Economic Relations between the European Union and China and Evaluation of Impact of China's Tariff Change on both Economies with a Computable General Equilibrium Model

Von der Universität Oldenburg

FKII Informatik, Wirtschafts-und Rechtwissenschaften

Genehmigte

Dissertation

zur Erlangung des Grades eines
Doktors der Wirtschaftswissenschaften (Dr. rer. pol.)
vorgelegt von

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geb.am 15.03.1968 in Anhui, V.R. China

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Tag der Disputation: 14，07，2005

Abstract

Bilateral economic relationships between the EU and China have been unprecedented since the adoption of China's transformation to a market economy in 1978. The second tuning point in this relation is to be considered China's WTO accession in 2001, which signifies that China's economy will be opened more than ever to the world. Thus, issues on economic relations between the EU and China and evaluation of the impact of China's tariff change in the year 2002, which was the first year of China's accession into the WTO, on both economies are the major contents of this dissertation.

Through analysis of documents sourced from the EU and Chinese government, this dissertation investigates that for the EU, China seems to be the most important partner in Asia and predominant interests of Europe in China are in the domains of economics and politics. Economic relations are thought to be far more important for both the EU and China than other sensitive issues such as human rights.

On the basis of analyzing the economic data such as import and export, investment, technological transfer and aid, the situation of economic relations between China and the EU are described much more minutely. Major results of the analysis are that bilateral trade volume grew very quickly in the past two decades; machines and transport equipment and the other miscellaneous manufactured goods are the major trade goods; among the 12 member states of the EU, bigger states such as Germany, France, UK and Italy stand the leading role both in bilateral trade and investment from the EU to China; and through investment and technological transfer some of EU's enterprises seem easier to access the Chinese market than other competitors in the world.

A very interesting finding in analyzing bilateral trade data resulted from the bilateral

trade intensity and complementarities of trade are that China is a less important market for the EU compared to typical country exporting to the EU and vice versa, and geographical importance of the EU as a market for China was greater than the geographical importance of China as a market for the EU's export.

Among the biggest problems in bilateral economic relations and the biggest issues in China's accession into the WTO, tariff rate and non-tariff- barriers are also discussed in this dissertation. Analyzing the regime of the EU's trade protection shows that although the EU's tariffs have been reduced in recent years, its average tariff rate is higher than generally reported; even worse is, that China has become the major target of some NTBs initiated by the EU such as so called anti-dumping measurements. On the other hand, analyzing China's trade protection regime shows China is a country with very high tariffs, but due to the duty exemption system and numerous NTBs, the Chinese trade regime is highly distorted.

The impact of China's tariff change on China's economy, as well as EU's economy is another important point of this dissertation. To fulfil this task, a computable general equilibrium model (CGE) is developed and applied in the dissertation. Under some assumptions, the simulation results indicate that with China's tariff reduction, both of the economies have a positive reaction in terms of the change in growth rate of GDP. From a sector point of view, China's textile and clothing industry is one of the biggest winners whereas the motor vehicle and parts industry is the biggest losers with China's tariff reduction in 2002.

This dissertation tries to give the reader some useful information on economic relations between the EU and China in the past and at present. But much remains to be done both in analysing bilateral trade and modelling. In terms of modelling, although the CGE model is a relatively popular approach in doing policy shock analysis such as evaluation of the tariff change, the simulation results from Sino-EU

static model of this dissertation are under strict assumptions and observations only have a preparatory meaning. Besides, the Sino-EU static CGE model is not a dynamic CGE model, the simulation results from this model reveal only static effect of the tariff change rather than an accurate calculation of the dynamic effects of China's trade liberalization.

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Index of Abbreviations

ACP: African-Caribbean-Pacific Countries.

AD: Anti-Dumping

CD: Cobb-Douglas function

CES: Constant Elasticity of Substitution

CET: Constant Elasticity of Transformation

CGE: Computable General Equilibrium

CVs: Countervailing Measurements

ECM: Error Correction Model

EFTA: European Fair Trade Association

ELES: Extended Linear Expenditure System

EU: European Union

EUROSTAT: European Statistics

FDI: Foreign Direct Investment

GAMS: Generalized Algebraic Modeling System

GATT: The General Agreement on Tariffs and Trade

GDP: Gross Domestic Product

GEMPECK: General Equilibrium Modeling Package

GSP: Generalized System of Preferences beneficiaries

GTAP: The Global Trade Analysis Project

MFA: Multi-Fibre Agreement

MFN: Most Favored Nation Status

MOFTEC: Ministry of Foreign Trade and Economic Cooperation, PRC.

MPS: Material Product System

NATO: North Atlantic Treaty Organisation

NTBs: Non-tariff Barriers

OECD: Organisation for Economic Co-operation and Development

PCMs: Price control measures

PTA: Preferential Trade Agreement

QRs: Quantitative restrictions

SAM: Social Account Matrix

S-EU CGE Model : the name of CGE static model of EU and China in this dissertation

SNA : System of National Accounts

TBT: Technical Barriers to Trade

VEPRs: Voluntary Export Price Constraints

VAR: Vector Autoregression

VAT: Value-Added Tax

WTO: World Trade Organization

S-EU CGE model: The   name of the static CGE model in this dissertaion

Introduction

With a solemn hammer down in Doha on 10. Nov. 2001, China, with its 15 years of efforts, had finally been admitted as a member of the WTO. This entry, considered as the most significant event since China adopted the policy of opening up and reform in the late 1970s, will be a major milestone in China's economic development, modernization and integration into the world economy in the future.

The reform era in China began in 1978 and has been a period of extraordinary growth in both trade and output. Part of the growth in trade has been a consequence of economic reforms, and part of the growth has been a consequence of opening to the world. In general, China's process of economic reform has been complex and incremental. Since China's accession into the WTO, recognition of the benefits of openness for growth has been an important element in China's willingness to make difficult reforms and will be involved in China's development.

As the biggest developing country and the biggest potential market, China's WTO membership will have a deep and great influence on other countries. China's commitment to open up its markets and to go on liberalizing its foreign trade system will create many opportunities for its trade partners and China will play a more active role in political affairs in the world. What comes about after China's accession into the WTO and how China's WTO membership effects other countries' development is an important issue for many people. Many articles and papers have been written on these issues. Some people argued that China and its major trading partner would be the biggest winners. But some of them worry about China's service industries, and some manufacturing industries which are highly protected through tariffs and so on.

In 2001, the author received a grant from the Chinese Scholarship Council and in 2002 received another grant from the Ministry of Culture and Science in the Lower Saxony region of Germany. With support from Prof. Dr. Klaus.W. Schüler (Professor of the Institute of Applied Economics at the University Oldenburg in Germany) and support from the Institute of Quantitative and Technical Economics at the Chinese Academy of Social Sciences. The author wishes to contribute a dissertation related to economic relation of the EU and China and the impact of China's accession to the WTO on both economies.

This dissertation is divided into 2 parts. Part 1 describes some issues on bilateral relationships including diplomatic policy, bilateral trade and problems between the EU and China. It consists of 5 chapters. Part 2 illustrates a static CGE model which can be used to simulate the impact of China's tariff change after China's accession into the WTO. Part 2 consists of 3 chapters.

As a background introduction, the EU's policy towards China and China's policy towards the EU, as well as the situation of Sino-EU bilateral are covered in the first and second chapters. In the first chapter, analyzing the official documents from the EU and China become the main content and methodology. In chapter 2, mass of the historical data which are covered in bilateral trade, investment and technical transfer from the EU to China are used which try to illustrate the rapid development of the bilateral economic relationship between the EU and China.

Chapter 3 and 4 try to analyze the level of trade protection of both economies, which is the major problem that exists in bilateral trade, and key factors in evaluating the tariff change with a CGE model. Also, mass of the data analysis is applied in describing NTBs and quantifying the level of protection.

In order to make part 1 relative complete, chapter 5 gives the reader some information on several non-economic factors that sometimes strongly influence Sino-EU trade and should pay attention to the study on bilateral relation. These factors include issues of the EU's trade preference, human rights and Taiwan affairs.

From chapter 6, the paper turns to evaluate the change in China's trade policy which focuses on China's tariff reduction after China's accession into the WTO. To overview methodology on such topic, chapter 6 briefly summarizes the analytical framework of evaluating the tariff change and correspondent modeling approaches.

Chapter 7 begins to describe the core structure of the Sino-EU CGE static model. This model has been specially designed to capture the impact of tariff change after China's accession into the WTO on some macro-economic indicators of China and the EU, as well as indicators in sectoral level. The form of function written in the model is quite standard. Besides, model database, calibration of parameters and sensitivity test of the model are also outlined in the last part of this chapter.

In chapter 8, the model is used to simulate the impact of tariff reduction on Chinese economy and EU's economy. Some macro-economic indicators and indicators in sectoral level such as sectoral output, sectoral import and export for China and the EU are reported according to the simulation result. In the last part of this chapter some sensitivity tests have been done in order to proof the robustness of the model.

This dissertation is directed to all readers interested in the Chinese economy and Sino-EU bilateral relations. But much remains to be done both in analyzing bilateral trade and modeling. In terms of modeling, the Sino-EU static CGE model is not a dynamic CGE model, further studies should be include a dynamic block. Another neglect is a monetary block. Of course the main reason of this loss is that the CGE's database is an input-output table which provides little information about the

relationship of the financial variables. But due to the importance of the financial market, further research should be taken into account.

Chapter 1   The EU's Policy towards China and China's Policy towards the EU

It has been nearly thirty years since diplomatic relations were established between the EU[1] and People's Republic of China, and twenty years since the signing of the trade and cooperation agreement[2]. The steady development of bilateral relations was interrupted by the 1989 "Tiananmen Square Event". But the normalization of relations, particularly in the past decade, has paved the way for a renewed surge in bilateral trade and investment.

Because diplomatic policy is always at the top in bilateral relations, chapter 1 tries to give a brief introduction on this issue. This chapter is structured according to the following parts: section 1.1 presents the evolution of the Sino-EU relationship. Section 1.2 illustrates the EU's current policy towards China. Section 1.3 specifies the policy of major member states towards China. Section 1.4 describes China's policy towards the EU. And, some concluding remarks are provided in section 1.5.

1.1   Evolution of the Sino-EU relation

As Europe and Asia are neighbors, relations between the two regions can be traced back to several centuries ago. Early in the Roman era, a silk-road was the connection of the two continents. Marco Polo's famous *The travels of Marco Polo* or *The Description of the World* in 14 centuries enabled European people to understand China. From the end of the 16th century to the middle of 18th century, after the opening the road from the west to the east across the ocean and companying with the

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[1] In this dissertation, the "EU" is used in the whole text in order to make consistency although "the EU" was once named as "the EC".

[2] In 1985, Jaques Delors, President of the European Commission, visited China and signed the first agreement on trade and economic co-operation and since then a comprehensive development cooperation program between China and the EU was born.

industrial revolution, the relationship between China and Europe once reached a high level. China's silk and china were very much welcomed in Europe and watches made in Europe were also well known in China.

But over a long period, the relation did not go smoothly. Because of the war, from the middle of the 19th century to the middle of the 20th century, there was no fair and meaningful diplomatic relationship between China and Europe. Up to the early 1970s, when new China (People's Republic of China, established on 01,10,1949) returned into the UN, the relationship between China and Europe began to enter a new era.

In 1975, China and the European Economic Community signed an agreement on the establishment of formal relations. At that moment both sides evolving in Kissinger's triangular construction had enhanced their respective international standing. With the restoration of the diplomatic relation and China's economic reform and opening up after the Third Plenary Session of the 11th Central Committee, China signed a series of cooperation contracts[3] with the EU. Soon after signing these agreements, the EU helped China obtain a membership with the Generalized System of Preferences Beneficiaries membership (GSP). From 1984, China and the EU enhanced annually a consultation system at a high level, through which common interested issues could be communicated frequently. In 1985, the EU-China Trade and Economic Cooperation Agreement was signed. In May 1988, the EU Council opened a delegation of the EU to China in Beijing.

In 1989, because of the "Tiananmen Square Event", the EU took the decided to suspend economic and cultural relations with China. The following year was the most difficult period in the bilateral relation after 1975. Nevertheless, starting from October 1990, the EU foreign ministers decided gradually to resume economic cooperation and to re-launch high level contacts.

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[3] In 1978, the EU and China signed a trade agreement in Brussels. In 1983, first EU-China scientific co-operation program was launched. In 1984, the first ministerial consultations took place between China and the EU in a framework of political co-operation and the first EU development-aid package for China was launched.

From 1991, regular meetings between the EU and China were held at a ministerial level, and high level political consultations were continued. In 1994, new bilateral political dialogue opened between the EU and China. Policy papers from the European Commission on the Asia Strategy entitled "The EU-Strategy for the Dynamic Asian Economies" showed that the commission prepared new strategies for Asia, as well as for China. It showed also that Europe wanted to develop a long-term, not only political but also economic relationship with China to reflect China's international, regional, economic and political influence.

1995 was a landmark in bilateral relations. As the EU sought to chart a long-run course for EU-China relations into the 21st century, "A Long Term Policy for China-Europe Relations" was born. It was the first communication and official document of European policy towards China. The EU stressed that the relation of Sino-Europe was the core of Eurasia relations. Setting up a political dialogue, developing trade relationship and strengthening global cooperation with China were the main issues in further developing China-Europe relations. From 1995, the relations shifted from a more or less economic relation, with criticism on political matters from the EU's side, to much more comprehensive and elaborate relations.

In 1996, the relationship between the EU and China developed much more widely, politically, economically and culturally. For instance, the first Asia-Europe Meeting was held in Bangkok. In May, the EU and China signed four co-operation agreements that focused on intellectual property, higher education, co-operation in dairy and foods, and buffalo rising.

In 1997, the EU and its major member countries showed a constructive stance to develop relations with China in human rights issues. The most important cases in this year on this point was that, in April, France, Germany, Italy, Greece and Spain repealed to sponsor the resolutions critical of China at the United Nations Commission on Human Rights. This case showed that the major member countries

such as Germany and France had to get rid of America's influence on setting a policy towards China to some degree, and could develop political relations with China more independently than before.

In 1998 there were enormous changes in debating on China's human rights in the EU. In February, a decision was made at a EU foreign minister meeting, which was, in resolutions, critical towards China at the United Nations Commission on Human Rights. Instead of putting forward a proposal to anti-China, the EU suggested using a constructive dialogue for further human rights problems in China. In March, a new document was set out in the 1998 communication entitled "Building a Comprehensive Partnership with China". Supporting China's accession into the WTO, strengthening political dialogue with China, promoting investment in China, supporting China's reform and openness and helped China to integrate into the world economy were important points in this document. At the same time, the EU deleted China from the list of "Non Market Economy Countries". The new strategy showed that the EU wanted to gradually view EU-China relations the same as EU-USA, EU-Japan and   EU-Russian relations[4].

Between 1999 and 2000, the negotiation of China's entry into the WTO was the main topic among EU-China relations. After trial negotiations, in May, 2000, "The Sino-EU Agreement on China's Accession to the WTO: Results of the Bilateral Negotiations" was born which indicated that China had almost finished all negotiations for accession into the WTO.

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[4] As is seen in EU (1998), "Building a Comprehensive Partnership with China", the EU firstly stated that, "Annual EU-China Summits would put the EU-China relationship on a commensurate footing with the EU's approach towards other major international partners such as the US, Japan and Russia, raising the profile of the EU in China and vice versa,……"

1.2   The EU's current policy towards China

1.2.1   Background of the EU's policy towards China

China is a big country with 1.3 billion people and became a permanent member of the United Nations Security Council after it returned to the UN. As the biggest developing country in the world, no country can ignore the existence of China. Yet during the 1970s', China experienced domestic chaos not only politically but also economically. Great differences in the ideology and the size of the economy led China and some member states of the EU to only having a minimal amount of contact.

From the end of the 1980s'to the beginning of the1990s', the EU experienced a period with low economic growth and productivity, and relatively high unemployment. And in order to join the Euro Zone, every member country tried to tighten financial policy. To stimulate economic growth and reduce the unemployment, one of the effective solutions was to enlarge overseas markets in order to solve their economic and social problems.

On the other hand, after economic reform and opening up, China developed very quickly with an average annual GDP growth rate of 9.5% during 1990-2000, especially between 1990 and 1995, the GDP growth rate was as high as ever at 11.8%. In parallel with quick economic growth, the bilateral trade between the EU and China also grew very fast. The trade volume (total import and export) increased from US$2.3 billion in 1975 to US$48.9 billion in 1998, which was more than 20 times higher than in 1975.

Due to the demand of further development, China has had a great capital demand in the   infrastructure,   energy   industry,   environmental   protection   and telecommunication industry. On the other hand, with the adjustment of Europe's industrial policy and as one of the biggest exporters in the world, the EU is more

willing to export capital and technique intensive products and import labor intensive products in which China has an advantage.

With China's increasingly assertive international role and growing economic weight in the world, the EU gradually recognized that China is going to be not only a politically big country but also an economic giant. Considering that China is far more important for the EU countries than some sensitive issues such as human rights, the EU quickly adjusted its policy towards China from 1990.

As is well known, the EU's economy is much stronger than China's economy and thus the EU has more power in policy-making on bilateral relations. Since 1995 the EU has set several official documents on its policy towards China, and on the other hand, until 2003, China has not signed any official papers on her policy towards the EU.

The current EU policy towards China is based on the following documents: "A Long Term Policy for China-Europe Relations" (EU,1995), "Building a Comprehensive Partnership with China" (EU,1998) and "EU Strategy towards China: Implementation of the 1998 Communication and Future Steps for a More Effective EU Policy" (EU,2001). The following parts will discuss about these documents in more detail.

1.2.2 "A Long Term Policy for China-Europe Relations"

In "A Long Term Policy for China-Europe Relations", the EU firstly and systematically described the EU's China policy. Firstly, this document pointed out that the EU preferred its China policy to be flexible. As outlined in this document, the "EU's policy towards China both supports the trend for reform in China and accommodates any uncertainties about the future direction of Chinese (and European)

domestic policies. The development of the EU-China relationship must be sustained as a long term goal". This means the EU should make a long term policy towards China but the policy should be flexible enough to cope with some uncertainties of China's development in the future.

Secondly, Europe needed to have a "long term bilateral relationship" with China in order to secure shared goals. Cooperation with China in many new common interests was the main theme in bilateral relationship. These common interests covered a variety of areas such as: progress towards full integration in the world market economy, strengthening of civil society, poverty alleviation, environment protection, human resource development, scientific and technological development, the information society, and trade and investment cooperation[5].

1.2.3 "Building a Comprehensive Partnership with China"

In "Building a Comprehensive Partnership with China", the EU's China policy was concreted into more detail, which was addressed as "comprehensive, long-term and independent". The EU firstly pointed out that the EU should enhance EU-China relations just as importantly as EU-USA, EU-Japan and EU-Russian relations. Besides this, the aim of this document also focused on the following 5 issues: (1) Engaging China further into the international community by upgrading the EU-China political dialogue, building upon the "Asia-Europe Meetings" process, addressing global issues, fostering dialogue on Asian regional issues and underpinning autonomy in Hong Kong and Macau; (2) Supporting China's transition to an open society based on the rule of law and respect for human rights by promoting human rights through open debate and cooperation; (3) Integrating China further in the world economy by bringing China into the world trading system and supporting economic and social reform; (4) Making Europe's funding go further in China; (5)

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[5] See EU (1995) "A   Long Term Policy for China-Europe Relations".

Raising the profile of the EU in China.

1.2.4 "EU Strategy towards China: Implementation of the 1998 Communication and Future Steps for a More Effective EU Policy".

The latest document on the China policy is "EU Strategy towards China: Implementation of the 1998 Communication and Future Steps for a More Effective EU Policy". The aim of this document was to be more precise, and not to re-define the strategy set out in the 1998 Communication entitled "Building a Comprehensive Partnership with China". By defining concrete and practical short and medium-term action points for the EU policy to progress more effectively towards the long-term aims defined in 1998, the EU suggested ways for further developing EU-China relations in this document. The key suggestions included[6]: (1) Engaging China further in the international community through a continued strengthening of the political dialogue in all levels; (2) Supporting China's continual transition into an open society through dialogue in some issues such as human rights; (3) Integrating China further in the world economy through the finalization of China's WTO accession;   (4) Making better use of the EU co-operation programs with China; (5) Raising the EU's profile in China which is also illustrated in "Building a comprehensive partnership with China".

1.2.5 Main points of the EU's policy towards China

The above 3 documents are the basis of the the EU's current China policy. These documents show that:

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[6] Quoted from EU (2001), " Strategy Towards China: Implementation of the 1998 Communication and Future Steps for a More Effective EU Policy".

(1)   According to the EU's various common statements, the predominant interests of Europe in China are in the domains of economics and politics. The EU primarily wants to "strengthen its economic presence in Asia in order to maintain its leading role in the world economy" (Heberer, 2002). Statements such as "A Long Term Policy for China-Europe Relations" and "Building a comprehensive Partnership with China" focus mainly on developing economic relation with China. And, "EU Strategy towards China: Implementation of the 1998 Communication and Future Steps for a More Effective EU Policy" is more principally concerned with bilateral cooperation and some political issues.

(2)   Considering the common interests and perspectives of both parties, the EU intends to support the Chinese development processed in economic, social and political terms in order to enhance China's capacity of governance and sustainable development.

(3)   Economic relations with China are far more important for the EU countries than other sensitive issues such as human rights issues. The EU's strategy on Chinese human rights is to some degree less of a focus than to the US's policy towards China. For example in terms of human rights issues, the US tends to put more pressure on China while the EU pursues through dialogue to deal with this issue.

(4)   Currently, in terms of strategy, the EU is apparently pursuing a more diplomatic, discrete and different political style in approaching China. Furthermore, the EU policy papers argue more in a way that despite the different political systems, there are a lot of common grounds and points of common or similar interests between the EU and China. Therefore, EU policy papers perceive China as a country that is moving in a positive direction and has the intention to become a reliable partner and a "civilized " political system.

1.3 Policy of major member states towards China

The member countries of the EU and China share common benefits in bilateral relations. As a union, every member country can reach consistency in dealing with international affairs as well as policy towards China as a whole. But due to the different background, state-interest serves as the basis in setting China's policy in each member country rather than the entire interest of the EU. Bigger countries always play a leading role both in diplomatic affairs and economic relations with other countries in the EU. For this reason, the following part will mainly illustrate China's policy of the UK, France and Germany.

1.3.1 The UK's policy towards China

The UK is a member of NATO, the EU and a permanent member of the United Nations Security Council. The UK attaches special value to its close relationship with the US and Commonwealth countries. The foreign policy of the UK has a strong Atlantic orientation and the central importance accorded to NATO. For historical reasons, the Far East is also one of the regional focuses in the UK's external relations.

The UK's China policy is deeply influenced by Hong Kong affairs. The problem with Hong Kong, which is involved in China's sovereignty and territory, is that it is the most important and sensitive issue in the evolution of Sino-UK relation. As having occupied Hong Kong for around 100 years, the UK has had many benefits in Hong Kong. Therefore, most of the differences and debates were arisen between the UK and China in the run-up to the transfer of sovereignty in Hong Kong. Especially, before July, 1997, due to the debating of reverting Hong Kong back to China, the relation of the UK and China fell into hot water.

After July, 1997, in which Hong Kong reverted to Chinese sovereignty, many political differences between China and the UK have been settled. Recognizing that Hong Kong has always been an international crossroad in trading, investment and tourism, it is also a home for the exchange of goods, finances, people and ideas. The UK changed its China policy from confronting towards mutual understanding. Therefore, the year 1997 is also the turning point in the history of Sino-UK relationships.

Concerning deep economic involvement and close personal ties in Hong Kong and a rapid growth of China in the world economy, in 1998, the UK and China had more contact than ever before. Especially in February, the UK together with other EU member states decided to withdraw resolutions as a result of criticism from the United Nations Commission on Human Rights towards China.   In October, a joint statement was published during Tony Blair's visit to China, which illustrated that the UK would build a comprehensive partnership with China.

1.3.2   French policy towards China

As one of the oldest European nations, a permanent member of the United Nations Security Council and a member of various alliances, France implements its highly independent foreign policy which was guided by General de Gaulle's foreign policy during the 1960s. France keeps strong initiatives in developing diplomatic relations with Middle East and Asia in addition to relations with European countries and the USA.

Despite big differences in the culture, size of economy and social system, China and France share similar or same views and have common interests on many important international issues, such as anti-overlord on big countries and state independence. Both China and France advocate for the establishment of a multi-polar world and wish to keep the diversity of civilizations.

Due to these common interests on international issues, from the early 1960s, France and China began corresponding with each other. In 1964, China and France established diplomatic relations. This event made France the earliest western country to have diplomatic relations with PR. China. After 1964, French-China relations developed smoothly. In the 1980s, considering that China was a polar of a multi-polar world and a basic element in the world's balance and peace force, France regarded China as a "particular partner" of France.

Between 1989 to 1993, because of the "Tiananmen Square Event" and French vending weapons to Taiwan, the Sino-France relation fell into a "frustration period".

After 1993, with signing of the official report on Sino-France relationships and many number of visits, developing relationship with Asia became the main task in French foreign policy. "Building a priority partnership with China" and "building a long term partnership with China basis on supplemental and common benefits" were the main themes in French policy towards China.

Currently, the two countries have maintained a favorable and close relation in exchanges, cooperation which involves many fields such as economy and trade, technology, education and culture, and a high-level of contacts and communication in international issues.

In policy-making of Sino-France relations, two significant characters should be mentioned here: (1) The line of thought of the Presidents has a strong influence on the French policy towards China. As the first western country to establish diplomatic relations with the new China, France, for a long time, has had a deep-rooted background and a traditional friendship with China. One of the contributors to the Sino-France relationship is the French president. From General de Gaulle to

President Pompidou and Chirac[7], most of the French presidents have had a "China Complex" of which, many have become relishing tales known to people in Sino-French diplomatic history. (2) Arms sales to Taiwan is the most sensible element in Sino-French relations. As is well known, France is one of the biggest weapon exporters in the world. Meanwhile, Taiwan is one of the biggest weapon importers. The military cooperation between France and Taiwan emerged in 1989, which was triggered by two main factors, the "Tiananmen events" in 1989 and France's weapon industry's dramatic need for new clients at that time. French arms sales to Taiwan strongly influenced Sino-France relation. For instance, after Paris and Taiwan signed a big deal that involved purchasing 16 frigates by Taiwan in 1991 and the Mirage deal in 1992, China closed France's Canton consulate and excluded the French companies from the bidding lists of many contracts in which France lost about 3-6 billion French Franks. To some degree, arms sales to Taiwan dominate bilateral relation between China and France.

1.3.3   German policy towards China

Historically, relations within European countries were the main focus of German foreign policy. Germany thinks little about Asian affairs and the Asian market. Correspondence between the People's Republic of China and Germany began in the late 1960s. The establishment of diplomatic relations between the two countries was in 1972 after China was back into the UN. From 1972 to 1989, regular visits between China and Germany strongly promoted a bilateral relationship in a very healthy and smooth way. The relation was only interrupted in 1989 due to the "Tiananmen Square Event".

In late 1990, with the resuming of relations between the EU and China, Germany renewed its relations with China. Especially in 1993, the "German Asia Strategy" was published. This was the first official document on German policy towards Asia

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[7] Although the Sino-French relation experienced a rise and fall during President Mitterrand's era, this did not affect his love for the Chinese culture.

in which China was considered a "priority partner country in Asia" and thus shared an advantage in cooperation with Germany in relation to other Asian countries. In 2001, the German Ministry of Foreign Affairs published its policy towards East Asia entitled "Tasks of German Foreign Policy: East Asia, At the Begging of the 21st Century" (Auswärtiges Amt des Bundesrepublik Deutschlands, Federal Foreign Office, 2002), which illustrated its main policy towards China.

German policy towards China can be summarized as follows.

(1)   Bilateral economic cooperation is the focus in Sino-Germany relations

Mutual business interests are one of the pillars of German relations with China. After 1972, more than 20 agreements on economic cooperation between China and Germany were signed. Furthermore, in the 90s, concerning that China was going to become the world's biggest market for capital goods and infrastructure, Germany established the German Center for Trade and Industry in Beijing and Shanghai as well as a German Chamber of Commerce in Beijing, which serve as regional offices at the German Chamber of Commerce in China. Up to 2001, China had been the third biggest trading partner with Germany outside Europe (after the USA and Japan).

(2)   The important position of Cooperation in environment and technology

German policy towards China in many ways includes not only trade and investment but also cooperation in environment and technology. In the 1990s, Germany began to cooperate with China in the field of environmental protection. Many German companies were working together with their Chinese partners to resolve China's enormous environmental problems. Projects involved in renewable energies, as well as reforestation and the environmentally-sound modernization of power stations were important fields of government development cooperation. In 2000, Germany began

to cooperate with China not only in the field of transferring environmental protection technology but also in environmental administration.

Meanwhile, Germany engages in a wider range of cooperation with China in the field of science and technology than with any other East Asian countries. On the basis of an intergovernmental agreement on scientific and technological cooperation signed in 1978, nearly all German scientific organizations have concluded their own cooperation agreements with China which involved academic exchange, organizing academic symposia, workshops and joint research and training projects. More than 220 cooperation projects exist between institutes of higher education, covering almost every scientific and technological discipline.

(3) The "One-China-principle" serves as the basic German policy on Taiwan issues

In Kohl's era, Germany consistently emphasized the "One-China-principle" and turned down Taiwanese requests for German arms products. On account of the "One China Policy ", the current German government also does not maintain diplomatic relations with Taiwan and is in favor of peaceful resolutions to solve all the differences arising on the two sides of the Taiwan Strait. For vending weapons to Taiwan, the German government has also reaffirmed not to ratify arms sales to Taiwan.

(4) Solving human rights issues through dialogue

With 1.3 billion people, the situation of China's human rights has always been the key concern in German policy towards China. To improve the human rights situation in China, the German Government is engaging bilaterally and within the EU in a dialogue on human rights with the Chinese government at an expert level. Human rights issues are also an important part of political dialogue at the Foreign Ministerial level.

1.4   China's policy towards the EU

The document, titled "China's EU Policy Paper", was published in Oct. 2003, and was the first document on the China's policy towards the EU.

The paper illustrated that China-EU relations on the whole have been growing stronger and more mature than ever before. China-EU relations were better than any time in history, because "there was no fundamental conflict of interest between China and the EU and neither side posed a threat to the other," and "the common ground between China and the EU far outweighed their disagreements." (Ministry of Foreign Affairs of the PRC, 2003)

From some global policy points of view, the paper noted that both China and the EU stood for democracy in international relations and were both committed to combating international terrorism and promoting sustainable development through poverty elimination and environmental protection endeavors.

From an economic point of view, the paper illustrated that China and the EU were highly complementary economically due to their respective advantages. The Chinese government would enlarge the trade with EU in the future.

According to the paper, China's EU policy objectives were:

(1)   To promote a sound and steady development of China-EU political relations under the principles of mutual respect, mutual-trust and seeking common grounds while reserving differences, and contributing to world peace and stability;

(2)   To deepen China-EU economic cooperation and trade under the principles of mutual benefits, reciprocity and consultation on an equal basis, and to promote

common development;

(3)　To expand China-EU culturally and to expand people-to-people exchanges under the principle of mutual emulation, common prosperity and complementarities, and to promote cultural harmony and progress between the East and the West.

1.5　Conclusion

Much has changed in Europe, China and the world since China's economic reform and opening up to the outside world in 1978. From 1978 to now, the relationship between China and the EU has experienced an uneven development. This chapter describes the evolution of Sino-EU relations and the main points of the EU's current policy towards China, some member states' policies toward China, as well as China's policy towards the EU.

♦　With regard to the role of bilateral relations, the EU is the major policymaker in Sino-EU relations. Therefore, the EU's policy towards China plays a leading role in both political and economic relations between the EU and China.

♦　As far as national interests and international relations are concerned relations with the US and Eastern Europe seem to be more important for the EU than the relationship with China. Besides, for the EU, China seems to be the most important country in Asia, economically as well as politically.

