

MPIA Network Session Paper

Economic Reform, Income Distribution and Poverty in China: A General Equilibrium Micro-simulation Approach

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Research Proposal

**Economic Reform, Income Distribution and Poverty in China: A
General Equilibrium Micro-simulation Approach**

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1. Abstract

The main objective of this research is to analyze the effects of China's economic reform such as changes in the China's taxation system and trade liberalization on income distribution and poverty reduction. Previous research on this issue in China limited by either descriptive illustration or by the representative households using standard CGE model. This gives ambiguous results in analysis of poverty effects. The study aims at using a computable general equilibrium micro-simulation model to mimic what are the impacts of China's taxation system and trade liberalization on China's overall incidence of poverty and uneven impacts on household income distribution and poverty incidence in different socioeconomic groups. This is a very important issue in the present economic debate in today's China, because Chinese government is trying to establish a Harmonious Society in the coming five years. Through our research, we could tested whether the policies can be an effective instrument to help the poverty alleviation currently underway in China.

2. Research Question and Core Research Objective

In the late 1970's China began to implement economic reform and opening to the outside, with the rapid economic growth, in the early 2000s it began to be noticed that there had been a significant increase in inequality in the distribution of income during the economic reform period. According to the new poverty line which is meant "to reflect the steadily improving living standards of rural households" (NBS, 2004), the poverty headcount rate based on this higher poverty line was 9.1 percent in 2003, representing 85.2 million rural inhabitants (Reddy and Minoiu, 2005), while China's average GDP growth rate during 1990~2003 was 9.3% .

There was soon an explosion in China's economic literature describing this situation and analysing the causes of the trend of poverty. Having been highlighted in China's "Key Points of the Proposed 11th Five-Year Plan" in November 2005, in which "Building a Harmonious Society" is one of the six tasks of China's government in the next five years, economic growth, income distribution and poverty is now being a hot topic in today's Chinese economic and social research field.

Besides, after accessing into the WTO in 2001, China is now oriented to more trade liberalization. This new openness has been accompanied by concern that the poor will be adversely affected, and that the distribution of income in China will deteriorate.

Using general equilibrium and micro-simulation technique for China, this study aims to clarify the linkage between China's economic reform, income

distribution and poverty in China and estimation the effects on households such as reduction of barriers to trade, reform in taxation system, as well as other domestic reforms that may have a strong impact on income distribution and poverty. The study's main objective is to model Chinese economy and simulate relative policy shocks on households. Further, the effects of reform in taxation system that relate to income distribution and policy shock such as change in tariff with China's accession into the WTO on household income, welfare and level of poverty will be accounted.

Under this research proposal, the following questions will be addressed:

- What is the linkage between China's economic reform, income distribution and poverty in recent years?
- Given China's industrial structure and characters of transmission economy, how to modelling policy shocks?
- What has been the impact of policy on income inequality and living standard in recent China?
- How much did poor people in China share in the gains from growth and trade liberalization?
- What role was played by economic policies in reducing poverty in China?
- What kinds of suggestion on designing China's policies such as taxation policy and trade policy in the future can we offer from the study?

The obvious objective of the study is to illustrate the relationship between economic growth, income distribution and poverty in China and evaluate poverty and distributional effects of macroeconomic and trade policies in

China. So the central objective of the study can be divided into four specific objectives:

- profile of economic growth, income distribution and poverty in China
- establish a Chinese CGE micro-simulation model which can mimic Chinese economy and its characters, as well as the relationship between economic policy, income distribution and poverty in recent China
- simulate policy shocks such as taxation policy and trade liberalization on income distribution and poverty in China
- raise policy suggestions with regard to income promotion and equal opportunity provision.

3. Scientific Contribution of the Research

The study on the links between economic policy, poverty and income distribution is a central question of economic development. A number of approaches have been taken either to analyze these links or construct of suitable tools to analyze the impact of macroeconomic policies such as change in trade policy or tax policy on poverty and income distribution.

