

Applied General Equilibrium Modelling of China's Trade

东艳 李春顶 John Whalley 著

中国对外贸易问题的一 般均衡建模与模拟

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Yan Dong

Yan Dong, senior research fellow, director of trade department of Institute of World Economics and Politics (IWEP), Chinese Academy of Social Sciences (CASS), post doc in University of Western Ontario, visiting scholar in Columbia University. Her research fields include international trade theory and policy, regional economic integration, and global value chain. She had hosted and attended tens of research programs include Chinese national social science fund, Chinese national science fund, and the Scientific Research Foundation for the Returned Overseas Chinese Scholars, funded by State Education Ministry of China, the Scientific Research Starting Foundation for Returned Overseas Chinese Scholars Funded by Minister of Human Resources and Social Security of China. She academic research papers has been published in the journals of The World Economy, Economic Modelling, Journal of Policy Modelling, and Applied Economic Letters.

Chunding Li

Chunding Li was born in 1983, and got his PhD degree from Fudan University. He is the deputy director and senior research fellow in the department of International trade at Institute of World Economics and Politics (IWEP) of Chinese Academy of Social Sciences (CASS). His research fields include international trade friction and dispute, heterogeneous firm trade, regional economic integration, and economic modelling and simulation. He had hosted and attended tens of research programs include Chinese national social science fund, and funds from the Ministry of Commerce, the Ministry of Finance and National Development Bank of China. He had published more than 10 English version academic research papers in the journals of The World Economy, Economic Modelling, China Economic Review, Applied Economics and etc., nearly 10 English version economic policy briefs in the newspapers of Global Times, VOX EU, CIGI paper and etc., more than 70 Chinese version academic research papers in the journals of the World Economy, Finance and Trade Economy, Quantitative and Technological Economic Research and etc., more than 60 Chinese version economic policy briefs in the newspapers of Renmin Daily, Chinese Social Science News, Chinese Securities News and etc.

John Whalley

John Whalley is one of Canada's most pre-eminent experts in the field of global economic. He holds a BA in Economics from Essex University (1968), and an MA (1970), M.Phil (1971) and a PhD (1973) from Yale University. He is a Fellow of the Royal Society of Canada (FRSC). Currently, he holds a number of academic positions, including William G. Davies Professor of International Trade and Co-Director of the Centre for the Study of International Economic Relations in the department of Economics at Western University (UWO, Canada). He is also a Distinguished Fellow at The Centre for International Governance Innovation (CIGI, Canada); Research Associate at the National Bureau of Economic Research in Cambridge, MA; Coordinator in the Global Economy Group of CESifo, University of Munich; and a former Visiting Fellow at the Peter G. Peterson Institute for International Economics in Washington, D.C. John has written and Co-authored dozens of scholarly articles on a variety of subjects, including international trade and development, public finance, general equilibrium theory and computation, Soviet and transition economies, environmental issues and the economy, and Canadian trade policy.

Preface

This book compiles some of cooperative academic research papers by Yan Dong, Chunding Li and John Whalley. Most of these papers use applied general equilibrium modelling and simulation methodology to explore China's related international trade facts, difficulties and policies.

John Whalley is a professor in the department of Economics of Western University (UWO) in Canada, and he is a pioneer in the applied general equilibrium calibration and simulation field. Yan Dong and Chunding Li both work in the Institute of World Economics and Politics (IWEP), Chinese Academy of Social Sciences (CASS). From the year of 2008 to 2010, Yan Dong had ever worked in the Western University with John Whalley as a post – doctoral fellow. After that, Chunding Li had worked with John Whalley as a post – doctoral fellow from 2010 to 2012. During these periods of cooperative research, we used computational general equilibrium methodology to study China's economic theory and policy in the fields of trade, climate change, imbalance, regional trade agreement negotiations, and etc. In memory of these joint research times, we choose some representative and important works to compile this book, and hope it can benefit you in learning applied general equilibrium modelling and simulation methodology as well as understanding China's international trade situations.