♦　According to various EU common statements, the predominant interests of Europe in China are in the domains of economics and politics. Economic relations with China are thought to be far more important for the EU countries than other sensitive issues such as human rights issues.

♦ The EU as a whole could reach consistency in some basic principles in dealing with China. But due to the different backgrounds, state-interest serves as the basis in setting China's policy in each member country rather than the EU's interests.

♦ Due to the importance of the EU for China both in diplomatic affairs and economic development, the basis of China's policy towards the EU is that China tries to keep a harmonious relationship with the EU and develops cooperation projects in almost all fields.

Chapter 2   Economic Relations between China and the EU

Before the establishment of the official diplomatic relationship, there was very little trade between China and the EU[8]. After China entered back into the UN in the early 1970s, bilateral trade began to normalize. After several years of effort, in 1975, when China and the EU established an official diplomatic relationship, the trade volume between China and the EU reached US$2.3 billion. Since then, with the signing of the trade agreement of EU-China in Brussels in 1978 and many efforts on developing trade partnership and political understanding, the steady development of bilateral relations keeps continuing (only interrupted by "Tiananmen Square events" in 1989 for a short period). In 2002, the bilateral trade volume between China and the EU reached US$80 billion, which was thirty-four times more than in 1975.

Today, China is one of the most important Asian export markets for the EU. On the other hand, the EU is also one of the biggest trading partners of China. Both regions have gained from this trade relationship in a historical view. The main content of this chapter outlines the economic relations between China and the EU with the evolution of Sino-EU diplomatic relations.

This chapter will be divided into 5 sections. Section 2.1 reviews the bilateral trade of Sino-EU. Section 2.2 analyzes the EU's FDI in China; and section 2.3 reviews aid and technological transfer from the EU to China. Section 2.4 quantifies the relation of Sino-EU trade using the index approach. Section 2.5 is concludes.

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[8] In order to make the data consistency of the whole text (except the data in chapter 8), the EU refers to EU12 here, which include: Belgium, Luxemburg, Denmark, France, Germany, Greece, Ireland, Italy, the Netherlands, Portugal, Spain, and the UK.

2.1 Bilateral trade of Sino-EU

2.1.1 Growth of the bilateral trade

The Sino-EU's trade and economic relations served as the basis for the development of bilateral relations, which have been developing rapidly with great potential after China's economic reform. Parallel to China's booming GDP and total trade, the trade flows between the EU and China have also surged. Total bilateral trade in 1975 was only US$2.3 billion, but by 2002 this had boomed to US$80 billion, which has increased more than thirty-fold since the establishment of diplomatic relations between the EU and China.

In the period from 1981 to 1989, the annual average nominal growth rate of bilateral trade was 13.1%, and the growth kept expanding at a rate as high as 15.9% from 1990 to 1996. Yet, in the period from 1997 to 2001, bilateral trade fluctuated very strongly, and the nominal growth rate of bilateral trade waved between 6.9% and 30.5%[9].

In terms of the shares of bilateral trade and companying with the rapid growth of bilateral trade volume, the shares of Sino-EU trade weighted 12.9% of China's total trade volume from 1986 to 1990 and kept at a rate from 12.3%-13.7% after 1990. Later, the share of bilateral trade volume in EU's total trade kept increasing from 0.5% during 1986 to 1990 up to 1.9% in 2002.

Compared with other countries, the EU is one of the biggest trade partners of China in the world. Meanwhile, China has become more and more important to the EU. By 1999, with 1.6% of the total EU's trade volume, China stood as the second largest recipient of EU export in Asia, only behind Japan, which shared 2.8%. In 2001,

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[9] The reason for this big gap could be that before 1999, the dates were sourced from Napes Database (Introduction about Napes Database see footnote 11, but the data in 2000, 2001 and 2002 came from the China Statistical Yearbook, not from the Napes database).

China was the EU's 3rd largest trading partner outside of Europe.

Table 1   Bilateral trade volume, the growth rate of bilateral trade and bilateral trade
            share

year	Bilateral trade volume (bn US$)	Growth rate (%)	Bilateral trade share in China's total trade (%)	Bilateral trade share in EU's total trade (%)
1981-1989 (average)	8.4	13.1	12.9	0.5
1990-1996 (average)	25.4	15.9	12.3	1.1
1997	39.8	8.4	12.2	1.4
1998	44.1	10.8	13.7	1.5
1999	47.2	6.9	13.1	1.6
2000[*]	61.6	30.5[10]	12.9	1.5[a]
2001[*]	69.2	12.4	13.5	1.7[a]
2002*	80.0	15.6	12.9	1.9[a]

Source: Napes Database[11]

Note: "*": Data has a "*" comes from NBS, the "China Statistical Yearbook
         2001,2002, 2003"

     "a" : Data has "a" comes from "bilateral trade volume" in the second column

         divided by trade volume of EU sourced from WTO, "International Trade

         Statistics 2000, 2001, 2002".

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[10] Because of the change of the data source, there could be big errors in this growth rate.
[11] Napes database: NAPES is a comprehensive database of long-term economic indicators for the
Asia-Pacific region covering bilateral trade, economic and industrial research and development. This
database has been developed jointly by the Australian National University and Victoria University of
Technology. The Economic Profiles are based on the World Bank (WB), World Development
Indicators (WDI) supplemented by national sources and current data from the International Monetary
Fund (IMF).

2.1.2   Trade balance

From the information of balance of payments for the current account, before 1990 the EU enjoyed a surplus of the current account (excluding a little trade deficit from 1980-1983), which peaked in 1985 with a US$2.3 billion surplus. The accumulated surplus of the EU from 1990 to 1995 was US$11.8 billion. The turning point appeared in 1996, in which China enjoyed a US$1.5 billion trade surplus and from then until 2002, increased it every single year. From 1996 to 2002, China's total trade surplus with the EU reached US$54.8 billion.

According to the data from EUROSTAT, China's total trade surplus with the EU is much larger than such data sourced from National Bureau of Statistics of China, which is the EU-15 accumulated 168.6 billion Euro trade deficit in Sino-EU trade from 1999 to 2002. There are also great differences in import and export data according to other official organizations. But a common point is that China enjoyed a trade surplus in Sino-EU trade in recent years.

The European Union paid much attention to this problem. They gave an explanation, as is written in "A Long Term Policy for EU-China Relations": "Despite many efforts to analyze the reasons for discrepancies between the EU and Chinese statistics, the discrepancies still remain significant. ….. Both EUROSTAT and a GATT statistics subgroups have explained these discrepancies as the result of differences over how to include Hong Kong re-export figures in the statistics".

Despite this technical problem, the increase of the bilateral trade volume increased the bilateral trade volume and in the long run, it will be no harm both parties and thus bring only benefits to all member countries of the EU and China.

Figure 1   Trade balance between the EU and China from 1990 to 2002[12]

Unit: bn. US$/year
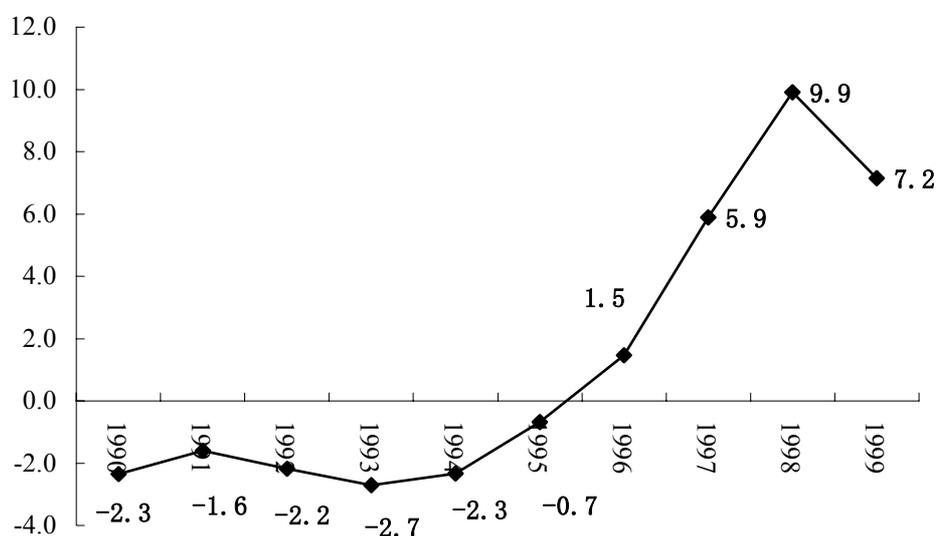
Sources: Data from 1990 to 1999 are sourced from Napes Database

Data from 2000 to 2002   are sourced from NBS, "China Statistical

Yearbook 2001,2002,2003"

2.1.3   Commodity share of the bilateral trade

The commodity shares of Sino-EU trade are summarized in table 2. From the data in 1999 offered by this table, machines and transport equipment and the other miscellaneous manufactured goods were China's major export products to the EU, which the total share of these two groups of products was 70.4%[13]. Basic manufacturing goods were China's third major export products to the EU, which shared 15%. Shares of food and livestock, crude materials and chemical products were ranged from 3.2% to 7.2%. Other products, such as beverages and tobacco,

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[12] Because the data for Belgium and Luxemburg was not available in 1999 in the Napes Database, the data of 1999 excluded these two countries. But this will not change the trend of this curve.

[13] Bilateral trade in different commodities is not available in China's Statistical Yearbook. The data that we can use in this section are all sourced from Napes database. And the latest data is from 1999.

mineral fuels, animals and vegetable oil, and other goods played almost no role in bilateral trade. Total share of these 4 kinds of products was only 1.1%.

Table 2   Bilateral export commodity shares from 1997 to 1999   unit:%

		China export to EU			EU export to China		
Commodity		1997	1998	1999	1997	1998	1999
0	Food and Livestock	3.6	3.6	3.2	1.6	1.9	1.8
1	Beverages Tobacco	0.3	0.3	0.1	0.3	0.4	0.4
2	Crude Materials	3.7	3.1	3.2	2.4	3.1	5.7
3	Mineral Fuels	1.2	1.4	0.9	0.3	0.3	1.6
4	Animal Vegetable Oil	0.1	0.1	0.1	0.7	0.7	0.2
5	Chemical Products	9.3	8.5	7.2	8.8	8.2	8.6
6	Basic Manufacture	16.6	16.3	15.0	11.3	11.2	10.5
7	Machines and Transport Equipment	26.8	31.1	34.8	64.3	61.7	58.5
8	Other Manufactured Goods	38.4	35.7	35.6	4.7	5.3	5.3
9	Goods not by Kind	0.0	0.0	0.0	5.8	7.2	7.4
	total	100	100	100	100	100	100

Notes: 1. Commodity share definition: Commodity shares give a country's share of trade in a commodity group. They are defined as a country's trade in a commodity, divided by a country's trade in the total of all commodities in the group and by partner countries.

2. Commodity classification: Standard International Trade Classification, Revision 3 (SITC Rev.3).

3. Source: Napes Database

A significant change of the commodity share is: food and livestock, and crude materials. The average trade share of these two kinds of products was only 6.4% in 1999 rather than over 40% in the period from 1972 to 1978. From the change of the structural point of view, among the 10 groups of products, the share of food and livestock, and crude materials declined the fastest compared to other product groups. In contrast, the share of machines and transport equipment grew the fastest, from 0.78% in 1975 to 34.8% in 1999.

In the light of the EU's international trade statistics data, machinery transport equipment was the EU's major export product that had an annual average share in the period from 1979 to 1988 of 43.4%, 65.4% in the period from1989 to 1994, and 58.5% in 1999. Basic manufactured goods and chemical products were the EU's second and third major export goods to China, which had an annual average share of 16.7% and 15.3% from 1979 to1999 respectively. Total export shares of beverages and tobacco, mineral fuels, animals and vegetable oil was around 1%. Shares of goods not by kind grew very fast from 0.1% in 1979 to 7.4% in 1999.

2.1.4   Country share of the bilateral trade

There are great differences in population, area and the level of economic development among the member countries of the EU. And thus different countries play different roles in the world economy, as well as in trade with China. A country with a high population rate, more area and a higher economic level such as the UK and Germany, has a relatively bigger share in bilateral trade. Therefore, a great difference in bilateral trade among member countries is the main feature in analyzing country share. Table 3 describes the bilateral trade volume and country share of the trade between China and member states of the EU in 2002.

Table 3   Bilateral trade volume and trade share of China with member

states of the EU   Year: 2002

Member country	Trade volume with China Import+Export unit: bn US$	Share in total trade volume of EU-China Unit: (%)
Belgium-Luxemburg	5.0	6.1
Denmark	1.6	2.0
France	8.3	10.4
Germany	27.8	34.7
Greece	0.8	1.0
Ireland	1.5	1.8
Italy	9.1	11.4
Netherlands	10.7	13.4
Portugal	0.4	0.5
Spain	3.5	4.4
UK	11.4	14.3
Total	80.0	100.0

Source: NBS, "China Statistical Yearbook" 2003

Note: Shares in total trade volume of EU-China are calculated by the author.

Among the 12 member countries, Germany, Italy, UK, Netherlands and France are the main trading partners of China. The bilateral trade share of these 5 countries with China was 84.2% in 2002. Especially, Germany stood as the EU's leading trade partner with China, which shared 34.7% of the total Sino-EU trade volume in 2002. Trade volume between China and Ireland, Greece, Portugal was very little, which shared less than 2% respectively.

Historical data showed this kind of structured change very little in the past two decades. Yet, the increase of trade volume between China and a big country such as Germany guides the trend of trade between China and the small countries of the EU. After 1994, in which bilateral trade shares of China with 7 smaller countries was 14%, the growth rate of bilateral trade between China and 7 smaller countries increased faster than the growth rate of China with 5 bigger countries. Up to 2002, the trade volume between China and 7 small countries reached US$12.8 billion, which shared 15.8% of the total Sino-EU trade.

From the balance of payment point of view, different member states demonstrate totally different. Among the five big member countries, Germany and France enjoyed trade surplus almost every year from 1998 to 2002, but the Netherlands, the UK and Italy have always had a trade deficit. Before 1996, the total trade surplus of Germany, France and Italy[14] was greater than the total trade deficit of the Netherlands and the UK, and led the EU as a whole to a trade surplus with China. But after 1996, as a result of an increased trade deficit with China in the Netherlands and Spain, the story was totally changed.

A very special country is Spain, although the bilateral trade between China and Spain shared only 4.4% of the total EU-China trade, but regarding the balance of trade between China and the EU, Spain contributed 15% of the total in 2002.

As with the bilateral trade share, small countries of the EU played a limited role in the balance of trade between the EU and China. Except Spain, the other 6 member states contributed 19% of the total trade deficit in 2002. More detail about the above description see table 4.

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[14] Italy had enjoyed a trade surplus with China until 1997.

Table 4   Trade balance between China and member countries of the EU

Unit: bn US$/Year

	1998	1999	2000	2001	2002
Belgium-Luxemburg	0.8	0	0.9	0.8	0.9
Denmark	0.1	0.2	0.2	0.3	0.3
France	-0.4	-0.9	-0.2	-0.4	-0.2
Germany	0.3	-0.6	-1.1	-4.0	-5.0
Greece	0.4	0.3	0.5	0.6	0.7
Ireland	0.1	0	0.0	-0.1	0.1
Italy	0.3	0.2	0.7	0.2	0.5
Netherlands	4.3	4.4	5.5	5.8	7.5
Portugal	0.2	0.2	0.2	0.2	0.2
Spain	1.1	1.3	1.5	1.5	1.7
UK	2.7	1.9	2.7	3.3	4.7
Total Trade balance	9.9	0	10.9	8.2	11.3

Source: Napes Database from 1998 to 1999

NBS, "China Statistical Yearbook" from 2001 to 2003

2.2   The EU's FDI in China

2.2.1   Evolution of the EU's FDI in China

Foreign direct investment inflows into China have grown strikingly since economic reform and open-door policies were implemented in 1978. FDI inflows picked up slowly in the 1980s and exploded in 1992 and 1993 in which China's government expressed China's strong commitment to a market economy. This trend lasted 7 years until 1998, in which an Asian Financial Crisis took place and as one of the

result of this crisis, China's FDI slowed down in 1999. But soon after 1999, from 2000 China's FDI began to increase again. Figure 2 shows that China's FDI inflows moved in tandem to variation of policy and economic transformation.

Figure 2   China's actually used FDI   unit: bn US$/Year
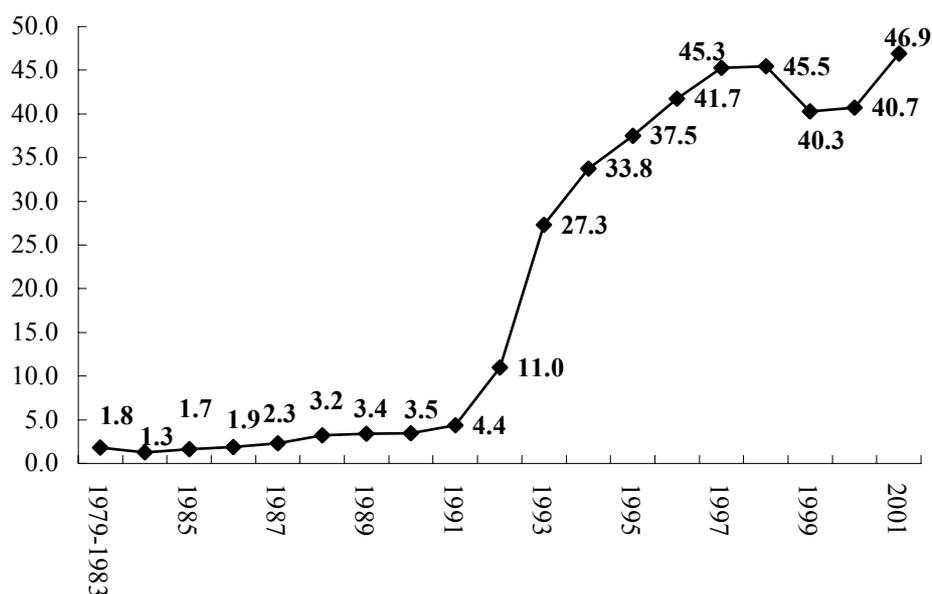
Source: NBS, "China Statistical Yearbook"

In terms of share of FDI inflow, while the world's total inflows of FDI increased rapidly from an annual average of US$ 115.4 billion for the period of 1984-1989 to US$400 billion in 1997, China's share increased by more than 20-fold from only 2% to 11.3% of the world's total during the same period. By other destinations, Southeast Asia and developing countries shared 8.5% and 19.2% from 1984-1989, and 20.6%, 37.2% in 1997, which represented only about a 7-fold and 8-fold growth, respectively (Tuan, 2002).

Yet, the bulk of China's massive FDI inflows did not stem from the world

economy's industrial growth centers. The triad economies of the EU, Japan and USA each accounted for less than 10% of all China's actually used FDI except in 2000, while total FDI from Hong Kong, Chinese Taipei and Singapore accounted more than 50% of all China's FDI flows.

The EU, as the biggest investor in the world, started to invest in China at the end of the 1970s[15] at a very low level. There were about 100 investment projects which the investment totaled less than US$1 billion (contract investments) each year from the EU in China from 1979 to 1992. The realized investment was even less, each year about US$0.2 billion according to Chinese Investment Statistics. Although China's GDP increased very quickly during this period, the trend in shares of FDI (contract investments) from the EU was decreased, from 10.6% in 1986 to 1.6% in 1992. Share of realized FDI from the EU declined also from 8.0% in 1986 to 2.2% in 1992.

From 1993, with the commitment of establishing market economy, some European companies began to increase investment in China and thus promoted the EU to invest in China as a whole. The share of the number of EU investments in China continued to increase from 1.6% in 1992 to 5.3% in 1999, but started to decrease from 2000 to 2001. In 1999, the share of the contractual investment and actually used investment also peaked with 14.2% and 11.1% in 2000. From 1986 to 2001, China had ratified a total of 12,619 projects of the EU in China, with a contractual investment of US$69.1 billion and an actual input of US$35.7 billion. And it ranked the EU the fifth place in terms of countries and regions investing in China.

2.2.2   The EU's FDI shares in China

Despite the rapid growth of FDI in China, the EU's investment in China lags behind that of the main competitors both in terms of the number of joint ventures and the

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[15] The main reason of this situation is China launched its foreign investment policy after 1978.

value of FDI.

In terms of the number of joint venture, from table 5, shares of the number of FDI projects sourced from the EU continued to increase in 1986, but with a low level which was under 5%. Up to 2001, this situation had not changed. By 2001 the EU invested 1101 projects, which shared 4.2% of the total number in China, while the USA and Japan invested 2606 and 2019 projects which shared 9.9% and 7.7% of the total respectively.

Table 5   Statistics on EU investment in China

	1986-1990	1991-1995	1996-2000	2000	2001
Number of Investment Projects From the EU	319	5248	4923	1028	1101
Total Investment Projects in China	22728	229739	104621	22347	26140
Weights (%)	1.4	2.3	4.7	4.6	4.2
Contracts Investment from the EU (bn US$)	16	18	29.9	8.9	5.2
Total Contracts Investment in China (bn US$)	245	355.5	280.0	62.4	69.2
Weights (%)	6.5	0.5	10.7	14.3	7.5
Realized Investment from the EU (bn US$)	7	4.9	19.8	4.5	4.2
Total realized investment in China (bn US$)	146	114.2	213.5	40.7	46.9
Weights (%)	4.8	4.3	9.3	11.1	9.0

Source: Yearbook Editorial Board, the Institute of the World Economics and Politics,

Chinese Academy of Social Sciences (CASS), "The Yearbook of World Economy" 1999/2000,2001,2002/2003

This story changed a little bit in terms of actually used FDI in China. The performances of China's actually used FDI from the EU, Hong Kong, Singapore, Taiwan, the USA, Japan and other major Chinese investors in the period from 1986-2001 is summarized in table 6. Besides Hong Kong, Singapore, Taiwan, which are part of the so called "Great China", the EU stood in second place (only after USA) compared to other countries or regions, its average annual share of China's actually used FDI from 2000 to 2002 was 8.4%, while USA shared 10.2% and Japan shared 8.1%,.

The main reason for this change is that the average size of EU projects tends to be bigger than that of its competitors and some of them are undisputed leaders in key sectors of China's industry such as automobiles, telecommunications and pharmaceuticals.

Furthermore, although the EU is not the largest investor in China[16], it is the best and most high-tech and advanced equipment exporter together with these investments. Most of the EU's FDI are invested with high technology and multipliers compared to other forms of investments such as speculation-driven ones in the real estate business in China.

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[16] Hong Kong and Macau companies were the biggest investors in China from 1979 to 1993, with 114,147 projects, 150 $ billion of contracts and some 50 $ billion disbursed. This represents around two-thirds of projects and contracts and three-quarters of used foreign capital. Taiwan comes second, increasing to 3/4 the share of FDI in the Chinese origin.

Table 6   Realized FDI in China by source countries (1986-2002)

Unit: bn US$ and % (in parentheses)

origin	1986-1999 (total)	2000	2001	2002
China's total FDI inflow	307.63	40.71	46.88	52.74
Hong Kong	155.63(50.6)	15.50(38.1)	16.72(35.7)	17.86(33.9)
USA	24.83(8.1)	4.38(10.8)	4.43(9.5)	5.42(10.3)
Japan	23.98(7.8)	2.92(7.2)	4.35(9.3)	4.19(7.9)
Taiwan	23.86(7.8)	2.29(5.6)	2.98(6.4)	3.97(7.5)
EU*	21.39(7.0)	4.24(10.4)	3.97(8.5)	3.39(6.4)
Singapore	~	2.17(5.3)	2.14(4.6)	2.34(4.4)
Korea	6.36(2.1)	1.49(3.7)	2.16(4.6)	2.72(5.2)

Source: NBS, "China Statistical Yearbook", "China Foreign Economic Statistical Yearbook"

Notes: 1. Percentages of total in parentheses

2. * for 1986-1998 in the first column

3. The first column of Taiwan covers the period of 1989-1999, and all others from 1986-1999 except the EU.

2.2.3   Country shares of EU's FDI in China

As is well know, there are big differences in the size of economy among the member states of the EU. Therefore, the performance of the investment of each state in China is unbalanced. Similar to the country share in bilateral trade, bigger countries such as the UK, Germany, Italy, France and the Netherlands invested much more capital in

the Chinese market than the other 7 small countries. Data in 2001 showed: the share of the number of investment projects in China of the 5 bigger countries was 86.1%, while shares of contract investments and realized investment were 94.2% and 95.6% respectively.

Table 7   FDI of member countries of the EU in China in 2001

	Project		Contracts Investment		Realized Investment	
	number	Weight (%)	Volume (Mn US$)	Weight (%)	Volume (Mn US$)	Weight (%)
Belgium	31	2.8	9.4	0.2	20.0	0.5
Denmark	24	2.2	84.0	1.8	56.4	1.4
France	151	13.7	565.8	11.9	532.5	13.4
Germany	280	25.4	1171.5	24.7	1212.9	30.6
Greece	8	0.7	40.9	0.9	7.3	0.2
Ireland	7	0.6	6.7	0.1	1.3	0.0
Italy	134	12.2	235.1	5.0	220.0	5.5
Luxemburg	12	1.1	48.5	1.0	28.8	0.7
Netherlands	114	10.4	974.0	20.6	776.1	19.6
Portugal	6	0.5	28.5	0.6	26.0	0.7
Spain	65	5.9	57.7	1.2	33.9	0.9
UK	269	24.4	1515.6	32.0	1051.7	26.5

Source: MOFTEC, (Ministry of Foreign Trade and Economic Cooperation of PRC)[17], "Foreign Investment Statistics" series

In more detail, three tiers can be summarized in terms of the EU's realized investment in China in 2001, Germany, the UK, Italy, France and the Netherlands

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[17] At present this Ministry is merged with the Ministry of Commercial of PRC.

can be called the "first tier" of Chinese investors, which invested more than US$100 million in 2001. Belgium, Denmark, Luxemburg, Spain and Portugal were among the 'second tier' that invested between US$10 million and US$100 million. The third tier included Greece and Ireland which invested below US$10 million.

2.2.4   Industrial shares of the EU's FDI in China

With regard to the industrial structure of EU investment in China, there are no published statistics both in the EU and China. The following results were obtained from a report[18] on a survey issued by the Institute of Investment, China Planning Committee[19].

In 1998, in terms of the number of investment projects, the EU investors favored to invest in electronics, electrical equipment and telecommunication equipment, machinery, trade, insurance, financial and chemical products, motor vehicles and parts, and in food and beverage industries.

In terms of the volume of investment, the allocation of the EU's FDI focused on automobiles and parts, medicine and medical equipment, electronics, electronic equipment, chemical products, and the food and beverage industries. Among these investment projects, machinery manufacturing shared more volume of investment than other industries.

Obviously, there were big differences in analyzing industrial structure in terms of the number of the investment project and volume of investment. For example, while the number of investment projects in the motor and parts industry shared only 8% of the

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[18] The report is from one of the chapters in the book "EU and China: assessment on prospect of bilateral trade " edited by Pei, Changhong (2000)

[19] In 1998, the Institute of Investment and the China Planning Committee held a survey on the situation of EU investment in China. This was the first time that China held such survey on these issues. The questionnaires were distributed to 4500 enterprises which related to EU investment. Overall, 807 were feed back. This is the only information which we can use at the present. The China Planning Committee is now called the "China Reform and Development Committee".

total number of investment projects, its volume of investment shared 27% of the total. On the contrary, industry such as trade, insurance, financially shared almost 10% of the total number of projects, but used only 2% of the total volume of investment.

2.2.5   Distribution of the EU's FDI in China

The pattern of geographical distribution of EU's FDI inflows in China changed little from the late 1970s up to now. Unlike other investors, EU investors favored Changjiang Delta areas such as Shanghai, Jiansu, Zhejian rather than Guangdong and Fu Jian. Data from a survey at the Institute of Investment showed, 43% of the EU's companies chose the location of their enterprises in Changjian Delta areas. Beijing received 10% of the total EU's investment in China. The remaining 47% was shared by other regions in China.

The spatial distribution of EU investment in China could be explained from the location decision-making of enterprises. When EU enterprises chose their location of investment, they focused on the following points: (1) potential market size for their product, (2) distance from the market, (3) government's investment promoting policy or preferential policy, (4) distance from the production material, (5) quality of the resident and (6) infrastructure of the location. In China, government designed "preferential" in FDI promotion policy had significant effects for the attraction of FDI. It was revealed that heavy regional biasness towards the east and the coastal regions and "preferential" policy strongly promoted EU enterprise investment in this area.

Figure 3   Distribution of EU investment in China   Year: 1998
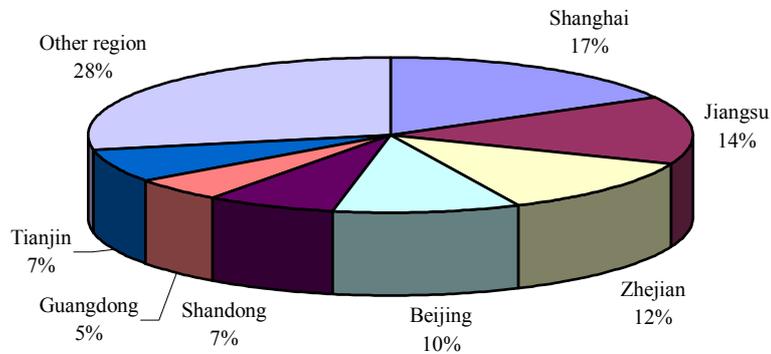
Source: Pei, (2000)

2.2.6   Performance of EU enterprises in China

EU enterprises in China achieved relatively positive performance. According to Pei (2000), around 40% of the total enterprises earned profit in China. The other 45% of the total reached an equilibrium point of profit and cost. Only 15% of EU enterprises had a loss in China (See figure 4). In general, EU investment in China was much healthier than investment in other regions of the world.

Figure 4   Performances of EU Enterprises in China   Year: 1998
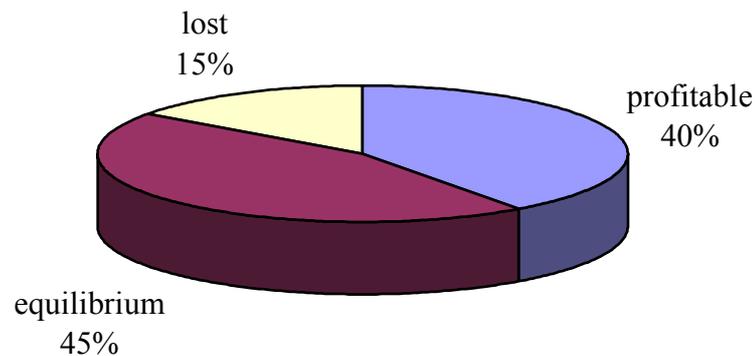
Source: Source: Pei, (2000)

The same results have been also obtained from an investigation hosted by the Delegation of the EU to China. Data from this investigation showed that 47% of EU enterprises satisfied with their performance in China. 42% of the enterprises thought although the realized profit was lower than they wished before, the situation of their investment in China could be acceptable. Only 11% of the firm was unsatisfied with their performance in China.

A study on investment of German companies in China conducted by Roland-Berger strategy consultants in 1998, reached almost the same result as above. This study represented that 47% of the total investigated German enterprises made a profit in China. 24% of the total was lost in the Chinese market. In terms of the degree of satisfaction with the investment in China, 22% of the firms were very satisfied with their performance in China, 58% of the total were satisfied. Only 20% of the firms were not satisfied (China Business, 1998).

2.3   Technological transfer and aid from the EU to China

2.3.1   Technological transfer from the EU to China

As is defined in "Encouraging International Technology Transfer" written by Keith E. Maskus, technology transfer refers to "any process by which one party gains access to a second party's information and successfully learns and absorbs it into his production function" (Maskus, 2003). Numerous channels of international technology transfer such as through trade in goods and services, FDI, licensing, joint ventures, movement of labor make technology transfer faster today than ever before.

The technological transfer program from the EU to China covered a variety of areas

such as agriculture, information techniques, telecommunication techniques, aerospace, statistical techniques, energy and training cooperation.

