China's Trade Liberalization for WTO Accession and Its Effects on China
--A Computable General Equilibrium Analysis

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Abstract

This paper presents an assessment of both the short-run and long-run comparative static effects on China of trade liberalization commitments for China's WTO membership. This assessment is developed using our CGE model, PRCGEM. In this paper, the static and static plus growth effects and dynamic impact of the tariff cuts offered for China's WTO membership are simulated, and the results on Chinese macro-economy, sectoral trade patterns and output growth and regional output growth are analyzed.

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1. Introduction

In the 90's,Chinese government has taken a series of important steps to actively promote its trade liberalization in order to respond to the globalization trend of world economy and participate in international competition and cooperation on the basis of GATT/WTO rules. The steps of its trade liberalization are promised to APEC forum and required for accession to WTO membership. These steps include gradual reductions in China's tariff and non-tariff barriers (NTBs), especially those announced on April 1996 and October 1997 and committed on 15 November 1999 in Sino-U.S. WTO Deal.

Trade liberalization that composes mainly of tariff reductions and NTBs removal would bring benefits and drawbacks to one economy, and the comprehensive impact of trade liberalization has some uncertainty. Bruno (1997) thought that trade liberalization, in long run, would improve resource allocation efficiency and promote economic growth by introducing competition and benefit local consumers by decreasing cost per unit; however, in short run, trade liberalization would result in distribution cost by leaving open some highly protected sectors or negative balance of payments cost by rapid growth of imports. Agion and Montiel (1996) argued that trade liberalization would not necessarily result in decreases of employment and output and negative balance of payments. Sachs and Warner (1995) show in his multi-country cross-section analysis that the short-run impact of trade liberalization on one country's economic growth depends on the structure of that economy.

Given the uncertainty of the comprehensive impact of trade liberalization and the fact of Asian financial crisis, some people in academic and decision-making institutions cast doubt on the probable effects of trade liberalization on China. Trade liberalization offers for APEC Forum and China's WTO membership involve reductions in China's tariff and non-tariff measures. The gains may more than offset the losses from China's joining the WTO, however, the potential high cost of this move has raised doubt on the necessity of China's accession to WTO, especially in the short-run period in which deflation is still lasting and unemployment rolls bulging. The short-run and long-run comparative effects of trade liberalization on Chinese economy deserve serious assessment.

To comprehensively assess the potential economic effects on China of China's market accession commitments for WTO membership, we apply our CGE model, PRCGEM (PRC general equilibrium model), to isolate and measure the comparative effects of tariff reductions. Although the shocks of the Chinese terms-of-trade changes brought about by other members' trade liberalization, which may be computed by using GTAP (Global Trade Analysis Project) model (Adams,1998),has incremental impact on Chinese economy, this study would focus on the shocks of tariff cuts offered for China's WTO membership. The effects of the tariff liberalization for China's accession to WTO on Chinese macro-economy, sectoral trade patterns and output growth and regional output growth are simulated.

The main results show that tariff cuts induced by trade liberalization have minor but positive effects on macro-economy in terms of GDP and its component changes. Some industries win and others lose because of their differences in input and output patterns, as well as export transformation and import substitution possibilities. One region's responses to tariff shocks depend upon its industrial advantage.

2. Trade liberalization in China

Until 1992, China's trade barriers were still very high with a simple average nominal tariff rate as high as 43.2% and a variety of non-tariff measures including licensing, quotas, tendering and other controls. Since then, China has taken steps to greatly reduce tariffs and remove non-tariff measures pursuant to its bilateral commitments and to support its WTO accession bid.

2.1 Trade Pattern and Tariff Reduction

Chinese tariff rates operate as part of an industrial policy to protect its specific industry sectors and build its international competitiveness. Since 1992,China has speeded up its tariff liberalization. By 1998,China reduced six times its simple average tariff from 43.2% to 17.0%. Table 1 presents the details. On January 1999, the Ministry of Finance announced tariff reductions for 1014 commodities in the forestry, textile and toy sectors. On January 2000,China adjusted tariff schedule to increase the number of import tax codes from previous 6940 to 7062 and partially reduced further tariff rates. A total of 819 textile commodities have undergone tax rate reductions.

However, the actual tariff collection rate is far lower than the nominal tariff rate both because of legal tariff exemptions and illegal smuggling and corruption. The first three columns in table 2 provide a profile of China's trade pattern and actual tariff collection rates in 1997. In 1997,the trade weighted and simple average actual tariff rates at 40 sector level are only 2.49% and 2.44% respectively while the simple average nominal tariff rate is as high as 23% (17%) before (after) October 1997(see table 2). Hence, the official tariff rates should be scaled down to accommodate the tariff exemptions and smuggling so that the China's tariff barriers wouldn't be overestimated.

Table 1. Tariff Schedule Adjustments(1992-1999) %

	Nominal Tariff rate after adjustment	Tariff line	Coverage of tariff reduction
1992.01	43.2	225	3.6
1992.12	39.9	3371	53.8
1993.12	36.4	2898	45.6
1995.07	35.6	23	0.36
1996.04	23.0	4971	75.9
1997.10	17.0	4874	69.8
1999.01	16.5	1014	14.6

Source: 1992-1997,see Xiang Huaicheng(ed.), 1999 China Financial Report,p77.
1999, China Daily, January 7,1999.

