Economic Effects of China's Import Expansion Strategy

Li Chunding (李春顶)[*1], Lang Yongfeng (郎永峰)[2] and He Chuantian (何传添)[3]
[1]School of Economic Management, China Agricultural University, Beijing, China
[2]School of Economics, Nanjing Audit University, Nanjing, China
[3]Research Center for International Trade and Economics, Guangdong University of Foreign Studies, Guangzhou, China

Abstract: *Since 2018, China has enacted a string of policy initiatives to increase imports. To quantify this import expansion strategy's economic effects, we created a large numerical general equilibrium model and quantitatively simulated the economic effects of the reductions of tariff and non-tariff barriers on China and other economies. Our simulation results show that overall, China's import expansion strategy benefited both itself and others and contributed to employment, welfare, and trade growth in China and the rest of the world. In relative terms, however, China's import expansion strategy benefited other countries more than it did itself and contributed more to the growth of the world economy. Additionally, the import expansion strategy may effectively promote China's trade balance, and the trade equilibrium effect driven by the reduction of non-tariff barriers is more significant than that of tariff barriers. Furthermore, regarding the self-benefiting effects of import expansion, the effects of nontariff measures are significantly greater than those of tariff measures, and this result has policy implications for China's import expansion strategy going forward.*

Keywords: *Import expansion strategy, economic effects, general equilibrium simulation*
JEL Classification Code: F51, C68, F13
DOI: 10.19602/j.chinaeconomist.2022.05.04

1. Introduction

The Report to the 18th Chinese Communist Party (CCP) National Congress called for "enacting a more proactive opening-up policy following the new trend toward economic globalization in order to keep pace with the new developments of economic globalization",[1] and the Report to the 19th CCP National Congress further stressed the importance of "adopting high-level trade and investment liberalization and facilitation policies", "developing China into a strong trading nation", and "bringing about a new pattern of all-round opening-up".[2] In raising the level of open economy, a key element and intrinsic requirement is to expand imports. Amid rising unilateralism, trade protectionism and anti-globalization sentiments after the global financial crisis, China faces increasingly challenging international trade frictions (Dong, 2018). As such, China's initiative to expand imports has been motivated by the need to balance foreign trade.

[*] CONTACT: Li Chunding, email: lichd@cau.edu.cn.
The authors appreciated funding from the National Social Science Foundation Major Project (Grant NO.20&ZD119).
[1] FIRMLY MARCH ON THE PATH OF SOCIALISM WITH CHINESE CHARACTERISTICS AND STRIVE TO COMPLETE THE BUILDING OF A MODERATELY PROSPEROUS SOCIETY IN ALL RESPECTS, Report to the Eighteenth National Congress of the Communist Party of China on Nov 8, 2012, Part IV Article 5.
[2] Secure a Decisive Victory in Building a Moderately Prosperous Society in All Respects and Strive for the Great Success of Socialism with Chinese Characteristics for a New Era, Delivered at the 19th National Congress of the Communist Party of China October 18, 2017, Part V Article 6.

Under the dual pressures of increasing opening-up and balancing foreign trade, the General Office of the State Council of China promulgated the *Circular of the Ministry of Commerce and Other Departments Concerning the Opinions on Expanding Imports and Promoting Balanced Foreign Trade Development* in July 2018, calling for "taking the initiative to increase imports to improve the quality of the domestic supply system, meet people's needs for consumption upgrades, improve both imports and exports, and promote balanced foreign trade development". This document put forth policy options concerning the improvement of import infrastructure, the layout of international markets, and trade liberalization and facilitation. China has decided to take the initiative to expand imports based on the following three considerations (Dong, 2018): to promote consumption, adjust the structure, and raise the level of opening up; to balance China's imports and exports and ease trade frictions and disputes; and to promote global trade liberalization and economic growth.[3]

Taking the initiative to expand imports can have both positive and negative effects on China. It can create more competition against homegrown products in the domestic market to the detriment of domestic industrial development and employment, but it can also improve the quality[4] of consumption, balance trade and promote industrial upgrades that are conducive to economic growth. For other economies, China's import openness may bring about greater market demand, with primarily positive effects for China. Indeed the initiative to expand imports is intended to benefit its trading partners and itself, yet the short-term economic outcomes for China are uncertain. We therefore attempt to measure these possible outcomes by constructing general equilibrium model and running numerical simulations.

Existing studies on the economic effects of China's import expansion strategy, most of which are qualitative research, have examined the positive effects of China's import expansion strategy, possible shocks to competition, and China's possible countermeasures, and most of this literature has considered the effects of the import expansion strategy to be positive. A brief discussion of some representative examples follows. On the basis of comparing the international experience of import expansion, Yang (2011) put forth specific measures for implementing China's import expansion strategy that involved importing more technologies and equipment, importing more from developing countries, establishing an "inclusive import system with Chinese characteristics", relaxing the imports of upscale consumer goods, and reducing import taxes and tariffs. Similarly, Yu (2018) argued that more imports could increase consumer choice, household welfare, firm performance, and total factor productivity (TFP). Zhang (2018) considered the strategy of import expansion as an important way to raise China's standard of living, expedite industrial restructuring, and balance foreign trade development. Furthermore, Gu (2018) also considered import expansion to be an important initiative to raise China's standard of living to promote economic development. In addition, Dong (2018) noted that China has taken the initiative to increase imports based on its experience over the four decades of reforms and opening up, and Wang (2018) discussed the motivations of China's import expansion strategy, problems, and relevant pathways that warrant attention before implementing the strategy.

In our literature survey, we found no prior research on the specific quantitative economic effects of China's import expansion strategy. Nevertheless, there is an abundance of literature on the empirical analysis of import effects on the Chinese economy in general, which can be roughly divided into the following four directions: the effects of imports on domestic innovation (Gao and Wang, 2010; Shen and Zhou, 2014; Zhang, 2015; Liu and Qiu, 2016; Chen *et al*., 2017); the economic growth effects of imports (Pei, 2013;Xu, 2007); the welfare effects of import product categories, quality, and source regions (Chen *et al*., 2011; Wei and Fu, 2016; Zhang and Zou, 2018); and the effects of imports on domestic

[3] Notice of the Ministry of Commerce and other departments on the opinions on expanding imports to promote the balanced development of foreign trade, July 2, 2018.

[4] It means to promote the consumption upgrade.

Table 1: Quantitative Research Literature on the Effects of Import on China's Economy

Topic of research	Data employed	Research conclusions	Research literature
Effects of imports on China's domestic technology progress, innovation and productivity	Monthly data of China's three-digit industrial sectors from February 2003 to November 2007 controlling for embodied and disembodied spillovers	There is a significantly positive correlation between import competition and embodied spillovers; Imports have direct negative spillover effects on sectoral TFP and technology efficiency	Gao and Wang (2010)
	Data of China's industrial enterprises	Import tariff concessions contribute to rising TFP of China's manufacturing enterprises, and the effects are greater for importing intermediate inputs	Shen and Zhou (2014)
	China's enterprise-level data of 1998-2007: product-level data classified by capital and intermediate inputs	China's policy to increase import of advanced manufacturing equipment and components is in conflict with its innovation-driven strategy	Zhang (2015)
	China's enterprise-level data of 1998-2007: Import tariff data of intermediate inputs	Increasing the import of intermediate inputs puts a damper on technology innovations by Chinese companies	Liu and Qiu (2016)
	China's firm-level data and product-level import data of 2000-2006	Imports of intermediate inputs tend to increase firm R&D intensity, and such effects are stronger for the import of intermediate inputs from high-income countries	Chen *et al*. (2017)
Effects of import volumes and trade structure on economic growth	Product-level trade data of 255 subcategories by SITC classification standard for 59 economies from 1995 to 2010, as well as service import data of 11 subcategories	There is a positive correlation between change in import structure and economic growth; more imports of capital goods help raise economic growth rate	Pei (2013)
	China's macroeconomic data and foreign trade data of 1978-2005	Expanding imports of advanced technologies, critical equipment and energy and raw materials in domestic short supply helps boost economic growth	Xu (2007)
Consumer welfare effects of import product categories, regional diversification and quality	Product-level data of China's imports in 1995-2004	Growth in the categories of import products increased the welfare of Chinese consumers	Chen *et al*. (2011)
	Product-level data of China's imports in 1998-2010 and data of top 30 import sources	Diversification of import products and regions helps raise Chinese consumers' welfare.	Wei and Fu (2016)
	Product-level data of China's imports in 1995-2014 and quality index of import products	Growth in the categories of import products and improvement of their quality help raise Chinese consumers' welfare	Zhang and Zou (2018)
Effect of imports on domestic employment	China's firm-level import product categories, number of import source countries, capital goods, and intermediate products in 2000-2006	Imports have significantly positive effects on the employment of enterprises engaged in both import and export businesses; import categories, imports from low-income countries and import of capital goods all have significant effects on the employment growth of enterprises	Wei and Li (2018)
	Import data at the level of WTO member countries (regions) in 2002-2011	Non-tariff barriers have greater effects on the employment of importing countries compared with tariff barriers; there is no difference in the effects of imports on employment in developed and developing countries	Zhan and Yu (2016)

Source: Compiled by the authors.

employment (Wei and Li, 2018; Zhan and Yu, 2016). Table 1 offers a summary of the research topics of representative studies, data employed, and key conclusions.

Most of these existing quantitative studies have used basic historical data for simple empirical regression analysis. To our knowledge, no study has yet been carried out on systematic quantitative analysis of the effects of China's import expansion strategy using a full general equilibrium model. Since China's import expansion strategy involves future policy concerns, its policy effects cannot be unraveled merely with historical data. Instead, a more effective approach is to conduct a simulation analysis based on a relevant general equilibrium model.

To this end we construct a large numerical model of the Chinese economy and offer the following innovations to the existing literature on Chinese imports. First, we introduce tariff and nontariff barriers as well as the structural trade imbalance of "inside currency" to depict the trade surplus preferences of individual countries and endogenously determine the level of trade in equilibrium. Second, we provide a systematic and comprehensive quantitative analysis and comparison of the economic effects of several of China's import expansion strategy candidate policy initiatives. Third, this paper fills a void in the literature by performing the first comprehensive quantitative analysis of China's import expansion strategy using numerical simulation.

The remainder of this paper is structured as follows. Section 2 reviews the stylized facts and policy measures of China's import expansion strategy; Section 3 covers the construction and parametric calibration of the theoretical model; Section 4 simulates the economic effects of China's measures to expand imports, including tariff and nontariff barrier reduction policy measures separately as well as the reduction of both tariff and nontariff barriers. Finally, Section 5 offers conclusions and policy implications.

2. China's Import Expansion Strategy: Stylized Facts and Policy Measures

According to China's customs data, China's imports and exports totaled 31.54 trillion yuan in 2019, a year-on-year increase of 3.4%, including 17.23 trillion yuan in exports, a year-on-year increase of 5%, and 14.31 trillion yuan in imports, a year-on-year increase of 1.6%, with a trade surplus of 2.92 trillion yuan, a year-on-year increase of 25.4%[5]. Although the rapid growth of China's imports over recent years (see Figure 1) trailed export growth, to a certain extent, it is the result of the expansion of import policy measures.

After its WTO accession in 2001, China took the initiative to liberalize import trade and cancel import quota and licensing systems, and in 2006, China adjusted its foreign trade policy under the banner of "proactively expanding imports" by lifting import tariffs for some commodities and facilitating imports, especially those from the least developed countries (LDCs)[6]. In 2012, the Chinese Ministry of Commerce enacted the *12th Five-Year Plan for Foreign Trade Development*, calling for "implementing a proactive import strategy, expanding import volumes, and balancing foreign trade" and in 2017 released the 13th Five-Year Plan for Foreign Trade Development, which identified "proactive import policy" as among the eight priorities of foreign trade work and called for encouraging the import of advanced technology and equipment, stabilizing the import of resource products, and increasing the imports of general consumer goods.

Since 2018, China has expedited the implementation of its import expansion strategy and policy initiatives. On March 5, 2018, Premier Li Keqiang noted in his annual government work report that "we should proactively expand imports, successfully hold the first China International Import Expo (CIIE), and lower import tariffs for automobiles and some daily consumer goods for the

[5] Data here are from China's customs statistics: http://www.customs.gov.cn/.
[6] China and the World Trade Organization, The State Council Information Office of the People's Republic of China, June 2018.