Kuznets was the pioneer in the field of analysis of the link between growth and inequality. The famous Kuznets law illustrated that in the early stages of development, inequality increases, and then decreases in the following stages. A dual economy model by Robinson (1976) made it possible to specify the assumptions on which the U-curve rests. Through a model of a dual economy in general equilibrium, Bourguignon (1990) examines the effect of a "modern" growth shock on the shape of the Lorenz curve and

shows how the nature of growth depends on the parameters of demand. Eswaran and Kotwal (1993) studied the impact of various development strategies on poverty and inequality through a two-sector, two factors and two household classes model.

Among tools of analyzing the links between economic growth, poverty and income distribution, computable general equilibrium (CGE) models are widely used because of their ability to produce disaggregated results at the sectoral or microeconomic level within a consistent macroeconomic framework (Adelman and Robinson, 1988; Dervis et al., 1982; Bourguignon and al., 1991; De Janvry and al., 1991).

Piggott and Whalley (1985) used 100 household categories to simulate the impacts of a given shock. De Janvry, Sadoulet et Fargeix (1991) assumed a lognormal distribution of income within each category where the variance is estimated using base year data.

More recently, Decaluwé, Dumont and Savard (1999) present a CGE micro-simulation model for 150 households based on fictional archetypal data. They construct the model so as to allow comparisons with the earlier approaches with multiple household categories and fixed intra-category income distributions. They show that intra-category variations are important, at least in this fictional context.

The only general equilibrium micro-simulation with true data is performed by Cogneau and Robillard (2000). They examine the impact of various growth shocks, such as increases in total factor productivity, on poverty and

income distribution in the context of a national model of Madagascar.

To the case of China, Martin Ravallion and Shaohua Chen (2004) apply new poverty lines to newly assembled distributional data from National Bureau of Statistics (NBS) aims to document and explain China's record against poverty over the two decades. They found: (1) While the incidence of extreme poverty in China fell dramatically over 1980-2001, this progress was uneven over time and across provinces. (2) Rising inequality within the rural sector and provinces greatly slowed poverty reduction. (3) Taxation of farmers and inflation hurt the poor; external trade had little short-term impact.

Using a recursive dynamic computable general equilibrium (CGE) model of China, Zhai and Hertel evaluates the impact of some key labor market reforms on rural-urban inequality and income distribution. The simulation results show that the reforms in rural land rental market and *Hukou* system, as well as increasing off-farm labor mobility would reduce the urban-rural income ratio dramatically. Furthermore, the combination of WTO accession and factor market reforms improves both efficiency and equality significantly.

In China, two institutes studied on policy shocks using CGE model. The one is Development Research Center (DRC), the State Council of China. Shantong Li and Fan Zhai in 1997 from DRC used a 41-sector, 10-households recursive dynamic CGE model of China to simulate dualistic foreign trade regimes (ordinary trade regime and processing trade regimes), aims at providing a comprehensive analysis of the impact of China's WTO

accession. Another institute is Institute of Quantitative and Technical Economics (IQTE), Chinese Academy of Social Sciences. They build two versions of CGE model, one of the CGE models is cooperated with University of Monash (Mingtai Fan and Yuxin Zheng, 2000). Another version is cooperated with CPB, Netherlands Bureau for Economic Policy Analysis. Both of the models were used to mimic the impact of China's WTO accession.

In general, CGE model incorporates relative price and/or aggregate economic responses but lacked the rich distributional detail. To Chinese CGE model sourced from DRC and IQTE, the obvious limitation is that heterogeneity within household types is not accounted for, which is a serious limitation when studying e.g. poverty impacts.

In this paper, we develop a CGE micro-simulation model that in structure maintains the characteristics of a CGE model and meanwhile allowing integration the information of more than 70000 households. The model proposed in this project has two characters. The first is we propose a more flexible income distribution function. Secondly, the intra-group distributions are specified so as to conform to the different socio-economic characteristics of the groups.

4. Policy Relevance

China is actually struggling against inequality and poverty among its populations. Early in 1986, to supplement the economic reforms, the State Council's Leading Group for Poverty Reduction was established to

coordinate targeted interventions against poverty. Several policies that have also been implemented and impressed to reduce the poverty and increase income of households, such as de-collectivization and the privatization of land-use rights under the “household responsibility system” at the beginning of China’s reform period; reducing and cutting farmer’s infra-marginal tax; food price subsidies available for formers; establishing new system of unemployment insurance and benefits available to individuals forced into involuntary early retirement; lifting the tax collection starting line from 800 yuan (98.8 US dollars) to 1,600 yuan (197.3 US dollars) in 2006.

