Agriculture Trade Liberalization and Poverty in China: A Dynamic CGE Model Analysis

Xiaohe Liu
AGRICULTURE TRADE LIBERALIZATION AND POVERTY IN CHINA: A DYNAMIC CGE MODEL ANALYSIS

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By
Xiaohe Liu (Principal Researcher)
Lan Fang (Researcher)
Hongye You (Research Assistant)

Institute of Agricultural Economics & Development (IAED)
Chinese Academy of Agricultural Sciences (CAAS)
12 Zhongguancun Nandajie
Beijing 100081, CHINA
E-mail: xliu17@hotmail.com

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Abstract
China’s trade liberalization has progressed smoothly since the late 1980s. The gains and losses from agricultural trade liberalization are often unevenly distributed within a country, especially for China, which has nearly 100 million rural people involved in agriculture experience poverty. In this study, we use a dynamic CGE model of China to track the changes of household income and expenditure patterns due to the impacts of WTO membership on China’s agriculture. Then we also compare several different scenarios to maintain a better trade policy for poverty elimination. The results from this study could be of great value for policy makers to identify courses of action for enhancing the positive income distributional outcomes and reducing any unfavorable effects from further changes in trade policy.

Keywords: trade liberalization, poverty, agriculture, dynamic CGE model
1. Main research questions and central research objectives

Since her accession to the WTO, China has undertaken substantial trade reforms in agriculture: tariff rates have been reduced, tariff structures simplified, and quantitative restrictions converted to tariffs. The average tariff rate on agricultural products was reduced from 23.2% in 2001 to 15.35% in 2005. Compared to the world's average agricultural products tariff rate, 62%, China has become a member of the group which has the lowest average agricultural tariff rate amongst all countries. However, China's average amount of natural resources per capita is much less than that of other countries, and the techniques in agricultural production are less advanced. As a result, China possesses no comparative advantage in most agricultural products. According to the review of the agricultural trade liberalization in recent years, there have been some impacts on Chinese farmers, who are categorized as being in the poorest group in China. Examples of the crops produced include soybean and tropical fruits. These sectors may be largely impacted during the trade liberalization and the consequential influence will obviously hurt the farmers. But until now, the impact of agricultural trade liberalization on the poor is still not quite clear and, therefore, is the subject of very intense debate.

Some questions to which answers are required include the following. Is the trade liberalization in agriculture within last five years favorable or harmful to the poor? What are the effects on different income levels of the poor? What alternative or accompanying policies may be used in order to ensure a more equitable distribution of the gains from freer trade? What are the channels through which these changes are most likely to affect the poor? These are examples of the quite challenging concerns that are the focuses of the ongoing debate on agricultural trade reforms.

In order to answer these questions, we use a dynamic CGE model MC-HUGE\(^1\) with an emphasis on the agricultural sector. However, until now, the MC-HUGE model has only one type of labor and a single representative household. We will extend the nation-wide dynamic CGE model into multi-household and multi-labor, so that we can analyze the effects of trade

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\(^1\) Monash-China Hunan University General Equilibrium Model built by Peter B. Dixon, Yinhua Mai, Maureen T. Rimmer Centre of Policy Studies, Monash University, 2006.
policy changes under WTO agreement on agriculture from 2002 to 2005. Therefore, the specific objectives of the study are:

1. To analyze the impact of implementation of the WTO Commitments relating to cuts in tariffs on agricultural products on poverty in China;

2. To compare the influences induced by different domestic supports and fiscal policy scenarios to the poverty during agricultural trade liberalization in the year 2002-2005;

3. To provide alternative strategies and policy options for further trade liberalization.

2. Scientific contribution of the research

Computable general equilibrium (CGE) models have long been used for poverty analysis. In traditional analysis, however, the Representative Household formulation is used to represent consumer behavior in the model. This formulation, although adequate for many purposes, limits our investigation of poverty and income distribution analysis.