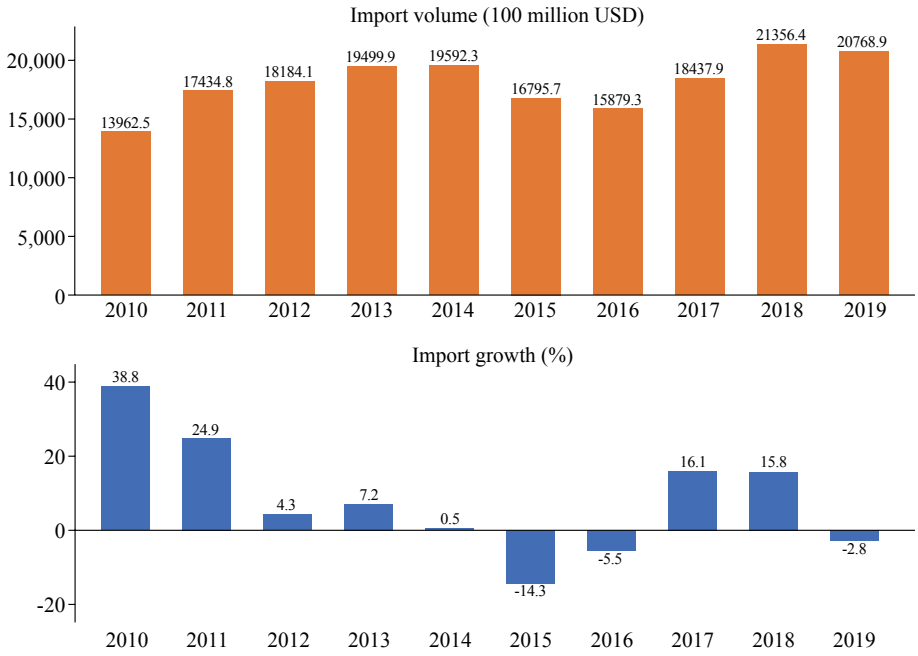

Figure 1: China's Import Volume and Growth Rates, 2010-2019

Source: WTO trade statistics.

promotion of industrial upgrade and balanced trade development." In his speech at the Boao Forum for Asia on April 10, 2018, President Xi Jinping reaffirmed China's commitment to "further expanding opening up" and identified "proactively expanding imports" as one of the four priorities for carrying this out. Similarly, on July 9, 2018, the Ministry of Commerce and 19 other Chinese ministerial agencies jointly released the *Opinions on Expanding Imports and Promoting Balanced Trade Development* that outlined the need to improve conditions for trade facilitation, optimize international market layout, improve import infrastructure, promote production and consumption upgrades, and give play to multi-channel import promotion (see Table 3 for detailed measures). At a press conference in January 2019, the Ministry of Commerce and the Chinese General Administration of Customs reaffirmed China's commitment to expanding imports by taking bolder steps and hosted the second CIIE. Furthermore, at a press conference in December 2019, the State Council Information Office announced four policy initiatives to expand imports by continually lowering tariff rates, holding the CIIE on a regular basis, increasing trade facilitation with higher standards, and fostering demonstration areas for import promotion and innovation. Table 2 details important policy reports, speeches and documents on China's import expansion strategy from 2018 to 2019.

China has been rolling out actual policy initiatives to expand imports since 2018 (Gu, 2018). As of July 1, 2018, the Chinese government has lowered tariff rates for automobiles and daily consumer goods. Tariff rates for automobiles went from as high as 25% to as low as 15%, and those for automobile parts and components were lowered from as high as 25% to as low as 6%. Average tariff rates fell from 15.7% to 6.9% for the eight categories of consumer goods, including food, clothes, shoes and hats, furniture, groceries, stationery, sporting and entertainment goods, home electronics, and daily chemicals and pharmaceutical and healthcare products.[7] As of November 1, 2018, China has started to lower import

[7] China and the World Trade Organization, The State Council Information Office of the People's Republic of China, June 2018.

Table 2: Key Policy Reports, Speeches and Documents on the Import Expansion Strategy since 2018

Time	Title	Description
March 5, 2018	Premier Li Keqiang's government work report in 2018	Proactively expanding imports, successfully holding the first CIIE, and lowering import tariffs for automobiles and some daily consumer goods. Broadening market openness and promoting industrial upgrade and balanced trade development to increase consumer choice
April 10, 2018	President Xi Jinping's speech at the Boao Forum for Asia 2018	Expanding opening up by (i) greatly relaxing market access; (ii) creating a more attractive investment climate; (iii) protecting intellectual property rights (IPRs); (iv) taking the initiative to increase imports
July 9, 2018	The Ministry of Commerce and 19 other ministerial agencies jointly released the Opinions on Expanding Imports and Promoting Balanced Foreign Trade Development	(i) Improving international market layout; (ii) optimizing import structure and promoting production and consumption upgrades; (iii) improving trade liberalization and facilitation conditions; (iv) giving play to multi-channel import promotion effects
January 2019	The Ministry of Commerce and the General Administration of Customs vowed to proactively expand imports at a press conference	Greater steps will be taken in 2019 to expand imports to promote trade balance, support domestic economic development, and import critical components and consumer goods, and host the second CIIE successfully
December 2019	The Ministry of Commerce called for expanding imports in four aspects at a press conference of the State Council Information Office	(i) Continuously lowering tariff rates; (ii) regularly holding the CIIE and preparing for the third CIIE; (iii) promoting trade facilitation with high standards and expedite the implementation of the WTO's Trade Facilitation Agreement (TFA); (iv) creating import promotion and innovation and demonstration areas

Source: Compiled by the authors.

Table 3: Specific Initiatives of the Opinions to Expand Imports

Initiatives	Description
Optimizing import structure and promote production and consumption upgrades	(i) Supporting welfare-related imports; (ii) lowering import tariffs for some commodities; (iii) improving duty-free store policy and import more duty-free products; (iv) vigorously develop trade in emerging services; (v) increase the imports of technologies and equipment conducive to economic transition and development, as well as agricultural and resource goods
Optimizing international market layout	(i) Focusing on countries involved in the Belt and Road Initiative (BRI) as priority sources of imports; (ii) creating a global network of free-trade zones with high standards to expand imports; (iii) implementing preferential arrangements for importing goods and services from the least developed countries (LCDs)
Promoting multi-channel positive effects	(i) Successfully hosting the China International Import Export (CIIE); (ii) promote effective interactions between foreign trade and investment; (iii) innovate import modes, replicate the experiences of cross-border e-commerce pilot zones, and expedite the pilot programs of parallel automobile imports
Improving conditions for trade liberalization and facilitation	(i) Creating import promotion platforms; (ii) optimizing import customs clearance procedures; (iii) reducing institutional cost for the import process; (iv) improving the domestic business climate and enhance the development of foreign trade credibility system and the protection of intellectual property rights (IPRs)

Source: Compiled by the authors.

tariffs for some commodities and expedite customs clearance facilitation with the overall tariff level expected to decrease from 9.8% in 2017 to 7.5% and the trade-weighted average tariff rate expected to decrease to 4.4% in 2018.[8] From November 5-10, 2018, the first CIIE was held at the National Exhibition and Convention Center in Shanghai, and since then efforts have been made to expand imports through various avenues. As of January 1, 2019, China has implemented interim tariff rates for over

[8] The State Council of the People's Republic of China, http://www.gov.cn/xinwen/2018-10/01/content_5327319.htm (accessed on October 1, 2020).

700 types of commodities and waived export tariffs for 94 commodities, including chemical fertilizers, blast furnace slag, iron ore, phosphorite, and coal tar, and as of July 1, 2019, China has implemented its fourth-step reduction of the most-favored-nation (MFN) tariff rates for 298 IT products and adjusted the interim tariff rates for some IT products.[9] Additionally, as of January 1, 2020, the State Council Tariff Code Committee decided to implement interim import tariff rates below MFN rates for over 850 commodities,[10] and at its regular press conference in January 2020, the Ministry of Commerce vowed to create import promotion and innovation demonstration areas, to expedite the development of import innovation platforms by fostering import distribution centers, and to promote the exemplary role of the demonstration areas.[11]

Table 4: List of China's Policy Initiatives to Expand Imports since 2018

Time	Title	Detailed description
As of July 1, 2018	Reduction of automobile import tariffs	Automobile tariff rates of 25% and 20% were lowered to 15%, and automobile component tariff rates of 8%, 10%, 15%, 20% and 25% were lowered to 6%
As of July 1, 2018	Reduction of import tariffs for daily consumer goods	Average tariff rates fell by an average of 55.9% from 15.7% to 6.9% for the eight categories of consumer goods, including food, clothes, shoes and hat, furniture, groceries, stationery, sporting and entertainment goods, home electronics, daily chemicals and pharmaceutical and healthcare products
As of November 1, 2018	Reduction of import tariffs for some commodities and customs clearance facilitation	Tariff rates were lowered for industrial goods under 1,585 taxable items. Average tariff rate was cut from 12.2% to 8.8% for electromechanical equipment in large domestic demand such as engineering machinery and instruments and meters, from 11.5% to 8.4% for such commodities as textiles and building materials, and from 6.6% to 5.4% for some resource commodities and primary processed goods. China's overall tariff level decreased to 7.5%, down from 9.8% in 2017, and the trade-weighted average tariff rate fell to 4.4%
November 5-10 2018	CIIE	Cohosted by the Ministry of Commerce and Shanghai Municipal People's Government, the CIIE is intended to steadfastly support trade liberalization and economic globalization and actively open up China's market to the rest of the world; the first CIIE was held at the National Exhibition and Convention Center in Shanghai during November 5-10
As of January 1, 2019	Adjustment of some import and export tariffs	Interim import tariff rates took effect for over 700 commodities; and export tariffs became exempted for 94 commodities, including chemical fertilizers, apatite, iron ores, slags, coal tar and wood pulp.
As of July 1, 2019	Tariff reduction for IT products	Implemented Step 4 tax reduction for the MFN tariff rates for 298 IT products and adjusted interim tariff rates for some IT products
November 5-10, 2019	The Second CIIE	President Xi Jinping attended the opening ceremony and called for advancing opening up at a higher level
As of January 1, 2020	Adjustment of import tariffs for some commodities	Implemented interim import tariff rates below MFN tariff rates for over 850 commodities
As of January 9, 2020	The Ministry of Commerce called for developing import promotion and innovation demonstration areas	Vowed to create import promotion and innovation demonstration areas and import distribution centers to expedite the development of import innovation platforms and enhance the exemplary role of the demonstration areas

Source: Compiled by the authors.

[9] From January 1, 2019, China has adjusted some import and export tariffs, and will no longer impose export tariffs on 94 commodities such as fertilizers, http://www.gov.cn/xinwen/2018-12/25/content_5351808.htm (accessed on October 1, 2020).

[10] The State Council of the People's Republic of China, http://www.gov.cn/xinwen/2019-12/23/content_5463214.htm, accessed on October 1, 2020.

[11] Ministry of Commerce, http://www.mofcom.gov.cn/xwfbh/20200109.shtml (accessed on October 1, 2020).

3. Theoretical Model and Calibration of Parameters

3.1 Benchmark Theoretical Model

Our theoretical model encompasses production, consumption, and market clearing conditions for an open economy model. An economic environment for $m=\{1, 2,\cdots,m\}$ countries is specified, in which each country employs $t=\{1, 2,\cdots,t\}$ types of production factors to manufacture $n=\{1, 2,\cdots,n\}$ products. Firms produce all goods using all types of production factors with a constant elasticity of substitution (CES) production function in a two-layer embedded CES functional form. The first layer is labor force and intermediate inputs for making final products, and the second layer is T types of factor intermediate inputs. The demand for each factor input is determined by the output maximization under the production factor endowment constraint.

A two-layer embedded CES function is also used for consumers' utility function. Consumers first choose between different types of products to form the first layer and then choose between products from different countries to form the second layer. Utility maximization under the budget constraints determines consumer demand for products from different countries. Equilibrium among production, consumption, and trade determines market clearing conditions under general equilibrium, including the equilibrium conditions that factor supply equals factor demand, product supply equals product demand, and aggregate trade demand equals aggregate trade supply, as well as the zero-profit condition in a market of perfect competition among producers.

We also add make three extensions to the above model. First, both tariff and nontariff barriers are simultaneously included; second, monetary and "inside money" endogenous trade disequilibria are included; and third, the models of value chain and trade in value added are included. Since China's strategy of import expansion encompasses not only tariff reductions but nontariff barrier curtailment such as trade facilitation, it makes sense to introduce tariff and non-tariffs simultaneously. Inclusion of tariff measures into the model affects the consumer prices of imported products. Let t_i denote the import tariff level of country i. Then the relationship between the consumer price and producer price for country i to import products from country j becomes:

$$pc_{ij}^{l} = (1+t_i)p_j^{l} \tag{1}$$

Where, pc_{ij}^{l} is the consumer price for country i to consume tradable product l from country j, and p_j^{l} is the producer price of tradable product l from country j. Tariff revenue R_i can be expressed as:

$$R_i = \sum_{l}\sum_{j,i\neq j} p_j^{l} x_{ij}^{l} t_i \tag{2}$$

Where, x_{ij}^{l} is the consumer demand of country i for product l made in country j, $i=j$ means the consumption of a product made in the home country, and $i\neq j$ is the demand of country j for consuming imported commodities from country i.