Applied general equilibrium modelling and simulation methodology is one of main research technique and instrument in economics. The distinguishing characteristic of the general equilibrium approach is a focus on economy – wide resource allocation. This focus has made the approach a highly attractive vehicle for economic planning and policy analysis. The papers in this book provide a representative selection of applications of general equilibrium modelling to economic policy analysis. Therefore this book will be helpful for learning computational general equilibrium research technology, and meanwhile valuable for un-

derstanding the development of the general equilibrium modelling.

Research topics of selected papers in this book are mainly in international trade, including trade and climate change, trade policy bargaining, trade disputes, trade imbalance and regional trade agreement. Most of these topics set China as the research target or as examples. Therefore these papers are conducive to understand both presently important international trade issues and China's foreign trade policy.

We select 13 papers in this book, all of them had already published in academic journals including the *World Economy*, *Economic Modelling*, *China Economic Review*, *Journal of Policy Modelling*, *Applied Economics*, and etc. The former 7 papers are all cooperative works by Yan Dong and John Whalley, and the latter 6 papers are mainly cooperative works by Chunding Li and John Whalley.

Part A includes five papers discussing trade and climate change issues. The paper "How Large are the Impacts of Carbon Motivated Border Tax Adjustments" discusses the size of impact of carbon motivated border tax adjustments on world trade and welfare. We report numerical simulation results which suggest that impacts on welfare, trade, and emissions will likely be small. The paper "Carbon, Trade Policy, and Carbon Free Trade Areas" discusses both the potential contribution that trade policy initiatives can make towards the achievement of significant global carbon emissions reduction and the potential impacts of proposals now circulating for carbon reduction motivated geographical trade arrangements, including carbon free trade areas. The paper "Carbon Motivated Regional Trade Arrangements: Analytics and Simulations" presents both analytics and numerical simulation results relevant to proposals for carbon motivated regional trade agreements. Results show that carbon motivated regional agreements can reduce global emissions, but the effect is very small and even with penalty mechanisms used, the effects are still small. The paper "Joint Non - OPEC Carbon Taxes and the Transfer of OPEC Monopoly Rents" discusses the potential for joint OECD (or non - OPEC) carbon taxes to reduce OPEC's monopoly rent and provide benefits to non - OPEC countries provided jointly agreed trigger strategies are adhered to enforce mutual cooperation. Results suggest that

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jointly enacted carbon taxes by the US, the EU and China can be heavily borne by oil exporters; they reduce the welfare of OPEC and increase the welfare of non – OPEC countries. The paper “Optimal Tariff Calculations in Tariff Games with Climate Change Considerations” discusses whether or not the introduction of climate change considerations into Nash tariff games increases or reduces post retaliation tariffs. Results show that compared to conventional trade models, adding climate change considerations reduces the level of optimal tariffs, but this only occurs when the damage effects involved are large.

Part B includes four papers discussing China’s trade policy. The paper “Model Structure and the Combined Welfare and Trade Effects of China’s Trade Related Policies” presents a numerical model that captures the combined and interactive effects of three policy elements in prototype form of tariffs, policy towards SOEs in the industrial sector, and an exchange rate regime supporting large trade surpluses and additions to foreign reserves. Results show that large differences in policy impacts relative to a classical competitive model. SOE reform and a freely floating Chinese exchange rate have more impact on China’s welfare than tariff liberalization. Policies of RMB appreciation and increasing China’s money stock reduce China’s trade surplus. The paper “Gains and Losses from Potential Bilateral US – China Trade Retaliation” uses two closely related numerical general equilibrium models to analyze the potential consequences of US – China bilateral retaliation on trade flows and welfare. Results suggest that retaliation between the two countries can be welfare improving for US as it substitutes expenditures into own goods and improve its terms of trade with non – retaliatory regions, while China and non – retaliatory regions maybe adversely affected. The paper “China’s Potential Future Growth and Gains from Trade Policy Bargaining” uses a numerical general equilibrium model which captures China and her major trading partners and examines the outcomes of trade policy bargaining solutions (bargaining over tariffs and financial transfers) over time, and then measure both absolute and relative gains to China from trade bargaining. Simulation results indicate that China’s welfare gain from trade bargaining will increase over time if countries keep their present higher GDP growth rates for several decades. The paper “Rebalancing and the Chinese VAT” presents nu-

merical simulation results that suggest that China can both reduce its trade imbalance and receive welfare benefits by switching the value added tax (VAT) regime from the current destination principle to an origin principle. Results suggest that given China's trade surplus VAT regime switching to an origin basis can decrease China's trade surplus by over 40% , and additionally increase Chinese and world welfare.