In more detail, for example, by mid-1996, over 3,297 technology-transfer contracts worth US$26.5 billion had been signed by the Chinese government. According to EU figures, the contracts made the EU the "main supplier of advanced technology" in China. (DFI[20] International for the Bureau of Export Administration, 2002). In 1998, technology transfer projects from the EU to China amounted to 1,700, involving a contractual value of US$7.53 billion and accounting for 46% of the total value in the corresponding period. By the end of 1998, there had been 8,564 technology transfers from the EU to China, with a total contractual value of US$45.52 billion, accounting for 45.1% of the total value in the corresponding period (EU, 2000)[21].

Many of these transfers were conducted through a program called the "Community Framework Program for Research and Technological Development." By 1996, this program consisted of fourteen different joint research projects, involving collaboration in sectors ranging from agriculture to information technology.

Chief among these projects were the cooperation programs in automobile and aerospace research, which were thought to be one of the ways of European automotive industry penetration and technology transfer to Chinese manufacturers. Moreover, in 1996, as part of the EU-China Industrial Cooperation Program, the European automotive and aerospace organizations signed a pact with the Chinese government, wherein a total of US$7.5 million was invested in this cooperation research program, which aimed to "assist in the harmonization of technical standards, to assist industrial training in manufacturing as well as management, and to level up

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[20] DFI International is a consulting firm in the USA which specializes in research, analysis, and advising senior executives in industry and government on issues of strategy, technology, and innovation.
[21] EU (2000), "The EU's Relations with China - an overview".

quality awareness." (DFI, 2002).

Via this research and the technological development program, the European Association of Aerospace Industries was also in the midst of a two-and-a-half year joint aerospace development program with the General Administration of Civil Aviation of China   and the Aviation Industries of China. The goals of this program were similar to those in the auto sector: "to build closer ties" and "provide training" for the Chinese partners. The companies comprised the European Association of Aerospace Industries and donated $1.2 million to this effort. This program has given and would give EU companies greater exposure in China and to their Chinese counterparts. In return, China's companies received not only advanced technologies in key industries, but also received training on how to apply this technology.

2.3.2   Aid from the EU to China

Technology transfers are one part of a two-pronged European approach to the Chinese market. The other part is direct financial aid, of which the EU has given US$67 million since 1995 (DFI, International for the Bureau of Export Administration, 2002). EU aid focused on five areas: human resource development, support to economic and social reform, business and industrial co-operation, protection of the environment and rural development. Many of these programs were educational in nature. The EU's aid was provided to China under various programs, as described in the table below.

Table 8   EU aid to China

Program	EU Contribution (Mn. US$)
Training / Instruction	
1.China Europe Business School	16.78
2. China Invest	11.3
3.Junior Managers Program	11.23
4.Higher Education cooperation	11.02
5.Norms and Standards	5.88
6. IPR Cooperation	5.4
7. Training in STD & HIV/AIDS Prevention	3.14
Agriculture/Health	
1. Dairy Development Project II	33.9
2. environment Management Cooperation	14.69
3. China Europe Cooperation Agriculture	13.9
4. Support to Village Governance Reform	12.06
5. Qinghai Potato Development	3.6
6. Qinghai Livestock Development	3.5
7. Water Buffalo Project	3.14

Source: DFI International for the Bureau of Export Administration, (2002)

2.3.3   Reason of technological transfer and aid from the EU to China

Development of science and technology has long been a priority in Chinese policy planning, and in order to catch up with the industrialized countries, China has a long-run strategy towards absorption foreign technology in a range of advanced

technology sectors. This policy was implemented mainly through large-scale and technology development plans and projects that depended upon research and technological advances as well as foreign investment, joint research, and technology transfer. These projects have provided domestic and foreign investors attractive business opportunities. Some collaboration between foreign enterprises with Chinese organizations has occurred under these various programs in the form of investment and joint research.

On the other hand, technical transfer to China is also one of EU's policy towards China. In order to keep sustainable development of China, according to the EU's long-term policy to China, the EU's initiatives to promote economic and social reform should offer training and technical assistance to support China's modernization and market oriented policies in key economic sectors.

To EU investors, there was an economic benefit to seize the opportunities offered by the Chinese market. More practically, to most EU enterprises with high-tech, when transferred internationally, the extension of technology application was seen increasingly as a means whereby companies could globalize their production operations in order to take advantage of cost or market factors (Bennett, 2000). So besides the EU's macroeconomic and long term strategy towards China, the broad roles played by the governments of the EU have had the practical effect of gaining market shares for EU industries in China where this might not otherwise be possible or likely through true international competition but from such technology transfer and aid.

2.4   Bilateral trade intensity and the complementarity index of Sino-EU trade

Great achievements in Sino-EU bilateral trade, as well as investment and technology transfer from the EU to China enhance some of the Chinese scholar's interest in discussing topics related to the EU. Most of the papers defined this bilateral relations

descriptively as: "there are strong complementarities of Sino-EU trade. Sino-EU's trade will keep going with great potentiality" (Pei, 2000).

Economic complementarities between China and the EU play a crucial and active role in bilateral trade. Briefly thinking about the advantage of China and the EU in international trade, the following points can be quickly obtained: China has advantage in labor but lack of capital and technique; On the other hand, the EU has the advantage in capital and technique but the labor cost is relatively higher. Thus, complementarities could be an active factor in bilateral trade.

To get a deeper understanding of the EU-China trade relationship, two measures of bilateral trade and commercial relationship (trade intensity and trade complementarities) are examined in this section. Most of the available data is from the 1990s.

2.4.1 Bilateral trade intensity of Sino-EU trade

2.4.1.1 Concept of bilateral trade intensity

The bilateral trade intensity index casts bilateral trade within the global context. It provides a way to gauge the importance of geographical location. Many economists have used this index to evaluate the impact of regional trade agreements (Vollrath, 2001). In this part, trade intensity is an indicator of aggregate market shares which, in measurement terms, is China's share of exports destined for the EU relative to the EU importance as a global import market, and vice versa.

In detail, the bilateral trade intensity gauges an exporter's penetration of an importer

market within the context of overall world trade[22]. A simplified formula of this indicator is:

$$IT_{ij} = \frac{X_{ij}/X_{iw}}{M_{jw}/M_{ww}} = \frac{share \quad of \quad i's \quad exports \quad sent \quad to \ j}{j's \quad share \quad of \ global \quad imports}$$

w: World

i: exporter

j: importer

X_{ij}: exports from *i* to *j*,

M_{ij}: imports by *j* from *i*

IT_{ij}: bilateral trade intensity

The above mathematic definition shows: this index is quite neutral because it has no impact of country size, which is an important consideration when drawing comparison of market and/or destination shares[23].

IT_{ij} =1 represents that there is no difference in the importance to nation *i* of supplying imports to *j* than in supplying imports elsewhere in *i*'s foreign market.

From the exporter's point of view (using relative destination shares), IT_{ij} >1 shows that nation *j* is a more important market for exporter *i* than for the typical country exporting to *j*. Similarly, if 0< IT_{ij} <1, then nation *j* is a less important market for exporter *i* than for the typical country exporting to *j*.

From the importer's point of view (using relative destination shares), IT_{ij} >1 shows

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[22] The definition of trade intensity, complementariy of trade and relative explanation are quoted from Vollrath, Thomas L. (2001).
[23] See Bergstrand (1985), "The gravity equation in international trade : some micro-economic foundations and empirical evidence".

that nation *i* is a more important supplying nation *j* with needed imports than in supplying "other" importing countries. Similarly, if $0< IT_{ij} <1$, then nation *i* is a less important supplying nation *j* with needed imports than in supplying "other" importing countries.

IT_{ij} can be calculated for any individual commodity *k* as well as for any sector aggregate *s*. They permit comparisons to be drawn across destination and/or origin markets (Vollrath, 2001).

2.4.1.2   Trade intensity of Sino-EU trade

Appling the concept of intensity of trade, figure 5 is obtained.

Figure 5   Trade intensity index of Sino-EU trade
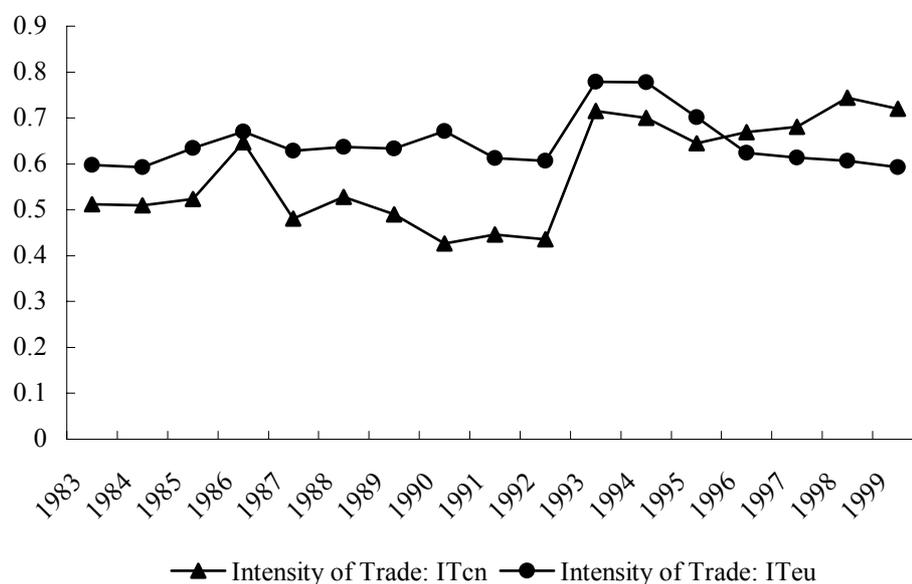
Source: Napes database and EU (EU, 2003): "External and Intra-European Union

   Trade Statistical Yearbook 2003"

Note: (1)   China's export to the EU and the EU's export to China comes from

the Napes database

(2) China's export to the world and the EU's export to world (excluding intra-EU export) from the EU (EU, 2003)

(3) EU and China's import and world total import come from the EU (EU, 2003)

(4) ITcn: Trade intensity index of China to the EU (China is the exporter)

ITeu: Trade intensity index of the EU to China (EU is the exporter)

Figure 5   shows that China's trade intensity with the EU (IT_{cn}) experienced a relatively fluctuated trend around 0.5 (average) during the period of 1983 to 1992, and then jumped from 0.42 in 1992 to 0.72 in 1993. The average of trade intensity during the period of 1993 to 1999 was about 0.7.

Turning to EU's trade intensity with China (IT_{eu}), a relatively stable trend also appeared from 1983 to 1992, in which the average IT value was about 0.63, and relatively rapidly increased to almost 0.8 in 1993 and 1994, then decreased to around 0.6 between 1994 to 1999.

Obviously, in the period of 1983 to 1999, both the intensity of trade from China to the EU (IT_{cn}) and the EU to China (IT_{eu}) were less than 1. It means China's exports to the EU were less than the exports expectation according to the EU's share in world import, and thus, China was a less important exporter for the EU than for the typical country exporting to the EU, and vice versa.

Comparing the position of the two curves, the above figure shows also that the geographical importance of China as a market for EU exports was greater than the locational importance of the EU as a market for China's exports between 1983 to 1995 (Curve IT_{eu} is higher than IT_{cn}). But after 1996, geographical importance of the EU as a market for China was greater than the locational importance of China as a

market for EU exports (Curve IT_{eu} is lower than IT_{cn}).

2.4.2 Complementarity index of Sino-EU trade

2.4.2.1 Concept of complementarities of the trade

The definition of the IT index shows, that this index ignores the structure of different commodities in bilateral trade. Considering this point, IT_{ij}^{s} can be decomposed into two components—a complementarity index (CC_{ij}^{s}) and a trade bias index (TB_{ij}^{s}) in the following way (Vollrath, 2001):

$IT_{ij}^{s} = CC_{ij}^{s} * TB_{ij}^{s}$ =commodity complementarity times trade bias within the *s*-sector

In brief, the complementarity index correlates one country's export specializations with its partner's import specializations across the spectrum of all traded goods. In other words, the CC index is a trade-weighted measure to the degree in which the exporter's profile of comparative advantages corresponds with the importer's profile of comparative disadvantages. From a structured point of view, CC_{ij}^{s} is a trade-weighted measure for sector *s* to the degree in which the relative-export-share structure of nation *i's* exports ($RXS^{k}i$) corresponds with the relative-import- share structure of nation *j's* imports ($RMS^{k}j$) across all k^{24} commodities within the *s* sector:

$$CC_{ij}^{s} = \sum_{k \in s} \left[\theta^{k} * RXS_{i}^{k} * RMS_{j}^{k} \right]$$

where:

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[24] k refers in this chapter aggregating of 0~9 goods under Rev3. commodity classification.

$$RXS_i^k = \frac{X_{iw}^k / X_{iw}^s}{X_{ww}^k / X_{ww}^s} = \frac{share \quad of \quad k \quad in \quad i's \quad \exp orts \quad of \quad s \quad goods}{share \quad of \quad k \quad in \quad the \quad world's \quad \exp orts \quad of \quad s \quad goods}$$

$$RMS_j^k = \frac{M_{jw}^k / M_{jw}^s}{M_{ww}^k / M_{ww}^s} = \frac{share \quad of \quad k \quad in \quad j's \quad imports \quad of \quad s \quad goods}{share \quad of \quad k \quad in \quad the \quad world's \quad \exp orts \quad of \quad s \quad goods}$$

$$\theta^k = \frac{X_{ww}^k}{X_{ww}^s} = share \quad of \quad k \quad in \quad global \quad \exp orts \quad of \quad s \quad goods$$

RXS_i^k is Balassa's *revealed comparative advantage.* RMS_j^k has the same structure, except that import rather than export data are used. In other words, the index CC_{ij}^s can be interpreted as being a trade-weighted measure for sector *s* to the degree in which exporter *i's* profile of "comparative advantages" corresponds with the profile of "comparative disadvantages" for importer *j*. In other words, this index depicts how specialization in the commodity composition of nation *i's* exports to the global market meshes with the specialization in the commodity composition of nation *j's* imports from the international market.

Compared with IT, trade complementarity is an indicator of a market match, and captures the degree to which each nation's exports complement the other's imports. Roughly speaking, it looks at whether "we are selling what they want to buy".

There is always some degree of complementarities in bilateral specialization patterns, provided *i* exports some goods that *j* imports within the sector *s*. equal to one represents a threshold, with a value greater (less) than one showing a greater (lesser) level of complementarities in the composition of what exporter *i* exports and what importer *j* imports than occurs between the average pair of countries. Upward slopes provide evidence that the structural change taking place is consistent with a more efficient use of both partner and global resources (Vollrath, 2001).

2.4.2.2   Complementarities of trade for Sino-EU trade

According to the introduction of section 2.4.2.1, correlation of China's export specialization and EU import specializations across the spectrum of all the tradable goods, figure 6 is obtained. It displays the change of complementarities of bilateral trade between the EU and China (where China is the exporter).

Obviously, the curve is divided into two separate parts: part of value of the complemetarity is greater than 1 (1978-1986) and part of the value of the complemetarity is smaller than 1 (1987-1999).

Figure 6   Complementarity of trade between China and the EU

China: reporter and exporter   EU: importer   Unit: %
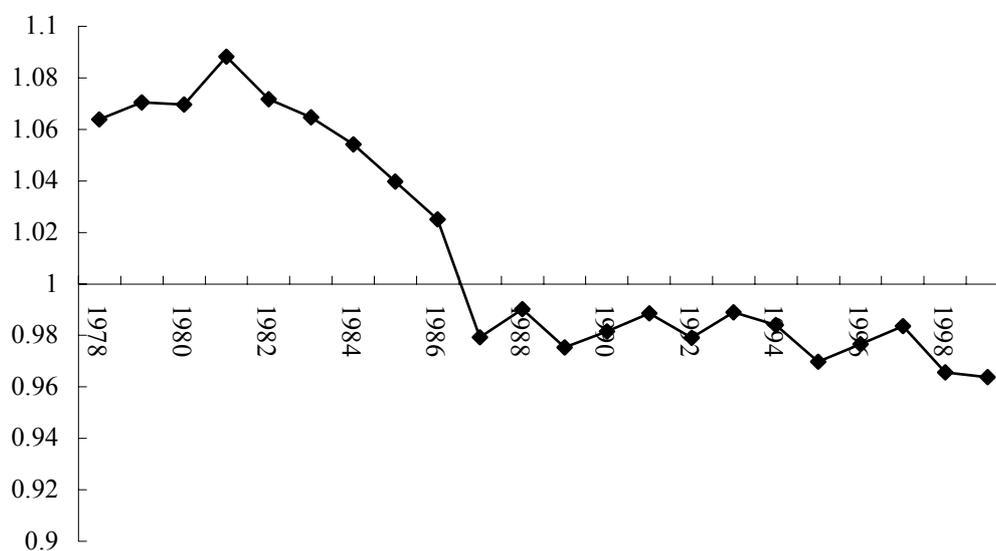
Source: Napes Database

From 1978 to 1986, complementarities of Sino-EU trade were greater than 1, which shows that, China and the EU shared a greater lever of complementarities in the

composition of China's export and EU import than occurs between the average pair of countries. This is largely attributable to the fact that China specialized in the production of labor intensive goods such as agriculture products and some basic manufactured goods while the EU specialized in the production of capital and technical intensive goods such as machinery and transportation equipment during that period. It suggests also that China had been selling more of what the EU wanted to buy between 1978 and 1986.

1987 was the turning point of this trend, from 1987 to 1999, complementarities of China and the EU trade were smaller than 1 which maybe shows that China and the EU specialized in the production of similar goods.

The most significant finding in the case of Sino-EU trade was that, in all cases, complemetarity exhibited downward-sloping trends after 1978. This finding suggests that China is doing worse in matching with the EU's market. Further suggestions can be made that China's structural change and shifting trade patterns after 1978 have not benefited China's exports to the EU because China has been selling less of what the EU wants to buy.

Another interesting finding from this calculation is, while China shares more and more of the EU's import market, the complementarity of China's exports to the EU is decreasing. Data from EUROSTAT shows, of all EU external imports, the import share of China kept increasing from 0.7% in 1980 to 8.2%[25] in 2002.

How to reconcile the increasing import market shares from China to the EU with a declining trade complementarity? One possibility is: while China is doing worse in market matching with the EU, other countries are doing even worse. That is, while

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[25] The share is calculated using the EU's total import from China divided by the EU's total import which excludes import among EU member states.

China is doing worse than before, others are doing even worse than before, hence China is increasing market share in Europe.

2.5   Conclusion

In this chapter, bilateral trade of Sino-EU, EU investment in China and technological transfer and aid are discussed. The main results about the above issues are:

♦   Bilateral trade volume between the EU and China grew very quickly in the past two decades. Machines and transport equipment and the other miscellaneous manufactured goods were the major trade goods. Among the 12 member states, bigger states such as Germany, France, the UK and Italy took the leading role in bilateral trade between the EU and China.

♦ The EU is one of the biggest investors in China. The investment project is characterized by large capital and real high-tech transfer. Most favorable industries of EU enterprises are automobiles and parts, medical and medical equipment, electronics, electronic equipment, chemical products, food and beverage industries and machinery manufacturing. In terms of distribution of investment, Changjian Delta stood in first place for EU companies. The performance of these investment projects is relative positive.

♦   Technological transfer and aid also play a very important role in bilateral trade relations between the EU and China. Under some cooperation programs involved in technological transfer and aid, some EU enterprises seem easier to access the Chinese market than other competitors.

♦   Bilateral trade intensity of China to the EU shows China is a less important market for the EU compared to typical country exporting to the EU and vice versa. The geographical importance of the EU as a market for China was greater than the

locational importance of China as a market for EU exports.

♦ The calculating result of the complementarity shows that China is doing worse in matching with the EU's market. It could be also present that China's export structure changed and a shifting trade pattern since 1978 has not benefited China's export to the EU.

Chapter 3   EU Trade Protection in Bilateral Trade

There are two reasons for focusing on analyzing trade protection. One reason is that tariff is the main instrument in the regime of trade policy measures and an important issue in trade relations. Secondly, analyzing the impact of China's tariff change on China's economy and EU economy after China's accession into the WTO is the major issue of the second part of the dissertation, to this aim, information about EU and China's tariff must be provided.

After WWII, tariffs were gradually abolished not only in developed countries, but also in developing countries. In order to protect the domestic market, besides tariffs, non-trade barriers such as quota regulations, antidumping measures, and technical barriers to trade have played or are playing a significant role in most developed countries. It is well known that, a proportion of European manufacturing remains protected, largely through the regular use of antidumping measures and the persistence of quantitative restrictions in textiles and clothing. Therefore, as one of the biggest developing countries in the world, China's exports have been strongly limited due to these restrictions.

This chapter is structured as follows. Section 3.1 overviews EU tariff rates. In section 3.2 EU NTBs including anti-dumping, quota, technical barriers to trade are discussed. In section 3.3 some calculation results of the EU's rate of protection are given which will be used in the S-EU CGE[26] model. Section 3.4 provides some concluding remarks.

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[26] The S-EU CGE model is the name of the CGE model build in the second part of my dissertation. See "List of Abbreviations".

3.1 EU tariff rates

Developed countries have greatly reduced their tariffs in recent years, especially on manufactured products that they trade among themselves. Since 1947, these tariff reductions have been accomplished in multilateral negotiations under GATT or the WTO auspices. Largely as a result of these negotiations, tariff levels are now quite low in most developed countries. For example, the simple average bound tariff of industrial products of the EU was 4.1% in 2001 and for all goods, it was 5.0% in 1999 (Hoekman, 2002), although these averages conceal a wide range of tariff rates on individual items.

Yet, more cautious studies on these data show that EU tariffs are higher than generally reported. Table 9 presents the most-favored-nation bound EU tariffs for all the sectors producing goods for 1990 and 1999. This information is drawn from "Measuring the costs of protection in Europe" (Messerlin, 2001). This table provides 4 major results: First, the simple average of all EU existing tariffs on goods was 7.4% in 1990 and 7.0% in 1999, which was significantly higher than the average generally reported. Second, the simple average of all EU existing tariffs has declined by a small amount from 7.4% to 7% within 10 years. Third, the number of tariff lines was increasing from 1990 to 1999. This sort of tariff reshuffling makes possible tariff increases on new products for protectionist motives. In terms of the EU, this motive could be that the EU faces difficulties in following the fast course of modern technical progress and thus sets new tariff lines to protect the domestic market. Fourth, the tariff rate, in which China has a comparative advantage such as textiles and clothing, has a relatively higher tariff and a greater tariff line than manufactured goods.

Table 9   EU tariff rates in 1990 and 1999

ISIC4	Sectors	1990		1999	
		Number of tariff lines	Average MFN Tariffs (%)	Number of tariff lines	Average MFN Tariffs (%)
100a	Cereals (rice excluded)	16		21	14.0
100b	Meat (bovine and ovine)	44	20.0	26	11.2
100c	Dairy products	67		61	9.7
100d	Sugar	7		7	
100e	Other agriculture	443	10.1	538	8.9
200	Mining	110	0.5	137	0.2
311-12	Food products	483	15.5	1586	19.5
313	Beverages	52	17.5	180	8.6
314	Tobacco	7	66.6	9	47.3
321	Textiles	1081	9.9	1059	8.5
322	Apparel	219	12.3	225	11.6
323	Leather and leather products	102	4.7	102	3.2
324	Footwear	68	10.9	58	7.4
331	Wood products	124	5.3	181	2.6
332	Furniture and fixtures	27	6.0	38	1.8
341	Paper and paper products	196	7.6	200	3.8
342	Printing and publishing	43	6.1	41	3.0
351	Industrial chemicals	881	7.1	1153	5.3
352	Other chemicals	361	6.2	423	3.4
353	Petroleum refineries	40	4.6	62	2.1
354	Petroleum and coal products	13	2.6	17	0.4
355	Rubber products	80	5.9	105	5.5

356	Plastic products, nec	139	8.9	35	5.9
361	Pottery, china, etc	24	8.4	25	5.9
362	Class and products	131	8.3	137	4.8
369	Nonmetallic products	121	4.5	132	2.4
371	Iron and steel	469	4.8	521	2.7
372	Nonferrous metals	262	4.6	255	2.9
381	Metal products	524	5.8	354	3.0
382	Machinery	924	4.1	1017	
3825	Office and computing equipment			76	0.8
382x	Other machinery			941	1.8
383	Electrical machinery	501	5.8	679	
3832	Radio, TV, and communication			321	3.6
383x	Other electrical machinery			358	2.6
384	Transport equipment	342	6.1	354	
3841	Shipbuilding			63	1.6
3842	Railroad equipment			40	1.8
3843	Motor vehicles			164	6.3
3844	Motorcycles and bicycles			34	6.1
3845	Aircraft			47	1.7
3849	Other transport equipment			6	1.5
385	Professional goods	352	8.3	381	2.2
390	Other industries	263	5.5	308	3.1
	Total number of tariff lines	8516		10427	
	Average level of trade barriers				
	1. Simple average		7.4		7.0

2.Value-added	weighted	8.2	6.6
average			

Source: Messerlin, Patrick (2001), "Measuring the costs of protection in Europe", Institute for International Economics

3.2 EU non-tariff barriers

EU trade protection is far from relying on tariffs. NTBs, such as export restraints, quotas on imports from centrally planned economies, antidumping measures, and technical barriers to trade have played or are playing a role in the EU's trade policy.

An overview of NTBs in the EU shows a substantial reduction in the use of NTBs between 1988 and 1996 and influence of the NTBs in international trade had also decreased. Drawn information from the OECD estimates in table 10, shows that in 1988, some 6.2% of imports were affected by (quantitative) export restraint agreements of one kind or another applied at the Community level, while 2.2% of imports were affected by anti-dumping and countervailing measures or voluntary export price restraints in the same year. By 1996, the import coverage of export restraints, which was mainly applied in the textiles and clothing sectors, had fallen to 3.0%, while the import coverage of anti-dumping measures, including price restraints, had fallen to 0.2%.

Table 10   Use of different types of non-tariff barriers (NTBs) by the EU, 1988 and
1996

NTB type	Frequency ratio		Import coverage ratio	
	1988	1996	1988	1996
All NTBs	26.6	19.1	13.2	6.7
- Core NTBs	25.2	15.1	10.9	4.2
-- Quantitative restrictions (QRs)	19.5	13.1	7.8	3.8
--- Export restraints	15.5	11.4	6.2	3.0
--- Non-automatic licensing	4.4	1.5	2.2	0.8
--- Other quantitative restrictions	0.2	0.2	0.1	0.0
-- Price control measures (PCMs)	12.4	3.2	6.0	0.5
--- Variable levies	6.3	1.4	1.8	0.1
--- Anti-dumping, Countervailing Measurements and Voluntary Export Price Constraints (AD/CVs & VEPRs)	2.6	0.9	2.2	0.2
--- Other Price control measures	4.3	1.0	2.1	0.3

Source: OECD (1997), "Indicators of tariff and non-tariff trade barriers"

Unfortunately, in terms of sectoral incidence of relative restrictive NTBs by the EU, the influence of the NTBs' reduction was not so significant in Sino-EU bilateral trade as that what is shown as the above. Because the sector which was most affected by NTBs continues to be textiles and clothing, but there was no sign of reduction in the use of measures. The substantial reduction in NTB coverage in agriculture as well as food, beverages and tobacco does not change the decline trend of bilateral trade in the above commodities between the EU and China.

Table 11   Sectoral incidence of relative restrictive NTBs by the EU, 1988 and 1996

ISIC	Description	Frequency ratio		Production-weighted frequency ratio	
		1988	1996	1988	1996
1	Agriculture, forestry & fishing	20.6	8.5	18.8	7.2
2	Mining & quarrying	0.0	5.0	0.0	6.7
21	- Coal mining	0.0	42.9	0.0	42.9
22	- Crude petroleum	...	0.0	...	0.0
23	- Metal ore mining	...	4.4	...	4.4
29	- Other mining	0.0	3.6	0.0	3.6
3	Manufacturing	26.2	13.4	12.6	5.4
31	- Food, beverages & tobacco	50.7	17.2	48.5	11.1
32	- Textiles and apparel	73.8	75.2	74.9	75.4
33	- Wood & wood products	0.0	0.0	0.0	0.0
34	- Paper & paper products	2.7	0.7	1.2	1.9
35	- Chemicals & petroleum products	5.4	2.9	3.5	1.6
36	- Non-metallic mineral products	6.6	0.0	4.4	0.0
37	- Base metal industries	37.5	0.6	37.7	0.6
38	- Fabricated metal products	4.1	0.0	4.6	0.0
39	- Other manufacturing	1.4	0.0	1.3	0.0
Total	All Products	25.3	13.0	12.7	5.6

Source: OECD (1997). "Indicators of tariff and non-tariff trade barriers"

Note: ISIC is the abbreviation of "International Standard Industry Classification"

In terms of NTBs targeted at China's import goods by the EU, antidumping, quota, and technical barriers are the most important NTBs which will be discussed in the following parts.

3.2.1   Anti-dumping

3.2.1.1   Anti-dumping: a vague concept

According to Article VI, GATT 1994, antidumping is defined as: "The contracting parties recognize that dumping, by which products of one country are introduced into the commerce of another country at less than the normal value of the products, is to be condemned if it causes or threatens material injury to an established industry in the territory of a contracting party or materially retards the establishment of a domestic industry. For the purpose of this article, a product is to be considered as being introduced into the commerce of an importing country at less than its normal value, if the price of the product exported from one country to another is less than the comparable price, in the ordinary course of trade, for the like product when destined for consumption in the exporting country, or,   in the absence of such domestic price, is less than either   (i) the highest comparable price for the like product for export to any third country in the ordinary course of trade, or (ii) the cost of production of the product in the country of origin plus a reasonable addition for selling cost and profit".

Under the terms of the GATT for antidumping action, the basic criteria required to be taken are that a product is being 'dumped' and that this dumping is causing injury to domestic producers of the like product. Although exporters are not prohibited from

dumping per se, the importing country is entitled to take action as long as these criteria are met.

Obviously, price is the most important element in judging whether the action is dumping or not. Dumping is a more general way to define as selling a good for export at a price that is lower than it is sold on the exporters' domestic market (its 'normal value'). Certain other provisions could be applied if no such domestic prices exist because not enough sales are made in what is known as the "ordinary course of trade" (principally where substantial sales are made in the domestic market below the cost of production). Such provisions therefore allow for the export price to be compared with another figure - usually the price of sales to a third country, or a constructed price taking into account the cost of production.

The above specification of the GATT code of antidumping is relatively vague. They define dumping in three possible ways, one of them being sales below the "normal value of the products". The notion of the "normal value of products" are not well specified, leaving consideration of whether dumping has occurred in a particular instance. Another concept about price, which is "cost of products plus reasonable addition for selling and profit" is also very ambiguous. For instance, some of Chinese goods are 10 times cheaper in the Chinese market than in the European market, but when these goods are sold in the European market at the price that is 10 times higher than in China, they are still regarded as "dumping". Lastly, the definition of injury as "retard established industry" is also not so precise.

Even worse is if national laws do not provide the appropriate specifications according to the spirit of the WTO, antidumping is most likely to be captured by special interests seeking protection.

3.2.1.2   Anti-dumping cases initiated by the EU

With the reduction of tariffs, antidumping laws constitute very potent instruments of protectionism used in the EU. During the 1980s, the EU ruled on around 900 dumping claims. The average ad valorem equivalent of antidumping measures between 1980 and 1987 was 23%. In 1990, approximately 1.8 billion ECU worth of imports were subject to new preliminary of final antidumping measures (Schuknecht, 1992).

In 1995, 1996, and 1998, in order to cope with the new rules under the WTO, the EU has repeated amendments of its antidumping regulation that aims at conforming EU provisions to the international antidumping agreements and meanwhile protect the domestic market.

Table 12 presents the total number of EU antidumping cases by year for the period of 1980 to 1999.   It provides the coverage of EU antidumping cased by trading partners. The table also shows that EU anti-dumping regulation has a significant trend, where there is a shift of the main targets of the EU antidumping activities from OECD countries to Non-OECD countries, in particular, a shift to China and other Asian emerging markets.