Meanwhile, with China’s accession into the WTO, reduction of the tariff and abolishing some Non-Trade-Barriers will benefit some manufacturing exports as well as foreign investment in the urban-based services, which will increase rural-urban disparity and thus influence the pattern of income distribution in different industries and poverty incidence in different household groups.

It will be with great interest to give Chinese government and international organization advice on how we can reduce inequality and poverty with China’s trade liberalization and reform of taxation system, and finally establish “a Harmonious Society ” and reaching the millennium development goals.

5. The Methodology

(1) Reason for use of methodology

To fulfil the task described as above, we plan to develop a CGE model with micro-simulation to quantify the effects of change in policy such as trade tariff and tax reform on income distribution and poverty level in China. This methodology is quite plausible in policy shock analyse for China mainly due to availability of data. Further, In China, long time series data are not complete and sometimes not available for an econometric model. In China, the National Bureau of Statistics (NBS) of China began to compile national income accounts from 1952 to 1984 according to Material Product System (MPS). From 1985 to 1992, national account featured the coexistence of MPS and the System of National Accounts (SNA). Since 1993, the SNA has been the sole basis of the national accounts system. Every five years the NBS has published a new I-O table. At present, although it was not really a SAM according to an SNA system in developed countries, it was very similar. So China's I-O tables are relatively completed. Compared with the I-O table, collecting the time series data is much more difficult. Firstly, some important statistics data are not included in China's statistics system. Secondly, with the reforming of China's statistics system, the definition of the statistics data changed immensely. From this point of view, China's statistical data is much more available for a CGE model rather than an econometric model.

(2) Structure of the model

·Macro CGE framework

The model to be use in this study was based on the CGE model developed by Li Wang (2005) for the analyses of the impact of China's trade policy

changes on Chinese economy and EU's economy. This model is a standard neoclassical static model. The equilibrium is general in the sense that it concerns all the market (goods market, labour market, factors' market and international markets) simultaneously. The model has a neoclassical economics fundament. Producers are assumed to maximize profits, purchase inputs and supply products to both the domestic and world markets. Consumers receive income from the firm and then consume goods and services according to maximized utility. The government collects taxes and also consumes. Prices and wages are determined to clear regional commodity and factor markets.

The model in this project will consist of six blocks: price block, firm behavior block, household behavior block, government behavior block, international trade and investment demand block and general equilibrium condition block. The core equations of firm behavior, government behavior, international trade and investment demand are explained in detail in the following sections.

The output function (or technology) can be nested in 2 stages. The first stage is the sector output, which is derived from intermediate inputs and a composite primary factor. In detail, it is specified by a CES function of intermediate input and CES composite primary factor. The second stage is the composite primary factor or value added by sector, which is also characterized by the CES function of skilled, unskilled labor, capital, land and other sources. Sector output is sold on the domestic market or exported to other regions through the Constant Elasticity of Transformation (CET) function.

In many CGE models representative household expenditure behavior functions are derived from the maximization of the Cobb-Douglas or Constant Elasticity of Substitution (CES) utility. The limitation of using these functional forms for consumption is that they imply unitary income elasticity of demand. This fails to account for the way changes in income affect the structural adjustment of the economy to exogenous shocks (Noland, 1998). In order to avoid such drawbacks, consumption demand in our model will be determined by using the utility function associated with the extended linear expenditure system (ELES).

The role of the government is to provide public services such as public goods, health and education, and to provide a safety net for its people. So the government's activity consists of purchasing goods and services and making transfer payments and financing these expenses and transfers. Government spending can be financed in two ways: taxing and borrowing from the private sector. In the CGE model for this project, the government income comes from seven tax revenues, which include indirect tax, primary factor tax, tariff, consumption tax, export tax, household income tax and intermediate input tax.