The inclusion of nontariff measures also affects the consumer price of imported products. We let NB_{ij} note the level of nontariff barriers, expressed by *ad valorem* tariff equivalent for goods imported by country i from country j. Then the relationship between consumption price and production price of products imported from country i to country j is becomes:

$$pc_{ij}^{l} = (1+t_i+NB_{ij})p_j^{l} \tag{3}$$

Nontariff barriers include additional import and export spending on transportation, language, regulatory compliance, and technical standards and other matters and generate no tax revenue. However, the additional cost of nontariff barriers has to be reflected in actual resources. Here, we assume that such cost goes into nontradable goods and other service-based products. Assuming that the cost of nontariff barriers is NR_i, we have:

Table 5: Basic Structure of the General Equilibrium Model

Category	Description	Mathematical expression
Production function	CES-type function with *t* types of production factor inputs for making *n* types of products	$Q_i^l = \phi_i^l \sum_s [\delta_{is}^l (F_{is}^l)^{\frac{\sigma_i^l - 1}{\sigma_i^l}}]^{\frac{\sigma_i^l}{\sigma_i^l - 1}}$, *i* is country, *l* is sector, and *s* is production factor. Q_i^l is output of sector *l* in country *i*, F_{is}^l is demand of sector *l* in country *i* for factor *s*, ϕ_i^l is the parameter for the scale of sector *l*'s production in country *i*, δ_{is}^l is the parameter of input share of factor *s* in the production of sector *l* in country *i*, and σ_i^l is the elasticity of substitution of input factor for sector *l*'s production in country *i*.
	Output maximization under the factor endowment constraint determines factor demand	$F_{is}^l = \frac{Q_i^l}{\phi_i^l} \sum_s [\delta_{is}^l (w_{is})^{(1-\sigma_i^l)}]^{\frac{\sigma_i^l}{1-\sigma_i^l}}$, w_{is} is the price of factor *s* in country *i*.
Utility function	Two-layer embedded CES consumer utility function	$U_i(X_i^l) = \sum_l [\alpha_{il}^{\frac{1}{\sigma_i}} (X_i^l)^{\frac{\sigma_i - 1}{\sigma_i}}]^{\frac{\sigma_i}{\sigma_i - 1}}$, X_i^l is country *i*'s consumer demand for product *l*, α_{il} is country *i*'s consumption share parameter for product *l*, and σ_i is country *i*'s consumption elasticity of substitution for differnet products.
	Utility maximization under budgetary constraint determines consumer demand at two levels. Level-1 structure is the choice of *N* types of products; level-2 structure is choice of products made by different countries	Level-1 demand: $X_i^l = [\sum_j \beta_{ij}^{\frac{1}{\sigma_i'}} x_{ij}^{l\,\frac{\sigma_i' - 1}{\sigma_i'}}]^{\frac{\sigma_i'}{\sigma_i' - 1}}$, where β_{ij} is the parameter of country *i*'s share of consumption of country *j*'s products, σ_i' is the elasticity of substitution of country *i*'s demand for products from different countries, and x_{ij}^l is country *i*'s consumer demand for product *l* made in country *j*; level-2 demand: $x_{ij}^l = \frac{\beta_{ij}(X_i^l P_i^l)}{(pc_{ij}^l)^{\sigma_i} [\sum_j \beta_{ij} (pc_{ij}^l)^{(1-\sigma_i)}]}$, P_i^l is the price of country *i*'s consumption of product portfolio *l*, and pc_{ij}^l is the price of product *l* made in country *j* and consumed by country *i*.
Market clearing conditions	Factor market, product market, global trade and zero-profit condition	Factor market: $\sum_l F_{is}^l = \overline{F_{is}}$, where $\overline{F_{is}}$ is country *i*'s endowment of factor *S*; product market: $Q_i^l = \sum_j x_{ji}^l$; global trade: $\sum_i Y_i = 0$; zero-profit condition: $p_i^l Q_i^l = \sum_s w_{is}^l F_{is}^l$

Source: Compiled by the authors.

$$NR_i = \sum_l \sum_{j, i \neq j} p_j^l x_{ij}^l NB_{ij} \tag{4}$$

After introducing tariff and nontariff barriers, consumer income I_i of country *i* becomes:

$$\sum_t w_i^l \overline{F_i^t} + R_i = I_i \tag{5}$$

Here, $\overline{F}_i^t$ is country *i*'s endowment of factor *t*, and w_i^t is the price of factor *t* in country *i*. Considering the cost of nontariff barriers for the country's nontradable goods, the relationship of their output and consumption must satisfy:

$$Q_i^{NT} = \frac{NR_i}{p_i^{NT}} + X_i^{NT} \tag{6}$$

Where, Q_i^{NT} is country *i*'s output of nontradable goods, p_i^{NT} is the production price of country *i*'s nontradable goods, and X_i^{NT} is demand for country *i*'s nontradable goods.

There are three steps in modeling trade disequilibria. First, the exogenous fixed trade disequilibrium method, which is trade disequilibrium that is based on the benchmark scenario and stays constant; second, monetary endogenous trade disequilibrium modeled by specifying an exogenous constant money supply volume to determine the level of trade disequilibrium endogenously by the difference

between total consumer spending and money supply; and third, the endogenous trade disequilibrium of inside money with a modeling approach derived from Patinkin (1971) inside money equation, which has previously been applied by Walley *et al*. (2011) and Li and Whalley (2014) in the general equilibrium models.

Our benchmark model adopts a monetary endogenous trade disequilibrium set up, like Li *et al*. (2018) model based on data from different years, countries, and regions. Specifically, we introduce the money supply into the model under the assumptions of a fixed exchange rate regime and an inflexible money supply policy. In the interest of simplicity, we only consider the transaction demand of currency and specify the number of each country's currency flows to be 1. Hence, a country's money demand equals the total volume of market transactions and the total transaction volume of all products in the model, and a country's fixed money supply is specified as equal to the total volume of market transactions and free from any change and adjustment once determined. Under the fixed exchange rate regime, the level of trade disequilibrium is endogenously determined by constant money supply and aggregate consumer income:

$$S_i = I_i - \overline{M}_i \tag{7}$$

Here, S_i is country i's trade surplus, I_i is country i's gross revenue, and $\overline{M}_i$ is country i's money supply. Finally, global trade market clearing requires the trade surpluses of all countries to be offset by one another in the aggregate:

$$\sum_i S_i = 0 \tag{8}$$

3.2 Inside Money and Value Chain Trades

To test the reliability of the benchmark model's simulation results further, we also introduce two other model features into the benchmark framework and simulate the economic effects of import expansion under different set-ups for a comparative analysis of the robustness of simulation results. Specifically, we construct an endogenous trade disequilibrium model of inside money by introducing an "inside money" variable, whose value is equal to a country's trade disequilibrium. As such, the value of this variable is positive if a country has a trade surplus and negative if it has a trade deficit, reflecting the power to purchase future consumption with current inside money and the overdraft of future consumption by issuing and borrowing inside money. Inclusion of inside money into the utility function not only represents a country's preference for trade surplus but also endogenously determines the amount of inside money under its budget constraint (the level of trade disequilibrium). Since the value of the consumption utility function cannot be negative, we specify an appropriate virtual ceiling of inside money, so that the sum between the virtual ceiling and trade imbalance for any country is greater than 0. Using the sum between trade imbalance and the virtual ceiling to denote the level of inside money and entering it into the utility function solves the problem of the value of inside money turning negative in case of trade deficit. The trade imbalance of inside money is introduced to influence consumption and production through its effects on the consumer budget constraint and endogenously determine trade imbalance. The introduction of the value chain is used to account for the intermediate inputs used in production. The trade in value-added system can be introduced into the model using the input and output from value chains.

3.3 Data and Parametric Calibration

Based on the needs of our research topic, for our model simulation we created an economy with 26 economies and used data from China, Brazil, India, Mexico, Russia, Malaysia, Indonesia, Thailand, Vietnam, the Philippines, the United States, the European Union, Japan, Canada, Australia, New Zealand, South Korea, Singapore, Saudi Arabia, Kuwait, Bahrain, Brunei, Chile, Peru, Qatar, and the rest of the world (ROW). For simplicity, we assume that each economy employs two production factors, labor (L) and capital (K) for producing two types of products, manufactured and nonmanufactured goods. In the value chain model structure, production factors include labor (L) and intermediate inputs (M),

and intermediate inputs are manufactured with the two factors of labor (L) and capital (K).

We used economic and trade data of the above economies from 2018 to calibrate the model. The production input and industry output data of various economies are primarily from the World Bank's World Development Indicators (WDI) database. Since Gross Domestic Product (GDP) data denote the gross output of economies, we calculate the output of nonmanufacturing sectors indirectly using data from the service and agriculture sectors of each economy as a share of GDP, and we let the labor income (wage) of each sector denote labor factor input. For consumption data, import represents the consumption of foreign products with data from UN Comtrade. We indirectly calculate consumer demand for domestic products with output data and trade data. Data for ROW were obtained by subtracting the data from the above-listed economies from aggregate global data.

For the monetary endogenous trade disequilibrium model, money supply is determined by aggregate consumer demand for the two kinds of products, and demand for inside money is jointly determined by the level of trade imbalance and the ceiling of inside money. We set the ceiling of inside money to be one trillion US dollars to ensure that each economy's trade imbalance plus this value is greater than 0, which is a continent and normal assumption. For the value chain model, trade in value-added and input-output data are taken from the OECD's database and the World Input-Output Database (WIOD), respectively.

Product elasticity of substitution and factor elasticity of substitution in the consumption and production functions cannot be obtained directly from the above calibration calculations. Normally, these values can be determined through an econometric estimation of large-sample historical data or from existing literature. We therefore reference Betina *et al*. (2006) and Whalley and Wang (2010) to specify the values of all elasticities to be 2, and later test the sensitivity of our simulation results to this choice.

For data of tariff and nontariff barriers, our tariff data are the MFN tariff rates from the tariff database of the World Trade Organization (WTO), and we indirectly determine nontariff barriers by subtracting trade cost from tariff levels. Following Novy (2013) method for calculating trade cost, trade data required for the calculation are from the United Nations Comtrade database, and GDP and value-added in services data are from the World Bank's WDI database. In addition, ROW's tariff rates are the average import tariff rate levels of all the ROW economies.

We begin the calibration of the model parameters with the benchmark model. Referencing Shoven

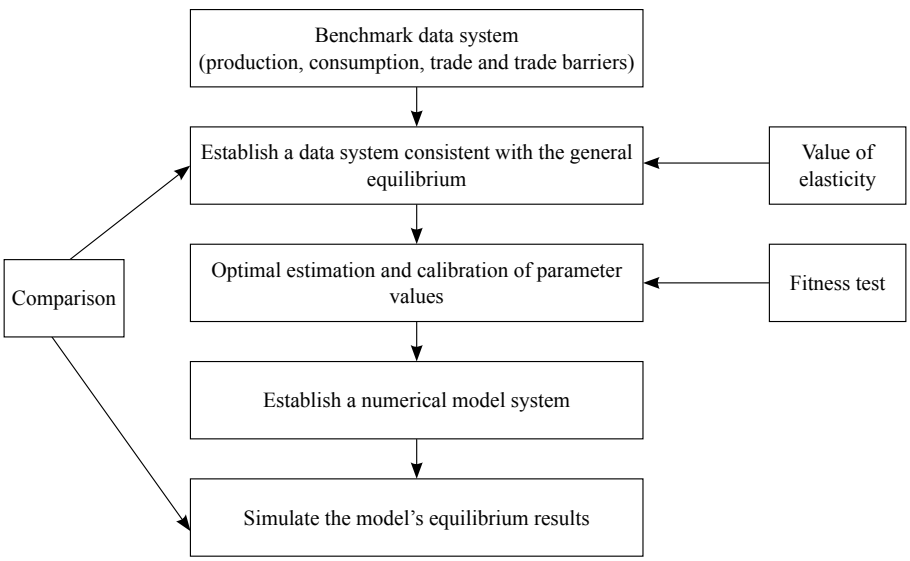

Figure 2: Calibration Process of the General Equilibrium Model System

Source: Compiled by the authors.

and Whalley (1992) for the calibration method, we employ the benchmark data system to calculate the parametric values in reverse. Specifically, we deem the model's variables (from data) to be parameters (and the parameters to be variables) in order to solve the model's equilibrium and obtain the parameter values based on the data. See Figure 2 for the calibration process. In solving the general equilibrium in the specific calibration and simulation, we specify an economy's wage level as the general numeraire. With the numeric general equilibrium model system obtained after parametric calibration, we then perform an analysis of different policy options for China's import expansion strategy to attempt to answer the question of whether China's import expansion strategy benefits itself, other economies, or both.