In the Sino-US deal signed on November 1999 for China's accession to WTO membership, it is reported that China agreed to reduce its tariff rates on agricultural products to 14.5~15%, decreasing about by 12% from its 1997 tariff base. China pledged to cut its tariff rates on wood and paper to 5~7.5% by 2005,decreasing about by 55% for wood products and 49% for paper products ; lower its industrial tariffs to an overall average of 9.4% by 2005, decreasing

about by 53.7% from its 1997 tariff base for other industrial products on average.

Taking into account the differences between nominal tariff rates and actual tariff collection rates, we use the actual import and tariff revenue in 1997 (see table 2) as the base year data. Due to no more information may be available about the final offer by China for its accession to WTO membership, tariff rate reduction on sector will be given just like available information presented; otherwise, the average tariff reduction will be imposed for other industrial sectors. In the following, this tariff reduction is chosen as a shock and its effect is isolated and analyzed.

2.2 Removal of Non-Tariff Barriers to Trade

China's non-tariff barriers (NTBs) to trade usually include a broad array of licenses, quotas, tendering, state trading, and other controls. Combined with high tariffs, Chinese NTBs overlap and serve as a web of protection for its specific domestic industries. As a result, the removal of NTBs is also required for its accession to the WTO membership. In fact, China has removed over 1000 quotas and licenses on a wide range of commodities since 1992. The number of products requiring licenses and quotas is said to be so far only 395.

Despite the removal of quotas and license requirements during the period 1992-1998,China is required to remove further NTBs for its WTO accession. Among them include the elimination of China's WTO-inconsistent licensing, quotas and tendering requirements, the elimination of China's trade-related investment measures, and market openings in specified Chinese serviced sectors, etc. Given the significance of NTBs in China's trade policy regime, it is in any event meaningful to quantify the probable economic impact of the removal of NTBs in the context of China's WTO accession. However, quantitative estimates of the impact of the required China's NTBs are precluded because of necessary data limitation except for Zhang's calculation of tariff equivalents (TEs) for China's NTBs(see table 3). Zhang(1998) applied the calculation to imports of 25 of China's most highly protected products, covering only 30% of all Chinese imports in 1994.

This study includes no quantitative estimates of the impact of liberalization of China's NTBs specified in the offer for accession to WTO. It does not mean that it is inessential to incorporate the estimated TEs for China's NTBs, at least, into the following model framework to quantify its impact on Chinese economy. Rather, it is left open for model revised in the time provided for this paper. In addition, data on levels of protection for trade in services are not available. Therefore, the effects of trade liberalization are underestimated and mainly subject to those derived from tariff liberalization for China's accession to WTO.

3. The PRCGEM Model and Base Year Data

Trade liberalization for China's accession to WTO affects the Chinese economy through the interactions among domestic economic agents (producers and consumers),sectors and macroeconomic variables as well as foreign trade and trade-related investments. The use of computable general equilibrium (CGE) models to simulate the effects of trade liberalization has rapidly become a formal practice. This is because quantitative assessments made with CGE models are usually more detailed and comprehensive than those made through other methods.

This study quantifies the impact of probable tariff offer specified for China's WTO membership by employing a single-country CGE model, described as PRCGEM in the following. In the time provided for this study, we miss the chance to combine the PRCGEM with the GTAP model to incorporate the terms-of-trade shocks because the version 4 GTAP database is not available.

3.1 The PRCGEM Model

The PRCGEM model used in this study is a new version of the one that has been constructed by the Center of Policy Studies,Monash University and the Institute of Quantitative and Technical Economics of the Chinese Academy of Social sciences (Adams,1998). It is a single-country CGE model and follows the standard assumptions as most CGE models regarding perfect competition, constant return to scale, national product differentiation in trade goods, and small-country assumption about the import price. On the supply side, as with the original version of PRCGEM, each producer is assumed to purchase an intermediate input from domestic and foreign markets and employ a composite primary factor of production both on CES basis to seek the least costly means of producing a given level of output. The producer supply the domestic absorption and foreign export on CET basis to maximize profits and pay wages to labor and rentals to owners of capital. On the demand side, three agents are assumed: a private household disaggregated into peasant and non-peasant, the government and an investor. The household is assumed to allocate its income from factor returns to consumption of domestic and import goods and savings to seek utility maximization. The government is assumed to exogenously consume composite goods by taxation revenue. The investor collects savings from the three agents and foreign savings to buy capital commodities on CES basis, which is assumed to be bound by fixed investment/capital ratios or related to relative rates of return in each industry. The export demand is assumed to be downward-sloping and import supply infinite elastic. The price behavior is money-neutral. Equilibrium is reached when demand equals supply for all goods and factors, each industry earns zero profit and gross investment equals aggregate savings.

The PRCGEM has the flexibility to switch for comparative static simulations or dynamic forecasts by altering the closure. The capital-accumulation dynamics (Horridge,et al,1996) is incorporated into the model. When equations describing the accumulation of capital between periods are turned off , the base period for the model will not change and the model can be used as a single-period comparative static one to produce short-run or long-run simulations. A comparative-static simulation quantifies the deviation of the state with a policy change from the state without the policy change. It is a counterfactual scenario. The usefulness of a comparative-static analysis is that the impact of a policy change can be isolated, the simulated results can only be attributed to the relevant policy change. When the equations describing the accumulation of capital between periods are turned on, however, the base for the model will be updated from one to next periods at the same time policies are implemented, and the model can be used as a multi-period dynamic forecasts. In this case, factors of production and GDP are simultaneously updated over time along with policy changes. The usefulness of a dynamic analysis is that it can be used to replicate known development patterns from the recent past and forecast the possible development patterns in the coming future by incorporating the technical changes and adjustment costs, which close the gap between model and actual outcomes in tracking history exercise.