Total domestic demand includes household consumption, government consumption, intermediate input demand, and investment demand. Consumption functions for different agents (household and government) have been discussed as above, as well as the intermediate inputs demand equation. Investment demand is simply defined as a portion of total output.

On the other hand, from the supply side of these demand points of view, total domestic demand is sourced from domestically produced goods and imported goods, further more, imported goods are sourced from different regions.

General equilibrium condition will also be carefully considered in our model.

·Micro simulation

Micro simulation block tries to capture distributions of earnings and income of Chinese household. In China, household incomes come from various sources: agricultural activities, formal wages, informal activities, dividends of formal capital, income from sharecropping, and transfers from other households and from the government etc. For the big difference in earning between the rural area and urban area, income functions for different household in different areas are estimated separately using econometric method. So that in micro simulation block we try to model rural household wage income function, rural household informal income function, urban household wage income function, urban household informal income function,

This block is built on microeconomic data to explicitly represent the heterogeneity of qualifications, preferences and labor allocation at the microeconomic level. In addition, relative prices are determined endogenously through market-clearing mechanisms for goods and factors.

·Linkage between CGE and Micro simulation

Another question is how to achieve the consistency between the macro framework and micro-economic indicator in order to evolution of inequality and poverty index. Normally, there are two ways. One is proposed by Cogneau and Tobilliard (2000) which is named “fully integrated micro-macro framework”. It is based on a standard CGE model where representative households and workers are replaced by a full sample of households and workers whose behaviours are observed from household and labour force surveys. The advantage of this method is its ability to capture the impact of the macroeconomic changes on the workers and households, and also the feedback effect of the micro-simulation on the macro part of the model. The second method that can be implemented is the “layered micro-macro framework” suggested by Robilliard, Bourguignon and Robinson (2001), who model the effects on poverty and inequality of the financial crisis that hit Indonesia in 1997.

We plan to use a quasi-layered method. Further, the link between macro-CGE model and the micro-simulation model is through a vector of prices, wages. For the change in the link variables that result from a shock in the macro part of the model, the micro household database is modified in a way that is consistent with the link variables.

6. Data Requirements and Sources

(1) Source of the SAM

As in any general equilibrium model applied, the main source of database is the Social Accounting Matrix (SAM). SAM for China in this project will be based on the GTAP Version 6.0 database.

(2) Source of the elasticity

Elasticity of the substitution in the model includes elasticity of substitution between domestic and imported goods in the Armington aggregation, elasticity of substitution between primary factors, elasticity of substitution among imports from different destinations, elasticity of substitution between composite intermediate inputs and value-added, elasticity of transformation between domestic sales and exports. The best way to get the elasticity is to estimate it using either econometric approach or “validation” procedure. To make the work easier and reasonable, the author will borrow these elasticity from the GTAP database directly otherwise estimated them by herself.

Besides some elasticity, before solving the CGE model, a so-called parameter calibration procedure must be undertaken so that the values of some key parameters (except elasticity of substitution) are directly calculated from the model equilibrium conditions. Such methodology is widely used in CGE models. Further, they use equilibrium data to find the values of the share and scale parameters in the production functions, CET function, import demand function, as well as parameters in the ELES functions. To be used in calibration, however, the data must also represent a solution to the model.

(4) Source of the household survey

It is clear that data on households' behaviour is a crucial part for analysing the impact of shocks and policies on income distribution and poverty. We draw data on this issue from the Rural Household Surveys (RHS) and the Urban Household Surveys (UHS) of China's National Bureau of Statistics (NBS). At present, the surveys have had nationally representative sample sizes of about 70,000 households in rural areas and 30-40,000 household in urban areas.

7. Dissemination Strategy

This study is jointly worked by research staff of Institute of Technical and Quantitative Institute Economics of CASS and National Bureau of Statistics, PR. China. So some research reports and discussion papers will submit to State Council of China and leading group of Anti-Poverty of State Council. (CASS is responsible for writing such inner working papers) from the result of the project. Papers will also be presented to different international and national conferences such as the conference organized by PEP, A publication in an international journal is another objective.

8. Key References

Adelman I. and S. Robinson. 1988. "Macroeconomic Adjustment and Income Distribution: Alternative Models Applied to Two Economies." *Journal of Development Economics* 29(1):23-44.