3.4 Effectiveness Test of the Numeric Model

After establishing the numerical model system, we perform a validity test to test whether the model replicates actual economic data and test the model's goodness-of-fit by comparing its simulated values to actual data. In this section, we perform the validity test of the benchmark model's goodness-of-fit with respect to GDP, employment, export, and imports. Our test results indicate a very small gap between the model's simulated values and actual data, and the numerical model's goodness-of-fit with actual data is above 90% (see Table 6). As such, we assume that our simulation results will be feasible.

Table 6: Numerical Validity Test Results

Economy	GDP		Employment		Export		Import	
	Actual value	Simulated value	Actual value	Simulated value	Actual value	Simulated value	Actual value	Simulated value
China	13608.2	13608.2	7620.6	7620.6	2494.2	2371.9	2134.9	2079.1
US	20544.3	20540.3	16230.0	16230.0	1665.3	1757.6	2611.4	2731.9
EU	18748.6	18748.6	14811.4	14811.4	2308.2	2372.1	2335.1	2277.2
Japan	4971.3	4971.3	3778.2	3778.2	738.2	1025.3	748.2	807.5
Canada	1713.3	1713.3	1319.2	1319.2	450.4	657.3	459.9	477.3
Mexico	1220.7	1220.7	939.9	939.9	450.7	644.4	464.3	500.2
India	2718.7	2718.7	1875.9	1875.9	322.5	559.5	507.6	535.4
Russia	1657.6	1657.6	1276.4	1276.4	451.5	771.5	240.2	216.6
Saudi Arabia	786.5	786.5	597.7	597.7	294.5	517.6	135.2	110.3
Australia	1433.9	1433.9	1089.8	1089.8	252.8	355.5	235.5	196.6
Bahrain	37.7	37.7	25.6	25.6	14.3	36.8	20.6	21.8
Brazil	1868.6	1868.6	1588.3	1588.3	239.9	443.2	181.2	136.7
Brunei	13.6	13.6	8.0	8.0	6.6	13.8	4.2	4.1
Chile	298.2	298.2	229.6	229.6	75.5	129.8	74.2	63.1
Indonesia	1042.2	1042.2	677.4	677.4	180.2	351.8	188.7	134.4
South Korea	1619.4	1619.4	1133.6	1133.6	604.8	846.9	535.2	536.3
Kuwait	140.6	140.6	105.4	105.4	71.9	174.8	35.9	32.1
Malaysia	358.6	358.6	272.5	272.5	247.3	407.5	217.4	201.1
New Zealand	204.9	204.9	155.7	155.7	39.8	65.9	43.7	40.4
Peru	222.1	222.1	175.5	175.5	47.9	89.1	43.1	38.2
The Philippines	330.9	330.9	241.6	241.6	67.5	140.5	115.1	104.3
Qatar	191.4	191.4	109.1	109.1	84.3	189.4	31.7	25.1
Singapore	664.2	664.2	484.9	484.9	411.7	639.1	370.5	404.7
Thailand	504.9	504.9	378.7	378.7	252.5	416.9	249.2	227.3
Vietnam	425.2	425.2	310.4	310.4	243.7	395.1	236.9	227.1
ROW	11064.1	11064.1	8408.7	8408.7	7796.1	3843.6	7592.4	5688.3

Source: Compiled based on GAMS software simulation results.

4. Simulation Analysis of China's Import Expansion Strategy

China's import expansion strategy includes two categories of initiatives, policy reduction of tariff rates and reduction of nontariff barriers. Hence, our simulation analysis is divided into three scenarios: The import expansion effects of tariff reductions, the import expansion effects of nontariff barrier reduction, and the import expansion effects of simultaneous tariff and nontariff barrier reductions.

For each scenario, we are concerned with the economic effects on China, the United States, other economies and the global economy, as well as the economic effects on all economies in the entire model, and we analyze the reduction of each type of barrier under reductions of 10%, 30%, and 50%. The economic effects of China's import expansion strategy are then measured as percentage changes (%) by comparing modeled equilibrium under each simulated scenario and equilibrium in the benchmark year case. These indicators include social welfare expressed by equivalent variation (EV) as a share of GDP, GDP, manufacturing employment, trade, exports, imports, and trade imbalance.

4.1 The Effects of Tariff Reductions

On the whole, we find that China's import expansion strategy is unfavorable to its GDP growth, but creates positive effects on social welfare, trade, manufacturing, and employment and improves trade imbalance. Specifically, tariff reductions by 10%, 30%, and 50% corresponded to changes in China's GDP by -0.05%, -0.15%, and -0.252%; aggregate trade volumes by 0.599%, 1.833%, and 3.118%; trade imbalance by -2.966%, -9.089%, and -15.476%; change in social welfare by 0.176%, 0.539%, and 0.918%; and increases in manufacturing employment by 0.015%, 0.044%, and 0.073%, respectively. Possible mechanisms in which import tariff reductions cause China's GDP to fall are twofold. First, there may be a crowding out effect where import expansion crowds out the consumption of domestic products, causing domestic demand and economic aggregate to decrease. Second, there may be a price effect: Lower import tariff rates effectively bring down import prices and the overall price level, causing GDP to decrease (see Figure 3).

Additionally, for all other economies, China's import reductions were conducive to GDP growth, manufacturing employment, and trade volumes, but China's import tariff reductions had neqative effects on social welfare. Specifically, China's import tariff reductions by 10%, 30%, and 50% created changes in US welfare by -0.016%, -0.050%, and -0.086% and changes in global welfare by 0.001%, 0.002%, and 0.001%; changes in US GDP by 0.014%, 0.044%, and 0.076%; changes in global GDP by 0.027%, 0.083%, and 0.141%; changes in the ROW's welfare by -0.046%, -0.140%, and -0.239%; and changes

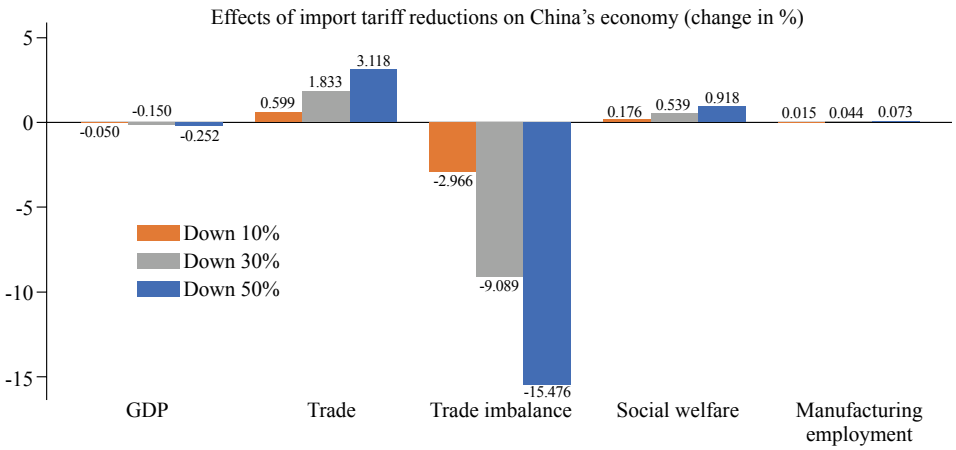

Figure 3: Effects of Import Tariff Reductions on China's Economy

Source: Compiled based on simulation results.

Table 7: The Effects of China's Import Tariff Reductions (change in %)

Economy / variable	Social welfare	GDP	Manufacturing employment	Trade	Trade imbalance	Export	Import
	Import tariff reduction by 10%						
China	0.176	-0.050	0.015	0.599	-2.966	0.087	1.319
US	-0.016	0.014	0.051	0.045	-0.541	0.118	-0.013
ROW	-0.046	0.102	0.074	0.129	-0.594	0.282	0.021
World	0.001	0.027	0.052	0.165	0.000	0.165	0.165
	Import tariff reduction by 30%						
China	0.539	-0.150	0.044	1.833	-9.089	0.264	4.037
US	-0.050	0.044	0.156	0.139	-1.660	0.363	-0.040
ROW	-0.140	0.314	0.226	0.394	-1.819	0.865	0.063
World	0.002	0.083	0.157	0.504	0.000	0.504	0.504
	Import tariff reduction by 50%						
China	0.918	-0.252	0.073	3.118	-15.476	0.445	6.868
US	-0.086	0.076	0.266	0.236	-2.828	0.617	-0.069
ROW	-0.239	0.534	0.384	0.670	-3.098	1.471	0.108
World	0.001	0.141	0.267	0.857	0.000	0.857	0.857

Source: Compiled based on simulation results with GAMS software.

Table 8: Effects of Import Tariff Reduction by 30% on Various Economies (change in %)

Economy	Social welfare	GDP	Manufacturing employment	Trade	Trade imbalance	Export	Import
China	0.539	-0.150	0.044	1.833	-9.089	0.264	4.037
US	-0.050	0.044	0.156	0.139	-1.660	0.363	-0.040
European Union	-0.078	0.070	0.147	0.158	1.566	0.332	-0.074
Japan	-0.133	0.147	0.286	0.460	9.204	0.859	0.022
Canada	-0.079	0.088	0.089	0.101	-2.472	0.205	0.004
Mexico	-0.060	0.070	0.048	0.022	-0.763	0.047	-0.001
India	-0.096	0.073	0.053	0.038	-1.437	0.188	-0.086
Russia	-0.090	0.131	0.164	0.233	0.638	0.334	0.029
Saudi Arabia	-0.110	0.199	0.126	0.286	0.781	0.406	0.053
Australia	-0.189	0.250	0.487	0.752	-39.519	1.422	0.103
Bahrain	-0.045	0.068	0.002	-0.004	-0.054	0.075	-0.025
Brazil	-0.128	0.154	0.337	0.540	3.334	0.910	0.038
Brunei	-0.015	0.014	-0.002	0.134	1.772	0.262	-0.017
Chile	-0.031	-0.0001	-0.037	0.691	13.05	1.360	-0.058
Indonesia	-0.109	0.130	0.083	0.217	-4.866	0.447	0.005
South Korea	-0.238	0.387	0.366	0.691	5.71	1.128	0.163
Kuwait	-0.067	0.314	0.062	0.209	-2.31	0.391	0.050
Malaysia	-0.106	0.294	0.067	0.201	-8.163	0.379	0.030
New Zealand	-0.106	0.247	0.141	0.250	-0.379	0.694	0.064
Peru	-0.100	0.251	0.13	0.307	-0.595	0.737	0.087
The Philippines	-0.122	0.183	0.111	0.101	-0.182	0.294	0.019
Qatar	-0.067	0.246	0.065	0.164	0.782	0.223	0.090
Singapore	-0.113	0.179	0.058	0.104	0.988	0.186	0.005
Thailand	-0.150	0.280	0.142	0.276	-4.15	0.520	0.056
Vietnam	-0.147	0.293	0.078	0.253	-3.476	0.492	0.041
ROW	-0.140	0.314	0.226	0.394	-1.819	0.865	0.063
World	0.002	0.083	0.157	0.504	0.000	0.504	0.504

Source: Compiled based on simulation results with GAMS software.

in global GDP by 0.102%, 0.314%, and 0.534%, respectively (see Table 7). The possible mechanism for import tariff reductions' reduction of social welfare in the ROW is that China's falling import tariffs increased demand for products from and employment in the ROW, but result in a relative decrease in consumer demand and is thus unfavorable to social welfare improvement due to consumption. As such, we find that China's import tariff reductions were only conducive to increases in global GDP and manufacturing employment and trade.

4.2 The Effects of Nontariff Barrier Reduction

The reduction of nontariff import barriers had negative effects on China's GDP and positive effects on China's welfare, manufacturing employment, trade volume, and trade imbalance, and all such effects were large. Specifically, the reductions of nontariff barriers by 10%, 30%, and 50% caused changes in China's GDP by -0.282%, -0.880%, and -1.527%; welfare by 0.456%, 1.443%, and 2.542%; manufacturing employment by 0.279%, 0.882%, and 1.553%; trade volume by 0.983%, 3.065%, and 5.320%; and trade imbalance by -3.961%,-12.339%, and -21.391%, respectively (see Figure 4).