Turning to the product breakdown of the EU's anti-dumping cases, the iron and steel, chemicals and textiles (mainly polyester yarns and fibers) industries are most heavily affected by anti-dumping duties, followed by consumer and electrical goods (TVs, micro-wave ovens). Anti-dumping investigations and measures affecting the textiles industry have been increasing from 1997. The interesting point in EU's anti-dumping case is that there is no single anti-dumping case in the agricultural sector which is strongly protected by the EU.

Table 12   Targets of cases initiated by the EU during1980-1999

targeted countries	1980~1999	1990~1999
	Total number of cases	Total number of cases
OECD countries	146	61
United States	28	8
Japan	36	23
Non-OECD countries	239	320
Eastern Europe	20	41
Euro-Med countries	4	8
Asian tigers	37	65
China	26	59
Other Asian countries	8	82
Mercosur countries	15	10
Mexico, South Africa	9	9
Other countries	14	4
All countries	385	381

Source: Messerlin, Patrick A. (2001): "Measuring the costs of protection in Europe. European commercial policy in the 2000s", Institute for International Economics

3.2.1.3   Anti-dumping targeted China from the EU

In 1979 China got her first antidumping regulation imposed on its export products from the EU. From that time almost every year the trade battle of antidumping

regulation and against regulation between China and the EU kept continuing. Compared with other countries and regions, the EU imposed the most antidumping regulation on China's products. For example in 1991, the percentage of antidumping case on China's export products from the USA was 28.5%, from Australia was 19%, from Japan was 4.7%, but from the EU, it was 33%, which was the highest.

Indeed, over the six years period of 1993-1998, China has been the major target of anti-dumping cases initiated by the EU with total 26 cases, followed by India (22), Korea (17) and Thailand (14). Latest information from interim report of the EU shows: China ranked No. 1 targeted country in antidumping cases initiated by the EU in recent years. By year 2000, 2001 and 2002, the shares of antidumping cases targeted China initiated by the EU were 55%, 10% and 33% (see table 13). Products involved in investigation were mainly some chemical products and crude material.

Few study on why there are so many antidumping investigations targeted China by the EU in recent years. The explanation here focuses on 2 points: (1) As is discussed above, price is the criteria in defining whether the products are dumped or not. In investigation involved in Chinese export products, the EU chose "the price in the third country" as references other than the domestic price in China because up to now China is considered not "a full market economy" by the EU. Due to the cheap labor costs in China and China's distorted exchange rate system, price of most Chinese export goods is much lower than products from other countries, especially from developed countries. (2) With the booming of China's economic growth, a great number of export-oriented enterprises are established. Some of such enterprises produce alike products. In order to get contract from foreign partner, "forcing price down" becomes the main competitive strategy of these firms in international market. This factor results in antidumping investigation initiated not only from the EU but also from other countries.

Table 13   Some statistics on China as the targeted country in antidumping

   investigations initiated by the EU

	2000	2001	2002
Number of total cases initiated by the EU (1)	11	10	12
Number of cases : EU to China (2)	6	1	4
Share (=(2)/(1))	55%	10%	33%
Rank (According to the number of cases)	1	6	1
Products involved in the cases	Aluminium foil, Paracetamol, Lamps, Ferro molybdenum, Stones, Zinc oxides	Sulphanilic acid	Lighters, Para-cresol, Furfuryl alcohol, Sodium cyclamate,

Source: EU (2000,2001,2002,2003), Interim report: "Statistics Covering the Year
   2000, 2001, 2002, 2003"

3.2.2   Quota regulations

There is no legal basis in the GATT or in the EU for the implementation of quantitative restrictions. Imports of products originating from countries where the cost of production is unusually low can be subjected to import quantity limitations. The EU placed a quantitative quota on the basis of Multi-fiber Arrangements (MFA). The other quantitative restriction that is effective in the EU is a restriction on agricultural products. All these quotas will be removed before the end of 2005 as the Multi-fiber Arrangements are being phased out (Government of Pakistan, 1998)

Before 1979, each member state of the EU implemented their own import quota restriction system, which refers to quota and licensing. From 1979 to 1992, instead of a member state's national quota restriction, the EU as a whole, implemented a common quota regulation to non-EU countries. Information drawn from "Trade Protection in the European Community" (Schuknecht, 1992) shows that before 1987, 8% of imports in industrialized countries were covered by a quantitative quota restriction. The EU applied over 500 quota restrictions against non-member countries, half of them in the context of the Multi-fiber Arrangements against clothing and textiles. Most EU quotas are targeted at a centrally planed economy or developing countries. For instance, in 1988, about 1000 quotas were enforced by member-states in such countries excluding the textiles and clothing quotas.

In terms of quotas on Chinese imports, as a union, the EU has enforced most of the quota regulations on China's export products compared to other countries of the world. According to an EU document (EU,1995), before 1995 some 4,700 quotas on Chinese products took place in.[27] After the establishment of a "single market", on Feb. 1994, although the EU decided to cancel 6417 quotas on Chinese export goods regulated from each member state,   a new quantitative restriction system called

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[27] see   EU (1995) " A Long Term Policy for China-Europe Relations".

"common import quotas" was established. Under this new regulation, 7 classes of China's export of non-textile goods, which included footwear, china, toys, radio and twined products and 15 kinds of textiles and clothing goods were limitedly exported to the EU. The total quota on Chinese goods did reduce, yet, the countries that had no quota on China's goods such as Finland began to implement quota regulations on China goods after 1994.

The EU's quota restriction on Chinese goods covers mainly on two groups of products. One is the quota on textiles and clothing under Multi-fiber Arrangements. As is well known, China is the biggest textiles and clothing producer because of its cheap labor costs, and meanwhile, the textiles industry is also China's back-bone export industry. Similarly, as one of the biggest textiles and clothing producers and consumers, the EU pays also great attention to the textiles industry, especially in Germany, the UK and Italy[28]. But due to high labor costs, the textiles industry is also one of the most difficulty industries in the EU. To protect the domestic textiles and clothing industry, about a quarter of the EU's total imports in this sector is under quotas. As the biggest textiles and clothing trade partner[29], the influence of the EU's quota on Chinese textiles and clothing under Multi-fiber Arrangements is very significant.

The quota on Chinese electrical products is another aspect on this issue. For example, up to 2002, Chinese color TV exports were subject to the EU's quota system of 400,000 units a year (People's daily, 2004).

To most Chinese producers under the EU's quota restriction, worse is, EU quotas are

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[28] The EU was the world's largest exporter of textile products in 2002 with a 15% share and the world's second largest exporter of textiles and clothing accounted for a 11% share just behind China. In 2002, the EU imported € 71 billion textiles and clothing goods, or around 20% of total world imports, second after the US which accounts for 24 % of world imports.
[29] The EU imports of textiles and clothing in 2001 amounted to € 72.1 billion and its exports to € 43 billion. The EU main textiles and clothing trade partners are China (€ 10.4 billion exports to the EU), Turkey (€ 8.1 billion) and India (€ 4.1 billion).

given to importers in the EU. Chinese exporters have no chance to arrange production before they get a deal from EU importers, and therefore, sometimes they lose price-setting rights in bargaining with EU importers.

3.2.3　EU technical barriers

3.2.3.1　EU technical barriers

Technical regulations and standards are used by governments to achieve domestic policy objectives such as containment of health and environment-related risks; and to facilitate trade by ensuring the interoperability of technical systems and improving market transparency. These standards, technical regulations, and certification systems enhance the availability of information and to reduce uncertainties about the quality of goods and services purchased by firms and households. Also, these technical requirements can sometimes contribute to reinforce consumer confidence and boost sales of products of both domestic and foreign origins (Walkenhorst, 2002).

On the other hand, technical standards are generally voluntarily defined by business groups or nongovernmental standardization organizations, whereas technical regulations are legally binding. Together with a technical standards system, certification systems are also intended to assure compliance with existing standards or regulations. To this extent, technical standard regulations and certification systems differ across countries, they may act as technical barriers in the flow of trade. And furthermore, excessive or cumbersome measures have the potential to undermine market contestability, discourage imports, and, thus, reduce economic efficiency.

Recently, the EU policy in technical regulations has partially tried to shift from harmonization of member-state technical regulations to mutual recognition of these

regulations. However, according to imperfect statistics, there are more than 100,000 technical regulations and standards on import products among EU's member states. For instance, on food products, despite the setting technical regulations on origin, material, components and leftovers of pesticides on food of the import products, regulations or technical standards on package and material of package of these foodstuffs are also set.

Moreover, the member states maintain a number of national marketing and import bans on some import products even though those products have already been approved by the EU. And to some import goods, the EU has implemented an "Automatically Alert System", which means, if one of the EU member countries finds an import good has not passed the technical inspect, other member countries will automatically refuse to import this kind of good at the same time.

As one of the results of such a complex technical standard and inspection system, the EU got the most complaints of abuse of technical barriers which is shown in table 14. From 1999 to 2002, the EU had complaints by a total of 7 trading partners due to technical dispute, which shared 58% of the total disputes of the world. Among these disputes, goods related to food issues were a key sub-category of technical regulations that provide important policy-oriented lessons.

Table 14   Technical barrier disputes from 1999 to 2002

1999			2000		
Request for consultation	Product	Number of the case	Request fro consultation	Product	Number of the case
Canada,	Asbestos	1	Canada,	Asbestos	1

Brazil	and Products containing Asbestos		Brazil	and Products containing Asbestos	
India	Rice	1	USA[30]	Rice	1
Canada	Wood of Conifers	1			
world[31]		5	world		4
Share of cases targeted the EU		60%	Share of cases targeted the EU		50%

2001			2002		
Request for Consultations	Product	Number of case	Request for Consultations	Product	Number of case
Canada, Brazil	Asbestos and Products containing Asbestos	1	USA	Rice	1
USA	Rice	1	Venezuela Chile United States Ecuador	Sardines	1

[30] Actually, the dispute happened between Belgium and USA.
[31] This index refers to the dispute case of the total world in that year.

Venezuela Chile United States Ecuador	Sardines	1	Argentina	wine	1
World		5	World		5
Share of cases targeted the EU		60%[32]	Share of cases targeted the EU		60%

Source: EU (2000,2001,2002,2003), Interim report: "Statistics Covering the Year 2000,2001,2002,2003"

3.2.3.2 Influence of EU technical barriers on China's exports

More and more of China's export goods confront technical barriers in the international market, especially in the European market. These technical barriers have to do mostly with: pesticide leftovers of foodstuff, ratio of a lead in Chinese products, Pentachlorophenol found in leather products, recycling indicator of packages, indicator of dyestuff in textiles and clothing, etc. (Li, 2003).

China's products suffered from technical barriers covered by a variety of industries, from general and traditional export goods such as agriculture goods, textiles and clothing, and toys, to new export goods such as manufacturing goods, electronic goods and hi-tech products. For instance, in terms of agriculture goods and foodstuff, due to EU regulations on remains of pesticides and hygienic inspections, most of such goods made in China are out of the European market.

Recently, other key EU instruments in joining together the technical   barriers   and

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[32] This figure was calculated by the author.

environment are eco-labeling[33] for environmentally friendly products and eco-audit[34]. From the publishing of the "ISO1400 Standard System" in 1996, China's export goods confront this sort of new TBT in EU's market. Under so-called "Green Barrier", besides the technical standards and qualified inspections on export products, the producing process and environmental influence of the product is also a technical criteria in the EU market. This makes Chinese goods, which are produced under relatively lower industrial techniques compared to EU standards, much more difficult to enter into the European market.

3.3   EU rate of protection used in the S-EU CGE model

3.3.1   Methodology in calculating the rate of protection

Generally, measuring the rate of overall protection should combine tariff rates and tariff equivalents of NTBs, which need a lot of statistical information.   Tariff data can be easily accessed from an official statistical source. The difficulty is calculating the tariff equivalent of NTBs. Alan V. Deardorff and Robert M. Stern (Deardorff, 1997) from Michigan University provide us with relatively precise formulas on equivalent NTBs according to international economics theory, thus, the rate of protection (tariff rate +equivalent of NTBs) could be derived.

For a good that is not traded internationally:

MC: marginal cost in production

r_p : producer rent (markup over marginal cost)

P_e: ex-factory price

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[33] This regulation adopted in March 1992, provides that the manufacturer or first importer of a product may apply for an eco-label to the competent body in the member state. The body decides whether to award a label after assessing the product, and consulting widely.

[34] Eco-audit is stated in the Maastricht Treaty as: a voluntary environmental auditing scheme which requires participating companies to incorporate environmental protection standard into their production process. Member States share the task of coordinating the scheme, receiving applications to participate and drawing a list of approved "verifiers" who can decide on compliance with the regulations.

C_w: cost of wholesale distribution

$P_w=P_e+C_w$: wholesale price

C_r: cost of retail distribution

$P_r=P_w+C_r$: retail price

$C_d=C_w+C_r$ total cost of distribution

So, $P_r=P_e+C_d=MC+r_p+C_d$

For a good that is traded internationally:

MC: Marginal cost in production

r_p :   producer rent

P_e: ex-factory price

C_w: cost of wholesale distribution

r_x: exporting-country post-factory rent per unit of NTB, build into f.o.b. price

$P_f=P_e+C_w+ r_x$:   f.o.b. price

C_t: cost of transport and insurance per unit

$P_c=P_f+C_t$:   c.i.f. price

t :   tariff in specific terms of import country per unit

r_m: importing-country rent per unit of NTB

$P_t=P_c+t+r_m$:   an inside border price of import country (market price of import country)

C'_w: cost of wholesale distribution of import country per unit

$P_w=P_t+C_w$:   wholesale price of import country

C_r: cost of retail distribution of import country

$C_d=C'_w+C_r$ total cost of distribution of import country

Let, P_r : retail price in import country

$P_r=P_e+C_w+r_x+C_t+t+r_m+C_d$

$$=MC+r_p+ C_w+r_x+C_t+t+r_m+C_d$$

In terms of calculating the protection rate, the defining rate of protection (RP) as the rate of overall protection of the import country. The following formula can be derived as:

$$RP=t+ r_m = P_t\text{-}P_c$$

In the above formula it can be explained that the NTB can be seen as a sort of tariff, which would lead to the same value of this inside-border price by creating rents. The protection rate of one country is thus equal to the inside border price (market price) of an import country minus c.i.f price.

3.3.2   EU protection rates used in the S-EU CGE model

The database used in the S-EU CGE model is GTAP 5 pre-released data. In this database, inside border prices and c.i.f world prices of import goods are not available. But the import volumes at market price in import countries and at the world price (c.i.f) are offered. According to the formula illustrated in 3.3.1, we have:

$$IM*PM^m=(1+t+t_n)*IM*PM^w$$

In which, IM: quantity of import

PM^m: market price of import goods in import country

PM^w: world c.i.f price of import goods (exchange rate has been considered)

t: tariff rate of import country

t_n: equivalent of NTBs of import country

Then,

$$t+t_n =(IM* PM^m)/(IM* PM^w) \text{-}1$$

The calculation result is outlined in table 15.

Table 15   The rate of protection of the EU to China used in the S-EU CGE model
              Year: 1997

industry	Imported goods from EU at c.i.f. world price (million US$) (1)	Imported goods from EU at market price (million US$) (2)	Tariff rate +Equivalent of NTBs =(2)/(1)-1
grains and oil seeds	131.36	160.65	0.22
No grain crop	319.62	346.55	0.08
Livestock	422.33	453.74	0.07
Meat and milk products	74.75	101.30	0.36
Food processing	469.62	618.30	0.32
Tobacco and beverages	82.44	89.31	0.08
Forestry and wood products	695.48	715.58	0.03
Fishery products	26.39	26.46	0.00
Energy products	158.80	158.80	0.00
Minerals products	943.66	1001.08	0.06
Textiles	2411.74	2656.21	0.10
Apparel	6024.50	6690.79	0.11
Leather and sporting goods	4571.54	5004.90	0.09
Other light manufacture	6784.97	7123.38	0.05

Manufacture intermediate	6980.46	7324.51	0.05
Motor vehicles and parts	128.40	133.71	0.04
Other transportation equipment	467.41	492.63	0.05
Electronic equipment	8045.98	8653.01	0.08
Other machinery and equipment	8039.58	8372.47	0.04
Trade and transportation	9147.01	9147.01	0.00
Utility housing and construction	307.37	307.37	0.00
Rate of protection			0.09

Source: Global Trade Analysis Project (GTAP) 5.0 pre-release database and author's
calculation

3.4   Conclusion

♦   Although EU tariffs have been reduced in recent years, a more cautious study shows that the EU's MFN average tariff rate is higher than generally reported.

♦   Antidumping is one of most frequently used NTBs used by the EU in protecting its domestic market. Recently, China has become the major target of antidumping cases initiated by the EU.

♦ Technical barriers to trade serves as a relatively new measurement in protecting the EU's domestic producer. Despite technical standards and the quality inspection system, some regulations on the producing process and influence on the environment are also implemented in Sino-EU tradable goods. This drives some Chinese goods out of European market.

♦ Using the data from the GTAP database and applying the method of calculating NTBs introduced by Deardorf, the rate of protection of the EU to China was 9% in 1997.

Chapter 4   China's Trade Protection in Bilateral Trade

The past two decades have seen enormous changes in China's foreign trade policies such as in loosing foreign exchange controls, decentralizing the right of trading products, especially in reducing tariffs and NTBs regulations such as quotas, licensing regulations, removing export subsidies and abolishing many regulations on foreign investment. But on the other hand, until 1999, China still remained a country with a high tariff. Nominal tariffs remained at an average of 17 %, which was about 13%[35] higher than most developed countries and even 5.7% higher than many developing countries in 1999.

At the same time, some very significant differences between the tariffs rate calculated from the actual duty collection and nominal tariff rate, the tariff rate calculated from the actual duty collection rate and the nominal trade weighted import tariffs were observed. For example, China's nominal import tariffs in 1996 and 2000 were 35.6% and 17%, and later, the nominal trade weighted import tariff rates were 23.4% and 16.4%, but the actual duty collection rates were only 2.6% and 4.0%. It suggests that simply using a nominal tariff rate, trade un-weighted or weighted import tariff rate to analyze the degree of China's trade protection is not so satisfying.

Fortunately, the study on China's tariff rate and relative issues are warming up with the China's accessing into the WTO. In the middle of 1990s, some basic studies on these issues, which were mainly based on simple tariff rates from China Custom Statistics were appeared in China's economic study literature, such as Yang (1997), and Li (1997). But considering exemption and smuggling[36], some economists argued that China's protection level, which was calculated according to China's nominal

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[35] See table 16.
[36] The accurate information about smuggling is not available in Chinese official documents, so further discussion about the role of smuggling in China's trade regime is omitted here.

tariff rate, had been highly distorted and simply using a tariff rate from China's Custom Statistics in relative China's macroeconomic model could have mislead some characters of China's trade system (Li, 1997 and Leeuwen, 2000).

Meanwhile, China's trade protection is far from relying on tariffs. NTBs, such as, state trading and designated trading systems, quotas and licensing, antidumping measures and technical barriers to trade have played and are still playing a significant role. Due to China's special economic and administration system, quantitatively analyzing China's entire NTBs is very difficult. This is not only because of a lack of some accurate data and document information, but also because of the methodology of quantifying China's NTBs. The institute for international economics is a pioneer in this issue[37].

Two major tasks of this chapter are to outline the main measurements of China's trade protection and to estimate the degree of China's trade protection. The chapter is organized as follows. Section 4.1 overviews China's tariff rates in recent years, including the level and structure of tariff rates, and more over, the tariff rates of 21 industries or commodities is provided. In section 4.2, China's NTBs including the state and designating trade system, quotas and licensing, anti-dumping, value-added tax (VAT) policy and technical inspection are discussed. In section 4.3, some calculation results of China's rate of overall protection and protection rate of China to the EU used in S-EU CGE model according to price-comparison methods are given. Section 4.4 concludes.

4.1   China's tariff rates: level and structure

From 1949 to 2002, China enacted the " Regulation of the People's Republic of China on Import and Export Duties" three times. The first one was enacted in 1951,

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[37] In 1999, the book entitled " "Measuring the costs of protection in China" (Zhang, 1999) was published by Institute for International Economics.

and the other two were enacted in 1985 and 1992 respectively.

Before China's economic reform, with the highly centralized administration trade system, the mechanism of decision making of the trade system was not transparent. And the aim of setting tariff lines focused mainly on two points: (1) protecting the domestic industry, especially China's infancy and relative important industries such as the machinery industry; and (2) building its international competitiveness.

4.1.1   Level of China's nominal tariff rate

In 1991, China's trade tariff was very high with a simple average nominal tariff rate as high as 47%. Since 1992, China has sped up its tariff reducing process. From 47% to 42.9 % by the end of 1992, and continually down to 39.9 % by the end of 1993 due to the adjustment of 3371 duty codes at an average of 7.3 %. Again, China decided to reduce import tariffs for 2898 duty codes at an average of 8.8% in 1994, which brought the simple average nominal tariff level down to 36.3 %. At beginning of 1995, the rates for tobacco and liquor, magnetic tapes, middle automobiles, etc. were reduced and therefore the tariff level lowered to 35.6%.

Two other significant reductions on tariff levels were implemented on April 1, 1996, and October 1, 1997 respectively, which involved 4997 duty codes, (76.3 % of the total 6554 tariff lines) in 1996, and also involved a lot of tariff lines in 1997 (which lowered by 35 % on average). After these two times of adjustment, the average tariff rates declined significantly from 35.6% in 1995 to 17.6% in 1997.

By the year 2001, China's simple average tariff rate was 15.3%, which was only one third of the rates in 1991. The summary on the above tariff reducing process can be seen in table 16.

However, compared with other countries, China's tariff level was still significantly

higher than the average level of 129 developing countries and 23 developed countries. In further detail, China's average tariff rate from 1991 to 1999 was 28%, which was 11% (average) higher than 129 developing countries and 21.8% (average) higher than 23 developed countries. So it is very obvious to see why China has had the reputation of having high tariffs for such a long time.

Table 16.   Simple average tariff rates of China, 129 developing countries, 23 developed countries, 1991-2001,   unit:%

Year	Simple average tariff rate[38]		
	China	Developing Countries (129)	Developed countries (23)
1991	47.0	24.3	8.5
1992	42.9	21.5	7.9
1993	39.9	19.4	6.8
1994	36.3	18.7	7.2
1995	35.6	16.1	6.3
1996	23.6	14.9	5.3
1997	17.6	13.7	5.0
1998	16.8	13.1	4.4
1999	17.0	11.3	4.0
2000	16.4	n.a.	n.a.
2001	15.3	n.a.	n.a.
Average (1991~1999)	28.0	17.0	6.2

Source: 1. Tariff data of 129 developing countries and Developed countries come

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[38] All tariff rates are based on un-weighted averages for all goods in ad-valorem rates, or applied rates, or most-favored-nations, whichever data are available over a longer period.

from Hoekman, Bernard M.and Aaditya Mattoo, (2002), "Development, Trade and the WTO: A Handbook", World Bank

2. China's tariff data before 1999 comes from Hoekman, Bernard M.and Aaditya Mattoo, (2002), "Development, Trade and the WTO: A Handbook", World Bank except in 1991 and 1995 due to the lack of sort of data in this handbook. China's tariff data in 1991 and 1995 come from Yang, Shengming (1997).

3. China's tariff data after 1999 (include 1999) are edited by the author
   - Rate of 1999 comes from Shi Guangsheng (Aug, 4,1999, China's News Agency, in Chinese)
   - Rate of 2000 comes from People's Daily, 30,1 2,2000
   - Rate of 2001 from NBS, National Bureau of Statistics of China, *References Material of research* Vol.14, 2002. (all the above in point 3 are written in Chinese)

4. " n.a." : not available

4.1.2   Structure of China's tariff rates in 2002

In 2002, total of 7316 China's import tariff lines were enumerated. The average nominal simple weighted rate was 11.9%, among which, in terms of the industrial classification in the S-EU CGE model, the tariff rate of energy products, minerals products, other transportation equipment, trade and transportation and utility housing and construction were below 5%, among which, the tariff rate of trade and transportation and utility housing and construction were even 0.   The rates of grains and oil seeds, livestock, forestry and wood products, manufactured intermediate and other machinery and equipment were between 5-10%. The rates of no grain crop, fishery industry, other light-industrial products, electronic equipment, were between 10-15%. Meat and milk products, food processing, tobacco and beverages, apparel, textiles, leather and sport goods, motor vehicles and parts belonging to the industries

with high tariffs, which were over 15%.

Table 17   China's simple average tariff rates, by industry in 2002.

Industry	Simple average tariff rate (%)
grains and oil seeds	5.9[39]
No grain crop	14.0
Livestock	5.8
Meat and milk products	19.2
Food processing	18.9
Tobacco and beverages	39.2
Forestry and wood products	6.0
Fishery products	11.6
Energy products	4.9
Minerals products	2.2
Textiles	16.1
Apparel	21.6
Leather and sporting goods	15.6
Other light manufacture	10.4
Manufacture intermediate	8.7
Motor vehicles and parts	22.7
Other transportation equipment	4.5
Electronic equipment	12.5
Other machinery and equipment	9.9
Trade and transportation	0
Utility housing and construction	0

Source: 1. Original data come from Customs General Administration P.R.C (2002),

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[39] All data in this column are a simple average nominal of MFN tariff rates, and, if the item has a quota, the average rate is calculated using the rates under a quota restriction.

"Regulation of the People's Republic of China on Import and Export Duties in 2002"

2. Simple average tariff rates on different industries were calculated by the author.

One observation from the above data should be mentioned here, that is, China's tariffs tend to provide high protection for 1) the manufacturing sector, such as electronic equipment, motor vehicles and parts; and 2) final consumption goods such as apparel, food processing, tobacco and beverages.

4.1.3 China's actual duty collection rate

Although the average nominal tariff rate was very high as illustrated above, China's actual duty collection rate was significantly lower than the nominal tariff. For example, the nominal tariff rate in 1992 was 42.9 %, but the actual duty collection rate was only 4.3% (the rate is obtained using the total tariff revenue divided by the total import (c.i.f price)). This situation became worse from 1992 to 1995. Up to 1996, when China's exemption rate began to fall down, actual duty collection rate began to rise. Table 18 provides more information in detail.

One study from the World Bank showed that China's actual duty collection rate was estimated to be only between 5% and 6% of the c.i.f value of imports (Bach, 1997). A much greater part (around 68%) of the government tax revenue can be contributed to industrial and commercial tax. In this respect, China is more like a developed country rather than a developing country. In comparing the data from other developing countries in the period of 1987 to 1992, only Brazil had a duty collection rate of 6.9% in 1987. The data from countries such as Argentina and the Philippines, was 2 or 3 times higher than China's. For India, it was even 10 times higher (51.2% in 1986).

Table 18　China's actual duty collection rate and exemption rate from 1991-2001

year	Nominal tariff rate (%) [1]	Import (bn US$) [2]	Tariff revenue (bn US$) [3]	Actual duty collection rate (%) [4]= [3]/ [2]	Exemption rate (%) [6]=100-[4]/ [1]
1991	47	63.7	3.5	4.8	88.8
1992	42.9	80.6	3.9	4.3	89.3
1993	39.9	104.0	4.5	2.7	92.5
1994	36.3	115.6	3.2	2.6	92.6
1995	35.6	132.1	3.5	2.6	88.9
1996	23.6	139.0	3.6	2.7	84.6
1997	17.6	142.4	3.9	2.7	84.0
1998	16.8	140.4	3.8	4.1	75.9
1999	17	165.9	6.8	4.0	75.4
2000	16.4	225.1	9.1	4.2	72.8
2001	15.3	243.6	10.2	na	Na

Source: The data in [1], [2], [3] come from NBS, "China statistical yearbook"

Several papers have studied this issue and the relatively common explanation on this phenomenon is that China has a very high level duty exemptions system, which is one of the preferential policies to attract foreign investment. Such a system was first implemented as a duty drawback system until 1987. And from 1987, instead of this duty drawback system, relief from import duties was allowed at the point of import. These kinds of duty exemptions are primarily allowed for export-oriental enterprises, such as some joint ventures in China, where products are sold in oversea markets. Further, the most important categories that benefit from this exemptions system was

equipment imported with foreign investments and imported goods for processing trade (15% of total trade). Data shows that exemptions for export processing with supplied or imported materials covered 78% of the total estimated concessive imports in 1991 (Bach, 1997). In 1999, according to China's Customs authorities, 60% of imports entered either duty-free or subject to reduced duties. The exempt and reduced categories, with their 1999 import shares in parentheses, were processing trade (41%, exempted), initial investment of joint ventures (13%, exempted), and other exempted/reduced (6%, exempted or reduced).

However, concessive imports cannot alone explain such low actual collection rates. Other imports, especially imports by the government or imports used for priority projects are also exempted.

From the above description, characters of China's tariff regime can be summarized as the following: (1) China's tariff provides high protection for the manufacturing sector, especially the capital intensive sectors and final consumption goods. (2) There is significant difference between the nominal tariff rate and the actual collected rate, mostly because of China's import duty exemption system. (3) Due to the high share of import for exemption, the effects of high tariffs are very limited in some sectors.

4.2   China's NTBs: from 1992 to 2002

As is well known, combined with high nominal tariff rates, a variety of NTBs also play a very important role in China's trade protection. Generally, two major types of China's NTBs, which are quantitative restriction and non-quantitative restriction, should be mentioned here. Quantitative restrictions are also named "core" NTBs in the case of China's NTBs, which include: import quota and licensing. Non-quantitative restrictions are those, which refer to variable charges, antidumping, a designed trading and registration system, foreign exchange control, customs

valuation procedures, technical standard inspection and other barriers to trade[40]. In this section, only quotas and licenses, state and designated trading, anti-dumping, value-added tax policies and technical inspections are discussed, because these NTBs are the main measurements in China's trade policy regime.

4.2.1   China's quotas and licenses

In 1992, the number of commodities under quota control in China was lowered from 212 to 183, and at the same time, import licenses for 16 categories were removed. Lardy   estimates that the number of tariff lines subject to quotas and licenses was about 1247 tariff lines in 1992 (Ianchovichina and Will Martin, 2001). On December 31,1993, import licenses for another 9 categories of 283 kinds of commodities including steel, medicine, civil aircraft, and black-white TV sets were removed. In May 1994, China stopped issuing all mandatory plans for import and export, and canceled the import licenses and quotas for another 195 kinds of commodities. Those included 30 kinds of goods that were to be relieved of requirements by the end of 1994. In 1995, the import license for another 120 commodities was eliminated. In April 1996, the number of the remaining quotas was cut again by 30%.

After a few reductions, 261 kinds of import goods were estimated subjected to quotas and licenses in 1999, which was only one fifth of such a level in 1992. In 2001, an estimated 257 tariff lines were covered by a combination of licenses and quotas and 47 by licenses only.

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[40] In fact, this is not the whole story of China's NTBs.

Table 19   The number of products subject to quotas and licenses and the quota and

                licensing reduction in China during 1992-1997

year	Number of products subject to quota and licenses	Process of reducing Non-Tariff Barriers
1992	1247	- reduced the number of export goods subject to quota-license regulation from 212 to 183. - eliminated import-quota license requirements for 16 classes of goods.
1993	964	- eliminated import-quota license requirements for 9 classes of goods.
1994	769	- stopped issuing mandatory plans for imports and exports. - eliminated import license requirements for 195 goods
1995	649	- eliminated import license requirements for 120 goods
1996		- eliminated 30% of remaining quotas.
1997	384	
1998		
1999	261	
2000		
2001	257	
2002	170	

Source: (1) The illustration in column of "process of reducing NTBs" and data
before 1996 come from Zhang, Zhang and Wan (1999) "Measuring the
Costs of Protection in China", Institute for International Economics.

(2) The data for the period of 1996 to 2000 in the column "the number of
products subject to quota and licensed" come from Das, Dilip K. (2001),
"China's accession to the World Trade Organization: issues and
implications".

(3) Data in 2001 comes from Ianchovichina, Elena and Will Martin (2002),
"Evaluating Accession to WTO by China and Chinese Taipei" and the
data for 2002 see table 20.