Bourguignon F. 1990. "Growth and Inequality in the Dual Model of Development: The Role of Demand Factors." *Review of Economic Studies* 57(1990):215-228.

Bourguignon F., J de Melo and C. Morrisson. 1991. "Poverty and Income Distribution During Adjustment: Issues and Evidence from the OECD Project." *World Development* 19(11):1485-1508.

Bourguignon.F, L. Pereira da Silva and N. Stern. (2002) "Evaluating the Poverty Impact of Economic Policies : Some Analytical Challenges" accessed at www.undp.org/rblac/documents/poverty/Bourguignon-PovandMacro.pdf

Chen, Jian, and Belton M. Fleisher, 1996. "Regional Income Inequality and Economic Growth in China." *Journal of Comparative Economics*, 22: 141-164.

Chen, Shaohua and Martin Ravallion. 1996. "Data in Transition: Assessing Rural Living Standards in Southern China," *China Economic Review*, 7: 23-56.

Cockburn, J. "Trade liberalisation and poverty in Nepal: A Computable General Equilibrium Micro Analysis", Discussion paper 01-18, Centre de Recherche en Économie et Finance Appliquées (Université Laval), October 2001. <http://www.crefa.ecn.ulaval.ca/cahier/0118.pdf>

Cogneau, D. and A.S. Robillard (2000), "Growth Distribution and Poverty in Madagascar: Learning from a Microsimulation Model in a General Equilibrium Framework", mimeo, DIAL, Paris.

De Janvry A., E. Sadoulet and A. Fargeix. 1991. "Politically Feasible and Equitable Adjustment: Some Alternatives for Ecuador." *World Development* 19(11):1577-1594.

Decaluwé B., A. Patry, L. Savard and E. Thorbecke. 1999. "Poverty Analysis within a General Equilibrium Framework." CREFA Working Paper 9909. Université Laval.

Dervis K., J. De Melo and S. Robinson. 1982. "General Equilibrium Models for Development Policy". Cambridge: Cambridge University Press.

Dollar, David. 2004. "Globalization, Poverty, and Inequality since 1980," Policy Research Working Paper 3333, World Bank.

Eswaran M. and A. Kotwal. 1993. "A theory of real wage growth in LDCs." *Journal of Development Economics* 42(1993):243-269.

Goulder L.H and Eichengreen B. (1992), "Trade liberalization in general equilibrium: intertemporal and inter-industry effects", *Canadian Journal of Economics*, vol. XXV, No 2. pp. 253-280

Harrison, Glenn, W., Rutherford, T. F., Tarr, D. G. Trade liberalization, Poverty and Efficient Equity Presented at conference on Poverty and The International Economy, organized by the World Bank and The Parliamentary Commission on Swedish Policy for Global Development, held in Stockholm, October 11, 2000.

<http://www1.worldbank.org/wbiep/trade/papers/HRTpoverty9.PDF>

Hertel, Thomas W.; Preckel, V. Paul and Cranfield, John A. L. "Multilateral trade Liberalization and poverty reduction". October 10 , 2000
<http://www1.worldbank.org/wbiep/trade/papers/cranfield.pdf>

Ianchovichina, Elena, and Will Martin. 2004. "Impacts of China's Accession to the WTO." *World Bank Economic Review* 18(1): 3-28.

Li Shi (2003), "Chinese income distribution", *Economics*, No.2, Vol, 2, 2003, (in Chinese)

Li Wang (2005), "Economic relations between the European Union and China and evaluation of impact of China's tariff change on both economies with a computable general equilibrium model" <http://docserver.bis.uni-oldenburg.de/publikationen/dissertation/2005/waneco05/waneco05.html>

Li, Xuesong and Lejour, Arjan. (2001), "WTO membership and prospects of Chinese economy", China Financial Publishing House (in Chinese).

Piggott, J. and J. Whalley (1985), “UK Tax Policy and Applied General Equilibrium Analysis”, Cambridge, Cambridge University Press.

Ravallion, M. (1994), *Poverty Comparisons*, Harwood Academic Publisher.