Two possible mechanisms may be at work here. First, again there may be a crowding out effect: More imports may have crowded out the consumption of domestic products, thus causing domestic demand to diminish. Second, there may be a price effect: Falling import tariffs may reduce import prices and the overall price level, thus causing nominal GDP to decrease.

For other major economies, our simulation showed that reductions in China's nontariff import barriers had positive effects on social welfare in China, the United States, the ROW and the world as a whole. Specifically, the positive welfare effects are the most significant for China, and the least significant for the United States. Yet, reductions in China's nontariff import barriers created negative changes in GDP in China and the ROW, but helped improve China's trade imbalance. For instance, a 10% reduction in nontariff import barriers led to changes in welfare in the United States, the ROW and the world as a whole by 0.004%, 0.022%, and 0.082%; GDP by 0.005%, 0.086%, and -0.032%, manufacturing employment by 0.048%, 0.064%, and 0.083%; trade by 0.099%, 0.142%, and 0.268%; trade imbalance by -0.420%, -0.581%, and 0%; exports by 0.164%, 0.296%, and 0.268%; and imports by 0.048%, 0.034%, and 0.268%, respectively (see Table 9).

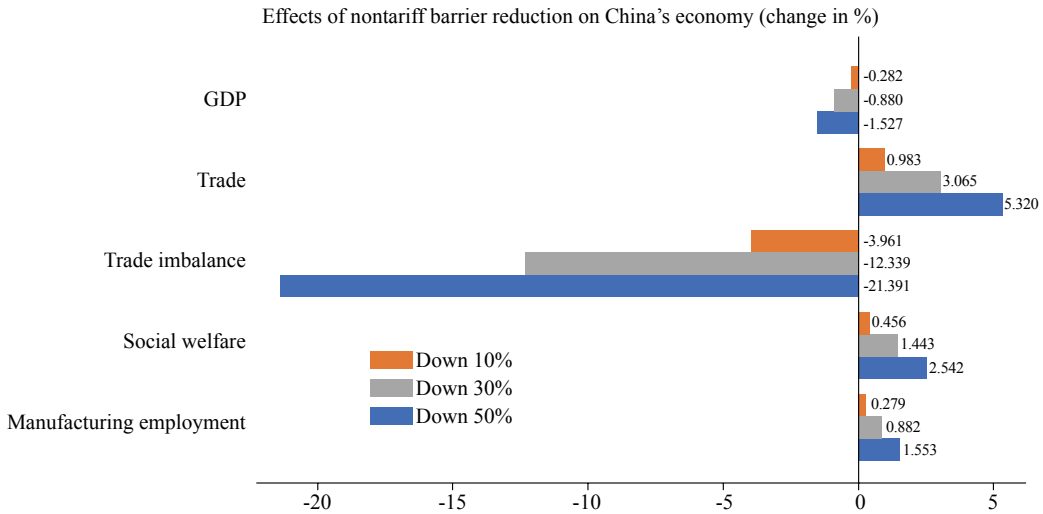

Figure 4: The Effects of Nontariff Import Barrier Reduction on China's Economy

Source: Compiled based on simulated the results.

Table 9: Policy Effects of Reduction in China's Nontariff Import Barriers (change in %)

Economy / variable	Social welfare	GDP	Manufacturing employment	Trade	Trade imbalance	Export	Import
	10% reduction in nontariff barriers to import						
China	0.456	-0.282	0.279	0.983	-3.961	0.272	1.980
US	0.004	0.005	0.048	0.099	-0.420	0.164	0.048
ROW	0.022	0.086	0.064	0.142	-0.581	0.296	0.034
World	0.082	-0.032	0.083	0.268	0.000	0.268	0.268
	30% reduction in nontariff barriers to import						
China	1.443	-0.880	0.882	3.065	-12.339	0.851	6.172
US	0.013	0.016	0.148	0.309	-1.288	0.508	0.150
ROW	0.075	0.26	0.194	0.434	-1.769	0.903	0.105
World	0.256	-0.101	0.26	0.837	0.000	0.837	0.837
	50% reduction in nontariff barriers to import						
China	2.542	-1.527	1.553	5.320	-21.391	1.481	10.708
US	0.026	0.026	0.253	0.537	-2.191	0.876	0.265
ROW	0.139	0.437	0.326	0.736	-2.995	1.530	0.180
World	0.447	-0.179	0.451	1.453	0.000	1.453	1.453

Source: Compiled based on simulation results with GAMS software.

Table 10: The Effects of a 30% Reduction in Nontariff Import Barriers (change in %)

Economy	Social welfare	GDP	Manufacturing employment	Trade	Trade imbalance	Export	Import
China	1.443	-0.880	0.882	3.065	-12.339	0.851	6.172
US	0.013	0.016	0.148	0.309	-1.288	0.508	0.150
EU	-0.033	0.058	0.183	0.336	1.797	0.517	0.095
Japan	-0.041	0.095	0.252	0.732	11.026	1.201	0.216
Canada	0.032	-0.013	-0.005	0.345	-8.150	0.688	0.027
Mexico	0.117	-0.116	-0.091	0.152	-5.303	0.326	-0.011
India	0.033	-0.031	-0.038	0.23	-2.606	0.518	-0.010
Russia	-0.043	0.119	0.189	0.813	2.087	1.133	0.172
Saudi Arabia	-0.002	0.044	0.038	0.899	2.655	1.324	0.073
Australia	-0.118	0.236	0.546	1.797	-89.738	3.320	0.323
Bahrain	0.004	-0.010	-0.006	0.010	-0.061	0.125	-0.019
Brazil	-0.152	0.224	0.554	1.968	11.41	3.217	0.269
Brunei	0.170	-0.154	-0.028	0.451	4.735	0.771	0.077
Chile	0.046	-0.00009	0.055	2.137	35.923	3.966	0.089
Indonesia	0.056	-0.011	0.012	0.994	-19.209	1.911	0.154
South Korea	0.104	-0.114	-0.077	0.110	0.993	0.187	0.017
Kuwait	0.091	-0.587	-0.134	1.553	-26.215	3.558	-0.199
Malaysia	0.129	-0.421	-0.098	0.176	-10.820	0.410	-0.049
New Zealand	0.199	-0.511	-0.313	1.225	-3.696	4.714	-0.219
Peru	0.145	-0.347	-0.184	1.961	-6.587	6.035	-0.124
The Philippines	0.207	-0.384	-0.242	0.554	-1.650	2.056	-0.082
Qatar	0.144	-0.579	-0.16	0.973	11.533	1.985	-0.282
Singapore	0.077	-0.227	-0.088	0.082	1.099	0.176	-0.033
Thailand	0.130	-0.240	-0.118	0.287	-6.316	0.651	-0.041
Vietnam	0.141	-0.346	-0.063	0.268	-4.565	0.578	-0.006
ROW	0.075	0.260	0.194	0.434	-1.769	0.903	0.105
World	0.256	-0.101	0.26	0.837	0.000	0.837	0.837

Source: Compiled based on simulation results with GAMS software.

4.3 The Effects of a Simultaneous Reduction in Tariff and Nontariff Barriers

When faced with a reduction in both tariff and nontariff barriers, we find that Chinese welfare, manufacturing employment, and foreign trade all increased, trade imbalance improved, and GDP decreased possibly due to price decreases after tariff and nontariff barrier reductions. Specifically, reductions in tariff and nontariff import barriers by 10%, 30%, and 50% led to change in China's GDP by -0.335%, -1.058%, and -1.860%; welfare by 0.641%, 2.066%, and 3.718%; manufacturing employment by 0.297%, 0.959%, and 1.728%; aggregate trade volume by 1.600%, 5.075%, and 8.969%; and changes in trade imbalance by -7.011%, -22.241%, and -39.315%, respectively (see Figure 5).

For other major economies, except for the falling nominal GDP of China and the global economy and decreasing welfare in the United States and the rest of the world, all other major economies benefitted in terms of welfare, manufacturing employment, and import and export trade. For instance, the simultaneous 50% reduction in tariff and nontariff barriers led to changes in welfare in the United States, the ROW, and the global economy as a whole by -0.065%, -0.101%, and 0.461%; GDP by 0.110%, 1.026%, and -0.035%; manufacturing employment by 0.556%, 0.747%, and 0.764%; trade by 0.828%, 1.485%, and 2.457%; trade imbalance by -5.399%, -6.442%, and 0%; exports by 8.800%, 1.918%, and 2.457%; and imports by 0.207%, 0.302% ,and 2.457%, respectively (see Table 11).

4.4 Comparison of the Effects of the Three Types of Import Expansion Measures

Table 13 compares the economic effects of 30% reductions in China's import tariffs, nontariff import barriers, and trade costs (tariff and nontariff barriers) on China and the rest of the world. For import tariff reductions, both China's GDP and the ROW's welfare were adversely affected, while all other economies benefitted in terms of GDP.

With the reduction of nontariff barriers, China's GDP fell, but welfare, manufacturing employment, and trade all rose. In addition, the ROW's welfare, GDP, manufacturing employment, and trade all increased. From the perspectives of GDP, manufacturing employment, and trade, China's import expansion strategy benefitted both other economies and itself, but in terms of nominal GDP, China's import expansion strategy only benefitted other economies. In the case of simultaneous reductions in tariff and nontariff barriers, the effect on China's nominal GDP remained negative while the effects for other indicators were all positive. Furthermore, for other economies, the effects were positive for all

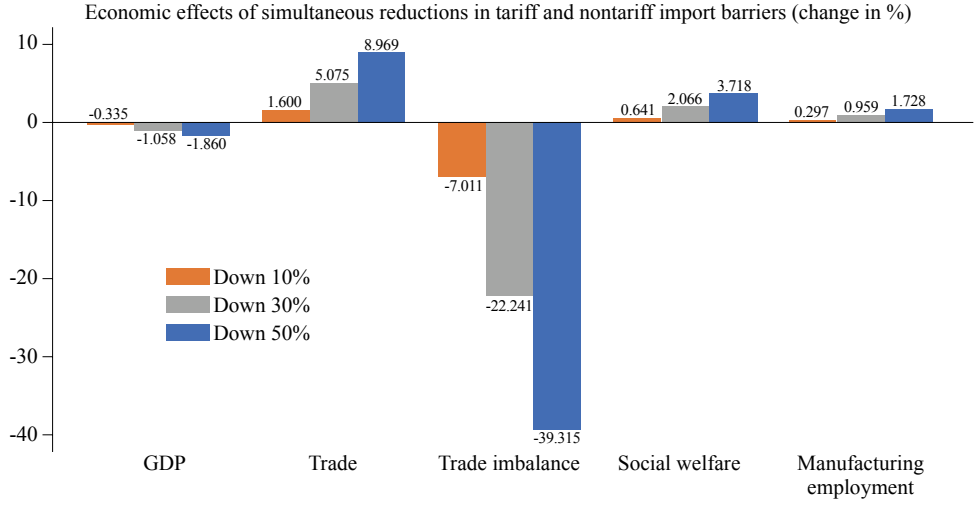

Figure 5: The Effects of Simultaneous Reductions in Tariff and Nontariff Import Barriers on China's Economy

Source: Compiled based on GAMS simulation results.

Table 11: The Effects Simultaneous Reductions in Tariff and Nontariff Barriers (change in %)

Economy / variable	Welfare	GDP	Manufacturing employment	Trade	Trade imbalance	Export	Import
	Simultaneous 10% reductions in tariff and nontariff import barriers						
China	0.641	-0.335	0.297	1.600	-7.011	0.362	3.337
US	-0.013	0.02	0.1	0.146	-0.975	0.286	0.035
ROW	-0.024	0.19	0.14	0.274	-1.187	0.584	0.056
World	0.083	-0.005	0.136	0.438	0.000	0.438	0.438
	Simultaneous 30% reductions in tariff and nontariff import barriers						
China	2.066	-1.058	0.959	5.075	-22.241	1.149	10.585
US	-0.039	0.063	0.316	0.466	-3.075	0.907	0.114
ROW	-0.067	0.592	0.433	0.855	-3.708	1.825	0.174
World	0.263	-0.018	0.432	1.389	0.000	1.389	1.389
	Simultaneous 50% reductions in tariff and nontariff import barriers						
China	3.718	-1.860	1.728	8.969	-39.315	3.255	18.709
US	-0.065	0.110	0.556	0.828	-5.399	8.800	0.207
ROW	-0.101	1.026	0.747	1.485	-6.442	1.918	0.302
World	0.461	-0.035	0.764	2.457	0.000	2.457	2.457

Source: Compiled based on simulation results with GAMS software.