Part C includes one paper discussing regional trade agreements. The paper "China and the TPP: A Numerical Simulation Assessment of the Effects Involved" uses numerical simulation methods to assess the potential effects of a TPP agreement on China and also China's inclusion or exclusion on other countries. Simulation results reveal that China will be slightly hurt by TPP initiatives in welfare when China is out, but the total production and export will be increased. Other non - TPP countries will be mostly hurt in welfare but member countries will mostly gain.

Part D includes three papers about other fields and methodologies. The paper "Chinese Firm and Industry Reactions to Antidumping Initiations and Measures" explores the reactions of Chinese firms and industries to these actions by using dynamic system GMM estimator and industrial panel data on all Chinese firms in the industry, foreign firms operating within China and state owned enterprises (SOE) for aggregated firms group. We find that antidumping actions by developed and developing countries negatively impact industrial profits and employee and firm numbers and also exports, but improve labor productivity. The paper "Foreign Affiliate Sales and the Measurement of Trade in Both Goods and Services" reveals that there is an incompatibility between measures of trade in goods and services. Measures of goods trade reflecting GATT are restricted to trade that crosses borders. Service trade, however, under GATS includes both cross border delivery and foreign affiliate sales within borders. We propose that for comparability the trade component of foreign affiliate sales in goods should be included in goods trade or affiliate sales should be removed from service trade data. The paper "The 'Productivity Paradox' of Chinese Export Firms" represents an attempt to test the relationship between the export and productivity of Chinese firms using the data set of nearly 3 million industrial firms in 20 indus-

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trial sectors over the period 1998 – 2007. Our test finds that non – export firms were more productive than export firms and export was negatively related to productivity, namely the lower the productivity of a firm, the higher its export. This finding is in contradiction with the hypothesis of new – new trade theory. The contradiction is referred to as the “productivity paradox” in this paper.

All papers in this book are representative of recent experience in empirical as well as theoretical analysis. We wish to express our hope that this book may contribute to the understanding of CGE modelling and application.

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Yan Dong in Beijing China
Chunding Li in London Canada
John Whalley in London Canada

List of Publications

1. Dong, Yan and John Whalley. 2012. "How Large are the Impacts of Carbon Motivated Border Tax Adjustments" . *Climate Change Economics*, Vol 3, No 1.
2. Dong, Yan and John Whalley. 2010. "Carbon, Trade Policy and Carbon Free Trade Areas" . *The World Economy*, Vol. 33, No. 9, pp. 1073 – 1094.
3. Dong, Yan and John Whalley. 2011. "Carbon Motivated Regional Trade Arrangements: Analytics and Simulations" . *Economic Modeling*, Vol. 28, No. 6, pp. 2783 – 2792.
4. Dong, Yan and John Whalley. 2012. "Joint non – OPEC Carbon Taxes and the Transfer of OPEC Monopoly Rents" . *Journal of Policy Modeling*, Vol 43, pp. 49 – 63.
5. Dong, Yan and John Whalley. 2011. "Optimal Tariff Calculations in Tariff Games with Climate Change Considerations" . *Applied Economics Letters*, Vol. 18, No. 15, pp. 1431 – 1435.
6. Dong, Yan and John Whalley. 2011. "Model Structure and the Combined Welfare and Trade Effects of China's Trade Related Policies" . *Global Economy Journal*, Vol. 10, No. 4, pp. 1 – 19.
7. Dong, Yan and John Whalley. 2012. "Gains and Losses from Potential Bilateral US – China Trade Retaliation" . *Economic Modeling*, Vol. 29, No. 6, pp. 2226 – 2236.
8. Li, Chunding and John Whalley. 2014. "China's Potential Future Growth and Gains from Trade Policy Bargaining: Some Numerical Simulation Results" . *Economic Modelling*, Vol. 37, pp. 65 – 78.
9. Li, Chunding and John Whalley. 2012. "Rebalancing and the Chinese VAT: Some Numerical Simulation Results" . *China Economic Review*, Vol. 23,

No. 2, pp. 316 – 324.