Savard (2003) provides a discussion on poverty analysis and CGE models. From the point of view of that author, the models dealing with poverty and income distribution analysis can be classified into three major categories: models with single representative household (RH), models with multiple households (MH), and the micro-simulation approach that links a CGE model to an econometric household micro-simulation model.

The Representative Household model is used as the traditional method, and has been widely used in the literature. The main drawback of this model for income distribution and poverty analysis is that there are no intra-group income distribution changes available, as the households are all aggregated into one representative household. This, obviously, limits the scope of economic behavior in the model.

The second approach, namely the multiple-household model (MH), consists of the multiplication of the number of households. Increasing computation capacity allows us to process a large number of households in the model. In an extreme case, the total number of households in a household survey could be used. Cockburn (2001), for instance, studied the effects of trade liberalization on the poor in Nepal by using all 3373 households from the
Nepalese Living Standards Survey in a national CGE model. Cororaton and Cockburn (2005) combined a CGE model with a micro simulation analysis of the effects of trade policy changes on poverty in Philippines, integrating all 24,979 households from the 1994 Family Income and Expenditure Survey. Rutherford et al. (2005) used all 55,000 households from Russian Household Budget Survey as ‘real’ households in their CGE model, analyzing the effects on poverty after Russia’s anticipated accession to the WTO. Annabi et al. (2005) use a dynamic micro simulation CGE model of Senegal with 3278 observations. This approach then allows the model to take into account the full detail in household data, and avoids pre-judgment about aggregating households into categories. The major disadvantages of this type of approach are that data reconciliation could be difficult, and the size of the model could become a constraint.

The third approach, namely MS, draws on micro-simulation techniques. Here, a CGE model generates aggregate changes that are later communicated to a micro-simulation model based on a large database of unit records. The main advantages of this approach are: firstly, there is no need to scale micro economic data to match the aggregated macro data; secondly, we can accommodate more households in the MS mode. However, Savard (2003) pointed out that the drawbacks of the approach are coherence between models, since the causality usually runs from the CGE model to the micro-simulation model, with no feedback between them.

In recent years, there has been much research using CGE models to analyze trade liberalization. Previous studies mainly focused on the possible impacts at the national level (DRC, 1998; USITC, 1999; Wang, 1999; Martin et al., 1999; Walmsley et al., 2000; Lejour, 2000; Fan and Zheng, 2000), although some CGE studies do have considered the regional situation (Yang and Huang 1997; Fan and Zheng 2000; Diao et al. 2002, 2003; Jiang 2003). It is confirmed that the effects of trade liberalization at the national or regional level is positive. However, this does not imply that different types of household in China would benefit equally because that income is always unevenly distributed among sectors. Someone may seriously suffer due to the transaction of economic development and trade policies. Although there is a large literature in which CGE models have been used to measure the impact of trade reforms, very few attempts have been made to investigate the impact of agricultural trade liberalization.
on poverty, especially in China. Therefore, it is important to conduct this research.

In this paper, we intend to extend a dynamic CGE model that maintains the framework of a basic dynamic feature and meanwhile allowing integration of 10 types of households and 6 types of labor. The model proposed in this project has two characteristics. Firstly, the dynamic model, which is based on Monash model (Dixiong P.B. M.T.Rimmer 2002), possesses a high level of microeconomic detail. Secondly, the intra-group distributions are specified so as to conform to the different socio-economic characteristics of the groups.

3. Policy relevance

During the reform period, which started in 1978, China made huge progress to achieve its objectives: agricultural production rose sharply, rural industries absorbed a large part of farm labor, poverty fell dramatically, and the level and quality of food consumption improved significantly. The commune system was replaced by one where individual families hired land from the collectives, ensuring that almost all rural households had access to land and were, at minimum, food self-sufficient.