Table 12: Specific Effects of Simultaneous 30% Reductions in Tariff and Nontariff Import Barriers on Various Economies (change in %)

Economy	Welfare	GDP	Manufacturing employment	Trade	Trade imbalance	Export	Import
China	2.066	-1.058	0.959	5.075	-22.241	1.149	10.585
US	-0.039	0.063	0.316	0.466	-3.075	0.907	0.114
EU	-0.116	0.132	0.344	0.515	3.504	0.885	0.023
Japan	-0.181	0.251	0.557	1.238	21.011	2.139	0.246
Canada	-0.049	0.079	0.088	0.465	-11.098	0.933	0.033
Mexico	0.057	-0.047	-0.044	0.183	-6.339	0.390	-0.012
India	-0.065	0.043	0.016	0.281	-4.217	0.737	-0.099
Russia	-0.139	0.262	0.369	1.092	2.847	1.532	0.210
Saudi Arabia	-0.116	0.254	0.172	1.236	3.586	1.806	0.132
Australia	-0.317	0.507	1.073	2.655	-134.659	4.940	0.443
Bahrain	-0.04	0.060	-0.003	0.006	-0.119	0.213	-0.045
Brazil	-0.291	0.395	0.930	2.621	15.405	4.312	0.321
Brunei	0.161	-0.146	-0.027	0.611	6.861	1.073	0.071
Chile	0.017	-0.00009	0.018	2.959	51.241	5.571	0.031
Indonesia	-0.056	0.125	0.100	1.266	-25.16	2.465	0.166
S. Korea	-0.135	0.272	0.289	0.807	6.762	1.325	0.180
Kuwait	0.025	-0.283	-0.074	1.839	-29.732	4.119	-0.153
Malaysia	0.024	-0.139	-0.033	0.384	-19.41	0.806	-0.02
New Zealand	0.094	-0.274	-0.176	1.542	-4.254	5.651	-0.159
Peru	0.046	-0.099	-0.054	2.368	-7.493	7.067	-0.038
The Philippines	0.089	-0.209	-0.135	0.685	-1.912	2.455	-0.064
Qatar	0.078	-0.347	-0.099	1.187	12.847	2.304	-0.199
Singapore	-0.037	-0.054	-0.033	0.190	2.138	0.370	-0.030
Thailand	-0.020	0.037	0.023	0.579	-10.797	1.207	0.013
Vietnam	-0.005	-0.061	0.014	0.535	-8.257	1.099	0.036
ROW	-0.067	0.592	0.433	0.855	-3.708	1.825	0.174
World	0.263	-0.018	0.432	1.389	0.000	1.389	1.389

Source: Compiled based on simulation results with GAMS software.

Table 13: The Effects of 30% Reductions in Import Barriers (change in %)

Measure / variable	Welfare	GDP	Manufacturing employment	Trade	Trade imbalance	Export	Import
	Economic effects on China						
Tariff	0.539	-0.150	0.044	1.833	-9.089	0.264	4.037
Nontariff	1.443	-0.880	0.882	3.065	-12.339	0.851	6.172
Tariff + nontariff	2.066	-1.058	0.959	5.075	-22.241	1.149	10.585
	Economic effects on the ROW						
Tariff	-0.140	0.314	0.226	0.394	-1.819	0.865	0.063
Nontariff	0.075	0.260	0.194	0.434	-1.769	0.903	0.105
Tariff + nontariff	-0.067	0.592	0.433	0.855	-3.708	1.825	0.174

Source: Compiled based on simulation results with GAMS software.

indicators other than welfare. Except for nominal GDP, China's import expansion strategy benefitted both other economies and itself. Finally, the reduction of nontariff barriers had the most significant positive effects on China, followed by the simultaneous reductions in tariff and nontariff barriers. The effects of tariff reduction, however, were mixed.

5. Robustness Tests and Sensitivity Analysis under Different Model Specifications

To test the robustness of the benchmark simulation results, we now employ different model specifications to simulate the economic effects of China's import expansion strategy and compare them to the benchmark results to examine the reliability of the simulation results generally. One test is to introduce the trade imbalance structure of "inside money" to analyze the economic effects of import expansion under the trade surplus preferences of individual economies. The other test is to introduce value chain and trade in value-added to investigate the economic effects of import expansion with trade relations between economies manifested as trade in value-added.

5.1 The Trade Imbalance Model with "Inside Money"

For simplicity, we only report the results of import barrier reductions by 30% under the three modes of import expansion and only display the economic effects on China and other economies (excluding the ROW). Our Simulation results show that China benefitted from increases in welfare, manufacturing employment, and trade but suffered a dip in GDP. Other economies benefitted from growth in welfare, GDP, manufacturing employment, and trade. This indicates that the import expansion strategy helped both other economies and China. From economic GDP alone, however, import expansion benefitted other economies rather than China. Additionally, our comparison of various modes of tariff and nontariff barrier reductions shows that reductions in nontariff barriers were more favorable to both China and to other economies (see Table 14).

The comparison of simulation results under the inside money trade imbalance model and benchmark model simulation results shows that the effects on China and other economies share a consistent direction and that the differences in the magnitude and intensity of these effects were limited. However, the effects on the welfare of the ROW were positive in the scenario of tariff-only and tariff and nontariff reductions under the inside money model, the simulation results under the benchmark model were negative. The reason for this is that in the trade imbalance model of inside money, the entry of inside money into the utility function led to a change in the value of inside money. That is, an increase in trade surplus may have affected social welfare and caused differences from the simulation results under the benchmark model. In terms of the intensity of this and the other effects, though, the results for

Table 14: The Effects of Import Barrier Reduction by 30% under the Inside Money Model (change in %)

Measure/variable	Social welfare	GDP	Manufacturing employment	Trade	Trade imbalance	Export	Import
	Economic effects on China						
Tariff	0.024	-0.699	0.407	1.621	-7.085	0.902	2.482
Nontariff	0.911	-1.544	1.516	2.987	-11.264	1.810	4.397
Tariff + nontariff	0.951	-2.287	1.987	4.714	-18.579	2.791	7.019
	Economic effects on ROW						
Tariff	0.232	0.346	0.023	0.436	-1.197	0.493	0.383
Nontariff	0.346	0.393	0.010	0.482	-0.604	0.520	0.447
Tariff + nontariff	0.596	0.749	0.033	0.932	-1.786	1.027	0.843

Source: Compiled based on GAMS simulation results.

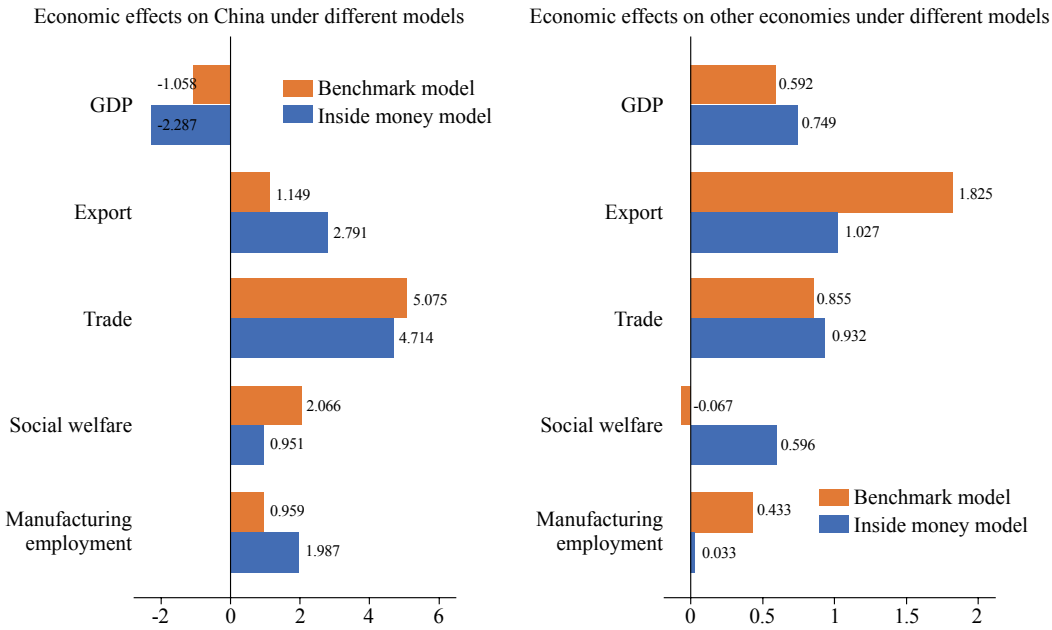

Figure 6: The Effects of Trade Cost Reduction by 30% under the Inside Money Model (change in %)

Source: Compiled based on simulation results.

the different indicators were not entirely consistent. Overall, the trade effect was the most significant, followed by the welfare effect, but the effects on employment and economic growth are more modest. For the trade effect, China experienced trade growth by 5.075% and 4.714% under the benchmark model and the inside money model, respectively, and other economies experienced trade growth by 0.855% and 0.932%, respectively (see Figure 6).

5.2 The Model with Value Chain and Trade in Value Added

Similar to the previous section, this section only reports the results of import barrier reduction by 30% under the three import expansion methods and only displays the economic effects on China and other economies (not the ROW). Our results indicate that China's GDP decreased but that welfare and trade will increased and trade imbalance improved. Except that tariff measures reduced their social welfare, other economies experienced higher social welfare, GDP, manufacturing employment, and trade

Table 15: The Effects of Import Barrier Reduction by 30% under the Global Value Chain Model (change in %)

Measure / variable	Social welfare	GDP	Manufacturing employment	Trade	Trade imbalance	Export	Import
	Economic effects on China						
Tariff	0.477	-0.159	0.014	2.074	-36.326	0.209	4.138
Nontariff	1.078	-0.687	0.572	2.804	-43.416	0.56	5.289
Tariff + Nontariff	1.616	-0.869	0.608	5.046	-82.578	0.792	9.758
	Economic effects on other economies						
Tariff	-0.033	0.353	0.075	0.256	5.119	0.476	0.014
Nontariff	0.154	0.361	0.052	0.266	5.621	0.508	0.005
Tariff + Nontariff	0.125	0.738	0.131	0.54	11.111	1.018	0.014

Source: Compiled based on GAMS simulation results.

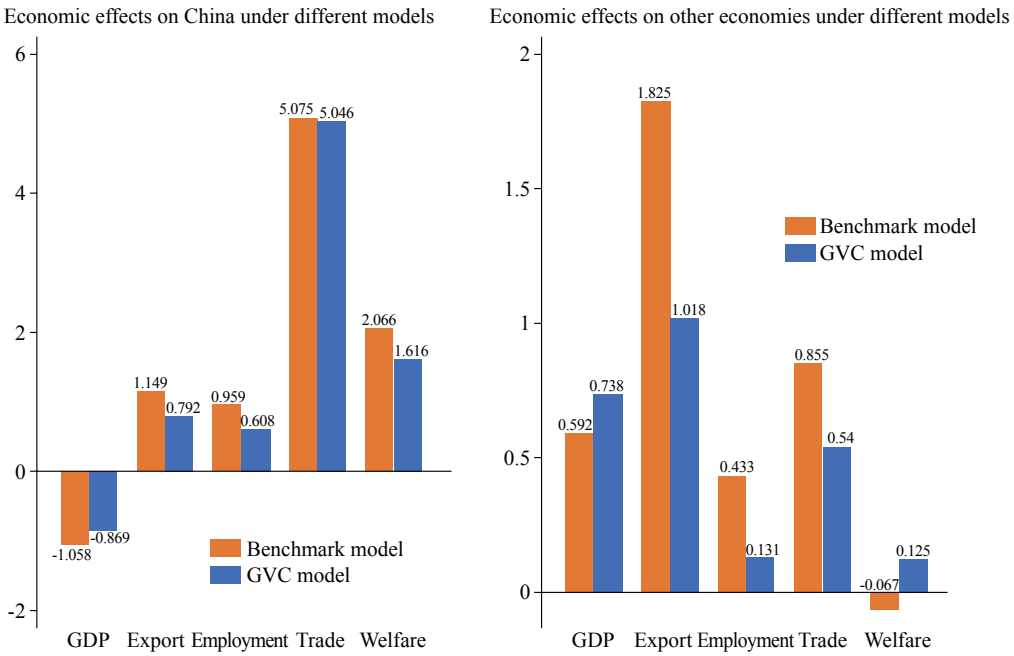

Figure 7: The Effects of Trade Cost Reduction by 30% under the GVC Model (change in %)

Source: Compiled based on GAMS simulation results.

(see Table 15).