The capital-accumulation dynamics as an inter-period linkage is often emphasized in dynamic modeling of trade liberalization since this is the most essentially time-sensitive behavior and is lacking from static models. The specification of the capital-accumulation dynamics in the PRCGEM model is similar to that in Horridge(1996). Capital stock is defined as the last period's capital stock plus net investment. The net investment equals to gross investment minus depreciation and is assumed to be new production capital in the next period. Hence, Accumulation patterns for capital stock at industry levels depend upon the depreciation rate, gross investment rate and the allocation of gross investment among industries. In the PRCGEM model, the gross investment is endogenously specified to allocate among industries according to fixed investment/capital ratio or relative rate of return in each industry while the gross investment rate is set exogenously. In addition, along the dynamic path, economic growth is determined by exogenously set labor force growth rate, endogenously set rural-urban migration flows, the rate of total factor productivity (TFP) growth, as well as accumulation of physical capital stocks. The growth rates of sector-specific and economy-wide TFPs are so far exogenously set, but can be solved endogenously by closing the gap between model and actual outcomes in tracking history exercise.

The new version of PRCGEM distinguishes 124 commodities and 31 regions within China. Despite of this detailed disaggregation, key sector results in the following are just presented at an aggregated 40-sector level.

3.2 The 1997 Database

The model's base year database itself is an extended input-output table, which includes a capital formation table as well as the current flow table. The current flow table was compiled from the 124×124 commodities Basic Matrix of the 1997 Input-Output Table of China. The capital formation table, also called B matrix, was compiled according to relevant information in 1995 to provide investment usage at industrial level and facilitate the capital-accumulation dynamics specification. The composition of employment at 40-sector level was derived based on the wage share in the 1997 input-output table and the employment data at 15-sector level in 1998 China Statistical Yearbook. Additional data was also used to derive the actual tariff revenue at 124-sector level and the regional database.

The behavioral parameters employed in the new version of PRCGEM model have been revised according to new information. For example, the elasticities of substitution between primary factors of production for industrial sectors have changed to the estimated values from Gong and Lloyd (1999), and export demand elasticities were set at –3 rather than -5. However, most of other required elasticities were still assigned according to literature reviews.

4. The Database Update and the simulation results

To simulate the impact of China's tariff offer in 1999 for its WTO accession, it is required to adjust the 1997 database to create a 1998 database. Hence, in section 4.1, we first turn on the capital-accumulation dynamics and use this recursive dynamic version of PRCGEM to update the base year for trade policy analysis from 1997 to 1998. Then in section 4.2, the comparative-static impact, both with and without growth effects, of China's tariff reductions for WTO accession are simulated and presented after relevant macro closures are set up.

4.1 The Database Update for the year 1998

The current database for PRCGEM refers to 1997. Hence, it should be adjusted to conduct the comparative static analysis for the base year 1998.The technique for updating the complete database and generating the required data, described by Horridge (1996), is to use the dynamic PRCGEM model to project the economic development in 1998. In doing so, all variables for which historical changes can be observed should be set as exogenous so that we changes in technology and tastes will be endogenised. From the estimated changes in technology and tastes we can inferred their values to update the database for the year 1998.

Most macro variables and structural variables are observable and expert forecasts for them are available. In the time to provide this study, most structural variables at 40-sector level are still unavailable while macroeconomic variables for gross trade, household consumption, government expenditure, and investment are available. Table 4 presents these aggregates and their real growth rates in 1998. We update the database from 1997 to 1998 by employing the dynamic PRCGEM model to simulate the impact of these observed changes in macro variables. The actual changes in these macro variables are accommodated in the dynamic PRCGEM model exogenous by endogenising the relevant changes in technology and tastes. Preliminary structural results from the historical data-updating simulations are reported in table 5.

With the exception of real output changes for agriculture and construction, changes in output, employment, export value and import volume at industrial levels are generated by dynamic PRCGEM rather than from observed data. For agriculture and construction sectors, the inferred all factor augmenting technical changes are respectively –0.1% and –1.59% to accommodate the actual changes in output; otherwise, the modeling results for changes in GDP are respectively 2.9% and 13.6% without consideration of technology changes. The gaps between the actual data and estimated data, therefore, represent the historical movements in technology and tastes, which are very useful in explaining structural transformation in the economy.

4.2 Two Simulations and Results with the PRCGEM

To isolate and quantify the impacts of the tariff reductions for China's accession into the WTO, two comparative-static simulations are specified with the PRCGEM. As indicated in USITC(1999),the first simulation is designed to quantify just the static gains associated with factor reallocation efficiency, while the second simulation estimates also the secondary effects beyond the static effects, i.e., the growth effects associated with factor augment. Since all factors of production are held constant, the static gains stems from factor reallocation from less productive activities to more productive activities induced by trade liberalization. The growth effects stem from growth in production capacity and TFP because the additional income and savings resulted from policy-induced static gains can stimulate new investment and augment productive capacity and enhance TFP. The scenario with growth effect can be interpreted as a long-run adjustment whereas their exclusion represents more of a short tern adjustment. The inclusion of growth effects in a comparative framework implies that adjustments from policy-induced endowment growth are considered, even though the adjustment period for growth effects to fully materialize is not known.

Macro closures have been set up before the two simulations can run. For the first simulation, the closure mainly includes the following assumption:

- capital stock in each industry is fixed;
- the aggregate investment is fixed, and it is allocated among industries according to changes in relative rates of return.
- the aggregate labour supply is fixed, and is mobile between industries and has fixed inter-industry wage relativities.