Currently, China has about 200 million farm households with an average land allocation of just 0.65 ha. Limited arable land and a large rural labor force mean that, in general, China tends to have a comparative advantage in the production of labor intensive crops, such as fruits and vegetables, and a disadvantage in the production of land intensive crops, such as grains and oilseeds.

One of the most striking features of China’s development in the reform period has been a large and growing income disparity between the rural and urban populations. This is largely due to limited factor mobility, especially of labor and capital. Surplus farm labor and low labor productivity have resulted in low agricultural income and hidden unemployment in rural areas. The rural-urban gap in living standards is further accentuated by disparities in access to education, health care and other social services.

The level of policy support to agriculture, measured by %PSE, fluctuated from low levels through the 1990s, rising to 8% in 2003, but still well below the OECD’s average of 30%. Support levels are highest for import-competing commodities such as sugar and milk, but also
for exportable maize. Grain markets remain distorted, mostly due to state trading, which drives a wedge between domestic and world prices. The Total Support Estimate (TSE) is relatively high at 3.7% of GDP, reflecting a large expenditure on general services, in particular investments in agricultural infrastructure to improve productivity.

In line with the improving economic situation and sectoral performance, government priorities have shifted from increasing production, especially of food grains, to rural income support and, more recently, to environmental concerns. In the medium term, the main challenges for China’s policy makers include balancing the large income inequality between rural and urban populations; integrating small-scale farmers, who are dominant, into markets; stimulating internal reallocation of resources to create more efficient farm structures; reducing the negative impacts of increasing agricultural production on the environment; improving the competitiveness of agricultural and food products on domestic and international markets; and improving the governance of institutions in designing and implementing agricultural policies.

Meanwhile, with China’s accession into the WTO, reduction of the agricultural tariff and abolition of some Non-Tariff-Barrriers will benefit manufacturing sectors and hurt agricultural producers, and consequentially increase rural-urban disparity and thus influence the pattern of income distribution in different sectors and poverty incidence in different household groups.

It will be with great interest to give the Chinese government and international organization advice on how we can reduce inequality and poverty by means of China’s agricultural trade liberalization, and finally reach the millennium development goals.

4. Methodology

(1) Reason for use of methodology

The structure of the Chinese economy has changed significantly since the reform undertaken in 1978, and it will continue into the future. A standard static model can hardly describe the dramatic changes of economy structure. Therefore, a static model is not the best tool for analyzing policy, which is implemented during a long period. To fulfill the task described above, we plan to develop a dynamic CGE model with multi-household and different types of labors to quantify the effects of changes in policies such as agricultural
tariffs and domestic support policy on poverty in China. A dynamic model can handle the problems described above properly, whilst a static model cannot.

(2) Structure of the model

The dynamic CGE model MC-HUGE we will use in this study has been developed by the Centre of Policy Studies in Monash University and Hunan University in China. It is based on the Monash model and designed for forecasting and policy analysis. Like its predecessor, ORANI\(^2\), MONASH has a high level of microeconomic detail. Unlike ORANI, it has a strong forecasting capability. This is due to: firstly, a more detailed specification of inter-temporal (i.e. dynamic) relationships; secondly, a greater use of up-to-date data; thirdly, the enhancements which allow the model to take on information from specialized forecasting organizations and from recent historic trends.

The basic structure of a dynamic model is similar to that of a static model. The equilibrium is general in the sense that it concerns all the markets (goods markets, labor markets, factor markets and international markets) simultaneously. The model has a neoclassical economics format. Producers are assumed to maximize profits, purchase inputs and supply products to both the domestic and international markets. Consumers receive income from the firm and then consume goods and services in accordance with maximized utility. The government collects taxes and also consumes. Prices and wages are determined clearly by regional commodities and factor markets.

Moreover, the Monash model incorporates three types of inter-temporal links: physical capital accumulation; financial asset/liability accumulation and lagged adjustment process. For more detail, see Dixion, P.B. and M.T. Rimmer (2002).