Comparison of the simulation results under the global value chain (GVC) trade structure and benchmark model structure reveals that the direction of the overall impact is consistent, and that the intensity of the effects is similar, which suggests that the benchmark estimation results are reliable and robust. In the simulation results for other economies, the welfare effect is positive under the value chain model structure, but the result turns negative under the benchmark model. A possible reason is that trade relations between economies under trade in value-added are different from the overall trade relations. In terms of the intensity of effects, the effects on export and trade are the most significant, and the effect on employment is relatively modest. For instance, the GDP effect is -1.058% and -0.869% under the benchmark model and the value chain model, respectively, and the effect for other countries is 0.592% and 0.738% under the benchmark model and the value chain model, respectively (see Figure 7).

Table 16: Sensitivity of the Economic Effects from Simultaneous 30% Reductions in Tariff and NonTariff Barrier to the Elasticity of Substitution (change in %)

Economy / variable	Social welfare	GDP	Manufacturing employment	Trade	Trade imbalance	Export	Import	Social welfare	GDP	Manufacturing employment	Trade	Trade imbalance	Export	Import
	Elasticity of substitution E=1.5							Elasticity of substitution E=2.0						
China	1.914	-0.881	0.751	3.867	-19.386	0.469	8.667	2.066	-1.058	0.959	5.075	-22.241	1.149	10.585
US	-0.026	0.049	0.227	0.349	-2.469	0.722	0.054	-0.039	0.063	0.316	0.466	-3.075	0.907	0.114
Other economies	-0.051	0.552	0.424	0.688	-2.528	1.671	0.077	-0.067	0.592	0.433	0.855	-3.708	1.825	0.174
World	0.269	-0.028	0.341	1.089	0.000	1.089	1.089	0.263	-0.018	0.432	1.389	0.000	1.389	1.389
	Elasticity of substitution E=2.5							Elasticity of substitution E=3.0						
China	2.180	-1.188	1.192	6.313	-24.261	1.964	12.392	2.271	-1.287	1.443	7.577	-25.713	2.873	14.133
US	-0.051	0.077	0.407	0.588	-3.677	1.094	0.180	-0.062	0.090	0.498	0.715	-4.273	1.282	0.252
Other economies	-0.078	0.619	0.436	1.006	-5.112	1.958	0.279	-0.085	0.638	0.438	1.147	-6.811	2.082	0.390
World	0.257	-0.007	0.524	1.687	0.000	1.687	1.687	0.251	0.004	0.618	1.985	0.000	1.985	1.985
	Elasticity of substitution E=3.5							Elasticity of substitution E=4.0						
China	2.345	-1.365	1.707	8.863	-26.765	3.852	15.837	2.406	-1.426	1.981	10.171	-27.531	4.884	17.518
US	-0.073	0.103	0.59	0.845	-4.864	1.472	0.331	-0.084	0.115	0.682	0.978	-5.450	1.662	0.414
Other economies	-0.091	0.654	0.438	1.282	-8.913	2.201	0.503	-0.096	0.667	0.438	1.412	-11.581	2.317	0.618
World	0.245	0.015	0.713	2.285	0.000	2.285	2.285	0.239	0.027	0.809	2.588	0.000	2.588	2.588

Source: Compiled based on GAMS software estimation results.

5.3 Elasticity and Sensitivity Analyses of the Benchmark Simulation Results

There is certain arbitrariness in the assignment of values to the elasticity of substitution of the production function and the utility function in model calibration, which makes it necessary to further test the sensitivity of simulation results to the elasticity of substitution. We selected the elasticities of 1.5, 2.0, 2.5, 3.0, 3.5 and 4.0 to re-calibrate parameters and simulate the economic effects of the import expansion strategy. For simplicity, we only conducted a sensitivity analysis of the circumstance of simultaneous tariff and nontariff barrier reductions by 30% with simulation results shown in Table 16.

Sensitivity analysis result reveals that with different elasticity values, no change has occurred in the direction of all the effects, but the intensity of effect increased by a modest degree with the value of elasticity. This indicates that the simulation results are robust and reliable.

6. Concluding Remarks and Policy Implications

In this paper, we created a large numerical model system of general equilibrium, in which tariff and nontariff trade barrier structures were introduced based on the needs of research. In addition, the monetary endogenous trade imbalance structure, the inside money trade imbalance structure and the value chain and trade in value-added structure were employed respectively to evaluate and assimilate the economic effects of China's import expansion strategy. Under China's import expansion strategy, the specific policy initiatives could be divided into three circumstances to simulate the effects on China and other major economies focusing on such indicators as welfare, GDP, manufacturing employment, trade and the level of trade imbalance, and further explore whether the import expansion strategy served China's own interests or those of other economies. Results of quantitative analysis are listed in Table 17.

Table 17: Self-interest and Altruistic Effects of China's Import Expansion Strategy

Category / indicator			Social welfare	GDP	Manufacturing employment	Trade	Trade imbalance	Export	Import
Benchmark model	Tariff	Benefits itself	√	×	√	√	√	√	√
		Benefits others	×	√	√	√	√	√	√
	Nontariff	Benefits itself	√	×	√	√	√	√	√
		Benefits others	√	√	√	√	√	√	√
	Trade cost	Benefits itself	√	×	√	√	√	√	√
		Benefits others	×	√	√	√	√	√	√
Inside money model	Tariff	Benefits itself	√	×	√	√	√	√	√
		Benefits others	√	√	√	√	√	√	√
	Nontariff	Benefits itself	√	×	√	√	√	√	√
		Benefits others	√	√	√	√	√	√	√
	Trade cost	Benefits itself	√	×	√	√	√	√	√
		Benefits others	√	√	√	√	√	√	√
Value chain and trade in value-added model	Tariff	Benefits itself	√	×	√	√	√	√	√
		Benefits others	×	√	√	√	√	√	√
	Nontariff	Benefits itself	√	×	√	√	√	√	√
		Benefits others	√	√	√	√	√	√	√
	Trade cost	Benefits itself	√	×	√	√	√	√	√
		Benefits others	√	√	√	√	√	√	√

Note: √ Denotes positive effect, and × denotes negative effect.
Source: Compiled based on simulation results.

Results of simulation analysis suggest that: (i) Overall, China's import expansion strategy benefits both itself and other economies and is conducive to the growth of China's economy and the global economy, welfare improvement and trade growth. Comparatively, however, the strategy will benefit other economies more than it does China and contribute more to global economic growth. (ii) All the three import expansion initiatives will effectively balance China's trade, and in comparison, the nontariff measures are more effective. (iii) Compared with tariff measures, the effects of nontariff measures are more positive and beneficial for China. While tariff measures are more effective at promoting the economic growth, manufacturing employment, export and trade balance of other economies, nontariff measures are more effective at boosting welfare and trade growth. (iv) The import expansion strategy will reduce China's GDP under the following mechanisms: First, the crowding-out effect: i.e. import expansion crowds out the consumption of domestic goods and thereby dents domestic demand and economic aggregate. Second, the price effect: Falling import tariffs lead to a decrease in the price of imported goods and the overall price level, thus causing nominal GDP to shrink.

Results of quantitative simulation analysis provide us with the following policy implications: First, in using a combination of tariff and nontariff measures under the import expansion strategy, China should focus more on reducing nontariff barriers, promoting trade facilitation, and integrating rules and standards. Second, although the import expansion strategy is conducive to consumption upgrade, industrial upgrade, employment and trade, its adverse effects on economic growth warrant attention. Third, the import expansion strategy is a policy option that benefits China and global economic growth. As a responsible stakeholder with an increasingly important role on the world stage, China should deepen reforms and launch a new round of opening up in the face of trade protectionism from developed

countries, take the initiative to increase imports, maintain the multilateral trading system, and contribute its strength to global economic growth.

References:

[1] Betina, V. D., R. A. McDougall, and T.W. Hetel. 2006. "GTAP Version 6 Documentation: Chapter 20 'Behavioral Parameters' . " *GTAP Discussion Paper.*

[2] Chen, Yongbing, Wei Li, and Xuefeng Qian. 2011. "Estimation of the Welfare Effect of the Growth of China's Import Species." *The Journal of World Economy,* 12: 76-95.

[3] Chen, Z., J. Zhang, and W. Zheng. 2017. "Import and innovation: Evidence from Chinese firms." *European Economic Review,* 94: 205-220.

[4] Dong, Yan. 2018. "Actively Expand Imports: Openness and Confidence in the New Era." *Economic Daily*, May 15.

[5] Gao, Lingyun, and Luolin Wang. 2010. "Import Trade and Total Factor Productivity of Industry." *China Economic Quarterly,* 2: 391-414.

[6] Gu, Xueming. 2018. "Expanding Imports Is an Active Choice Following the Laws of Economic Development." *Economic Daily,* May 18.

[7] Li, C., and J. Whalley. 2014. "China and the Trans-pacific Partnership: A Numerical Simulation Assessment of the Effects Involved." *The World Economy,* 37(2): 169-192.

[8] Li, Chunding, Chuantian He, and Chuangwei Lin. 2018. "Evaluating the Effects of China's Countermeasures to China-U.S. Trade Frictions." *China Industrial Economics,* 10: 137-155.

[9] Liu, Q., and L.D. Qiu. 2016. "Intermediate Input Imports and Innovations: Evidence from Chinese Firms' Patent Filings." *Journal of International Economics,* 103: 166–183.

[10] Novy, D. 2013. "Gravity Redux: Measuring International Trade Costs with Panel Data." *Economic Inquiry,* 51(1): 101-121.

[11] Patinkin, D. 1971. "Inside Money, Monopoly Bank Profits, and the Real-balance Effect: Comment." *Journal of Money, Credit and Banking,* 3(2): 271-275.

[12] Pei, Changhong. 2013. "Import Structure and Economic Growth: Rule and Enlightenment." *Economic Research Journal,* 7: 4-19.

[13] Shen, Qi, and Shimin Zhou. 2014. "Import Tariff Reduction and Enterprise Total Factor Productivity: Micro Evidence from China." *Journal of Management World,* 9: 174-175.

[14] Shoven, J.B., and J. Whalley. 1992. *Applying General Equilibrium*. Cambridge: Cambridge University Press.

[15] Wang, Haifeng. 2018. "Actively Expand Imports to Open up a New Phase of Opening Up." *Zi Guang Ge,* 5: 23-24.

[16] Wei, Hao, and Tian Fu. 2016. "Import Variety and the Consumer Welfare Effect in China: Evidence from Product-level Data." *China Economic Quarterly,* 4: 1683-1714.

[17] Wei, Hao, and Xiaoqing Li. 2018. "The Impact of Imported Inputs on Firm Employment Dynamics." *Statistical Research,* 1: 43-52.

[18] Whalley, J., and L. Wang. 2010. "The Impact of Renminbi Appreciation on Trade Flows and Reserve Accumulation on a Monetary Trade Model." *Economic Modelling,* 28: 614-621.

[19] Whalley, J., J. Yu, and S. Zhang. 2011. "Trade Retaliation in a Monetary-Trade Model." *Global Economy Journal,* 11(1): 1-28.

[20] Xu, Guangyao. 2007. "Import Trade Structure and Economic Growth Correlation Analysis of China." *Journal of International Trade,* 2: 3-7.

[21] Yang, Zhengwei. 2011. "International Experience and Countermeasures for Expanding Imports." *Intertrade,* 3: 10-13.

[22] Yu, Miaojie. 2018. "Five AspectsAnalyze that Expanding Imports Is Good for China's Economy." *China Business Times,* June 26.

[23] Zhan, Hua, and Jinping Yu. 2016. "Trade Policy, Expanding Imports and Unemployment." *World Economic Papers,* 1: 52-67.

[24] Zhang, Jie. 2015. "Study on the Inhibitory Effect of Imports on the Patent Activities of China's Manufacturing Enterprises." *China Industrial Economics,* 7:68-83.

[25] Zhang, Yongliang, and Zongsen Zou. 2018. "Variety, Quality and the Gains from Trade: An Analysis Based on the Price Index." *The Journal of World Economy*, 1: 123-147.

[26] Zhang, Yuyan. 2018. "Expanding Imports Is the Established Direction that China Adheres To." *Economic Daily,* May 21.