For the second simulation, the closure is assumed as follows:

- ✧ the supply of capital is elastic and the rates of return on new capital is fixed in each industry;
- ✧ investment in each industry is proportional to capital stock in that industry and aggregate investment rate is fixed;
- ✧ labour supply is fixed in total and is mobile between industries and has fixed inter-industry wage relativities.

In addition, it is assumed in both simulations that real consumption by each household moves with GDP and government consumption moves in line with aggregate household.

After the closures are set up, the single-period version of the PRCGEM model is employed to simulate the static effects both with and without growth effects of tariff reductions for China's accession into the WTO, which is provided at the final column of Table 2. As noted above, the effects of liberalization of trade in services and the removal of NTBs are excluded from these simulations, and the overall effects of China's trade liberalization are understated, even though the estimated tariff equivalents for China's NTBs for selected products may be incorporated later.

Table 6 to 9 provides the comparative-static model results for 1999's tariff offer in Sino-US deal on Chinese macroeconomic variables, trade, output and employment at 40-sector level and disaggregated output at 31-region level. Unless otherwise indicated, most results are simulated for the base year 1998, accounting for both static effects and growth effects separately.

5. The Propagation Mechanism behind the Results: An interpretation

5.1 Macro Results

The potential effects on China's macroeconomic variables of the tariff reductions are shown in Table 6. Under the static case, China's real GDP would increase 0.06%. On the supply side, the increase in real GDP must mainly result from factor reallocation efficiency. Some of the efficiency gains would come about through labor migration from rural into urban parts, which results in the 0.02% decreasing in rural employment and the 0.07% increasing in urban employment. Real average wage is forced to rise by 1.10% because of this labor migration. Average capital rental would be brought down by 1.82% because imports subject to tariff reductions are a large component of the cost of constructing capital. On the demand side,

export increases 5.73% because of the 3.34% real devaluation and the –1.84% shift in China's terms of trade both induced by tariff reductions; import increases 7.26% because of changes in relative prices which induce substitution between domestically produced goods and foreign goods. As a result, the balance of trade would be forced to move towards deficit. And real household and government consumption is linked to real GDP by the closure..

However, as noted above, the static estimation would bias the overall impact on China's macroeconomic variables by ignoring policy-induced growth effects. If the growth effects from China's tariff reductions are accounted for, China's real GDP would be enhanced to increase by 0.62%. This implies that the growth effects would rely more on induced new capital than on sectoral reallocation of fixed capital. The results indicate that real investment would increase by 1.59% and capital stock 1.68%. Since rates of return on new capital are fixed by closure, the new capital would employ more rural labor to substitute for urban employment, resulting in 0.17% increase in rural employment and 0.01% decrease in urban employment. For growth to take place from trade liberalization, China's terms of trade would have limited improvement.

5.2 Sectoral Results

Table 7 and table 8 set respectively forth the likely effects without and with growth effects on trade pattern, employment and output at 40-sector level as a result of China's tariff reductions. Why some sectors have done better than others in the context of the effects of tariff reductions on their outputs? For example, instruments sector would benefit most from China's tariff reductions in either case, its output increasing by 3.25% in static case and 4.62% in growth case; metal ore mining sector, however, would lose most, its output decreasing by –2.25% in static case and –2.07% in growth case. Without losing generality, analysis made in the following will focus on the growth case unless otherwise indicated.

The effect on China's trade by sector relies largely on trade dependence ratio and relevant elasticity of substitution / transformation of industry trade. The tariff reductions would have different impacts, the second column in table 7-8, on highly protected sectors and import competitive sectors. For highly protected industries, the initial response is inactive to face greater foreign competition. The sector 17,Transport Equipment, is such a case for which import would decrease by -1.52% in static simulation and just increase by 0.06% (see row 17 in table 7-8) when growth effects are accounted for. It is so because this sector is a relative highly protected one with the nominal rate of 28.1% and a self-servicing sector with the intra-sector usage ratio to its total sales of about 50%. For less protected and import-depended industries, their profitability is enhanced and would import more to substitute away from higher-cost domestic goods in favor of cheaper foreign-produced goods. Sector 19 (Electronic and Telecommunications Equipment) is such a sector with 26.4% imported inputs to total intermediate inputs. The estimated results show that for sector 19, import would respectively increase by 6.79% and 7.46% in comparative-static simulations without and with growth effects.

The effect on China's export at 40-sector level, the first column in table 7-8, is very ambiguous, depending largely on whether an industry is domestic-oriented or export-orientated. If an industry is highly export-oriented, its export would be expected to increase strongly. For example, sector 20 (Instruments and Meters) is the most export-oriented sector with a 49.7% export ratio to its total sales. And its export would respectively increase 7.38% and 9.30% in comparative static simulation without and with growth effects, the second best in either case as indicated by the estimated results in Table 7-8. In contrast, if an industry is

domestically oriented in their sales, its export would not be expected to increase much. For example, sector 4 (Metal Ore Mining) is a highly domestically-oriented sector with a 99.18% ratio of domestic usage to its total sale, and its export would respectively increase just 4.68% and 3.08% in the static simulation without and with growth effects (row 4 in table 7 -8).