By 2002, which was the first year that China accessioned into the WTO, China's
trade authorities released a number of revised catalogues that reflected its WTO
commitments to phase out quota and licensing regulations for certain goods, which
cover oil, nature rubber and machinery products, electronic equipment, electric and
transportation equipment, and watches. Only 170 tariff lines were controlled by core
NTBs. Information about these data are listed in table 19 and table 20.

While China's tariff barriers' reduction suggest China's more open trade regime,
China's import licensing and quota system still remains opaque and restrictive. It
maintains a complex matrix of rules governing the licensing of such imports as
general commercial products, mechanical-electrical products, and some technology
products.

Table 20   China's quota, licensing in 2002, by commodity.

Commodities	Tariff line	NTBs
- Oil	8	quota
- Nature rubber	4	quota
- Vehicle wheel	2	quota
- Machinery products	7	quota
- VCD production-line	5	licensing
- Camera and parts	4	quota
- Transportation		
Equipment and parts	57	quota
	6	quota
- Watches	77	licensing
- Others		
Total	170	

Source: MOFTEC (Ministry of Foreign Trade and Economic Cooperation, PRC) "Compilation of the legal instruments on China's accession to the World Trade Organization"

4.2.2   China's state trading and designated trading agent system

Before 1994, China's trade approval system largely operated under the umbrella of its state-planned economy. A prominent feature of that system was state and designated trading agents. Under this system, only a limited number of firms could import and sell products in the domestic market, and export to the partner country. Firms became designated trading agents either by assignment from central government ministries in Beijing or by capturing part of the import quotas that were

distributed from Beijing to districts or industries. Most of these quotas could not be obtained through market competition, such as bidding.

After 1994, the story began to change. With the reform of China's international trade system and preparation for accession into the WTO, many trading rights were decentralized. In 2002, only a few commodities were designated trading goods. These goods and relative designated agencies are listed in table 21.

Generally, this kind of trading system could potentially work as NTBs. The World Bank has an estimated protection degree of China's designated trading. When trade in both agricultural and manufacturing goods was considered, the average protective impact of designed trading was about 9.3% in China. But as a result of China's accession into the WTO, designated trading will be phase out in several years and will not be the major tool of China's trade protection (Ianchovichina, Elena and Martin, 2002).

Table 21   China's state and designated trading agent system in 2002

Products	Tariff line	State trading enterprises
Grain	18	China National Cereals, Oil & Foodstuff Import and Export Co.
		1. China National Cereals, Oil & Foodstuff Import and Export Co.
		2. China National Native Products and Animal By-products Import & Export Co.
		3. China Resources Co.
Vegetable oil	7	4. China Nam Kwong National Import & Export Co.

		5. China Liangfeng Cereals Import & Export Co.
		6. China Cereals, Oil & Foodstuff Co.(Group)
sugar	6	1. China National Cereals, Oil & Foodstuff Import and Export Co.
		2. China Export Commodities Base Construction Co.
		3. China Overseas Trade Co.
		4. China Sugar & Wine Co. (Group)
		5. China Commerce Foreign Trade Co.
tobacco	18	1. China National Tobacco Import & Export Co.
Crude oil	1	1. China National Chemical Import & Export Co.
		2. China International United Petroleum & Chemicals Co.
Processed oil	7	3. China National United Oil Co.
		4. Zhuhai Zhenrong Company
Chemical fertilizer	25	1. China National Chemical Import & Export Co.
		2. China National Agricultural Means of Production Group Co.

Cotton	2	1. China National Textiles Import & Export Co.
		2. Beijing Jiuda Textiles Group Co.
		3. Tianjing Textiles Industry Supply and Marketing Co.
		4. Shanghai Textiles Raw Materials Co.

Source: MOFTEC, Ministry of Foreign Trade and Economic Cooperation, PRC, "Protocol on the Accession of the People's Republic of China"

4.2.3 China's anti-dumping

China's history of anti-dumping (AD) is fairly short. In 1997, China first established its anti-dumping regime. From 1997 to August 2001, a total of 24 investigations had been initiated. After only 3 cases started in 1997 and no case initiated in 1998, the number of cases rapidly increased, that is, 7 cases initiated in 1999, 6 cases in 2000 and eight cases in 2001. On January 1, 2002, to conform regulations to the provisions and requirements of an international anti-dumping agreement, a new Chinese anti-dumping regulation became effective. The latest report said, soon after this new regulation, China launched nine of its own dumping investigations in 2002.

Table 22 outlines Chinese antidumping measures from 1997 to 2001. The information derived from this table deserves 2 observations. Firstly, antidumping measures have been taken in the cases related to a variety of products of row material for intermediate use such as steel, cold-rolled silicon and methylene chloride. Secondly, China has more often targeted industrial countries such as the EU (4 cases), and the USA (4 cases) than the six top developing country antidumping users[41].

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[41] From 1995 to 1998, among the top ten anti-dumping users, Mexico, India, South Africa, Argentina, Turkey and Brazil are listed in the top ten. For more details about data see Messerlin (2001)

Table 22   China's antidumping measures in force and investigation

Initiation year	Case number	Country	Products
1997	1	Canada	Newsprint
1997	2	Korea	Newsprint
1997	3	USA	Newsprint
1999	1	Russia	steel, cold-rolled silicon
1999	2	Korea	polyester film
1999	3	Japan	steel, cold-rolled stainless
1999	4	Korea	steel, cold-rolled stainless
1999	5	EU Germany	Acrylates
1999	6	Japan	Acrylates
1999	7	USA	Acrylates
2000	1	EU Britain	methylene chloride
2000	2	EU France	methylene chloride
2000	3	EU Germany	methylene chloride
2000	4	EU Netherland	methylene chloride
2000	5	Korea	methylene chloride
2000	6	USA	methylene chloride
2001	1	Japan	polystyrene
2001	2	Korea	polystyrene
2001	3	Thailand	polystyrene
2001	4	Indonesia	lysine
2001	5	Korea	lysine
2001	6	USA	lysine
2001	7	Korea	Polystyrene, chips
2001	8	Korea	Polystyrene, staple fiber
Total	24		

Sources: MOFTEC, WTO Semi-annual report G/ADP/N/92/CHN, 11 September
2002.

Another significant feature of China's antidumping measure is that: the relatively
high level of measures adopted by the Chinese authorities: minimum antidumping
duties amounted to 14-15 %, whereas maximum duties amounted to 63-75%.

4.2.4   China's value-added tax policy and technical inspections

In addition to the problems mentioned above, value-added tax (VAT) policies[42]
remained another area of likely contention between China and its trading partners. As
has been discussed in section 4.1.3, a very high level of duty exemptions related to
the duty drawback system before 1987 and the duty exemption system after 1987
was implemented in China's trade system, which has give preferential VAT
treatment for export-oriental enterprises, joint venture and some government or
priority projects at the point of import.

Although in September 2002, China's Customs changed in VAT rebate policy for
imports intended for foreign-invested projects by which foreign investments in the
category that qualify for tax exemption by exporting all of their products must pay an
applicable tariff and VAT for imported equipment, these investments may, however,
receive rebates of 20 % each year for five years after an official examination shows
that the equipment was imported.

Recently, although the tax preferential policy such as the tax exemption system has
gradually changed, China's continuation of preferences for domestic enterprises or
special treatment for export-oriented enterprises still remains.

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[42] This policy is the basis for China's tax exemption system.

Lastly, China's inspection system for imports serves also as a trade barrier. According to the international standard regulation, the Administration of Quality Supervision, Inspection, and Quarantine of China issued a series of rules to streamline inspection and quarantine activities of imported products. For example, one rule, governing the import of used machinery and electronic equipment, adds layer of red tape to existing MOFTEC requirements by introducing pre-inspection.

Recent years, similar as EU's "Green barriers", Administration of Quality Supervision, Inspection, and Quarantine of China select products that involve so-called safety, hygiene, and environmental protection, as well as products that have been the subject of complaint or repeatedly involved in accidents, to conduct sample inspections. Though most countries' customs authorities reserve the right to perform random inspections, some observers think that the new China's inspection rule reintroduces an arbitrary inspection regime that was recently eliminated when China issued a list of products subject to China Compulsory Certification requirements.

4.3   The level of China's overall protection

Due to the old and particular trade system, many protective measurements are still vague in China's trade regime today. Evaluating China's trade protection system is still difficult, especially, giving an accurate data explanation.

One of the most difficult issues is calculating tariff equivalents of NTBs. To illustrate China's NTBs more completely, frequency and price-comparison methods are used in calculating the level of China's NTBs and overall protection. In general, the frequency method is the commonly receptive approach to explain NTBs which calculate the frequency of NTB measurements in total tariff lines. But sometimes due to its ignorance of the importance of different tariff lines on imports, relative precise formulas on NTBs equivalent on the basis of price comparison is also introduced to evaluate the level of China's overall protection which was been introduced in 3.3.1

and 3.3.2.

4.3.1   Frequency of tariffs and NTBs and their import coverage rates

A relative simply way to give the share of different measurements of protection is to calculate the frequency. Sourcing the data from the World Bank (Ianchovichina, 2002), table 23 is obtained. For the share of NTBs, China's non-tariff barriers of one kind or another covered 664 tariff lines by 2001, which was 9.9% of total tariff lines. Tobacco and beverage, motor vehicle and parts subjected to the most frequent NTBs, in which NTBs covered over 40% of the total tariff. The frequency of NTBs of grains and oil seeds, other transportation equipment, forestry and wood products, energy products, leather and sporting goods, manufacture intermediate and electronic equipment was between 19-40%. Other goods not classified in the above subjected to relatively less NTBs, which was less than 10% of the total tariff lines.

As mentioned above, examination of data on NTB frequency alone may be misleading because of the enormous variations in the importance of tariff lines. To gain some indication of the potential importance of non-tariff barriers, the import coverage of the key non-tariff barriers was calculated using data on non-tariff barrier coverage of tariff lines, and import data by tariff lines. Table 24 summarizes the import coverage of tariffs and NTBs in the year 2001.

Table 23　Tariff lines subject to import tariffs and NTBs, China, 2001

industry	Unrestricted tariff lines	Any NTB tariff lines	Total tariff lines
	(percentage of total in parentheses)		
grains and oil seeds	34 (81%)	8 (19%)	42 (100%)
No grain crop	224 (92.6%)	18 (7.4%)	242 (100%)
Livestock	68 (100%)	0 (0%)	68 (100%)
Meat and milk products	97 (100%)	0 (0%)	97 (100%)
Food processing	343 (94%)	22 (6%)	365 (100%)
Tobacco and beverages	17 (53.1%)	15 (46.9%)	32 (100%)
Forestry and wood products	23 (65.7%)	12 (34.3%)	35 (100%)
Fishery products	57 (100%)	0 (0%)	57 (100%)
Energy products	10 (71.4%)	4 (28.6%)	14 (100%)
Minerals products	304 (100%)	0 (0%)	304 (100%)
Textiles	711 (93.9%)	46 (6.1%)	757 (100%)
Apparel	289 (100%)	0 (0%)	289 (100%)
Leather and sporting goods	73 (73%)	27 (27%)	100 (100%)
Other light manufacture	1539 (95%)	80 (5%)	1619 (100%)
Manufacture intermediate	503 (73.4%)	182 (26.6%)	685 (100%)
Motor vehicles and parts	93 (59.2%)	64 (40.8%)	157 (100%)
Other transportation equipment	72 (80.9%)	17 (19.1%)	89 (100%)
Electronic equipment	205 (79.5%)	53 (20.5%)	258 (100%)
Other machinery and equipment	1418 (92.4%)	116 (7.6%)	1534 (100%)
Trade and transportation	0	0	0
Utility housing and construction	0	0	0
Total	6080 (90.1%)	664 (9.9%)	6744 (100%)

Source: Ianchovichina, Elena and Will Martin(2002), " Evaluating Accession to
    WTO by China and Chinese Taipei"
  Note: The trade data used here is from 2000.

Table 24　　The import coverage of non-tariff barriers in China, 2001

Industry	Unrestricted tariff lines (%)	Any NTB (%)	Total tariff lines (%)
grains and oil seeds	50	50	100
No grain crop	46.5	53.5	100
Livestock	100	0	100
Meat and milk products	100	0	100
Food processing	46.3	53.7	100
Tobacco and beverages	64	36	100
Forestry and wood products	6	94	100
Fishery products	100	0	100
Energy products	66.7	33.3	100
Minerals products	100	0	100
Textiles	86	14	100
Apparel	100	0	100
Leather and sporting goods	n.a	n.a	n.a
Other light manufacture	70	30	100
Manufacture intermediate	71.6	28.4	100
Motor vehicles and parts	68	32	100
Other transportation equipment	96	4	100
Electronic equipment	86	14	100
Other machinery and equipment	95	5	100
Trade and transportation	n.a	n.a	n.a

Utility housing and construction	n.a	n.a	n.a
Total	75.1	24.9	100

Source: Ianchovichina, Elena and Will Martin (2002), "Evaluating Accession to WTO by China and Chinese Taipei", World Bank

The import coverage of NTBs in China was 24.9% in 2001. Among which coverage rate of grains and oil seeds, no grain crops, food processing, forestry and wood products were over 50%. The import coverage of NTBs of tobacco and beverages, and motor vehicles and parts, which are subject to most frequently NTBs, were about 30%, which was significantly smaller than 50%. Other light manufactured, energy products and manufacture intermediate subjected also around 30% NTBs in import volume. Other goods which are not classified among the above goods had less than 15% of import coverage of NTBs.

4.3.2 Measuring the rate of China's overall protection

According to the formula introduced in section 3.3.2, table 25 is obtained. The table shows that the rate of China's overall trade protection in 1997 was 18.7% (simple average). By different industries, grain and oil seeds, tobacco and beverages subjected to the highest protection, at a rate of about 60%. Food processing, apparel, motor vehicles and parts belong to the second highest protected group, which has a rate between 30-40%. The rate of protection of livestock, meat and milk products, fishery products, textiles, manufacture intermediate, electronic equipment are lower than the average level. Other industries are not classified into the above subject to the rate of protection that is lower than 10%.

Table 25　　China's rate of overall protection in 1997

industry	Imported goods at c.i.f. world price (million US$)	Imported goods at c.i.f. market price (million US$)	Rate of Overall Protection (%)
grains and oil seeds	3038.8	4831.7	59.0
No grain crop	997.4	1210.1	21.3
Livestock	1173.2	1316.4	12.2
Meat and milk products	1476.4	1731.4	17.3
Food processing	5810.7	7992.9	37.6
Tobacco and beverages	1051.0	1707.9	62.5
Forestry and wood products	2445.3	2646.1	8.2
Fishery products	103.7	117.9	13.7
Energy products	9923.6	10376.2	4.6
Minerals products	6017.1	6551.0	8.9
Textiles	18941.1	22260.2	17.5
Apparel	1982.4	2590.5	30.7
Leather and sporting goods	2740.1	2984.8	8.9
Other light manufacture	2341.6	2718.7	16.1
Manufacture intermediate	56209.8	61841.2	10.0
Motor vehicles and parts	3607.6	4858.9	34.7

Other transportation equipment	4580.2	4802.8	4.9
Electronic equipment	28613.1	31800.5	11.1
Other machinery and equipment	41995.0	47072.0	12.1
Trade and transportation	20618.8	21021.6	2.0
Utility housing and construction	1667.4	1667.5	0
Rate of protection (China to the world and simple average)			18.7
Rate of protection (China to the world and trade-weighted average)			12.4

Source: Data of imported goods at c.i.f world price and imported goods at a c.i.f market   price are from the GTAP pre-released database.

4.3.3   Protection rate of China to the EU used in the S-EU CGE model

Similarly, applying the same methodology as in 3.3.2 and using bilateral trade data provided by the GTAP database, table 26 is obtained.

Table 26   Rate of protection of China to the EU used in the S-EU CGE model

industry	Imported goods from EU at c.i.f. world price (million US$) (1)	Imported goods from EU at market price (million US$) (2)	Tariff rate +Equivalent of NTBs =(2)/(1)-1
grains and oil seeds	36.9	68	0.84
No grain crop	23.8	25.4	0.07
Livestock	183.3	215.5	0.18
Meat and milk products	283.3	333.7	0.18
Food processing	536.7	864	0.61
Tobacco and beverages	661	1080.3	0.63
Forestry and wood products	120.3	134.9	0.12
Fishery products	35.6	39.3	0.10
Energy products	101.6	109.7	0.08
Minerals products	1038.9	1245.1	0.20
Textiles	713.6	875.6	0.23
Apparel	87.2	112.3	0.29
Leather and sporting goods	266.4	297.8	0.12
Other light manufacture	294.4	330.6	0.12
Manufacture intermediate	6144.8	6834.7	0.11
Motor vehicles and	1197.2	1532.1	0.28

parts			
Other transportation equipment	1592.6	1647.5	0.03
Electronic equipment	2533.2	2813.7	0.11
Other machinery and equipment	10277.9	11624.9	0.13
Trade and transportation	9070.2	9248.1	0.02
Utility housing and construction	882.7	882.7	0.00
Rate of protection (China to EU and simple average)			21.2
Rate of protection (China to the EU and trade-weighted average)			11.7

Source: Data of imported goods at c.i.f world price and imported goods at a c.i.f market price are from the GTAP pre-released database.

4.4   Conclusion

♦   The nominal tariff rate from the "Regulation of the People's Republic of China on Import and Export Duties" shows that China is obviously the country with very high trade protection.

♦ The actual collected tariff rate calculated from an actual collected tariff revenue shows that China has a very low actual tariff collected rate which results mainly from China's tariff exemption system.

♦ Calculation results applying a price comparison approach turns back to state that China shares the reputation with high trade protection. The differences in describing China's tariff rate highlight the difficulties in evaluation protection level of China. The results must be treated with considerable caution but they are, however, the sort of indicator of the highly distorted nature of the Chinese trade regime.

Chapter 5   Influence of Non-economic Elements in Bilateral Trade

The EU's favoring "inner-circle" regions in trade are well known. The complexity of the EU's free trade, association and other preferential agreements is the result of a wide array of historical, economic and geo-political factors (Auboin, 1997). Due to many reasons, China, as one of the five biggest economies of the world, is far away from being the EU's "core trading partner".

Given differences in historical background, cultural heritage, political system and economic development level, it is natural that the EU and China have different views or even disagree on some issues such as human right and Taiwan issues. When these issues are good treated, bilateral trade went smoothly and increased year after year, otherwise, the bilateral trade went on opposite direction.

This chapter focuses mainly on the above non-economic elements in Sino-EU bilateral trade. It is structured as follows. Section 5.1 illustrates the EU's traditional regionalism in international trade and its effect on bilateral trade between the EU and China. Section 5.2 illustrates the influence of human rights on bilateral trade. Section 5.3 discusses on Taiwan issues in bilateral trade. Concluding remarks are provided in section 5.4.

5.1   EU trade preferences

Historically, the EU has favored 'inner-circle' countries in economic and political relations. These countries refer mainly to countries in the EU, Mediterranean, Central and Eastern Europe. There are also countries outside these agreements, of which Russia being the biggest one. Through signing bilateral or multilateral agreements, some "unions" were set up such as the European Monetary Union, and the European

Economic Area and European Fair Trade Association (EFTA).

Furthermore, besides signing the agreement with inner-circle countries, signing the agreement with the non-inner-circle countries makes the EU's trade preference go far away. In 1999, the EU maintained contractual and reciprocal bilateral agreements with 22 countries, contractual and non-reciprocal bilateral agreements with 70 countries, and non-contractual and non-reciprocal bilateral agreements with 100 countries (WTO 2000)[43]. The EU is the direct source of 40 % of all the preferential trade agreements notified by the WTO.

EU trade is significantly influenced by these regional agreements signed between the EU and its preference countries[44]. Through signing regional agreements or establishing a single market, the EU uses trade as a means to support its close partners and to grant advantages to these areas.

Through these agreements, the EU is available to richer countries and they exclude products in which developing countries have a comparative advantage. Table 27 outlines the EU's total trade with major groups of partners from 1975 to 1995, which is an example of the EU's trade preference.

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[43] See WTO (2000), "The European community, trade policy review mechanism".
[44] Using the gravity model, Kari E.O. Alho (Alho, 2002) finds in his paper "The impact of regionalism on trade in Europe" that European trade is significantly influenced by various regional agreements and intensities of trade are strongly asymmetric between the regions.

Table 27   EU total trade with major groups of partners from 1975 to 1995, unit: bn. US$

Partner	1975	1980	1985	1990	1995
(a) Imports					
European Union 15	198.7 (55.5%)	455.5 (54.1%)	417.8 (57.8%)	976.5 (63.5%)	1158.9 (61.3%)
EFTA 3	13.4 (3.7%)	37.7 (4.5%)	34.5 (4.8%)	72.1 (4.7%)	87.6 (4.6%)
Other Developed	45.6 (12.7%)	106.3 (12.6%)	93.5 (12.9%)	202.3 (13.2%)	246.4 (13.0%)
Central/E. Europe	6.8 (1.9%)	13.3 (1.6%)	10.6 (1.5%)	19.7 (1.3%)	44.6 (2.4%)
ACP Countries[45]	12.4 (3.5%)	29.5 (3.5%)	23.8 (3.3%)	25.1 (1.6%)	26.1 (1.4%)
GSP Countries[46]	54.5 (15.2%)	123 (14.6%)	109.6 (15.2%)	213.9 (13.9%)	293.9 (15.6%)
China[47]	0.8 (0.2%)	2.7 (0.3%)	2.9 (0.4%)	5.7 (0.4%)	18.4 (1%)
World	358	841.7	722.4	1536.7	1889.8
(b) Exports					
European Union 15	196.4 (58.1%)	457.8 (61.0%)	420.5 (59.7%)	974.8 (66.0%)	1240.4 (62.2%)
EFTA 3	17.6 (5.2%)	44.4 (5.9%)	35.7 (5.1%)	74.2 (5.0%)	90.7 (4.5%)
Other Developed	29.3	59.6	94.6	159.2	206.1

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[45] ACP countries refer to African-Caribbean-Pacific Countries. See the list of abbreviations.
[46] GSP countries refer to the countries included in the Generalized System of Preferences. See the list of abbreviations.
[47] The data in this row comes from the Napes Database.

	(8.7%)	(7.9%)	(13.4%)	(10.8%)	(10.3%)
Central/E. Europe	9.9	14	9.2	18.3	53.5
	(2.9%)	(1.9%)	(1.3%)	(1.2%)	(2.7%)
ACP Countries	11.9	26	16.7	26.6	30.6
	(3.5%)	(3.5%)	(2.4%)	(1.8%)	(1.5%)
GSP Countries	64.5	120.3	102.5	195.1	326.1
	(19.1%)	(16.0%)	(14.5%)	(13.2%)	(16.3%)
China	1.4	2.3	5.2	8.0	19
	(0.4%)	(0.3%)	(0.7%)	(0.5%)	(1%)
World	338.1	750.3	704.9	1476	1995.5

Source: (1) Auboin and Laird (1997), "EU Import Measures and the Developing Countries", WTO

(2) Share of the trade volume in total in parentheses

As is shown in the table, the most significant data is the intra-EU15 trade data. Further, import among EU15 countries shared 58% (average) of the EU's total imports from 1975 to 1995, while export among the EU15 counted as 61.4% (average) of the total. By contrast, trade (import+export) with the GSP countries from 1975 to 1995 ranked second which shared 15.4% (simple average), while trade (import+export) with other developed countries shared 11.5% (simple average). Shares of value of trade between the EU15 and ACP countries, central or eastern countries in the same period were around 1.2%-3.5%. Lastly, the bilateral trade share between the EU and China was less than 1% of the total EU trade in the period of 1975 to 1990.

Messerlin argues that, through signing these cooperation agreements, the EU has the ability to addict into trade discrimination, which means that the EU was in the center of this regionalism while other countries form the periphery. For EU's Preferential Trade Agreement (PTA) partners being relatively small and inefficient countries, none of these PTAs has had a significant impact on EU economies. By contrast, it is

far from certain that the PTAs' net impact has been beneficial for the EU partners because the political and dynamic effects of these agreements may not have counterbalanced the static costs of their trade diversions. In fact, the EU has realized that many of the PTAs signed in the past have been a costly bargain for its partners and an exercise in futility for its own economic interests – hence ultimately a political burden in the long run (Messerlin, 2001).

Free trade worldwide is a distant goal, fraught with difficulties, but regional trading arrangements have been somewhat easier to attain and to implement in reality. Many well-informed observers fear that they could go too far and that the world could break up into hostile trading blocks. This is violation of the spirit of the WTO and in the long-run, this will also reduce the welfare of society.

5.2   Human rights

5.2.1   The role of human rights in EU foreign policy

EU trade policy has a high "political content". The principle guiding the formation of EU foreign policy has used an economic process for a fundamentally political goal. As is written in "A long term for EU-China relations" (EU,1995), "A commitment of human rights and fundamental freedom is at the heart of EU policy worldwide. Violations are not only a cause for concern in their own rights, but because the EU believes that espousal of international standards of human rights and acceptance of political liberalization is vital for long-term social and political stability." This statement directly points out that the issue of human rights is the key point in engaging China into the world economy, as well as the EU's establishing partnership with China.

Full respect for these principles is inextricably linked to economic relations between

the EU and China. All the EU institutions pursue human rights issues through a combination of timed public statements, formal private discussions and practical cooperation. To China, EU human rights and democracy served as the key criterion for obtaining EU technical transfer and aids, and sometimes, even bilateral trade volume. This kind of political stand, which is different from China's political system, strongly influenced the development of the normal bilateral relations and trade.

5.2.2 Influence of human rights on Sino-EU bilateral trade

Reviewing the Sino-EU's bilateral economic relations, as a crucial non-economic element, human rights paved the way of the volume of bilateral trade. Some statistics on bilateral trade and important events are listed in table 28.

Table 28   Bilateral trade volume, change and growth rate of trade volume, important events related to human rights between the EU and China: from 1975 to 1998

year	Volume of bilateral trade (bn. US$)	Change of trade volume (bn.US$)	Growth rate of bilateral trade (%)	Important events
1975				Establishment diplomatic relationship
	2.3			between EU and China
1981	4.4			
1982	4.3	-0.1	-2.3	
1983	5	0.7	16.3	First cooperation project
1984	5.5	0.5	10.0	First meeting in ministry level
1985	8.1	2.6	47.3	Chairman of the EU visited China and

				EU-China trade agreement was signed
1986	9.9	1.8	22.2	
1987	11.1	1.2	12.1	
1988	12.8	1.7	15.3	Establishment of EU's delegation to China
1989	14	1.2	9.4	04.06 event (Tiananmen Square Event)
1990	13.7	-0.3	-2.1	Second half year began to resume bilateral relationship
1991	15.1	1.4	10.2	First time to offer aid to refugee in Tibet.
1992	17.4	2.3	15.2	Resume of bilateral trade in all aspects.
1993	26.1	8.7	50.0	Offer aids jointly with UN's food project
1994	31.5	5.4	20.7	New dialogue began
1995	37.5	6.0	19.0	Firstly set "A Long Term Policy for EU-China relation". Began to dialogue in human rights.
1996	36.7	-0.8	-2.1	Terminate dialogue about human rights First Asia-Europe Meeting summit hold.
1997	39.8	3.1	8.4	Resume dialogue about human right
1998	44.1	4.3	10.8	"Building a comprehensive partnership with China" was born

Source: (1) Bilateral volume come from the Napes Database.

(2) Record of the events come from Pei, (2000).

According to the information provided in table 28, three periods can be summarized in bilateral trade in terms of the effect of human rights. The first period is from 1975 to 1988, which has no dispute on human rights between China and the EU. In the second period from 1989 to 1996, human rights issues strongly influenced diplomatic relations, as well as the bilateral trade volume. The third period, from 1997 to 1998, is the period of keeping disputes of human rights within limitation.

Without the influence of human rights in the first period, Sino-EU bilateral trade grew stably. Especially after 1980, the trade volume broke through US$5.0 billion and US$10.0 billion in 1983 and 1987 respectively. In the second period, disputes on human rights retarded bilateral trade, especially in 1990 (Tiananmen Events happened in 1989) and in 1996 (in which, the EU terminated dialogue with China on human rights issues) the growth rates of bilateral trade were negative, which both of them were –2.1%. After 1997, China and EU relations entered a period of "keep within limitation' in dispute of human rights. The bilateral trade volume in 1997 and 1998 was more than 3-fold of the volume in 1990.

Information drawn from table 28 also shows, although bilateral trade volume determined by factors such as: the size of the economy, relative prices, distance of the two partner country etc.(Bergstrand, 1985), trade policy and other non-economic factors such as human rights did strongly influence the bilateral trade. When issues of human rights were well treated, bilateral trade went smoothly and increased, otherwise, the bilateral trade went in the opposite direction.

Yet, experience shows us, that bilateral trade depends mainly on economic initiatives such as mutual interest and mutual profits. Disputes on human rights can never stop the trend of increasing bilateral trade. In the long run, cooperation and development will be the theme in Sino-EU bilateral relations.

5.3   Taiwan issues

Another important non-economic element is Taiwan affairs. As we all know, Taiwan affairs remain the most sensitive and complex issue in China along with its trading partner relations. The EU's Taiwan policy can be summarized as developing its economic relationship with Taiwan in line with the "One China" policy. More in detail,

at present, principally, the EU does not engage in any official visits with Taiwan political figures in the EU or its member countries under whatever name or pretext and does not engage in any contact or exchange with an official or governmental nature with Taiwan authorities. And, the EU does not support Taiwan's accession to or participation in any international organization whose membership requires statehood.

On the other hand, considering Taiwan's rapid economic development and increasing trade between the two regions, the EU's Taiwan policy has been changed since 1990. For example, the EU and Taiwan signed some agreements on shipping, textile products, copy rights, etc.   In 1999 since Taiwan's economic importance as the EU's 11th trading partner and the world's 14th largest trading entity, the EU has endeavored to develop deeper economic and trade relations with Taiwan than ever before. They hold annual consultations, which address economic, commercial, cultural and scientific topics. Further, in 2003, the EU opened the "European Economic and Trade Office" in Taiwan. Taiwan's WTO membership will imply further development of relations between the EU and Taiwan.

An example has been given in chapter 1, which illustrates that economic relations between China and France are strongly influenced by French arms sales to Taiwan. The EU's Taiwan policy will also greatly influence the Sino-EU bilateral relation in the future.

5.4   Conclusion

In this chapter, briefly, some non-economic aspects including EU trade preferences, human rights and Taiwan issues are discussed. The main results are as follows.

♦   The EU has favored "inner-circle" countries for a very long time. As a

developing country with 25 years of economic reform, China stands far from the EU's preferential circle, and thus EU trade preferences could be one of the obstacles of bilateral trade.

♦   Treatment on human rights and Taiwan issues paved the way of Sino-EU bilateral trade. When issues of human rights and Taiwan affairs was well treated, bilateral trade went smoothly and increased, otherwise, the bilateral trade went in the opposite direction.

Chapter 6   Approaches to Modeling the Impact of Tariff Change

Trade policy issues, in particular the analysis of the tariff, is always one of the most important contents in international economics. The familiar illustration of the gains and losses to a country with the imposition of tariffs can be traced back to almost a century ago[48]. After Corden's (1957) pioneering work in this area, Johnson (1960) illustrated the notion of consumption cost, production cost, etc. in evaluation of a protection system (Willenbockel, 1994).

Today there are two conventional methods in doing such quantitative analysis, which are the partial equilibrium approach and the general equilibrium approach. The partial equilibrium focuses on equilibrium in one market and is limited to interactions and feedbacks within markets. The general equilibrium approach deals with simultaneous equilibrium in a set of related markets and allows for interactions and feedbacks and their effects on equilibrium. There are trade-offs in the choice between using a partial-equilibrium model or a general equilibrium model to assess the effects of policy changes. The main advantage of the partial-equilibrium framework is that it exposes the major factors influencing the result, and is transparent, but feedback effects of policy changes are not taken into account. The general equilibrium model captures the feedback effects across sectors and countries, but it is more complex and requires substantially more data and sometimes different exogenous settings make it not as transparent as the partial equilibrium approach.