Rodrik, Dani (2000). “Comments on ‘Trade, Growth, and Poverty,’ by Dollar and Kraay.”

<http://ksghome.harvard.edu/~drodrik.academic.ksg/Rodrik%20on%20Dollar-Kraay.PDF>.

Wang, Zhi and Zhai, Fan, 1998. “Tariff reduction, tax replacement and implication for income distribution in China”. *Journal of Comparative Economics* 26, 358-387.

Wood, A. (1997). “Openness and wage inequality in developing countries: the Latin American challenge to East Asian conventional wisdom.” *World Bank Economic Review* 11: 33-57.

Zhai, Fan and Shantong Li (1997), “A Chinese general computable equilibrium model”, *Quantitative and Technical Economics Study* Vol. 3 1997 (In Chinese).

Zhai, Fan and Thomas Hertel, “Labor Market Distortions, Rural-Urban Inequality and the Opening of China’s Economy”, accessed at <https://www.gtap.agecon.purdue.edu/resources/download/1545.pdf>

Zheng, Yuxin and Fan, Mingtai (1998), “China's CGE model and policy analysis ”, Social Sciences Publishing House (in Chinese).

9. The research team

The research team is comprised of 2 researchers, based at the Chinese Academy of Social Sciences (CASS) and National Bureau of Statistics (NBS) separately in Beijing.

·Li Wang (Associate Professor, Dr. CASS)

·Wenbo Wang (Director of Macroeconomic Monitoring Division, NBS)

Ms. Li Wang is an associate professor of Institute of Quantitative and Technical Economics (IQTE), Chinese Academy of Social Sciences (CASS). She holds a PhD from Oldenburg University, Germany, obtained in 2005. Her thesis was entitled “"Economic relations between the European Union and China and evaluation of impact of China's tariff change on both economies with a computable general equilibrium model". She began to study on CGE model in 1998, when she took part in an international cooperation project between Chinese Academy of Social Sciences and Melbourne University, Australia, which is named “Models of Chinese Economy” financial supported by AusAID in Australia and the Australian Research Council. During her PhD study in Germany, her second supervisor, Prof. Dr. Heinz Welsch is very famous in the field of CGE model in Germany. From him she learned lots of about CGE modeling and techniques. Besides, being a research staff in the division of Modeling and Policy Analysis of IQTE, CASS, she is quite familiar with macroeconomic modeling and policy analysis. She will participate in all stages in this research, as major research staff and the team member specialized in the CGE modeling.

Mr. Wenbo Wang is a director of Division of Macroeconomic Monitoring in National Bureau of Statistics of China. He finished his master study in the early 1990s and was a visiting scholar in Stanford University and IMF soon after he was employed by NBS. His present field of studies is analysis of China’s fiscal policy, income distribution and economic forecasting. He will

responsible for the data source and policy on poverty alleviation and income distribution in this project.

10. Expected Capacity Building for Researchers and their Institutions

As the leading researcher, Dr. Li Wang just graduated from Germany Doctoral study which need the research environment and financial support after going back China. Also she will familiarise with poverty concept as well as its methodological approaches. In this way, she can provide more reasonable suggestion to Chinese government through writing working paper for CASS and State Council. A publication in an international review will be an important asset for her career. On the other hand, Mr. Wang will also involve almost all stages of the research so that the National Bureau of Statistics will benefit in terms of capacity building.

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

Dr. Li Wang

- Dissertation “Impact of China’s WTO membership on bilateral trade between China and EU with a CGE model” Supported by China Scholarship Council during 2002~2003 and Niedersächsisches Ministerium für Wissenschaften und Kulture during 2003~2005
- Cooperation project “Models of Chinese Economy” between Chinese Academy of Social Sciences and Melbourne University, Australia. Supported by AusAID in Australia and the Australian Research Council.

Mr. Wenbo Wang

- Calculation of Gini Index using China's statistics data supported by National Bureau of Statistics, China
- Evolution of policy on income distribution and empirical study on poverty in China supported by National Bureau of Statistics, China
- Study on the relation between agriculture and national economy supported by National Bureau of Statistics, China
- Study on the relation among economic speed, efficiency and structure supported by National Bureau of Statistics, China