Changes in output by sector, the fourth column in table 7-8, provide a more comprehensive understanding of the structural changes that would likely result from China's liberalization. An interpretation of the changes in output by sector requires us note the cost and sale structures underlying in the base data year. As mentioned above, an industry would have different response because of the difference in the industrial character, import competing, domestic oriented, or export oriented. The impacts of China's WTO accession on industrial outputs rely heavily on China's existing trade patterns and the input-output compositions

In fact, changes in output by sector can be broken into:

(1) Contribution of change in the local-market demand for domestic and imported goods;

(2) Contribution of change in import leakage because of import substitution;

(3) Contribution of change in exports.

The three contributions from domestic market effects(Con_Dom), import leakage effects (Con_Imp) and export effects(Con_Exp) are respectively reported in the last three columns in Table 7 and Table 8. This decomposition implies that changes in output by sector are the combinations of domestic-market effects, import leakage effects and export effects that would be induced by China's trade liberalization. In the following, three industries are chosen as samples so that the mechanisms underlying the industrial changes in output can be interpreted in details. The three industries are Metal Ore Mining (sector 4), Electronic and Tele-communication Equipment, and Instruments and Meters.

In the context of changes in output by sector, Instruments and Meters would be the largest winner of China's accession. Its output would increase by 3.25% in static case and 4.62% with growth effects. It is so because it is export-oriented, export accounting for 49.72% of the total sales of this sector. The induced change in export, increasing by 7.38% in static case and 9.30% with growth effects, would contribute 3.11% (=49.72%*7.38%) in state case and 3.91% with growth effects to the change in the sector's output. The contribution of the export expansion predominates the change in its output because both the domestic market expansion and import competition contribute a minor but positive effects to its output change.

As set forth in the sixth column of Table 7 and Table 8, the Metal Ore Mining industry would be the largest loser of China's accession. Its output would decrease by -2.25% in static case and –2.07% with growth effects. It is the largest domestically-oriented sector with a moderate dependence ratio (5.68%) of imports to total inputs and a weak protection. The great tariff reductions would drive the domestic-market demand contraction and import expansion to substitute higher-cost domestic goods for cheaper imports. As a result, the negative contributions of domestic-market demand and import competition would be imposed to predominate the changes in its output both in static case with and without growth effects.

The Electronic and Telecommunication Equipment sector is chosen as a sample for its typical

character of high import dependence ratio and trade orientation. According to the base year data, the dependence ratio of import to total inputs in this sector is 26.41% and 36.4% of sales is for export. Its import would be driven to moderately increase by 6.79% in static case and 7.46% with growth effects. However, the domestic market demand would be impeded to increase slower than its import because of its export orientation. As a result, import competition would negatively contribute to the changes in its output even though the induced 9.45% increase under the static case and the 10.66% increase under growth case in export would respectively contribute 3.03% and 3.41% to the changes in its output. The large contribution of export growth is offset by the negative contribution from import competition. Combined with the contribution from domestic-market demand, the output in this sector would be driven to increase by just 1.64% in static case and 2.90% with growth effects.

5.3 Region Output Results

Table 9 sets forth the effects on regional outputs in both simulations. The top-down disaggregation of the effects on the outputs of 31 regions follows the method of Monash Model. The industries in PRCGEM are classified as local industries and national industries. Local industries produce commodities (mainly services) that are not traded between regions. For these industries, it is assumed that demand in each region must equal to supply in that region. National industries, however, produce commodities that are traded between regions. For these industries, it is assumed that the same percentage change output applies to all regions. Hence, the differences in region's responses to the liberalization of tariff barriers are magnified by local industries.

We will not provide further analysis in details to illustrate the underlying mechanisms because of space limitation. What we want is just to indicate the following points:

(a) some regions have better aggregate responses than others because the industrial mix in these regions are relatively favored by the trade liberalization and the trade liberalization has a greater impacts on the industrial mix;

(b) the overall effects of China's accession on regional outputs would be understated if growth effects induced by China's trade liberalization are excluded from comparative static analysis.

6. Conclusion Remarks

A comparative static analysis is made to assess both the static effects with and without growth effects on Chines macroeconomy, sectoral structure and regional outputs of the proposed tariff liberalization for China's accession into WTO. This assessment is made by employing the PRCGEM model. Even though the capital-accumulation dynamics is incorporated in the new version of the PRCGEM model, the comparative static assement is still chosen because of the difficulty to specify the shock distribution from China's trade liberalization over time. The liberalization of tariff as well as non-tariff barriers is by any means scheduled to be staged over time.

Even though the liberalization of non-tariff barriers is not included in the simulations and hence the effects of China's WTO accession are understated, adjustments from endowment

growth are taken into consideration by accounting for growth effects in a comparative static framework. Based on the above assessments, we can reach the following conclusions that are of importance for policy implications.

First, China's accession to WTO would produce a positive but minor effects on its GDP and strong effects on its trade patterns. The growth effects beyond the static gains suggest that China's competitiveness in world trade would be enhanced but the reliance on imported goods would be increased.

Second, China's accession to WTO would reinforce structural transformation that has already been taking place over time. This implies that China's accession to WTO would benefit from its trade liberalization by improving economic efficiency and stimulating economic growth, with the costs from redistributing income from protected "losers" to export-oriented "winners" at sector and regional levels.

Third, the adjustments associated with China's accession to WTO are of great importance both in the model world and in the real world. Serious considerations of the adjustments deserve so that the full probable effects of China's accession to WTO can be captured and effective policies can be applied.