Appendix 1: Parameter Calibration of the Benchmark Model and Estimation Results

Attached Table 1: Calibration Results of Production and Level-1 Consumption Parameters

Economy	Production parameters for manufactured products			Production parameters for non-manufactured products			Level-1 consumption share parameters	
	Parameter of capital share	Parameter of labor share	Parameter of size	Parameter of capital share	Parameter of labor share	Parameter of size	Parameter of share of demand for non-manufactured goods	Parameter of share of demand for manufactured product portfolio
China	0.47	0.53	1.993	0.36	0.64	1.993	0.471	0.529
US	0.482	0.518	1.998	0.406	0.594	1.714	0.721	0.279
EU	0.34	0.66	1.815	0.296	0.704	1.815	0.706	0.294
Japan	0.36	0.64	1.854	0.464	0.536	1.854	0.614	0.386
Canada	0.353	0.647	1.842	0.353	0.647	1.842	0.456	0.544
Mexico	0.353	0.647	1.842	0.353	0.647	1.842	0.329	0.671
India	0.401	0.599	1.925	0.47	0.53	1.925	0.468	0.532
Russia	0.353	0.647	1.841	0.34	0.66	1.842	0.641	0.359
Saudi Arabia	0.36	0.64	1.854	0.401	0.599	1.854	0.484	0.516
Australia	0.36	0.64	1.854	0.423	0.577	1.854	0.621	0.379
Bahrain	0.409	0.591	1.935	0.36	0.64	1.932	0.164	0.836
Brazil	0.296	0.704	1.714	0.396	0.604	1.714	0.708	0.292
Brunei	0.451	0.549	1.981	0.367	0.633	1.99	0.103	0.897
Chile	0.354	0.646	1.842	0.36	0.64	1.841	0.49	0.51
Indonesia	0.423	0.577	1.954	0.353	0.647	1.954	0.35	0.65
South Korea	0.396	0.604	1.916	0.36	0.64	1.917	0.444	0.556
Kuwait	0.366	0.634	1.866	0.34	0.66	1.867	0.329	0.671
Malaysia	0.36	0.64	1.854	0.378	0.622	1.855	0.171	0.829
New Zealand	0.36	0.64	1.854	0.465	0.535	1.854	0.493	0.507
Peru	0.34	0.66	1.814	0.353	0.647	1.814	0.417	0.583
The Philippines	0.378	0.622	1.888	0.36	0.64	1.888	0.289	0.711
Qatar	0.465	0.535	1.99	0.378	0.622	1.99	0.383	0.617
Singapore	0.378	0.622	1.888	0.366	0.634	1.888	0.246	0.754
Thailand	0.366	0.634	1.866	0.296	0.704	1.866	0.341	0.659
Vietnam	0.378	0.622	1.888	0.378	0.622	1.888	0.131	0.869
ROW	0.360	0.640	1.854	0.36	0.64	1.854	0.078	0.922

Source: Compiled based on GAMS software calibration results.

Attached Table 2: Calibration Results of Level-2 Consumption Parameters (I)

Economy	Saudi Arabia	Australia	Bahrain	Brazil	Brunei	Canada	Chile	China	EU	India	Indonesia	Japan
Saudi Arabia	0.2240	0.0005	0.0050	0.0030	0.0090	0.0020	0.1740	0.1710	0.0160	0.0130	0.0140	0.0280
Australia	0.0680	0.1050	0.0490	0.0000	0.0140	0.0020	0.1130	0.1260	0.0330	0.0080	0.0420	0.0110
Bahrain	0.0090	0.0008	0.3360	0.0000	0.0110	0.0130	0.1250	0.1460	0.0170	0.0080	0.0210	0.0190

Continue

Economy	Saudi Arabia	Australia	Bahrain	Brazil	Brunei	Canada	Chile	China	EU	India	Indonesia	Japan
Brazil	0.0100	0.0000	0.0001	0.1150	0.0009	0.0003	0.3180	0.2230	0.0090	0.0150	0.0002	0.0150
Brunei	0.0050	0.0001	0.0110	0.0000	0.2990	0.0030	0.1080	0.0880	0.0090	0.0040	0.0260	0.0130
Canada	0.0050	0.0000	0.0810	0.0000	0.0130	0.1420	0.1910	0.1460	0.0140	0.0050	0.0340	0.0180
Chile	0.0240	0.0001	0.0210	0.0001	0.0070	0.0070	0.5410	0.0560	0.0050	0.0080	0.0380	0.0350
China	0.0050	0.0007	0.0140	0.0001	0.0120	0.0040	0.1390	0.3580	0.0180	0.0090	0.0290	0.0170
EU	0.0200	0.0007	0.0070	0.0004	0.0050	0.0020	0.0870	0.0590	0.4730	0.0170	0.0170	0.0160
India	0.0200	0.0004	0.0080	0.0001	0.0070	0.0007	0.1280	0.0400	0.0140	0.4820	0.0480	0.0200
Indonesia	0.0430	0.0020	0.0090	0.0030	0.0120	0.0090	0.1350	0.0740	0.0060	0.0200	0.3800	0.0210
Japan	0.0330	0.0010	0.0080	0.0010	0.0100	0.0080	0.1420	0.0930	0.0100	0.0170	0.0740	0.2010
South Korea	0.0000	0.0210	0.0110	0.0000	0.0110	0.0004	0.1630	0.1740	0.0380	0.0090	0.0500	0.0240
Kuwait	0.0260	0.0007	0.0140	0.0020	0.0050	0.0010	0.1720	0.0830	0.0290	0.0420	0.0670	0.0340
Malaysia	0.0010	0.0002	0.0160	0.0000	0.0180	0.0040	0.1870	0.0970	0.0130	0.0060	0.0450	0.0310
Mexico	0.0710	0.0001	0.0050	0.0000	0.0120	0.0030	0.1650	0.1420	0.0130	0.0170	0.0620	0.0330
New Zealand	0.0050	0.0000	0.0460	0.0000	0.0120	0.0200	0.1730	0.0840	0.0200	0.0110	0.0220	0.0150
Peru	0.0140	0.0001	0.0070	0.0004	0.0070	0.0006	0.1480	0.0740	0.0170	0.0580	0.0720	0.0580
The Philippines	0.0210	0.0002	0.0100	0.0000	0.0060	0.0007	0.0870	0.2360	0.0330	0.0050	0.0230	0.0080
Qatar	0.0050	0.0000	0.0140	0.0000	0.0040	0.0090	0.1880	0.2640	0.0160	0.0110	0.0350	0.0220
ROW	0.0070	0.0070	0.0170	0.0000	0.0130	0.0020	0.1160	0.1810	0.0240	0.0120	0.0280	0.0160
Russia	0.0150	0.0004	0.0070	0.0010	0.0060	0.0006	0.1190	0.1180	0.0170	0.0290	0.0600	0.0270
Singapore	0.0210	0.0007	0.0100	0.0030	0.0050	0.0020	0.1720	0.0660	0.0180	0.0290	0.1200	0.0310
Thailand	0.0040	0.0005	0.0110	0.0001	0.0570	0.0040	0.1520	0.1270	0.0180	0.0080	0.0420	0.0180
US	0.0130	0.0000	0.0090	0.0002	0.0040	0.0020	0.1700	0.0470	0.0130	0.0150	0.0520	0.1250
Vietnam	0.0010	0.0010	0.0090	0.0001	0.0030	0.0006	0.2120	0.4130	0.0560	0.0070	0.0150	0.0110

Source: Compiled based on GAMS software calibration results.

Attached Table 3: Calibration Results of Level-2 Consumption Parameters (II)

Economy	South Korea	Kuwait	Malaysia	Mexico	New Zealand	Peru	The Philippines	Qatar	ROW
Saudi Arabia	0.0003	0.0230	0.0060	0.0180	0.0030	0.0030	0.0020	0.0010	0.0030
Australia	0.0050	0.0060	0.0080	0.0010	0.0000	0.0007	0.0000	0.0020	0.2260
Bahrain	0.0010	0.0060	0.0190	0.0005	0.0090	0.0020	0.0010	0.0190	0.0110
Brazil	0.0000	0.0620	0.0005	0.0010	0.0000	0.0040	0.0004	0.0001	0.0003
Brunei	0.0001	0.0050	0.0230	0.0020	0.0030	0.0030	0.0002	0.0040	0.0080
Canada	0.0000	0.0040	0.0270	0.0030	0.0140	0.0010	0.0000	0.0020	0.0009
Chile	0.0050	0.0060	0.0020	0.0030	0.0050	0.0030	0.0030	0.0160	0.0110
China	0.0020	0.0090	0.0110	0.0020	0.0040	0.0050	0.0030	0.0460	0.0120
EU	0.0080	0.0080	0.0020	0.0010	0.0050	0.0010	0.0100	0.0110	0.0250
India	0.0010	0.0160	0.0020	0.0030	0.0004	0.0040	0.0060	0.0070	0.0170
Indonesia	0.0070	0.0120	0.0040	0.0030	0.0040	0.0100	0.0120	0.0170	0.0310
Japan	0.0190	0.0120	0.0040	0.0030	0.0060	0.0040	0.0220	0.0310	0.0350
South Korea	0.1470	0.0100	0.0030	0.0009	0.0001	0.0040	0.0020	0.0030	0.0570

Continue

Economy	South Korea	Kuwait	Malaysia	Mexico	New Zealand	Peru	The Philippines	Qatar	ROW
Kuwait	0.0040	0.0520	0.0030	0.0050	0.0010	0.0100	0.0040	0.0100	0.0280
Malaysia	0.0000	0.0050	0.1720	0.0010	0.0010	0.0020	0.0002	0.0080	0.0003
Mexico	0.0001	0.0210	0.0100	0.1920	0.0020	0.0030	0.0010	0.0050	0.0090
New Zealand	0.0000	0.0060	0.0320	0.0040	0.2520	0.0020	0.0001	0.0140	0.0080
Peru	0.0210	0.0220	0.0020	0.0050	0.0020	0.1920	0.0040	0.0170	0.0200
The Philippines	0.0090	0.0060	0.0070	0.0010	0.0008	0.0020	0.3400	0.0140	0.0003
Qatar	0.0000	0.0080	0.0060	0.0009	0.0020	0.0030	0.0003	0.2390	0.0020
ROW	0.0030	0.0070	0.0080	0.0040	0.0002	0.0030	0.0000	0.0140	0.3160
Russia	0.0250	0.0870	0.0100	0.0030	0.0001	0.0120	0.0160	0.0270	0.0410
Singapore	0.0060	0.0460	0.0030	0.0030	0.0009	0.0100	0.0120	0.0130	0.0340
Thailand	0.0008	0.0060	0.0640	0.0020	0.0030	0.0040	0.0006	0.0090	0.0070
US	0.0020	0.0230	0.0050	0.0020	0.0010	0.0060	0.0006	0.0060	0.0060
Vietnam	0.0030	0.0070	0.0070	0.0009	0.0010	0.0050	0.0020	0.0240	0.0100

Source: Compiled based on GAMS software calibration results.

Attached Table 4: Calibration Results of Level-2 Consumption Parameters (III)

Economy	Russia	Singapore	Thailand	US	Vietnam
Saudi Arabia	0.0220	0.0270	0.1050	0.0130	0.1170
Australia	0.0040	0.0090	0.0680	0.0050	0.0930
Bahrain	0.0030	0.0060	0.1120	0.0090	0.0960
Brazil	0.0540	0.0160	0.1150	0.0030	0.0380
Brunei	0.0020	0.0050	0.2920	0.0060	0.0840
Canada	0.0020	0.0120	0.1600	0.0110	0.1140
Chile	0.0060	0.0080	0.0350	0.0070	0.1480
China	0.0060	0.0070	0.0910	0.0130	0.1860
EU	0.0120	0.0060	0.0380	0.0060	0.1620
India	0.0340	0.0200	0.0360	0.0090	0.0770
Indonesia	0.0070	0.0160	0.0730	0.0130	0.0790
Japan	0.0120	0.0080	0.0890	0.0270	0.1280
South Korea	0.0060	0.0120	0.0830	0.0190	0.1520
Kuwait	0.1060	0.0460	0.0780	0.0190	0.1580
Malaysia	0.0040	0.0120	0.3040	0.0060	0.0660
Mexico	0.0210	0.0260	0.0960	0.0120	0.0800
New Zealand	0.0020	0.0070	0.1490	0.0110	0.1050
Peru	0.0270	0.0340	0.0640	0.0230	0.1130
The Philippines	0.0030	0.0050	0.1510	0.0060	0.0250
Qatar	0.0040	0.0070	0.0570	0.0090	0.0940
ROW	0.0060	0.0100	0.0950	0.0090	0.1040
Russia	0.0190	0.0200	0.1130	0.0070	0.2220
Singapore	0.0260	0.0920	0.0560	0.0210	0.2000
Thailand	0.0060	0.0080	0.3680	0.0130	0.0660
US	0.0140	0.0300	0.0340	0.1430	0.2780
Vietnam	0.0430	0.0050	0.0620	0.0110	0.0910

Source: Compiled based on GAMS software calibration results.