This chapter is organized as follows. Section 6.1 outlines the analytical framework on the effect of tariff reductions with a partial equilibrium approach. Section 6.2 illustrates the analytical framework of effect of tariff reduction with a general

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[48] Willenbockel (1994) wrote that "On the normative side, the familiar illustration of the gains and losses to a country associated with the imposition of a tariff system can be traced back to Barones's *Principi* of 1913."

equilibrium approach. Section 6.3 briefly introduces the partial equilibrium model and general equilibrium model. Section 6.4 is concludes.

6.1 Analytical framework on the effect of tariff reductions with a partial equilibrium approach

6.1.1 Effect of the tariff reduction on the domestic market: a small country case

Tariffs that raise the cost of importing foreign goods artificially distort the relative prices of domestic and foreign goods. The classic analysis on these effects is outlined in figure 7, in which D is the country's domestic demand for a specific good, S is the domestic supply curve, S_T is the aggregate supply curve (domestic supply plus import supply). S'_T is the supply curve after tariff abolishing (tariff reduced t)[49].

Figure 7   Effect of abolishing tariff with a small country assumption
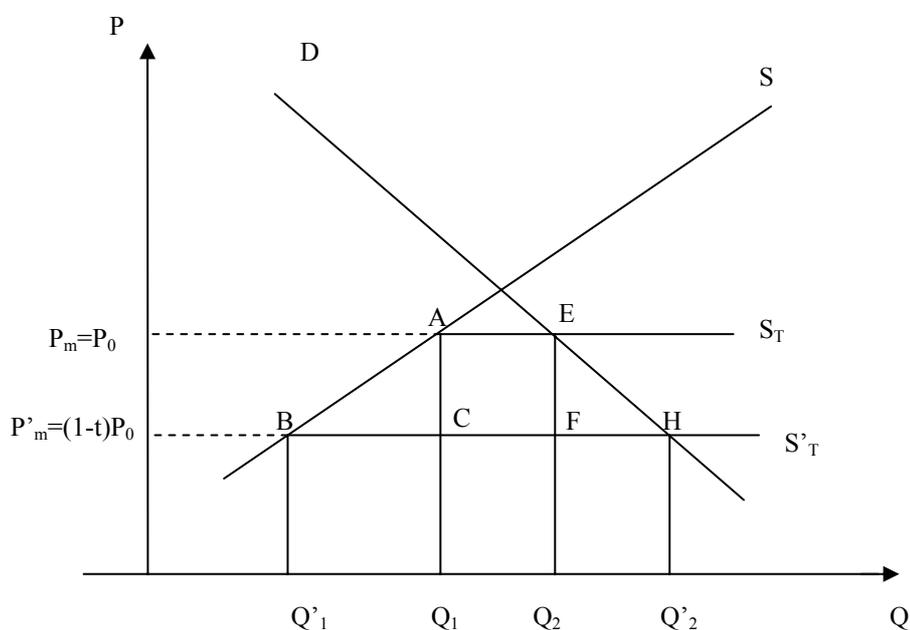
Assume that the domestic economy is small enough so that the change of its demand will not affect the world price. With the abolishing of tariffs, local consumer prices

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[49] The contents of this section were sourced mainly from Salvatore (1995) "International economics".

of imported goods become lower than the international price. There are four effects of this price decrease.

1. The price of domestically produced goods declines from P_m to P'_m

   $(P'_m =(1-t)*P_0)$

2. Declining of domestic price makes domestic production decline from Q_1 to Q_1'.

3. Due to the lower price of imports domestic consumption increases from Q_2 to Q_2'

4. The combination of lower domestic output and higher domestic consumption increases import from $(Q_2- Q_1)$ to $(Q_2'- Q_1')$

Consequently, there are three welfare effects where the tariff is abolishing.

1. Producer loss: area $AP_mP'_mB$

2. Consumption gain: area $E P_mP'_mH$

3. Government loss: area $EACF$

With the abolishing of the tariff, the total social welfare increases area ABC+ area EFH.

6.1.2   Effect of tariff reduction on the domestic market: a big country case

Figure 8 illustrates the effect of abolishing tariffs for a big country case. Here, D is the country's domestic demand for a specific good, S_1 is the domestic supply curve, S_T is the aggregate supply curve (domestic supply plus foreign supply), S'_T is the aggregate supply curve after tariff abolishing (note: the shape of S_T and S'_T curve in this figure 8 are different from the shape of S_T and S'_T curve in figure 7).

Before abolishing the tariff, because the country is a big country in the international

market, any change of its tariff policy will influence not only its import price but also world import price. With the tariff reduction t, the domestic import price reduces to P_m'. Four effects occur with the tariff reduction.

Figure 8   Effect of abolishing of tariff with a big country assumption
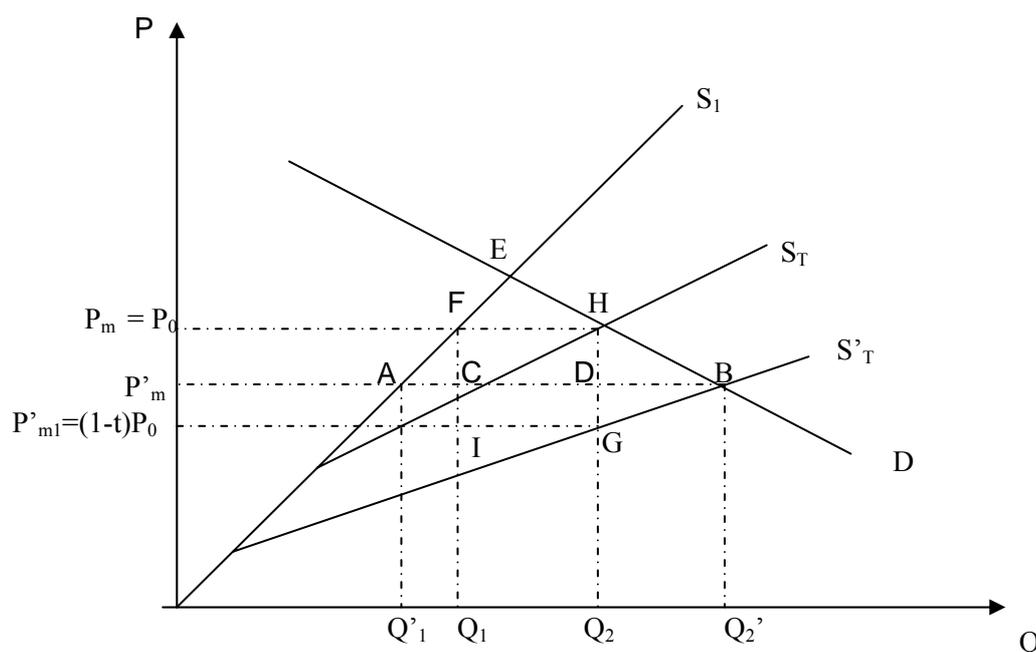
1. The price of domestically produced goods and the price of imports decline to P'_m, but $P'_{m1} < P'_m < P_m$

2. With the declining of the domestic price, domestic productions decline from Q_1 to Q_1'.

3. Due to the lower price of imports, the domestic consumption increases from Q_2 to Q_2'

4. The combination of lower domestic output and higher domestic consumption increases imports from (Q_2- Q_1) to (Q_2'- Q_1')

Consequently, there are three welfare effects with the tariff abolishing.

1. Producer lose: area $FP_mP'_mA$

2. Consumption gain: area $HP_mP'_mB$

3. Government lose: area HFIG

With the abolishing of tariff, total gains or lose of the big country depends on area AFC+area DHB-area CDGI.

6.1.3 Effects of tariff reduction on exporters: a big country case

Assume that there are only two countries labeled country 1 and country 2. Country 1 is a large import country and country 2 is a small export country. In Figure 9, the right diagram shows country 2's supply and demand curves for a specific good. For prices above the intersection of country 2's supply and demand, country 2 has an excess of supply that it will export. In the left diagram the MD and MS curves show country 1's import demand and import supply curve for specific goods, supposing that initially there is free trade between the two countries and this specific good produced in country 1 and country 2 are the same. MS_1 is also country 2's export supply curve. The free trade equilibrium prices and quantities are shown as P_1 and M_1 in country 1 and further, in country 2, the correspondent price is P_2 ($P_1 = P_2$) and the quantity of export is HD.

Suppose country 1's government reduces the tariffs equal to the distance between points "A" and " E' " in the left diagram. The reduction of the tariff can be represented as a downward shift of the MS curve. The net effect of tariff reduction results from the gap between the price in countries 1 and 2. This raises the price received by country 2's exporters. As a consequence, producers and consumers in country 2 face a higher price. The positive effect of these price changes are very direct. Consumption and imports in country 1 go up and domestic production goes down. Production and exports in country 2 rise, while consumption decreases. Using the analysis above it is easy to see that producers in country 2 gain more than country

2's consumers lose. Namely the higher prices are good for the country 2's producers by the area $P_2P_2'CD$, Country 2's consumers lose from higher prices by the area $P_2P_2'BH$. Country 2's gains are therefore equal to area BHDC.

Figure 9   Effect of abolishing of tariffs on exporters with a big country assumption
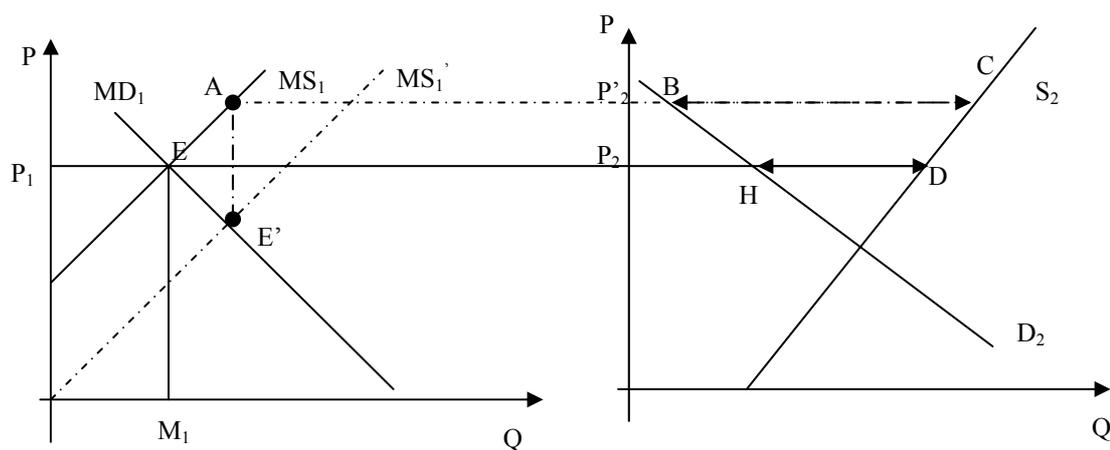
6.2   Analytical framework for the effect of tariff reduction with a general equilibrium approach

Here, we employ figure 10 to illustrate the general effect of a tariff in a small country. The diagram firstly gives us the transformation curve and the social indifference curve.

Figure   10   General equilibrium effect of the tariff reduction
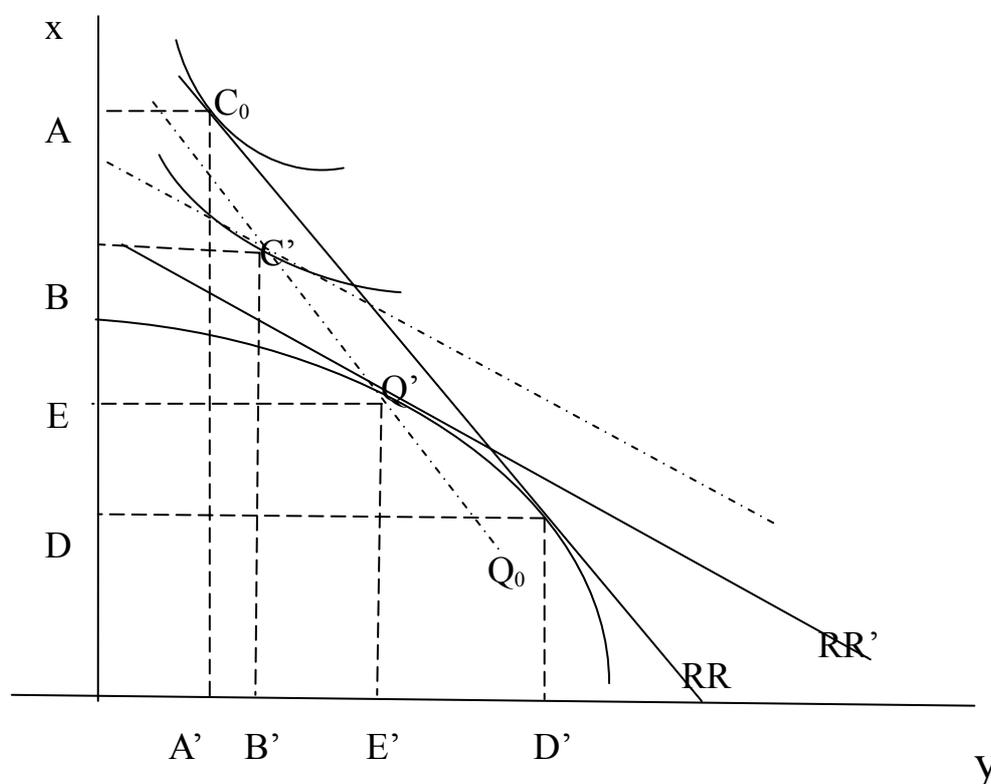
In the initial point, we have the curve *RR*, and after tariff imposing on commodity *x*, this curve changes the slope and turns to the curve RR'. The effect of the imposing of the tariff can be summarized as follows.

a)   Production effect: the domestic output of commodity *x* increased by *ED*, while the output of commodity *y* increased by *E'D'*.

b)   Consumption effect: the domestic consumption of commodity *x* decreased by *BA,* while the consumption of commodity *y* increased by *B'A'*.

c)   Volume of trade effect: import decreased by *AB+ED*, while the export is decreased by *E'D'+ A'B'*.

6.3   Modeling the effect of the tariff change

6.3.1   Partial equilibrium models

Partial equilibrium models which focus on analyzing the economic impact of the trade policy on individual markets or individual products concentrated on a particular subsection of the economy, where all other variables are treated as exogenous to the model and ignore feedback effects. Given this concentration of resources, it is usually possible to model the particular industry or commodity chosen in much greater detail and with much greater care than the case with general equilibrium models (O'Toole , 2002). The partial equilibrium models range from one country or one products model to multi-regions and multi-product models.

With regard to model structure, simple partial equilibrium models focus mainly on supply and demand in the market to be studied. Trade policy measures result in the difference between domestic prices and world market prices which induce adjustments in supply and demand and foreign trade; these in turn are associated with welfare shifts and redistributive effects between producers, consumers, and the government. Extending this approach to many markets and several countries, multi-regional and multi-product models concentrate on analyzing trade policy instruments in individual countries or individual products, and assuming interdependencies between factor and good markets. Usually, simple partial equilibrium models are particularly suitable for analyzing specific trade policy measures for individual products that account for only a small share of a country's volume of trade (Klepper, 2003).

Simple partial equilibrium models are relatively easy to implement because most of the variables in the model are exogenous in doing shock analysis. Models can be solved with commonly used software such as Excel, and the necessary data are generally available at industry level.

6.3.2   General equilibrium models

General equilibrium models that are used to analyze the economic impact of trade policies take into account feedback and general equilibrium effects. They range from models for a single country to multi-regional multi-product models.

The founder of general equilibrium theory was L. Walras. But actually different general equilibrium models may focus on different kinds of economic issues. Indeed, various forms of general equilibrium models with a rationing of foreign exchange and persistent excess demands in some important markets are also specified by some CGE models (Dervis, 1982).

With regards to the structure of a CGE model, basically, a CGE model consists of a large set of demand and supply functions that cover every market such as the commodity and factor markets, and the domestic and international markets in the economy. As an alternative, some price functions can appear in a CGE model rather than demand or supply functions.

The demand side of the model describes all demand behavior of the agents such as household, firm and government. The behaviors of these agents sometimes relate to domestic and sometimes foreign markets and therefore capture export and import demand. For example, private households can buy domestic goods and import goods; firms can also purchase intermediate input in the domestic and international markets. Generally speaking, the demand side covers production demand, investment demand and consumption demand, etc.

In terms of the supply side, as private households sell their labor and capital services to firms, it enables firms to produce. Besides buying these primary production factors such as labor and capital, firms also buy intermediate inputs from each other. And thus form the total output which supply is not only in the domestic market but also in

the oversea market.

In addition to participating in the regulatory process, the government has a number of tax and subsidy instruments available for redistribution purposes.

The above description shows that a static CGE model could be composed of the following equation groups, which are: supply equations' group, demand equations' group and sometimes as an alternative, price equation groups can also be developed. Equations in the model describe the following aspects: factor markets, goods markets, the price index and macroeconomic regulations. Meanwhile macro closure is also an important component of a CGE model.

The forms of the equation are written strictly according to economic theory, many of which are non-linear. In more detail, some equations follow simple rules captured by fixed coefficients, some equations follow relatively complex rules of the Constant Elasticity of Substitution function (CES) or other functions. For example, production can be written as a CES or Cobb-Douglas (CD) function and consumption equations can be written as an Extended Linear Expenditure System (ELES) function. The equations also include a set of constraints that have to be satisfied by the system as a whole but which are not necessarily considered by any individual actor. These constraints cover for factors' markets, commodities' and macroeconomic aggregates, such as balances for savings and investment, balance of government account, and the balance of current-account (Loefgren.etc, 2002).

Compared with the partial equilibrium model, a CGE model needs a variety of data. Basically, a CGE model tries to explain all the payments that are recorded in the Social Accounting Matrix (SAM)[50]. As a consequence, the model follows the SAM disaggregating of activities, commodities, transactions costs, factors, and institutions

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[50] For a basic SAM table see appendix 2.

such as households, enterprises, and government.

A variety of CGE models can be solved with the Generalized Algebraic Modeling System (GAMS) software and General Equilibrium Modeling Package (GEMPACK) software, and the collection of the necessary data are generally based on whether SAM is available or not.

6.3.2.1 General equilibrium models for individual countries

General equilibrium models for individual countries are limited to the economic analysis of the domestic effects of trade policy, ignoring possible feedback through global markets. In this case, there is greater interest in realistic modeling of the functioning of the various markets for goods, services and factor functions, and on the macroeconomic constraints and distributive impacts of trade policy measures. CGE models for individual countries thus attempt to put more emphasis on reflecting the structural characteristics of the country than multi-regional models do.

The basic structure of such models is to describe the behavior function of different agents such as producers, consumers, government, and the foreign sector and their economic activities such as factor demand and production of goods, factor supply and demand for goods, collection of taxes and redistribution of taxes.

CGE models for individual countries are primarily used to analyze the impact of domestic trade policies in the domestic economy if these policies affect more than one market and if the measures are likely to have macroeconomic impacts. The models provide valuable help, particularly in estimating the impacts on allocation and distribution in situations where the macroeconomic equilibrium is distorted by existing interventions and where the price mechanism fails to reach market equilibrium as a result of price controls, quantity controls, rationing, and rigidities. It

seems particularly relevant for analyzing trade policy decisions in developing countries.

6.3.2.2 Multi-regional General equilibrium models

Multi-regional models are best suited in representing the feedback effects of international trade agreements between various national economies. Usually these kind of CGE models consists of a number of country models linked by trade relationships. Each country model has a number of economic agents (one or more representative consumer, sectorally disaggregated firms, and the government) that determine the use of factors and goods. Economic interaction between the national economies takes place through bilateral trade. This can be limited to goods and services, but may also take into account trade in factors of production (foreign direct investment) or migration of labor (Klepper, 2003).

Multi-regional CGE models are preferred for analyzing multilateral agreements such as GATT rounds, as the effects of these agreements can only be adequately captured by considering all national reactions and their impact on global markets. They also provide information, at a relatively high level of abstraction, on the adjustment processes within a national economy to the policy-driven changes in the global economy. In addition, they are good at modeling international competitive and distributive effects.

From the very beginning of the 1980s, the World Bank began to build a world CGE model. Up to now, several CGE models have been successfully applied in policy analysis and shock evaluation (Hertel, 1997; Noland et al, 1998; Lloyd, 2001; Li and Wang, et al, 1996). The most famous CGE world models are: The World Bank's CGE model (Devis, 1982), Australia's ORANI model (Horridge,1998) and Purdue University's GTAP model (Hertel,1997).

6.4 Conclusion

Partial equilibrium approach and general equilibrium approach are two conventional methods to evaluate the impact of tariff change. The partial equilibrium model is much more transparent compared to the general equilibrium model, but due to ignorance of feedbacks and interaction within the markets, general equilibrium model has some advantages in modeling the economy when feedback effects are taken into account.

Chapter 7   A CGE Static Model of the EU and China

In China, since its accession into the WTO, several of China's CGE models have been established in order to evaluate the impact of the WTO membership on China's economy. These models include China's CGE model from the Chinese Academy of Social Sciences (Zheng and Fan, 1998) and China's CGE model from the Development and Research Center of State Council's (Li and Zhai, 1997). These two models are one region (China), multi-sector models, designed only for China's policy analysis, such as evaluation of China's trade liberalization and environmental policy.

As mentioned in chapter 6, the CGE model for a single country considered no feedbacks on international markets. With China's accession into the WTO, so called multilateral agreements have been signed between China and member countries of the WTO. The feedback of international markets should be considered in doing policy analysis. S-EU CGE model which will be described in detail in the following part of this chapter is an attempt for this purpose.

This chapter is structured as follows. Section 7.1 gives some explanations of using the CGE model in this study except that the CGE is a conventional method of analyzing the effect of tariff change. Section 7.2 gives the industrial classification in the S-EU CGE model. Section 7.3 illustrates the structure of the S-EU CGE model equation by equation. Section 7.4 describes database, parameter calibration and sensitivity test of the model. 7.5 is concludes.

7.1   The reason for using the CGE model

As have been discussed in chapter 6, the partial equilibrium model and the general

equilibrium model are two conventional models in evaluation of tariff change. Actually as a relative mature modeling technique, econometric model can also be implemented in doing policy shock simulation. Is the CGE model better than the econometric model in this study? In regard with China's economy, can the equation in the CGE model which is fully derived from the market economy be used in describing the behavior of the agents in China?

7.1.1 The CGE model has stronger theoretical background than the econometric model

A CGE model works by using data to describe the economy in a benchmark year, and by then, varying one or more elements so as to "shock" the economy and change the values of data items. Finally, the model then compares the new and original values for the economy as a whole and for each component.

From an economic fundamental point of view, CGE models differ from macro-econometric models and have a stronger theoretical basement than macro-econometric models. The first is that CGE models are almost always "calibrated" so that they replicate a particular benchmark year, whereas macro-econometric models are almost always estimated to fit a time series of observed historical data. The second is that CGE models tend to be tightly linked to standard neo-classical micro-economic theories of individual consumers and firms, whereas macro-econometric models do not have such a tight linkage, although some of the econometric equations have also economic meanings such as some structure models and also some recent Error Correction Model (ECM) models. Each method has advantages and disadvantages. But generally speaking, econometric models such as some ECM and VAR (Vector Auto-regression) models have a very good forecasting ability. The CGE model on the other hand, has a relatively strong policy analysis ability. But because the primary advantage of a CGE model derives from the

tight link to known theory, it makes users relatively easier to understand the economics of the model results[51]. This can also make it easier for policy makers to judge some political measurements.

7.1.2   China's economic system and incentive mechanisms that have greatly changed

After two decades of economic reform, market mechanism plays more and more of an important role rather than planning mechanisms in China. The major changes in the economic system and incentive mechanisms are as follows: (1) The absolute advantage and importance of state-owned enterprises is gradually replaced by non-state-owned enterprises such as collective-owned, individual-owned and joint venture. By 1996, state-owned enterprises accounted for only 28.5 % of total gross industrial output value, while collective-owned, individual-owned, and other types (including joint venture) of enterprises accounted for 39.4%, 15.5% and 16.5% respectively (NBS, China Statistical Yearbook 1997, p.411). On the other hand, state-owned enterprises' incentive mechanism also changed through deep reform. The behavior of enterprise in China could be assumed as the enterprise in the market system. (2)   Price reform in China has also succeeded in most of the products such as consumer goods and production goods. Planning-decision mechanisms in price-decision are largely replaced by market-decisions[52]. (3) Macroeconomic adjustment and regulation system is established in terms of a market system at a microeconomic level. Some macroeconomic regulation measures such as fiscal and monetary policies have worked in China's economic growth. Therefore, study on the changing of economic policy impacts on economy is meaningful. (4) Companying with the "opening door" policy, China is now partly integrated into the world economy and will go further into globalization. Any change of the world economy

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[51] Actually, some models, jointly with the CGE and Econometric model, have been developed. It makes the result of the model much more reasonable than the results from only a CGE model or an Econometric model.
[52] Further, appendix 1 shows the changing of price-setting in China from 1978 to 1996.

will influence China's economic growth and vice versa. 5). To some degree, economic agents such as consumers, firms and government in China decide their economic decision mostly according to the market itself which is similar to the behavior of assumption in neo-classical economics theory.

7.1.3 China's available economic data makes it possible to build a CGE model rather than an econometric model

In China, the National Bureau of Statistics (NBS) of China began to compile national income accounts from 1952 to 1984 according to Material Product System (MPS). From 1985 to 1992, national account featured the coexistence of MPS and the System of National Accounts (SNA). Since 1993, the SNA has been the sole basis of the national accounts system. Every five years the NBS has published a new I-O table[53]. At present, although it was not really a SAM according to an SNA system in developed countries, it was very similar. So China's I-O tables are relatively completed. Compared with the I-O table, collecting the time series data is much more difficult. Firstly, some important statistics data are not included in China's statistics system. Secondly, with the reforming of China's statistics system, the definition of the statistics data changed immensely. Thirdly, the available statistics data began mostly from 1978 and these data were taken annually, but some quarterly data were published only after 1994. From this point of view, China's statistical data is much more available for a CGE model rather than an econometric model.

7.2 Industrial classification of the Sino-EU CGE model

The basic database of the S-EU CGE model is the GTAP database. Industry is chosen

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[53] The available Input-Output table of China are: "Input-Output table of China-1981, 1987,1992,1997" edited by NBS, National Bureau of Statistics of China.

according to two references:1)   GTAP industrial classification[54] ; 2)   The rank and the importance in bilateral trade between China and EU. Table 29 is the industry classification in the Sino-EU model.

Table 29   Industry classification of S-EU CGE model

Industry	Code	Description
Grains and oil seeds	grn	(1)[55]Paddy rice, (2) Wheat, (3) Cereal grains nec[56], (5) Oil seeds
No grain crop	ngc	(4) Vegetables, fruit, nuts, (6) Sugar cane, (7) Plant-based fibers, (8) Crops nec, sugar beet, (12) Wool, silk-worm cocoons, (24) Sugar
Livestock	liv	(9) Bovine cattle, sheep and goats, horses, (10) Animal products nec,
Meat and milk products	met	(11)Raw milk, (19) Bovine cattle, sheep and goat, horse meat products (20) Meat products nec, (22) Dairy products
Food Processing	fod	(21) Vegetable oils and fats, (23) Processed rice, (25) Food products nec
tobacco and Beverages	ber	(26) Beverages and tobacco products tobacco
Forestry products	frs	(13) Forestry
Fishery products	fsh	(14) Fishing
Energy products	eng	(15) Coal, (16) oil, (17) gas, (32) Petroleum, coal products, (43) Electricity, (44) Gas manufacture, distribution
Mineral products	com	(18) Minerals nec (34) Mineral products nec
Textiles	tex	(27) Textiles

[54] See appendix 3.
[55] Code number in parentheses is the GTAP classification number.
[56] "nec" is the abbreviation of "not elsewhere classified".

Apparel	clt	(28) Apparel
Leather and sporting goods	lea	(29) Leather products
Other light manufacture	lmf	(30) Wood products, (31) Paper products, publishing industry, (33) Chemical, rubber, plastic products
Manufacture intermediate	int	(35) Ferrous metals, (36) Metals nec, intermediate (37) Metal products intermediate
Motor vehicles and parts	mvh	(38) Motor vehicles and parts and parts
Other transportation equipment	tra	(39) Transport equipment nec equipment
Electronic products	ele	(40) Electronic equipment
Other Machinery and equipment	mac	(41) Machinery and equipment nec. (42) Manufactures nec
Trade and transportation	tsv	(47) Trade (48) Transport nec transportation
utility housing and constructing	hos	(46) Construction (57) Dwellings and construction (52) Financial services nec (53) Insurance, (54) Business services nec (55) Recreational and other services (56) Public administration and defense, education, health (45) Water (49) Water transport (50) Air transport (51) Communication

7.3   Structure of the Sino-EU CGE model

S-EU CGE model is a multi-region (China, EU15 and rest of the world) ,

multi-sector (21 sectors), computable general equilibrium (CGE) model. It focuses mostly on total output, sector input and output, import and export, investment, consumption, income and saving, and prices. Each region has 21 sectors and 5 primary factors[57] of production, which are capital, skilled labor, unskilled labor, land and natural resources. Within each region, the model solves for domestic and trade commodity and factor prices which make a balance between supply and demand in all goods and the factor market.

The model has a neoclassical economics fundament. Each region is connected by commodity import and export. Producers are assumed to maximize profits, purchase inputs and supply products to both the domestic and world markets. Consumers receive income from the firm and then consume goods and services according to maximized utility. The government collects taxes and also consumes. Prices and wages are determined to clear regional commodity and factor markets.

The model consists of 6 blocks: price block[58], firm behavior block, household behavior block, government behavior block, international trade and investment demand block and general equilibrium condition block. The core equations of firm behavior, government behavior, international trade and investment demand are explained in detail in the following sections. The algebraic description of the model is in appendix 9.

7.3.1   Firm behavior

Assumption: (1)   Each producer is assumed to maximize profit.

(2)   In each sector there is only one producer. Each producer produces only one product.

(3)   Technologies in all sectors exhibit constant returns to scale.

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[57] See the set definition in appendix 8
[58] Price block is outlined in appendix 9 rather than in this chapter.

The basic reason for the existence of a firm is to make a profit. So the behavior of a firm focuses on producing goods and sells the goods in different markets. Figure 11 describes the structure of production. Briefly speaking, the output function (or technology) can be nested in 2 stages. The first stage is the sector output, which is derived from intermediate inputs and a composite primary factor. In detail, it is specified by a CES[59] function of intermediate input and CES composite primary factor. The second stage is the composite primary factor or value added by sector, which is also characterized by the CES function of skilled, unskilled labor, capital, land and other sources. Sector output is sold on the domestic market or exported to other regions through the Constant Elasticity of Transformation (CET) function.

Figure 11   Structure of production

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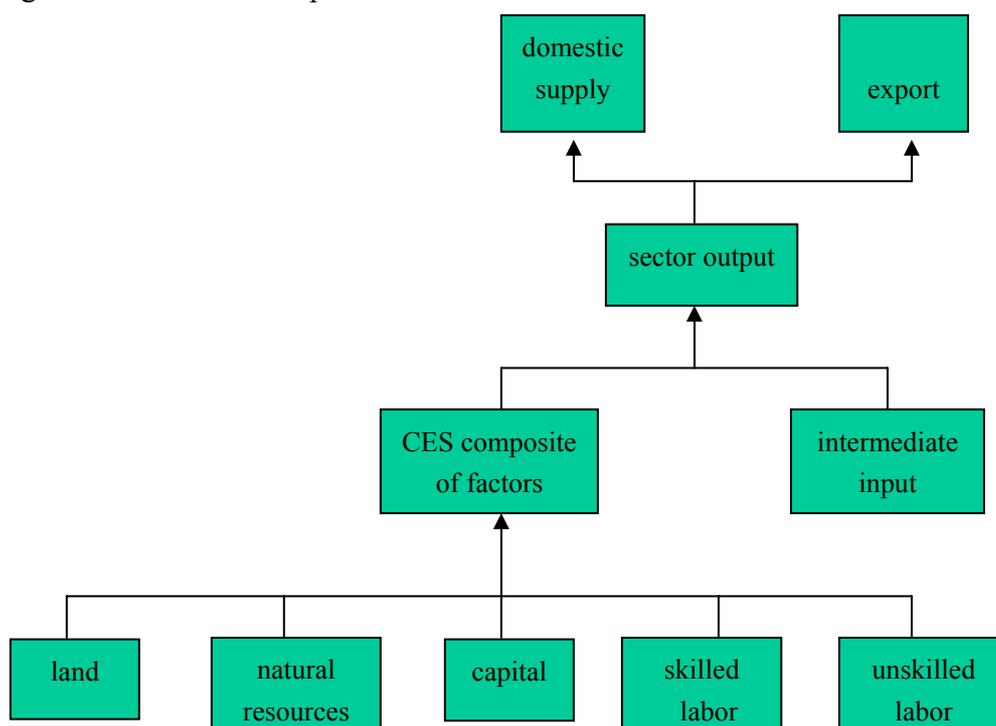
[59] This kind of technology can also be, alternatively, a Leontief function of the quantities of value-added and aggregate intermediate input. The Leontief alternative is the default. The CES alternative may be preferable in particular sectors if empirical evidence suggests that available techniques permit the aggregate mix between value-added and intermediate inputs to vary. Value-added is itself a CES function of primary factors whereas the aggregate intermediate input is a Leontief function of disaggregated intermediate inputs.(Löfgren, 2002)

Value-added function

Figure 11 shows also that value-added bundle can be split into skilled labor, unskilled labor, capital, land and other natural sources. This is done using a CES function. Function (1)[60], (2) provides the reduced form of first-order conditions for this level of the nest.