Table 2. Trade Pattern in 1997 and Tariff Rate by Sector

Sector	Exports (FOB)	Imports (CIF)	Actual Tariff Rate[1] (1997.1-12)	Nominal Tariff Rate[2] (1996.4-1997.10)	Tariff Cuts for WTO Membership[3](%)
1 Agriculture	408.27	399.95	1.54	27.2	-12.00
2 Coal	69.15	8.01	1.00	5.6	-41.00
3 Crude & Natural Gas	235.34	456.95	0.25	8.4	-41.00
4 Metal Ore	9.84	203.21	0.01	0.2	-41.00
5 Non-Ferrous Mineral	75.44	100.34	0.84	7.3	-41.00
6 Food Products	733.15	470.64	2.98	39.5	-41.00
7 Textiles	1711.53	873.96	5.51	29.0	-41.00
8 Clothing	2156.04	331.15	4.30	41.8	-41.00
9 Wood	294.49	118.54	2.79	28.1	-55.00
10 Paper	679.01	454.72	2.92	22.6	-49.00
11 Petroleum Processing	177.95	394.53	1.10	8.1	-41.00
12 Chemicals	1514.37	2113.02	2.73	17.4	-41.00
13 NonMetal Products	299.52	106.22	3.83	26.9	-41.00
14 Metals Processing	484.99	821.60	1.43	9.8	-41.00
15 Metal Products	650.43	335.02	2.45	20.4	-41.00
16 Machinery	482.87	1758.70	2.43	16.5	-41.00
17 Transport Equipment	310.79	476.93	3.31	33.7	-11.00
18 Electric Equipment	887.30	515.16	3.22	26.5	-41.00
19 Electronic Equipment	1782.39	1697.32	2.26	18.1	-41.00
20 Meters	412.77	345.14	3.29	21.9	-41.00
21 Maintenance	0.00	0.00	0.00	0.0	0.00
22 Other Manufacturing	406.05	114.15	6.51	0.0	0.00
23 Scrap & Waste	0.00	0.00	0.00	0.0	0.00
24 Electricity	38.20	0.19	0.53	3.0	0.00
25 Gas	0.00	0.00	0.00	0.0	0.00
26 Water	0.00	0.00	0.00	0.0	0.00
27 Construction	24.46	50.12	0.00	0.0	0.00
28 Transport& Warehousing	296.33	0.00	0.00	0.0	0.00
29 Post & Telecom.	110.81	24.18	0.02	0.0	0.00
30 Trade	0.00	0.00	0.00	0.0	0.00
31 Restaurants	112.31	43.12	0.00	0.0	0.00
32 Passenger Transport	178.25	85.31	0.00	0.0	0.00
33 Finance & Insurance	16.92	44.07	0.00	0.0	0.00
34 Real Estate	0.00	0.00	0.00	0.0	0.00
35 Social Services	755.18	367.21	0.00	0.0	0.00
36 Health Welfare	5.28	11.64	0.00	0.0	0.00
37 Education & Media	41.39	17.75	0.93	0.0	0.00
38 Research	0.00	0.00	0.00	0.0	0.00
39 General Services	0.00	0.00	0.00	0.0	0.00
40 Public Administration	5.41	20.23	0.00	0.00	0.00
Aggregate	15366.22	12759.07	2.49	23.0	-41.00

Notes: 1. Trade weighted; 2.simple average; 3. Estimation made by authors according to the Sino-US deal.

Table 3. Non-Tariff Barriers for selected products in China in 1994

product category	NTBs (%)
Food:	
Sugar	111.4
Wheat	72.4
Repressed Oil	88.6
Beverages:	
Soft Drinks	40.6
Inedible Raw Materials	
Plywood	26.1
Wool and Wool tops	4.2
Synthetic fiber(artificially produced)	7.0
Crude oil	16.7
Natural rubber	12.9
Synthetic rubber(artificially produced)	12.9
Fossil-fuel products:	
Gasoline	18.7
Diesel fuel	26.2
Chemicals:	
Aluminum phosphate plastics (chemically produced)	72.4
Plastics(chemically produced)	11.9
Manufactured goods	
Rooled-steel final products	23.8
Copper and cooper products	7.2
Aluminum and aluminum products	9.5
Transportation equipment:	
Motorcycles	11.2
autos(sedans)	24.2
Miscellaneous manufactured goods	
colored television	18.6
Videocassette recorders	46.3
Air conditioners	14.7
Microcomputers	6.0
Color tubes	18.6
Program-controlled switchboards	9.0
total/average	22.1

Source: Zhang Shuguang, Zhang Yansheng, and Wan Zhongxin, Measuring the costs of protection in China, (Washington,DC:Institute for International Economics, Unirule Institute of Economics,1998).

Table 4. Some Aggregates in 1997 and 1998

	1997 (100 million)	1998 (100 million)	1997-1998 Real Growth rate(%)
employment	6.96	7.00	0.5
fixed investment	25154.2	28180.8	12.2
peasant consumption	17436.8	17667.3	2.3
non-peasant consumption	17417.7	19253.9	11.1
government consumption	8724.9	9484.8	9.5
export	15160.7	15231.7	0.5
import	11806.5	11622.4	2.0
CPI			-0.8
export price index			-6.6
peasant nominal income			4.6

Source: State Statistical Bureau, *1999 China Statistical Yearbook*.