(3) Extend the basic model

The basic model of MC-HUGE only possesses one type of labor and one representable household. We will develop the basic model, extending labor and households to six types and ten types respectively. The six types of labor include urban skilled, urban unskilled, urban self-employed, rural skilled, rural unskilled and rural self-employment. The ten types of

\(^2\) ORANI-G is an applied general equilibrium model developed by Centre of Policy Studies, in Monash University, which has been applied to many countries.
households are classified by their income. There are five classes in both urban and rural region. Moreover, there are some links between different labors and households. With the detailed income and expenditure sections, the poverty and distribution study can be carried out.

5. Data requirements and sources

(1) Source of the Social Accounting Matrix (SAM)

Version 1 database of MC-HUGE is based on the GTAP Version 5 database that contains 1997 input-output data. The baseline of MC-HUGE Model, which is from 1997 to 2015, is already prepared along with the basic model. Also, as for this study, such detailed sectors are not required. We will aggregate non-agricultural sectors.

(2) Source of the household disaggregate

We use China Yearbook of Rural Household Survey and China Yearbook of Urban Household Survey to achieve the income and expenditure details of difference types of households in urban and rural regions. By using the data of different years, we also obtain the structure of income and expenditure variation during the long period and import it into dynamic model baseline to gain a more accurate historical forecast.

(3) Source of the labor disaggregate

According to GTAP database Version 6 (which disaggregates the labor into skilled and unskilled sectors) and China Economic Census Yearbook (The first national economic census) we will disaggregate labor sectors into six categories. Moreover by using the data of China Labour Statistical Yearbook, we can obtain the structure of labour variation during the long period and import it into dynamic model baseline to gain a more accurate historical forecast.

6. Dissemination strategy

Dissemination of outputs of this research project will be organized based on the following activities.

The first is to carry out a presentation in the academic community at IAED. This will be done if the proposal is selected for financing. Presentation materials will be prepared with
PowerPoint presentation copies and distributed to the participants of the seminar. The objective of this activity is to inform the audience about the research before it is implemented and to expand and discuss the basic knowledge with audiences about the focus of the research, the policy issues being addressed and the research techniques that would be used in the analysis. Thus, some comments and suggestions within the scope of the research may still be considered by the proponents before it is implemented.

The second dissemination strategy involves informing the target audiences about the outcome of the research, the recommendations and development strategies resulting from the research. This would be delivered through a conference or meeting where the participants may include the policy makers in the Department of Commerce and Department of Agriculture, the researchers (from universities and research institutions) and civil society (e.g. NGO, unions, community associations) in China. The goal of this dissemination strategy is to contribute to a policy debate by providing new data and ideas for analysis.

The last dissemination strategy is through publications and media. The findings of the research will be presented through journal articles, policy briefs and newspaper articles. Resources will be submitted to, among others, the *Journal of Chinese Rural Economy* (China), *The World Economy* and CAAS’s web sites. This form of dissemination will have a broader audience for the results of the study.

7. **Short list of key references**


8. The Research Team

The research team comprises three researchers, based at the Chinese Academy of Agricultural Sciences in Beijing:

- Prof. Xiaohe Liu (Principal researcher), male
- Dr. Lan Fang (researcher), female
- Mr. Hongye You (Research Assistant, CAAS), age 24, male

Xiaohe Liu is a Professor and Division Director at the Institute of Agricultural Economics & Development, Chinese Academy of Agricultural Sciences. Professor Liu did research in the field of international trade, agricultural markets and modelling, worked with international and bilateral organizations such as WB, FAO, ABARE as International Trade expert. For the proposed research, Professor Liu will provide senior guidance in the conduct of research particularly in addressing major agricultural trade policy and modelling issues, ensuring that activities are implemented according to schedule, reviewing and suggesting improvements in the various reports to be submitted, and co-authoring at least one journal publication. He will also organize and prepare the reports and then disseminate the final report and outcomes of this research to researchers in AARD, policy makers and other stakeholders in China.