Moreover, demand functions for value-added and composite intermediate goods are specified by function (1) and (2) separately. Demand of total value-added equals the unit factor requirement multiplied by the quantities of total output, and the unit factor requirement functions are obtained by taking derivatives of the unit cost functions with respect to the relevant factor prices (output price and value-added price)[61]. The same derivation process is also preceded in each composite intermediate input demand function.

$$VA_{ir} = \frac{1}{A_{ir}} (\alpha_{ir} * \frac{PY_{ir}}{PV_{ir}})^{\sigma_p} * YT_{ir} \qquad (1)$$

$$VN_{ir} = \frac{1}{A_{ir}} \left[(1 - \alpha_{ir}) * \frac{PY_{ir}}{PN_{ir}} \right]^{\sigma_p} * YT_{ir} \qquad (2)$$

in which, YT_{ir} : sector output in region r

VA_{ir} : demand for value-added in region r

VN_{ir} : demand for intermediate input in region r

PY_{ir} : average output price in region r

PV_{ir} : price of value added in region r

PN_{ir} : price of aggregate intermediate inputs in region r

A_{ir}, α_{ir}, σ_p are parameters

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[60] For the derivation of this function see appendix 4.
[61] For the derivation of price of output see appendix 5.

Primary factor demand function

Demand functions for each primary factor are specified in equation 3. The primary factor demand equals the unit factor requirement multiplied by the quantities of value-added. Similarly, the unit factor requirement function is obtained by taking derivatives of the unit cost functions with respect to the relevant factor prices (primary factor price and value-added price).

$$VF_{(f \in F)fir} = \frac{1}{B_{ir}}(\beta_{fir} * \frac{PV_{ir}}{PF_{fr}})^{\sigma_v} * VA_{ir} \qquad \sum \beta_{fir} = 1 \qquad (3)$$

F = (skilled labor, unskilled labor, land, capital, natural resources)

in which, VF_{fir} : primary factor demand in region r

VA_{ir} : demand for value-added in region r

PV_{ir} : price of value added in region r

PF_{fr} : primary factor price in region r

$B_{ir}, \beta_{fir}, \sigma_v$ are parameters

■   *Domestic and export supply*

From figure 11 we know that, the firm produces products for domestic and export markets. Usually, these goods are assumed to be imperfect substitutes produced as joint products with a constant elasticity of transformation. So we describe these two functions corresponding to the constant elasticity of transformation, which is very commonly used in today's CGE model. The functions are derived from revenue maximization, subject to the CET function, in which derivation process is very similar to unit factor requirement function[62].

$$SE_{ir} = \frac{1}{C_{ir}}\left[\frac{PE_{ir}}{\gamma_{ir} * PT_{ir}}\right]^{\sigma_t} * YT_{ir} \qquad (4)$$

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[62] The derivation of this function can be seen in appendix 6.

$$SD_{ir} = \frac{1}{C_{ir}} \left[\frac{PD_{ir}}{(1 - \gamma_{ir}) * PT_{ir}} \right]^{\sigma_t} * YT_{ir} \qquad (5)$$

In which, SD_{ir} : domestic sales in region r

SE_{ir}: domestic product sold at international market in region r

YT_{ir} : sector output in region r

PT_{ir}: output price in region r

PE_{ir}: price of domestic goods for export in region r

PD_{ir}: price of domestic goods sold at home country in region r

C_{ir}, γ_{ir} , σ_t are parameters

7.3.2   Household behavior

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

Household consumption function

The household consumption function in the S-EU CGE model is written under the following assumption: (1) Consumer consumes according to maximize utility and constraint to budget. (2) Consumer consumes both import goods and domestic goods, and the relationship of these two goods is non-perfect substitution.

And according to the Extended Linear Expenditure System derived from maximizing a Stone-Geary utility function subjected to household disposable income, the consumption function is specified in function 6[63]. Equations 7 and 8 define the household income function and household disposable income function. Household saving is defined as in equation 9, which is disposable income minus household consumption.

$$HC_{ir} = \eta_{ir} + \frac{\mu_{ir}}{PC_{ir}}(HD_r - \sum_r PC_{ir} * \eta_{ir}) \qquad 0<\mu_{ir}<1 \qquad (6)$$

in which, HC_{ir}: consumption of household in region r

HD_r: household disposable income in region r

PC_{ir}: consumer price in region r

η_{ir} : minimum subsistence requirements for household in region r

μ_{ir} : marginal propensity to consume for household in region r

Household income function

Household income is the sum of wage income of the skilled, unskilled labor and the rent of land and natural resources.

$$HI_r = \sum_{f=F}\sum PF_{fr} * VF_{fir} + trans^{gov}_r - ES_r \qquad (7)$$

F=(skilled labor, unskilled labor, land, capital, natural resources)

in which, HI_r: household income in region r

VF_{fir} : primary factor demand in region r

PF_{fr} : primary factor price in region r

ES_r : depreciation in region r

$Trans^{gov}_r$: government transfer in region r

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[63] Derivation of this function can be seen in appendix 7.

Household disposable income function

Household disposable income is household income minus income tax of household.

$$HD_r = HI_r - TXH_r \tag{8}$$

in which, HD_r: household disposable income in region r

HI_r: household income in region r

TXH_r: household income tax in region r

Definition of household saving

Total household saving in region r function is specified by disposable income minus household consumption.

$$HS_r = HD_r - \sum HC_{ir} * PC_{ir}$$

(9)

in which, HS_r: household saving in region r

HD_r: household disposable income in region r

HC_{ir}: consumption of household in region r

PC_{ir}: consumer price in region r

7.3.3   Government behavior

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

primary factor tax, tariff, consumption tax, export tax, household income tax and intermediate input tax.

Government consumption function

Government consumption function in the S-EU CGE model is simply specified as a fraction of total output.

$$GC_{ir} = \omega_{ir} * YT_{ir} \qquad\qquad (11)$$

in which, YT_{ir} : total output in region r

GC_{ir} : government consumption in region r

ω_{ir}: the share of government consumption in total output in region r

Government revenue function

$$GR_r = TARRIF_r + TXE_r + TXF_r + TXP_r + TXC_r + TXH_r + TXI_r \qquad (12)$$

in which, GR_r: government revenue in region r

$TARIFF_r$: tariff revenue in region r

TXE_r: export taxes in region r

TXF_r: primary factors taxes in region r

TXP_r: indirect taxes in region r

TXC_r: consumption taxes in region r

TXH_r: household income taxes in region r

TXI_r: intermediate input taxes in region r

Tariffs

Tariff revenue can be specified by the tariff rate times world price, and quantity of import.

$$TARRIF_r = \sum \sum tm_{irs} * PWM_{irs} * MS_{irs} \tag{13}$$

in which, $TARIFF_r$: tariff revenue in region r

MS_{irs} : region r import commodity (quantity) i from region s

PWM_{irs} : world price of commodity i which region r import from region s

tm_{irs}: tariff rate of commodity i in region r import from region s

Export Taxes

Export taxes can be specified by the export tax rate times the export world price and the quantity of export.

$$TXE_r = \sum tx_{ir} * PE_{ir} * SE_{ir} \tag{14}$$

in which, TXE_r: export taxes in region r

SE_{ir}: domestic product in region r sold at international market

PE_{ir}: export price of commodity i in region r

tx_{ir}: export tax rate of commodity i from region r to region s

Primary factor taxes

Primary factor tax can be specified by the factor tax rate times primary factor demand.

$$TXF_r = \sum \sum tf_{ir} * VF_{fir} * PF_{fr} \tag{15}$$

in which, TXF_r: primary factor taxes in region r

VF_{fir} : primary factor demand in region r

PF_{fr} : primary factor price in region r

tf_{ir} : primary factor taxes rate in region r

Intermediate input taxes

Intermediate input taxes can be specified by the intermediate input tax rate times the intermediate input.

$$TXI_r = \sum ti_{ir} * PN_{ir} * VN_{ir} \qquad (16)$$

in which, TXI_r: intermediate input taxes in region r

       VN_{ir} : demand for intermediate input in region r

       PN_{ir} : price of aggregate intermediate inputs in region r

       ti_{ir} : intermediate input tax rate in region r

Consumption taxes

Consumption taxes can be specified by consumption by government and household times the consumption tax rate.

$$TXC_r = \sum tc_{ir} * (GC_{ir} + HC_{ir}) * PA_{ir} \qquad (17)$$

in which, TXC_r: consumption taxes in region r

       GC_{ir} : government consumption in region r

       HC_{ir}: consumption of household in region r

       PA_{ir} : price of Armington goods in region r

       tc_{ir} : consumption tax rate in region r

household income tax function

$$TXH_r = th_r * HI_r \qquad\qquad (18)$$

in which, TXH_r: household income taxes in region r

HI_r: household income in region r

th_r: household income tax rate in region r

indirect tax function

$$TXP_{ir} = \sum tp_{ir} * YT_{ir} * PT_{ir} \qquad\qquad (19)$$

in which, TXP_r: indirect taxes in region r

YT_{ir} : sector output in region r

PT_{ir}: output price in region r

tp_{ir}: indirect tax rate in region r

Government transfer

The government transfer is defined as government revenue minus government expenditure and government savings.

$$trans_r{}^{gov} = GR_r - GE_r - GSAV_r \qquad\qquad (10)$$

in which, GE_r : government expenditure in region r

GC_{ir} : government consumption in region r

$trans^{gov}{}_r$: government transfer in region r

$GSAV_r$: government saving in region r

7.3.4   Other demand

Figure 12 shows the structure of domestic demand in the S-EU CGE model. Total domestic demand includes household consumption, government consumption,

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

On the other hand, from the supply side of these demand points of view, total domestic demand is sourced from domestically produced goods (function 5) and imported goods, further more, imported goods are sourced from different regions.

Figure 12   Structure of domestic demand
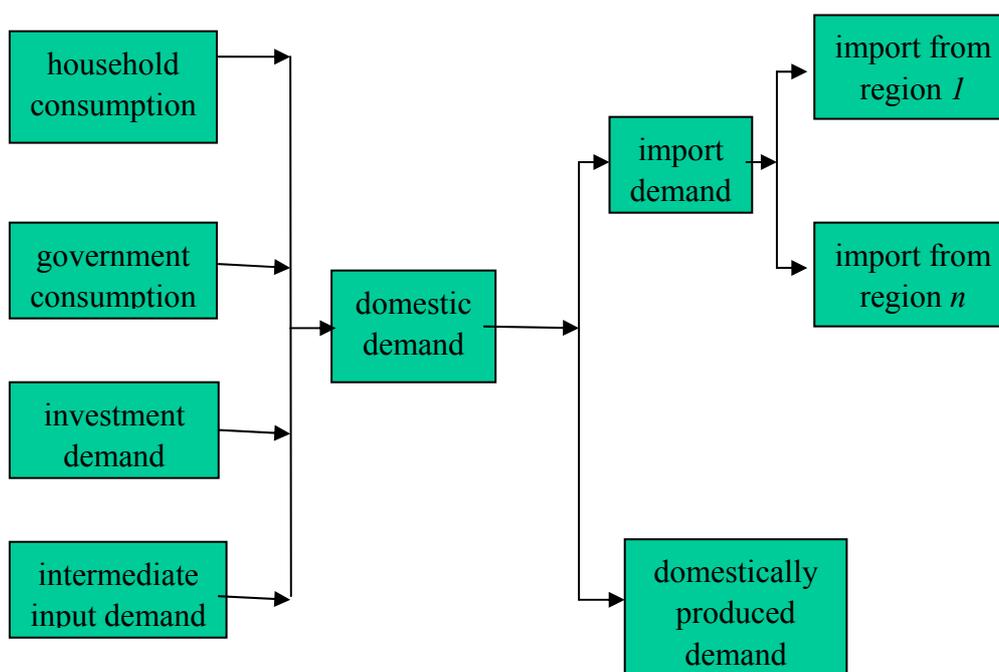
Investment demand function

The investment demand function of each industry is specified by the share of investment in the total output times the total output.

$$DI_{ir} = \varpi_{ir} * YT_{ir} \qquad\qquad (20)$$

In which,   DI$_{ir}$: investment demand in region r

YT$_{ir}$: sector output in region r

ϖ_{ir} : share of investment in total output in region r

Import demand function

Function 21 is a demand function of imported goods. Function 22 describes the
cost-minimizing choice of import purchases by different import sources. They are
derived from a corresponding cost function which was derived similarly to the
derivation of unit factor requirement functions.

$$IM_{ir} = \frac{1}{E_{ir}}\left[\ (1-\phi_{ir})\frac{PA_{ir}}{PM_{ir}}\ \right]^{\sigma_a} * AD_{ir} \tag{21}$$

$$MS_{irs} = \frac{1}{D_{ir}}(\varphi_{irs} * \frac{PM_{ir}}{(1+tm_{irs})*PWM_{irs}})^{\sigma_m} * IM_{ir} \tag{22}$$

in which,   IM$_{ir}$: import demand in region r

AD$_{ir}$: total domestic demand in region r

MS$_{irs}$: region r import good i from region s

PWM$_{irs}$: world price of commodity i which region r import from
        region s

PA$_{ir}$: price of Armington goods in region r

PM$_{ir}$: import price in region r

tm_{irs}: tariff rate of commodity i in region r import from region s

E_{ir}, D_{ir} , ϕ_{ir}, φ_{irs}, σ_a , σ_m are parameters

7.3.5   General equilibrium and definitions

Definition of domestic demand

Total domestic demand=household consumption +government consumption+ investment+ intermediate input

$$AD_{ir} = HC_{ir} + GC_{ir} + DI_{ir} + VN_{ir} \qquad (23)$$

in which, AD_{ir}: total domestic demand in region r

HC_{ir}: household consumption in region r

GC_{ir} : government consumption in region r

DI_{ir}: investment demand in region r

VN_{ir} : aggregate sector intermediate input in region r

Equilibrium in factor market

Total primary factor demand =total primary factor supply

$$\sum VF_{fir} = \overline{FS_{fr}} \qquad (24)$$

in which, VF_{fir} : primary factor demand in region r

$\overline{FS_{fr}}$: primary factor supply in region r

Equilibrium in government account

$$GR_r = GE_r + GS_r \qquad (25)$$

in which, GR_r: government revenue in region r

GE_r : government expenditure in region r

GS_r : government saving in region r (or government deficit in SAM in appendix 2)

Equilibrium of total investment and saving

$$\sum DI_{ir} * PI_{ir} = HS_r + GS_r + ES_r - BOT_r \qquad (26)$$

in which, DI_{ir}: investment demand in region r

HS_r : household saving in region r

GS_r : government saving in region r

ES_r : depreciation in region r

BOT_r : balance of trade in region r

PI_{ir} [64]: Investment price in region r

7.4   Database, Parameters Calibration and Sensitivity Test of the Model

7.4.1   Source of the SAM

As in any general equilibrium model applied, the main source of database is the Social Accounting Matrix (SAM). SAM for the EU, China and the rest of the world were built based on the GTAP Version 5.0 Pre-release database issued in 1997[65]. The structure of the SAM in the model can be seen in appendix 2. SAM for China, E15 and the rest of the world in 1997 which calculated from the database can be seen in appendix 11. A concordance of the classification of industry between the GTAP database and the model are described in appendix 3 and table 29.

7.4.2   Source of the elasticity of the substitution

CGE models are frequently criticized for lack of empirical foundations, particularly for estimates of behavioral parameters (Shoven and Whalley, 1992). Generally, the

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[64] Actually, PI_{ir} is replaced by PC_{ir} in programming the model using GAMS.
[65] With the help from Dr. Zhi Wang, who is a senior research staff member in United States Department of Agriculture, I got the database for this version at the very beginning 2003. Database see the last part of the dissertation.

research on this issue can be found in micro-econometrics literature, which provides spotty coverage of the parameters (Hansen and Heckman 1996) and in econometric literatures using direct econometric approaches.

The meaningful argument for the above two approaches are: (1) It is not clear that results from micro-econometric studies can be appropriately applied to the more aggregate sectoral and household representations usually present in CGE models (Hansen and Heckman, 1996). (2) Lack of data and conceptual difficulties in estimation, and the validity of resulting estimates are considered barriers to application of the econometric approach (Arndt and Robinson, 2001).

As an alternative to the econometric approach, some CGE researchers employ a simple "validation" procedure (Dixon, Parmenter, and Rimmer, 1997). Although this method has an advantage in using very little historical data, due to no statistical basis for judging the robustness of estimated parameters, this method is also not to be a perfect one.

As an alternative, parameter values are sometimes taken from specific studies that from the country being modeled and the studies are commonly accepted or from other countries with similar economic structures. As another commonly used method, given some fixed parameters, other parameters can also be calibrated. For example, in the case of static models, this is usually done for a baseline year. Some parameter values are calculated by the modeler according to the database in the baseline (Arndt and Robinson, 2001).

Elasticity of the substitution in the S-EU CGE model includes elasticity of substitution in production between value-added and intermediate goods, elasticity of substitution between domestic and imported goods in the Armington aggregation, elasticity of substitution between primary factors, elasticity of substitution among imports from different destinations, elasticity of transformation between domestic

sales and exports. The best way to get the elasticity is to estimate it using either econometric approach or "validation" procedure. To make the work easier and reasonable, the author borrowed these elasticity from the GTAP Pre-release database directly otherwise estimated them by herself.

7.4.3   Source of other Parameters

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

7.4.4   Calibration share and efficiency parameter in the CES function in the S-EU CGE model

The CES function is a major function form in the S-EU CGE model. This kind of function has been written in production block (equation of value-added demand, intermediate demand, and primary factor demand) and international trade block (equation of domestic produced product demand and import demand). As an example, now we illustrate how the share and shift parameters in the CES production function are calibrated in the model. As presented before, the value-added demand function and intermediate demand function are given as (27) and (28).

$$VA_{ir} = \frac{1}{A_{ir}} (\alpha_{ir} * \frac{PY_{ir}}{PV_{ir}})^{\sigma_p} * YT_{ir} \qquad (27)$$

$$VN_{ir} = \frac{1}{A_{ir}} \left[(1 - \alpha_{ir}) * \frac{PY_{ir}}{PN_{ir}} \right]^{\sigma_p} * YT_{ir} \qquad (28)$$

Equation (27) divided by (28), we can get

$$\frac{VA_{ir}}{VN_{ir}} = \left[\frac{\alpha_{ir}}{(1 - \alpha_{ir})} * \frac{PN_{ir}}{PV_{ir}} \right]^{\sigma_p} \qquad (29)$$

Rearranging the above equation, the share parameter calibration function is as followings.

The share parameter: $\alpha_{ir} = \left[(\frac{VA_{ir}}{VN_{ir}})^{-\frac{1}{\sigma_p}} * \frac{PV_{ir}}{PN_{ir}} + 1 \right]^{-1}$

Using α_{ir} and CES production function we get:

$$A_{ir} = \frac{YT_{ir}}{\left[\alpha_{ir} * VA_{ir}^{\frac{\sigma_p - 1}{\sigma_p}} + (1 - \alpha_{ir}) * VN_{ir}^{\frac{\sigma_p - 1}{\sigma_p}} \right]^{\frac{\sigma_p}{\sigma_p - 1}}} \qquad (30)$$

The same procedure can also be implemented in calculation the parameters in other CES function in the model.

7.4.5 Calibration share and efficiency parameter in the CET function in the S-EU model

The CET function is similar to the CES function, thus export supply and domestic

supply function have the similar function form as functions (27) and (28).

$$SE_{ir} = \frac{1}{C_{ir}} \left[\frac{PE_{ir}}{\gamma_{ir} * PT_{ir}} \right]^{\sigma_t} * YT_{ir} \qquad (31)$$

$$SD_{ir} = \frac{1}{C_{ir}} \left[\frac{PD_{ir}}{(1-\gamma_{ir}) * PT_{ir}} \right]^{\sigma_t} * YT_{ir} \qquad (32)$$

When dividing equation (31) by (32), we can get the share parameter in the CET function as the following:

$$\frac{SE_{ir}}{SD_{ir}} = \left[\frac{1-\gamma_{ir}}{\gamma_{ir}} * \frac{PE_{ir}}{PD_{ir}} \right]^{\sigma_t} \qquad (33)$$

$$\gamma_{ir} = \left[(\frac{SE_{ir}}{SD_{ir}})^{\frac{1}{\sigma_t}} * \frac{PD_{ir}}{PE_{ir}} + 1 \right]^{-1} \qquad (34)$$

Using γ_{ir} and CET function, we get the efficiency parameter of the CET function as follows:

$$C_{ir} = \frac{YT_{ir}}{\left[\gamma_{ir} * SD_{ir}^{\frac{\sigma_t-1}{\sigma_t}} + (1-\gamma_{ir}) * SE_{ir}^{\frac{\sigma_t-1}{\sigma_t}} \right]^{\frac{\sigma_t}{\sigma_t-1}}} \qquad (35)$$

7.4.6 Calibration parameter of minimum subsistence requirements and marginal propensity to consume for the ELES function in the S-EU CGE model

From function (6) we know, that the ELES function for household consumption is:

$$HC_{ir} = \eta_{ir} + \frac{\mu_{ir}}{PC_{ir}}(HD_r - \sum PC_{ir} * \eta_{ir}) \qquad (36)$$

Expenditure elasticity from the above equation is as follows.

$$\sigma_{ir} = \frac{\mu_{ir} * HD_r}{PC_{ir} * HC_{ir}} \qquad (37)$$

$$\therefore \quad \mu_{ir} = \sigma_{ir} * \frac{PC_{ir} * HC_{ir}}{HD_r} \qquad (38)$$

Here we use Frisch parameter[66]

$$\Theta \quad frisch_r = -\frac{HD_r}{HD_r - \sum PC_{ir} * \eta_{ir}} \qquad (39)$$

$$\therefore \quad \eta_{ir} = HC_{ir} + \frac{\mu_{ir} * HD_r}{PC_{ir} * frisch_r} \qquad (40)$$

After inputting expenditure elasticity and Frisch parameter in the CGE model, the GAMS program will automatically calculate the minimum subsistence requirements and marginal propensity to consume using the defined functions. The final results are shown in the attached report of GAMS.

7.5 Conclusion

♦ Main reason for using the CGE approach is that the author tried to simulate the impact of China's tariff change on the Chinese and EU economies. Among a variety

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[66] The Frisch parameter is the marginal utility of income with respect to income. Usually, in the CGE model calibration, this parameter is simply defined as the negative ratio between a household's total expenditures and the supernumerary income.

of economic models, CGE approach is widely applied in such issues and the Chinese economic system in 1997 suggested the possibility of applying this approach in study on policy shock analysis.

♦   The S-EU CGE model is a static model which consists of a production block, household block, government block, other demand block, and a general equilibrium block. Most of the equations are quite standard CGE functions with neo-classical ideology.

Chapter 8   Impact of China's tariff change on China and the EU

in 2002

2002 was the first year that China accessed WTO. Generally, China's commitments of WTO membership include a complex package of trade and investment liberalization measurements.: (1) China will reduce the weighted average tariff rate from 11.1% to 6.9% from 2001-2006; (2) China will eliminate most import quota restrictions by 2006; (3) China will permit non-state trading in most sectors; (4) China will open telecom, banking, securities, retail, distribution, professional services and other service sectors to foreign investment gradually from 2002-2007; (5) China will enjoy the benefits of gradual relaxation of MFA quota restrictions on textile and apparel products from the US and EU from 2002-2005 and elimination of such quota restrictions by 2005; (6) China will enjoy the most favorable nations status from all WTO members (Ma, 2002).

Since the S-EU CGE model is a static CGE model, only the shock of a tariff reduction in 2002 is simulated.   For there was no data on tariff in 2002 from GTAP database (the latest GTAP data for tariff was 2001 (version 6)), the rate of tariff reduction are calculated using nominal tariff rate in 1997 and 2002. In more detail, we calculate the reduction rate according to the following processes: (1) collecting simple average tariff rate in 1997 and 2002 (offered in section 4.1.2) sourced from public documents on China's import and export duty; (2) calculating reduction in the average tariff level between 1997 and 2002.

Table 30   Reduction in tariff used in the model

Industry	Simple average tariff rate (%)		Percentage change in
code	2000	1997	tariff rate (Δtm)

	[1]	[2]	$\Delta tm = ([2]-[1])/[2]$
grains and oil seeds	5.9[67]	6.9	-14.5
No grain crop	14.0	16.1	-13.0
Livestock	5.8	5.8	0.0
Meat and milk products	19.2	25.1	-23.5
Food processing	18.9	25.8	-26.7
Tobacco and beverage	39.2	56.7	-30.9
Forestry and wood products	6.0	8.2	-26.8
Fishery industry	11.6	21.6	-46.3
Energy products	4.9	6	-18.3
Minerals products	2.2	2.7	-18.5
Textile	16.1	24	-32.9
Apparel	21.6	28.8	-25.0
Leather and sport goods	15.6	19	-17.9
Other light manufacture	10.4	12.3	-15.4
Manufacture intermediate	8.7	11.5	-24.3
Motor vehicles and parts	22.7	31.9	-28.8
Other transportation equipment	4.5	5.7	-21.1
Electronic	12.5	16.9	-26.0

[67] All data in this column are simple average nominal MFN tariff rates, and, if the item has quota, the average rate is calculated using the rates under quota restriction.

equipment			
Other machinery and equipment	9.9	16.6	-40.4
Trade and transportation	0	0	0
Utility housing and construction	0	0	0
Simple average	11.9	16.3	-21.4

Note: 1. Original tariff rate are from Customs General Administration PRC "Regulation of the People's Republic of China on Import and Export Duties in 1997" and "Regulation of the People's Republic of China on Import and Export Duties in 2002" (in Chinese).

2. Date in column "[1]" and "[2]" are calculated by the author using the simple average method.

The model was firstly calibrated using 1997 as the base year, which means all data for baseline scenario were calibrated statically for the year 1997. And then run the simulation scenario where the tariff is cut in 2002. We compare the above two sets of the calculation results and then get the results of simulation outlined in section 8.2, 8.3 and 8.4.

8.1   Model closure

The model is a static CGE model, so we try to use the static short-term closure rule to set exogenous. To quantify the impact of the tariff reductions in 2002, the model closure includes in following:

(1) Supply of all the primary factor of each region in 2002 are the same as in

baseline scenario

(2) Government transfer of each region in 2002 are the same as in baseline scenario

(3) Total investment of each region in 2002 are the same as in baseline scenario considering that this assumption can filter the impact effect of investment.

8.2   Impact on China's economy

Due to many reasons, simulation of impact of tariff reduction on Chinese and EU economies observe only preparatory meaning because they are controlled under the assumptions such as the exogenous setting and difference between the theory and reality. For example, we assume equilibrium in labor market, but actually, in China, disequilibrium in labor supply and labor demand is one of the popular phenomena in the past 10 years and at present.

8.2.1   Impact on China's macro-economy

The results of change in China's macro-economic indicators are outlined in table 31. From the table we can see that with China's tariff change in 2002, China's GDP real growth rate will be 0.25% higher than the baseline year. Decomposing China's GDP, we get that, total consumption will increase by 0.42%, in which private consumption will increase by 0.12% and government consumption will increase by 1.60% respectively. Due to the closure assumption of the model, the growth rate of total investment changes 0%. Lastly, China's import increased by 0.42%, export increased by 0.38%.

Table 31   Change in China's macro-economic indicators

	Simulation scenario (100 Mn. US$)	Baseline scenario (100 Mn. US$)	Change in the indicators (%)
GDP	8128.1	8108.1	0.25
Consumption	5206.0	5184.4	0.42
Private consumption	4146.0	4140.9	0.12
Government consumption	1060.0	1043.5	1.60
Investment	3099.0	3099.0	0.00
Import	2162.4	2153.3	0.42
Export	1985.5	1978.0	0.38

8.2.2   Impact on China's sectoral output.

Figure 13 illustrates the percent change in China's sectoral output from the baseline. The figure shows that a total of 16 sectors have a positive effect and 5 sectors have a negative effect.

Output changes the fastest in apparel (10.9%), other transportation equipment (10.9%), leather and sporting goods (8.1%). Other sectors which have a positive effect change in their output between 0.07-3.7%.

The negative change appears in forestry and wood products by -2.1%. Besides, in manufacturing industry, motor vehicle and parts decrease its output the fastest by -0.79%. Other 3 sectors that have negative sign of effect are: no grain crops (-0.74%), mineral industry (-0.22%), trade and transportation (-1.06%).

Figure 13   Change in China's sectoral output   unit:%
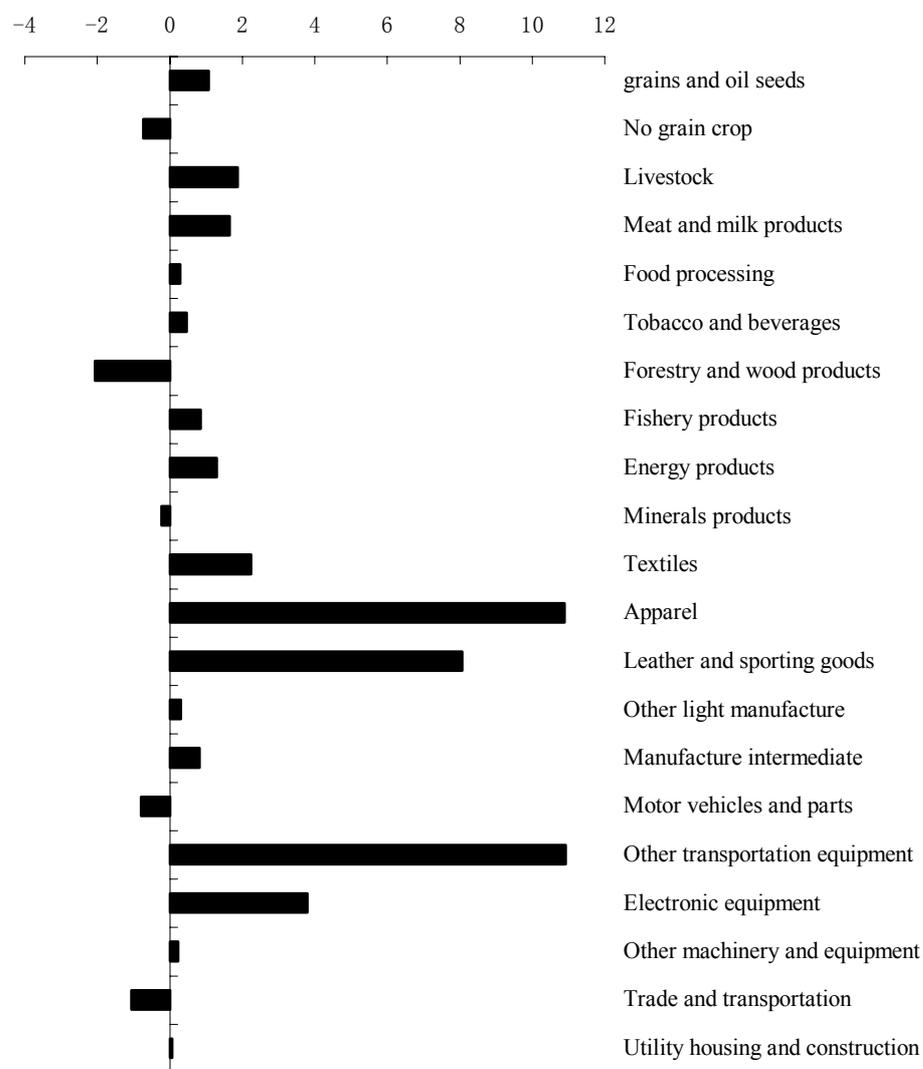
Significant results that we can get from this figure are: among all 21 sectors, textiles and other transportation equipment will be the biggest winners as the result of China's tariff change in 2002, most of China's agriculture industry gain also from the tariff change. On the contrary, among the manufacturing industry, motor vehicle and parts will be the biggest loser.