Table 5. Forecasts for Structure in 1998 (annual % growth rates)

No	Sector	real output	real employ	export value	Real import
1	Agriculture	3.50	-4.21	2.27	-5.29
2	Coal	12.18	7.12	5.89	1.62
3	Crude Petro.& Natural Gas	12.10	26.21	-2.74	19.55
4	Metal Ore	14.08	14.94	3.83	8.35
5	Non-Ferrous Mineral	12.01	9.14	4.70	4.21
6	Food Products	3.84	-4.57	3.62	-7.58
7	Textiles	1.41	-7.22	1.48	-8.83
8	Clothing	-0.67	-10.09	-4.98	-9.80
9	Wood	9.22	4.49	3.66	1.40
10	Paper	7.24	1.38	2.99	-1.12
11	Petroleum Processing	12.05	9.44	1.70	8.68
12	Chemicals	9.12	4.29	3.57	0.99
13	NonMetal Products	9.44	5.38	4.48	-0.99
14	Metals Processing	15.23	12.13	5.15	6.93
15	Metal Products	6.49	0.50	2.35	-0.90
16	Machinery	10.15	8.01	3.52	3.07
17	Transport Equipment	6.88	-0.81	4.19	-1.65
18	Electric Equipment	10.69	8.15	2.22	6.57
19	Electronic Equipment	7.72	0.79	-6.59	5.32
20	Meters	9.12	4.85	-7.71	7.56
21	Maintenance	11.25	9.29	-28.40	0.00
22	Other Manufacturing	6.96	3.80	1.64	-2.29
23	Scrap & Waste	9.31	8.73	-25.92	0.00
24	Electricity	12.51	7.38	5.94	0.00
25	Gas	13.90	4.73	7.92	0.00
26	Water	9.00	5.19	-28.58	0.00
27	Construction	11.80	5.86	7.07	3.29
28	Transport & Warehousing	9.83	2.19	6.58	0.00
29	Post & Telecom.	12.07	3.48	8.54	1.56
30	Trade	6.56	0.20	-29.06	0.00
31	Restaurants	8.12	3.02	4.54	-1.70
32	Passenger Transport	8.71	1.93	4.58	0.33
33	Finance & Insurance	8.06	4.26	5.11	-0.78
34	Real Estate	8.92	-9.02	-39.37	0.00
35	Social Services	9.98	2.76	5.19	0.51
36	Health Welfare	11.53	3.05	7.48	6.15
37	Education & Media	8.61	-0.16	8.44	1.65
38	Research	10.26	2.16	-30.06	0.00
39	General Technical Services	10.61	7.32	-28.18	0.00
40	Public Administration	10.24	-1.84	11.47	10.13

Table 6. Aggregate Impact of Tariff Cuts in Sino-US Deal %

Aggregate Variables	Static Effects	Static+growth Effects
Real Investment	0.00	1.59
Household Consumption	0.06	0.62
Export Volume(FOB)	5.73	5.54
Import(CIF)	7.26	9.05
GDP_exp	0.06	0.62
Capital Stock	0.00	1.68
Employment	0.00	0.00
Rural Employment	-0.02	0.17
Urban Employment	0.07	-0.01
Investment Price Index	-3.35	-2.86
Consumer Price Index	-2.82	-2.25
Export Price Index	-1.84	-1.78
Import Price Index(i.m.p)	-7.51	-7.51
GDP Defalator	-3.23	-2.71
Capital Rental	-1.82	-2.86
Real Average Wage	1.10	1.91
Ordinary Change in % (Balance of Trade)/GDP	-0.22	-0.59
Terms of Trade	-1.84	-1.78
Real Devaluation	3.34	2.79

Table 7. Static Impact of Tariff Cuts by Sector %

	Exports	Imports	Employment	Output	Con_Dom	Con_Imp	Con_Exp
1	3.52	0.10	-0.02	-0.02	-0.08	0.00	0.06
2	4.13	11.79	-0.20	-0.14	-0.22	-0.04	0.12
3	6.47	4.95	-5.57	-1.26	-0.50	-1.53	0.78
4	4.68	7.40	-3.84	-2.25	-0.98	-1.31	0.03
5	4.36	10.39	-0.75	-0.49	-0.12	-0.54	0.17
6	3.94	12.35	-0.25	-0.11	0.05	-0.37	0.21
7	4.95	11.17	1.59	0.79	0.72	-0.85	0.93
8	7.13	12.13	3.58	2.28	0.36	-0.56	2.48
9	4.98	16.49	-0.06	-0.04	0.11	-0.77	0.63
10	4.85	12.98	-0.67	-0.40	0.07	-1.19	0.73
11	6.82	6.87	-1.55	-0.58	-0.10	-0.82	0.35
12	5.26	8.35	-1.23	-0.60	-0.04	-1.05	0.50
13	4.65	11.77	0.10	0.06	0.03	-0.12	0.15
14	4.99	8.76	-1.47	-0.92	-0.34	-0.87	0.28
15	5.23	9.89	0.11	0.07	0.01	-0.60	0.66
16	5.07	7.72	-2.92	-1.49	-0.23	-1.55	0.28
17	5.03	-1.52	1.17	0.59	0.16	0.14	0.29
18	5.68	8.78	0.66	0.35	0.25	-0.73	0.83
19	9.45	6.79	3.57	1.64	0.58	-1.92	3.03
20	7.38	0.23	6.20	3.25	0.14	0.00	3.11
21	0.00	0.00	0.05	0.03	0.03	0.00	0.00
22	4.70	0.21	1.86	0.95	0.16	0.00	0.78
23	0.00	0.00	-1.43	-0.71	-0.71	0.00	0.00
24	4.65	0.00	-0.62	-0.19	-0.23	0.00	0.04
25	4.66	0.00	0.04	0.04	0.04	0.00	0.00
26	0.00	0.00	-0.19	-0.08	-0.08	0.00	0.00
27	4.69	0.01	0.02	0.01	0.01	0.00	0.01
28	3.97	0.00	0.39	0.20	-0.11	0.00	0.31
29	3.60	-0.07	0.59	0.13	-0.07	0.00	0.20
30	0.00	0.00	0.06	0.04	0.04	0.00	0.00
31	3.73	-0.09	0.17	0.10	-0.08	0.00	0.18
32	3.89	0.19	1.16	0.55	0.06	-0.01	0.50
33	4.04	0.00	-0.08	-0.04	-0.05	0.00	0.02
34	0.00	0.00	-0.31	-0.05	-0.05	0.00	0.00
35	4.55	0.03	0.97	0.61	0.02	0.00	0.59
36	4.78	0.09	0.12	0.11	0.09	0.00	0.01
37	3.87	-0.03	0.06	0.05	0.00	0.00	0.05
38	0.00	0.00	0.12	0.10	0.10	0.00	0.00
39	0.00	0.00	-0.01	-0.01	-0.01	0.00	0.00
40	3.92	0.06	0.07	0.06	0.06	0.00	0.01

