The advantages of using CGE models for trade policy analysis are clear, and although there are some significant challenges to their use, a careful application of such models can provide an invaluable asset to policymakers and researchers alike. It must however be remembered that CGE models remain illustrative simplifications of what a real economy looks like; hence the results must be understood as such. Nevertheless, if integrated into a thoughtful and encompassing analytical approach, and reinforced with the use of other tools such as indices and empirical analyses, CGE models are powerful tools that can significantly strengthen Thailand's trade policy during this critical juncture along its development path.

While there are many economists, experts, and scholars around the world that have a great understanding and applications on CGE model, it is now our region's turn.

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