10. Li, Chunding and John Whalley. 2014. “China and the Trans – Pacific Partnership: A Numerical Simulation Assessment of the Effects Involved” . *The World Economy*, Vol. 37, No. 2, pp. 169 – 192.

11. Li, Chunding and John Whalley. 2015. “Chinese Firm and Industry Reactions to Antidumping Initiations and Measures” . *Applied Economics*, Vol. 47, No. 26, pp. 2683 – 2698.

12. Li, Chunding, John Whalley and Yan Chen. 2015. “Foreign Affiliate Sales and the Measurement of Trade in Both Goods and Services” . *China Economic Review*, In Press, available at: <http://dx.doi.org/10.1016/j.chieco.2015.01.002>.

13. Li, Chunding and Xiangshuo Yin. 2010. “The Productivity Paradox of Chinese Export Firms: Review and Assessment” . *China Economists*, No. 4, pp. 74 – 82.

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Part A Trade and Climate Change GE
Modelling and Simulation

How Large are the Impacts of Carbon Motivated Border Tax Adjustments?

Yan Dong, John Whalley

ABSTRACT

This paper discusses the size of impact of carbon motivated border tax adjustments on world trade and welfare. We report numerical simulation results which suggest that impacts on welfare, trade, and emissions will likely be small. This is because proposed measures use carbon emissions in the importing country in producing goods similar to imports rather than carbon content in calculating the size of barriers. Moreover, because border adjustments involve both tariffs and export rebates, it is the differences in emissions intensity across sector rather than emissions level which matters. Where there is no difference in emissions intensities across sectors, Lerner symmetry holds for the border adjustment and no relative effects occur.

1. Introduction

Emerging policy proposals for carbon based tariffs or border tax adjustments by the EU, US and other OECD countries against developing countries that do not participate in global emissions reduction agreements are a central issue for current climate change negotiations^①. Although not formally part of the post Bali road map, de facto the threat of such measures is a central part of the negotiation process. Proposals for carbon motivated tax adjustments include both import tariffs (carbon tariffs) and export rebates by countries with emissions reduction commitments against those without commitments.

① See Brewer (2008), Dröge & Kemfert (2005), Weber & Peters (2009).

Such border adjustments by participating countries are driven by two related objectives. One is to provide competitiveness offsets for domestic producers since the added costs for domestic producers involved with domestic carbon pricing impose a competitive disadvantage on them. The other is leakage, i. e. that the reductions in emissions in participating countries such as the EU and the US generate increases in emissions elsewhere. For countries such as China, who are heavily export-oriented, and towards manufactures, the prospect is one of a world being decarbonized and going protectionist at the same time against a background of a continuing downturn in world trade from the financial crisis.

Border tax adjustments and both their rational and effects on trade is not a new topic. Earlier debate on border tax adjustments occurred following the adoption of the value added tax in the EU as a tax harmonization target in the early 1960's < see Dosser (1967), Shibata (1967), Krauss & Johnson (1972) >. The academic literature at that time suggested that with BTAs, a change between origin and destination basis is simply that between a broadly based production and consumption base both of which are neutral, with no direct effects on trade. Neutrality of trade, production, and consumption effects would thus prevail under a tax basis change < see Krauss & Johnson (1972), Whalley (1979), Grossman (1980), and Lockwood et al. (1994) >. As recently noted by Lockwood & Whalley (2008), carbon motivated border tax adjustments differ by product and sector, and so unlike in the debate on the VAT one needs to distinguish between price level and relative price effects < Neumark (1963), Hufbauer (1996) >. With product or sector specific BTAs, relative price effects will come into play, and neutrality only holds in special cases.

This paper presents numerical simulation results exploring the effects of carbon motivated border tax adjustments in large OECD economies on welfare, global and country emissions, trade flows and production^①. We use a multi-region general equilibrium structure covering the US, EU, China and a residual rest of the world. In this, countries produce commodities of varying emissions

① There are also legal issues as to the GATT compatibility of such schemes. There are not discussed here. See De Cendra (2006), Ismer & Neuhoﬀ (2007) .