Table 8. Static Plus Growth Impact of Tariff Cuts by Sector %

	Exports	Imports	Employment	Output	Con_Dom	Con_Imp	Con_Exp
1	2.06	2.58	0.17	0.26	0.26	-0.03	0.03
2	3.23	14.21	0.08	0.42	0.37	-0.04	0.09
3	3.41	8.17	-5.24	-2.04	-0.16	-2.28	0.41
4	3.08	10.01	-3.08	-2.07	-0.48	-1.62	0.02
5	3.79	12.79	-0.30	0.34	0.80	-0.60	0.15
6	3.07	14.46	-0.91	0.27	0.52	-0.41	0.16
7	4.75	12.08	-0.35	1.01	1.02	-0.89	0.89
8	7.19	13.06	1.87	2.77	0.83	-0.56	2.50
9	4.65	18.61	-0.43	0.62	0.87	-0.82	0.58
10	4.12	14.86	-1.15	-0.17	0.53	-1.30	0.61
11	5.52	9.49	-2.16	-0.18	0.58	-1.03	0.28
12	4.37	9.99	-1.55	-0.46	0.33	-1.20	0.41
13	4.54	13.99	0.22	1.21	1.19	-0.13	0.15
14	4.18	11.06	-1.19	-0.35	0.42	-1.00	0.24
15	4.81	12.05	-0.20	0.71	0.79	-0.67	0.60
16	4.02	10.58	-2.06	-0.88	0.79	-1.87	0.22
17	5.20	0.06	0.63	1.51	1.11	0.09	0.30
18	5.53	10.63	0.22	1.10	1.09	-0.79	0.81
19	10.66	7.46	1.67	2.90	1.30	-1.77	3.41
20	9.30	1.13	3.50	4.62	0.67	0.02	3.91
21	0.00	0.00	-0.21	0.69	0.69	0.00	0.00
22	4.91	1.04	0.53	1.64	0.82	0.00	0.82
23	0.00	0.00	-1.30	-0.17	-0.17	0.00	0.00
24	4.26	0.00	-0.84	0.42	0.38	0.00	0.04
25	3.90	0.00	0.20	0.67	0.67	0.00	0.00
26	0.00	0.00	-0.25	0.60	0.60	0.00	0.00
27	4.65	1.52	1.10	1.55	1.55	0.00	0.01
28	4.00	0.00	-0.01	0.84	0.52	0.00	0.31
29	4.83	0.84	-0.30	1.08	0.81	0.00	0.27
30	0.00	0.00	0.08	0.73	0.73	0.00	0.00
31	3.11	0.51	-0.11	0.63	0.48	0.00	0.15
32	4.36	0.79	0.26	1.19	0.64	0.00	0.56
33	3.98	0.67	-0.33	0.60	0.58	0.00	0.02
34	0.00	0.00	-0.66	0.79	0.79	0.00	0.00
35	4.53	0.74	0.56	1.21	0.62	0.00	0.58
36	3.94	0.63	0.42	0.64	0.63	0.00	0.01
37	3.00	0.49	0.36	0.58	0.54	0.00	0.04
38	0.00	0.00	0.32	0.67	0.67	0.00	0.00
39	0.00	0.00	-0.35	0.60	0.60	0.00	0.00
40	3.28	0.61	0.35	0.62	0.62	0.00	0.00

Table 9. Effects on Regional Outputs(%)

	Static Effect	Static+growth Effect
Beijing	0.22	1.05
Tianjin	0.18	0.78
Hebei	-0.11	0.44
Shanxi	-0.15	0.50
Inner Mongolia	-0.09	0.46
Liaoning	-0.18	0.40
Jilin	-0.07	0.47
Heilongjiang	-0.34	0.00
Shanghai	0.10	0.77
Jiangsu	0.06	0.66
Zhejiang	0.19	0.85
Anhui	-0.08	0.47
Fujian	0.25	0.83
Jiangxi	-0.07	0.45
Shandong	-0.11	0.42
Henan	-0.13	0.39
Hubei	0.00	0.56
Hunan	-0.10	0.48
Guangdong	0.32	0.90
Guangxi	-0.10	0.43
Hainan	0.07	0.57
Chongqing	0.08	0.78
Sichuan	-0.06	0.57
Guizhou	-0.09	0.46
Yunnan	-0.16	0.43
Tibet	-0.02	0.58
Shaanxi	-0.01	0.60
Gansu	-0.33	0.14
Qinghai	-0.35	0.17
Ningxia	-0.25	0.32
Xinjiang	-0.28	-0.01

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