Dr Lan Fang is a policy researcher in Division of National Economy, Shaanxi Provincial Development and Reform Commission, Xi’an, China. She has more than ten years of professional experience as an agricultural economist and policy analyst, advanced overseas education and training. Dynamic, result-oriented hands-on government economical policy management, particular at the interfaces research/development and economics/governance. She has sound practical and theoretical knowledge in the Chinese economy and policy and is excellent at identifying problems, implementing solutions and learns quickly.

Mr. Hongye You is a research assistant and has experience with CGE modelling and GEMPACK software. For the proposed research, he is expected to work closely with Prof.
Liu in the development of the proposed model, formulation of experiments, running the CGE models and preparation of reports. He hopes to co-author at least one journal article on the methodology and/or modeling of this study.

9. **List of team members’ prior training and experience in the issues and techniques involved.**

Liu, Xiaohe attended:

- ‘The Eleventh Annual Course for Global Trade Analysis’ at the Centre for Global Trade Analysis in Purdue University in August 2003.

You, Hongye attended:

- ‘Practical GE Modeling Course’ conducted by Centre of Policy Studies, Monash University in Hunan, China, in February 2006.
- ‘Dynamic GE Modelling Course’ conducted by Centre of Policy Studies, Monash University in Hunan, China, in September 2006.

10. **Expected capacity building**

Three main outputs of this project would have great importance for the participating researchers and their institutions, in particular CCATP. These outputs will thus contribute to institutional capacity building in the areas of economy-wide modelling and related analytical techniques on policy impact analysis.

1. Development of a tool for quantitative analysis (the mutil-houCGE model) that will
enable the user to explore agricultural trade policy scenarios and to analyze their impact on macroeconomic parameters and poverty alleviation;

2. Adoption of the quantitative analysis involving the CGE model and micro-simulation module that could be used as frameworks for analyzing agricultural policies in various studies such as forecasting, counterfactual analysis and policy evaluation relating to agricultural development and poverty issues;

3. Detailed listing and review of relevant economic literatures that will enhance the knowledge of the research team on new research methodologies and findings of other researchers. Lessons learned from such review can be used by the research team to improve and refine the analytical models that the team will use.

11. Any ethical, social, gender or environmental issues or risks which should be noted.

At the moment, we do not predict any social, gender or environmental issue that we can mention.

12. List of past, current or pending projects in related areas involving team members


Liu, Xiaohe with Professor T. Gordon MacAulay (the University of Sydney, Australia) and Associate Professor Jing Yang (Beijing Agricultural College) undertook a Dairy Australia Project of ‘A Study of Consumer Demand for Dairy Products in China’. Finding support for this project was provided by Dairy Australia in conjunction with Bonlac and National Foods during the period of 2004 to 2005.

Liu, Xiaohe & You, Hongye undertook a project of ‘Strategy of FTA’s Negotiations on Agriculture’, financed by the Ministry of Agriculture in 2006.
Liu, Xiaohe, as team leader, with You, Hongye are undertaking ‘ABARE-IAE Trade Modeling Exchange Project’ under the China-Australia Government Program sponsored by the AusAID during the period of 2005 and 2007, which is a joint research between the Institute of Agricultural Economics and Development (IAED) in the Chinese Academy of Agricultural Sciences (CAAS) and the Australian Bureau of Agricultural Resource and Economics (ABARE).

Liu, Xiaohe & You, Hongye are undertaking a joint research on ‘Construction a Regional Trade Model and Database for Agricultural Policy Analysis in Northeast Asian Countries’ contributed by the Institute of Agricultural Economics and Development (IAED) in the Chinese Academy of Agricultural Sciences (CAAS), Policy Research Institute in the Ministry of Agriculture, Forestry and Fisheries of Japan (PRIMAFF), and Korea Rural Economic Institute (KREI) from 2006 to 2007.