The figure shows also that the difference in change in sectoral output arising from the tariff reduction is very big. For instance, the highest value in figure 13 is 10.9% and the lowest value is -2.1%. The reason could be that the solutions of the price in the model change immensely in some sectors and thus lead to big change in quantity of sectoral output. The same story can also be found in the result of simulation of sectoral import and sectoral export.

8.2.3   Impact on China's sectoral import and export

Figure 14 describes change in import of China's 21 sectors in 2002 with respect to tariff reduction. Figure shows that total of 14 sectors have a positive effect, among which no grain crops (11.4%), forestry and wood products (14.8%) increase their import the fastest. Among the manufacturing industry, motor vehicle and parts (2.9%) and textiles (2.9%) have the biggest positive reaction. By contrast, total of 7 sectors have a negative effect, among which livestock, apparel and other transportation equipment have the biggest negative response.

Figure 15 describes change in China's sectoral export. Data shows, similar as China's import, many China's sectors expand their export with the reduction of the tariff, in which total of 15 sectors have a positive effect. Only 6 sectors have negative reaction. Furthermore, apparel (15.1%) industry increase its export the fastest, while most agriculture industries such as no grain crop, forestry and wood products, fishery industry have a negative reaction..

Figure 14　Change in China's sectoral import　　　　　　　unit:%
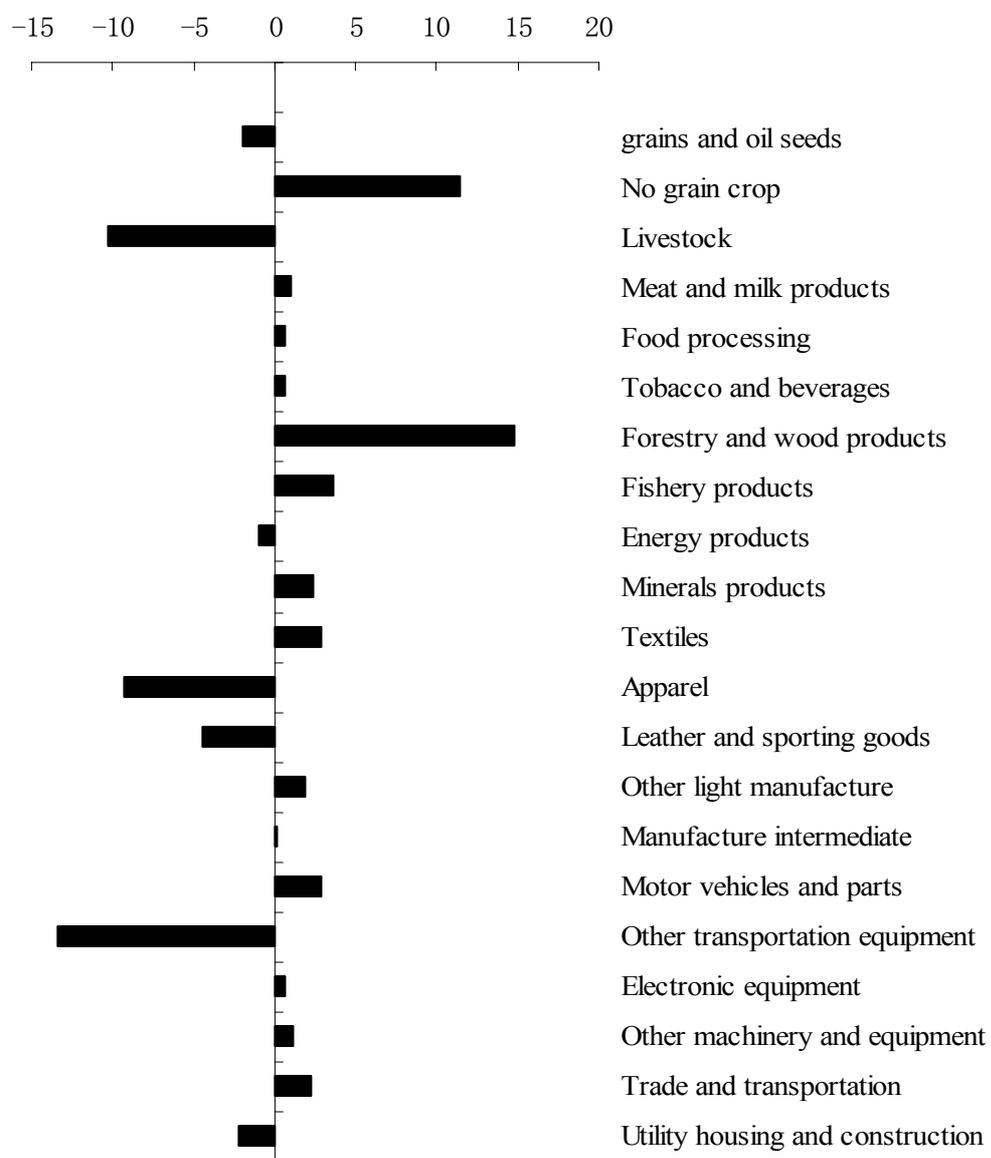
Figure 15　Change in China's sectoral export　　　　　　　unit:%


```
        -10   -5    0    5    10   15   20
```
grains and oil seeds
No grain crop
Livestock
Meat and milk products
Food processing
Tobacco and beverages
Forestry and wood products
Fishery products
Energy products
Minerals products
Textiles
Apparel
Leather and sporting goods
Other light manufacture
Manufacture intermediate
Motor vehicles and parts
Other transportation equipment
Electronic equipment
Other machinery and equipment
Trade and transportation
Utility housing and construction

8.3　Impact on the EU economy

8.3.1　Impact on the EU macro-economy

The results of change in macroeconomic indicators for the EU are outlined in table 32. Data in the table shows that China's tariff reduction in 2002 will make EU's GDP

growth rate increase by 0.08% from the baseline year. Total consumption increase by 0.11%, in which private consumption and government consumption increase by 0.12% and 0.08% respectively. Due to the closure assumption, the growth rate of investment keeps no change. In terms of international trade, the growth rate of EU import increased by 0.39%, export increased by 0.38%.

Table 32　Change in EU's macro-economic indicators　　Unit:%

	Simulation scenario (100 Mn. US$)	Baseline scenario (100 Mn. US$)	Change in the indicators (%)
GDP	78357.8	78288.0	0.08
Consumption	63849.0	63776.7	0.11
Private consumption	48943.2	48882.5	0.12
Government consumption	14905.8	14894.2	0.08
Investment	14875.3	14875.3	0.00
Import	10170.1	10130.9	0.39
Export	9803.6	9766.9	0.38

8.3.2　Impact on EU's sectoral

Figure 16,17 and 18 illustrate the percent change in EU's sectoral output, sectoral export and import from the baseline. Briefly, in terms of sectoral output, total of 12 EU sectors have a positive reaction, 9 sectors have a negative reaction. Among these sectors, other transportation equipment will expand its output the fastest by 4.6%. The bigger loser is energy products which decrease its output by -2.9%. Change in

import and export see figure 17 and 18.

Figure 16   Change in EU's sectoral output   unit:%

Figure 17   Change in EU's sectoral import   unit:%

grains and oil seeds
No grain crop
Livestock
Meat and milk products
Food processing
Tobacco and beverage
Forestry and wood products
Fishery products
Energy products
Minerals products
Textile
Wearing apparel
Leather and sport goods
Other light manufacture
Manufacture intermediate
Motor vehicles and parts
Other transportation equipment
Electronic equipment
Other machinery and equipment
Trade and transportation
Utility housing and construction

Figure 18   Change in EU's sectoral export   unit:%
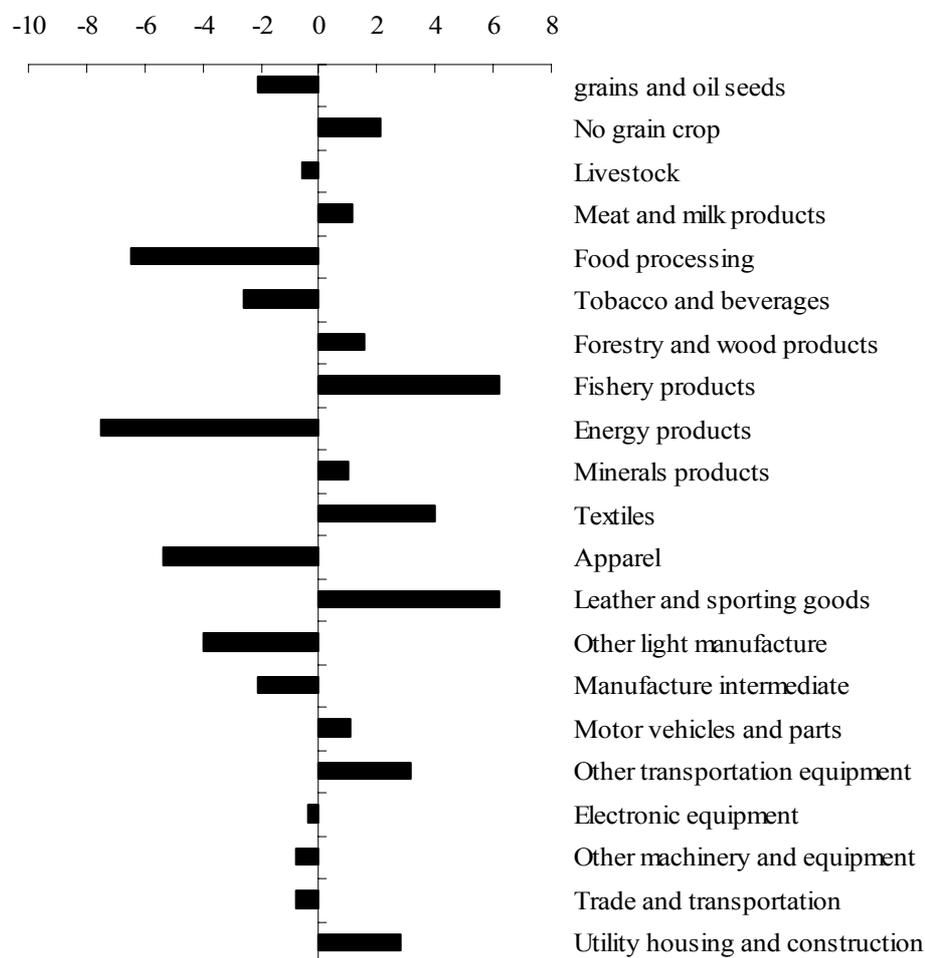
8.4 **Impact on the rest of the world**

8.4.1   **Impact on the macro-economy of the rest of the world**

Changes in the macroeconomic indicators of the rest of the world are outlined in table 33. Information from the table shows that China's tariff reduction in 2002 could

turn out to have a negative effect on GDP growth rate of the rest of the world by -0.07% from the baseline year. Total consumption is lowered by -0.09%, in which private consumption increases by 0.17%, while government consumption decreases by -1.34% respectively. Due to the closure assumption, the growth rate of investment keeps no change. In terms of international trade, the growth rate of import increased by 0.10%, export increased by 0.05%.

Table 33　Change in macroeconomic indicators for the rest of the world　　Unit:%

	Simulation scenario (100 Mn. US$)	Baseline scenario (100 Mn. US$)	Change in the indicators (%)
GDP	202220.5	202371.01	-0.07
Consumption	158226.7	158371.8	-0.09
Private consumption	130933.7	130707.2	0.17
Government consumption	27293.0	27664.6	-1.34
Investment	44486.3	44486.3	0.00
Import	12411.6	12399.7	0.10
Export	11919.0	11913.1	0.05

8.4.2　Impact on sectoral economic indicators of the rest of the world

Figure 19, 20 and 21 illustrate the percent change in sectoral output, sectoral export and sectoral import of the rest of the world from the baseline. Briefly, to the rest of the world, most of the sectors have a negative reaction (total of 13 sectors), among which leather and sporting goods, other transportation equipment decrease their

output the fastest by -3.1% and -2.2% respectively. Among the sectors that have a positive reaction, energy products is the biggest winner. The change in import and export see figure 20 and 21.

Figure 19   Change in sectoral output of the rest of the world   unit:%
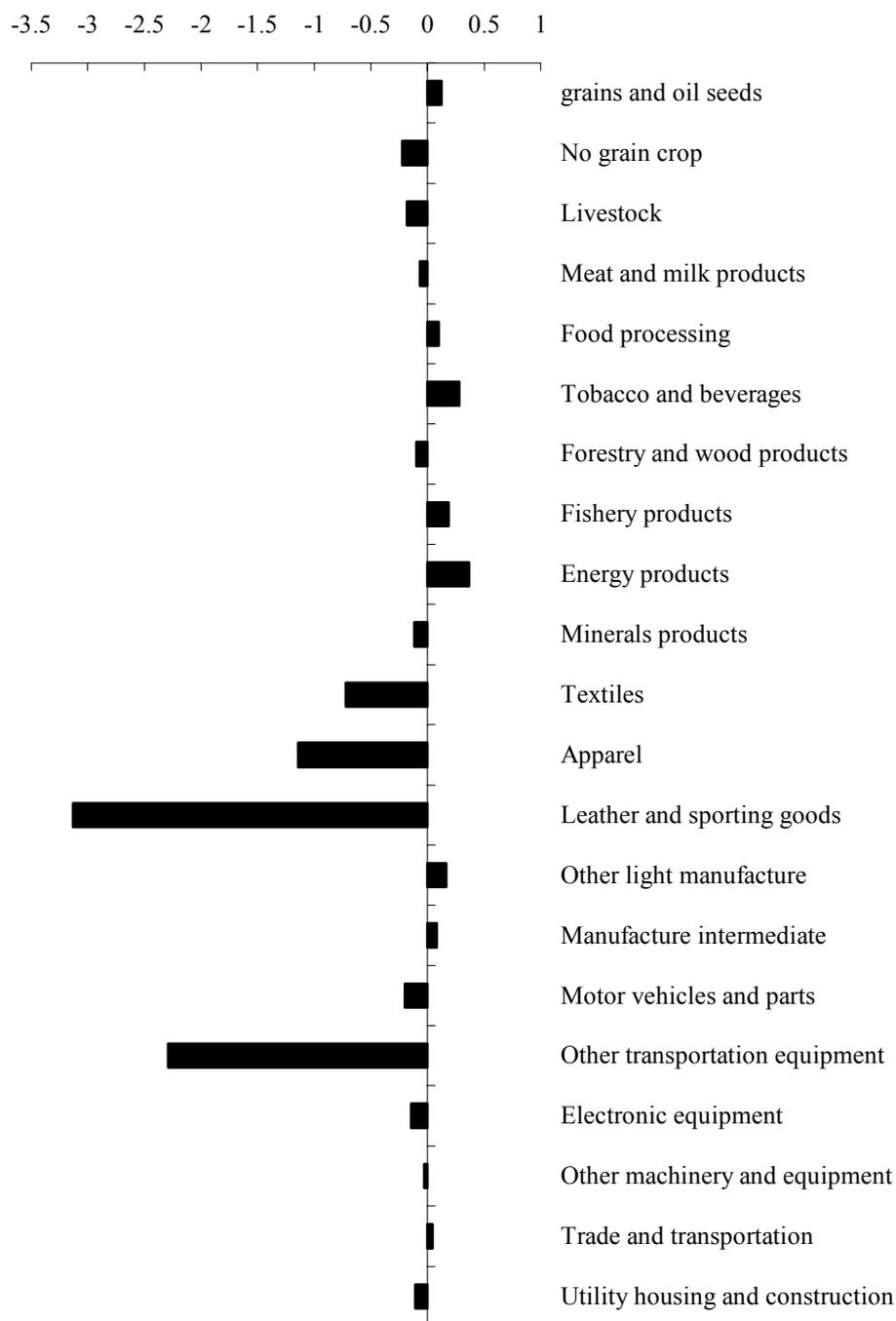
Figure 20   Change in sectoral import of the rest of the world   unit:%

grains and oil seeds	
No grain crop	
Livestock	
Meat and milk products	
Food processing	
Tobacco and beverage	
Forestry and wood products	
Fishery products	
Energy products	
Minerals products	
Textile	
Wearing apparel	
Leather and sport goods	
Other light manufacture	
Manufacture intermediate	
Motor vehicles and parts	
Other transportation equipment	
Electronic equipment	
Other machinery and equipment	
Trade and transportation	
Utility housing and construction	

Figure 21   Change in sectoral export of the rest of the world   unit:%
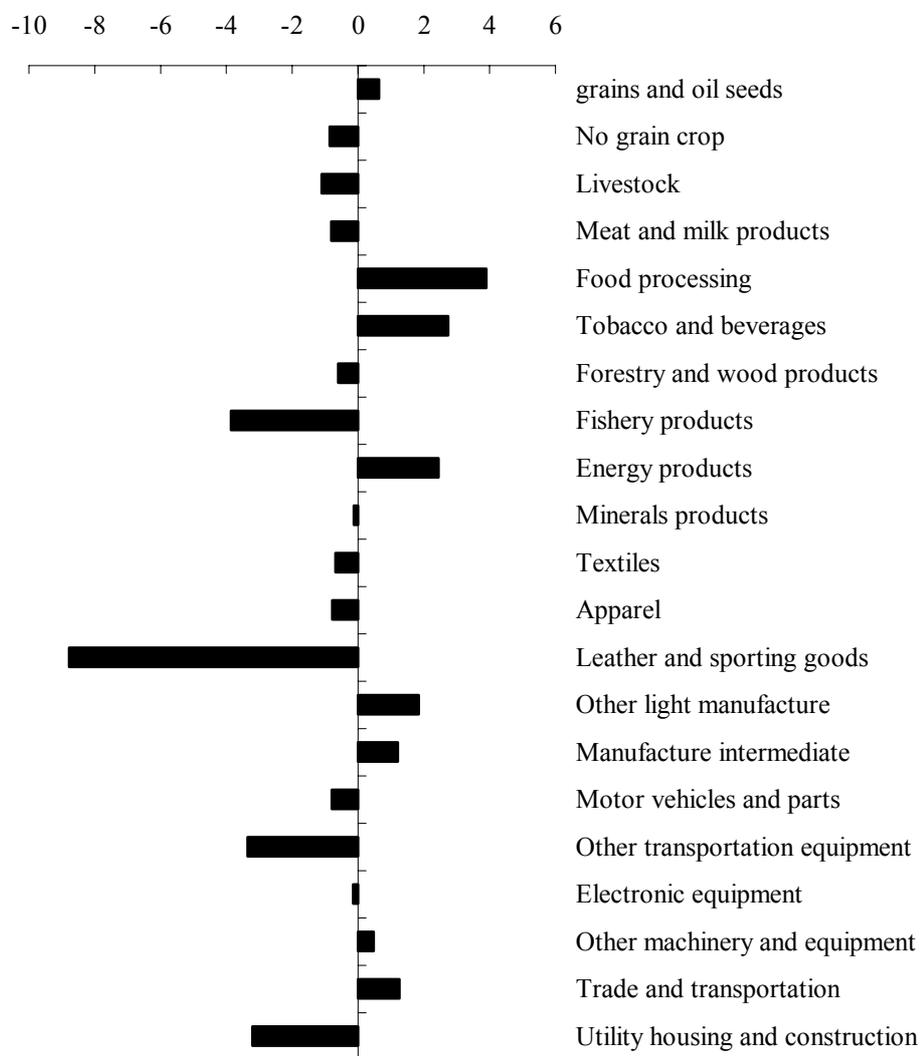
8.4.3   Explanation of the results

As classical trade theory indicates, removing trade distortions leads to further realization of   region's comparative advantage, more efficient allocation of production factors, and finally expansion of trade and increase the welfare of the whole society. Such type of efficiency gain is driven by region's comparative advantages, resulting in a structural adjustment in regional economy and finally

reshaping the structure of the economy.

In terms of the change in growth rate of GDP in the above report, taking China as an example, the increase in growth rate of real GDP should mainly result from factor reallocation efficiency. Some of the efficiency gains would come through labor migration from the rural area to the urban area. Figure 34 shows unskilled labor that employed by agriculture industries tend to be decreased (demand for unskilled labor decreases by -13.09 million US\$), and meanwhile demand for skilled labor increases by 0 US\$.

Different reaction of the different sectors could be interpreted according to: 1) the difference in the level of protection such as tariff and non-tariff barriers and the change in tariff; 2) the difference in the industrial character, such as whether the sector is labor-intensive, capital intensive; or whether the sector is domestic oriented or export oriented.

To illustrate point 1 as described above, taking examples in the case of China. In all of China's agriculture industries (grains and oil seeds, no grain crop, livestock, meat and milk product, tobacco and beverages, forestry and fishery), because the change in tariff for livestock industry is 0%, thus, import of such product decreases by -7% from the baseline, but the output and export of livestock increase almost the fastest compared to other agriculture industries. By contrast, for motor vehicle and parts industry, the tariff reduces by 28.8% from the baseline. This results in the increasing of the import of such product. On the other hand, relatively lower price of import motor vehicle promote the consumer to buy import vehicles, thus the output of motor vehicle and parts in China decrease the fastest.

Example which tries to support point 2 can be found in apparel industry due to its labor-intensive character. For the tariff reduction and China's trade liberalization,

more labor flow into such industry and thus increase the output level and export of apparel goods from China to the other countries.

Table 34   Change in China's factor demand   unit: million US$

	unskilled labor	skilled labor	capital
grains and oil seeds	-4.38	-0.01	-0.01
No grain crop	-3.24	-0.01	-0.01
Livestock	-2.52	-0.01	-0.01
Meat and milk products	-0.22	-0.01	-0.01
Food processing	1.98	0.16	0.13
Tobacco and beverage	-0.36	-0.01	-0.03
Forestry and wood products	8.09	0.07	0.09
Fishery industry	-10.81	-0.03	-0.05
Energy products	0.65	0.04	0.06
Minerals products	4.48	0.31	0.18
Textile	2.91	0.20	0.11
Apparel	6.38	0.33	0.21
Leather and sport goods	4.56	0.28	0.10
Other light manufacture	5.13	0.25	0.17
Manufacture intermediate	-0.72	0.05	-0.12
Motor vehicles and parts	-0.28	-0.01	-0.03
Other transportation equipment	3.66	0.25	0.17
Electronic equipment	0.90	0.08	0.05
Other machinery and equipment	7.85	0.67	0.31
Trade and transportation	-13.81	-2.05	-0.96
Utility housing and construction	-10.25	-0.54	-0.34

Due to China's huge population, industrialization and trade liberalization, the impact on EU's economy and the rest of the world with respect to China's tariff reduction are relatively difficult to explain. But sometimes, we still can give an explanation from the change in the allocation of primary factors. For example, in the case of the EU, due to China's lowered tariff in motor vehicle and parts industry and other transportation equipment, the EU expands its export and output in these 2 industries which are so-called capital-intensive industries. And it may be one of the motor of EU's economic growth. With regard to the rest of the world, possible explanation would be that, while China enlarge its output or export of some goods such as some manufacturing goods, other countries have to divert their resources from these manufacturing industries to agriculture industries due to China's strong export competition, and thus the countries that produce alike products shrink their output or export which could be one of the reasons of why the change in the growth rate of GDP of the rest of the world is negative.

8.5   Sensitivity test

If the parameter is not sourced from estimation using an econometric model or other reliable methods but just borrow the existing parameter from the literature, one question should be answered, that is, is the model robust or is parameters in the model believable? Especially, for a CGE model, most of the equations are written according to the standard theory, and the explanation of the simulation results partially depend on the choice of the parameters.

Usually, some partial sensitivity analysis (set one parameter change and other parameter fixed) is undertaken after simulation by changing the values of one, or several selected parameters to check the robustness of the model.

Given the functions employed in the S-EU CGE model, sensitivity analysis has been performed on the following elasticity according to a partial sensitivity test: (1) elasticity of substitution in production between value-added and intermediate goods using the CES function (SGN), (2) elasticity of substitution in production between domestic supply goods and export goods using the CET function (SGT), (3) elasticity of substitution between domestic and import goods(SGM) and (4) elasticity of expenditure using the ELES function (SGE). In the calculation procedure, firstly, let all the elasticity equal to the GTAP's parameters in the baseline, we get the simulation results of tariff reduction for "basis value". Secondly, we perturbed some elasticity to low value (half of the original value) and high value (1.5 times bigger than the original value), and repeat the simulation and then we get the simulation results for "low value" and " high value". Lastly, we calculate the percentage change in simulation result with "lower value" and "higher value", with respect to "basis value".

This sensitivity analysis is concentrated on the effects of a change in the above parameters on some macro-indicators such as growth rate of household consumption, government consumption, import, export and GDP. Results of sensitivity tests are listed in table 34, table 35, table 36 and table 37.

Surprisingly, except the case for higher value of elasticity of substitution between domestic and import goods (SGM*1.5), almost all the indicators change much less than the change in elasticity. The absolute percentage change is between 0-1.88%, which means the most of simulation results are rather insensitive to the chosen elasticity.

Concentrating on the value of elasticity of substitution between domestic and import goods, higher values of this elasticity will cause a relatively stronger reaction of the indicator for "government consumption", "import" and "export" for "China",

indicator of "government consumption" for "the EU" and "the rest of the world" (see table 35).　But the percentage change of this elasticity (a 50% increase) yields still a smaller change in the above indicator (highest: a -18.17% change) than the elasticity itself.

In general, the sensitivity analysis proved the simulation results to be relatively robust with respect to the values of crucial elasticity.

Table 35　Sensitivity test for elasticity of substitution in production between value-added and intermediate goods: change in the indicators from the "basis value"

Unit:%

Indicator	SGN*1.5			SGN*0.5		
	China	the EU	Rest of the world	China	the EU	Rest of the world
	Change in the indicator			Change in the indicator		
Household consumption	0.00	0.00	0.00	-0.06	0.07	0.08
Government consumption	0.00	0.00	0.00	-0.60	0.35	-0.15
Import	0.00	0.00	0.00	0.23	-0.40	0.35
Export	0.00	0.00	0.00	0.22	-0.39	0.36
GDP	0.00	0.00	0.00	-0.11	0.11	0.03

Table 36   Sensitivity test for elasticity of substitution between domestic and import goods: change in the indicators from the "basis value"

Unit:%

Indicator	SGM*1.5			SGM*0.5		
	China	the EU	Rest of the world	China	the EU	Rest of the world
	Change in the indicator			Change in the indicator		
Household consumption	1.43	-3.60	-1.24	-0.02	-0.03	0.01
Government consumption	-18.17	10.35	4.03	0.00	0.00	0.00
Import	13.08	-0.98	1.94	0.05	0.06	-0.01
Export	12.53	-0.94	2.01	0.05	0.06	-0.01
GDP	-2.03	-0.27	-0.25	-0.01	-0.02	0.01

Table 37   Sensitivity test for elasticity of substitution in production between domestic supply goods and export goods: change in the indicators from the "basis value"

Unit:%

Indicator	SGT*1.5			SGT*0.5		
	China	the EU	Rest of the world	China	the EU	Rest of the world
	Change in the indicator			Change in the indicator		
Government consumption	0.16	-0.40	0.13	0.09	-0.19	0.02
Import	1.88	1.01	-0.88	-0.71	0.61	0.00
Export	1.35	0.21	0.69	0.21	0.15	-0.01
GDP	1.34	0.21	0.69	0.22	0.16	-0.01

Table 38   Sensitivity test for elasticity of expenditure: change in the indicators from the "basis value"

Unit:%

Indicator	SGE*1.5			SGE*0.5		
	China	the EU	Rest of the world	China	the EU	Rest of the world
	Change in the indicator			Change in the indicator		
Household consumption	0.12	0.12	0.17	0.12	0.12	0.17
Government consumption	1.60	0.08	-1.34	1.60	0.08	-1.34
Import	0.42	0.39	0.10	0.42	0.39	0.10
Export	0.38	0.38	0.05	0.38	0.38	0.05
GDP	0.25	0.09	-0.07	0.25	0.09	-0.07

8.6   Conclusion

♦   Due to many reasons, simulation of impact of tariff reduction on Chinese and EU economies using the S-EU CGE model observes only preparatory meaning rather than accurate calculation of the effect of tariff change because the simulation results are controlled under assumptions.

♦   Data from the change in macro-economic indicators of China and the EU reveal that both China and the EU have a positive reaction in respect of China's tariff reduction.

♦   From impact on a sector point of view, to China's manufacturing industry, the apparel industry and other transportation equipment are the biggest winners and the motor vehicle and parts is the biggest loser. To the EU, the impact of China's tariff

change on EU's sectoral output, sectoral import and sectoral export are also very significant.

Appendix

Appendix 1   **Proportion and number of goods sold at state set and market prices, 1978-96**

	1978	1985	1990	1993	1996
Agricultural Products					
Market Prices	6%	30%	52%	88%	79%
State Set Prices	94%	37%	25%	10%	17%
Retail Sales of Consumer goods					
Market Prices	3%	34%	53%	94%	93%
State Set Prices	97%	47%	30%	5%	6%
Industrial Production Materials					
Market Prices	0%		36%	81%	81%
State Set Prices	100%		45%	14%	14%

Sources: Richard F. Garbaccio,Mun S. Ho,Dale W. Jorgenson (1999), "A CGE Model for Analyzing CO2 Emissions Reduction Strategies in China".

Note: (1) Original source of the data: Expert Group of "China Reform and Development Report" (1994) "China Reform and Development Report 1992-1993", p. 54 and NBS, National Bureau of Statistics of China "Price Yearbook of China 1997", p. 482.

    (2) Totals may not add up to 100% due to rounding and because some goods are sold at "guidance prices".

Appendix 2   SAM structure in the S-EU CGE model

Receipts	Expenditures								
	Activities	Com-moditites	Factors	House-Holds	Enterprises	Governments	Saving-Investment	Rest of the world	Total
Activities		domestic supply				export subsidies		export	Total sales
Com-moditites	intermediate inputs			household consumption		government consumption	investment		Total Domestic sales
Factors	value-added								Factor income
House-holds			labor income rent of land and natural resources		enterprise transfer to household				House-hold income
Enterprises			capital income						Enterprises income
Govern-ments	indirect taxes factor taxes intermediate input tax	tariff		household income tax household consumption tax		net transfer among government (government consumption tax).	government deficit		Government income
Saving-Investment				household savings	depreciation			foreign savings	Total savings
Rest of the		imports							Foreign income

world									
Total	Total cost	Total absorption	Factor Expenditure	House-hold Expenditure	Enterprise Expenditure	Government Expenditure	Investment	Foreign Expenditure	

Appendix 3   GTAP   industry classification

Number	Code	Description
1	pdr	Paddy rice
2	wht	Wheat
3	gro	Cereal grains nec
4	v_f	Vegetables, fruit, nuts
5	osd	Oil seeds
6	c_b	Sugar cane, sugar beet
7	pfb	Plant-based fibers
8	ocr	Crops nec
9	ctl	Bovine cattle,sheep and goats, horses
10	oap	Animal products nec
11	rmk	Raw milk
12	wol	Wool,silk-worm cocoons
13	for	Forestry
14	fsh	Fishing
15	col	Coal
16	oil	Oil
17	gas	Gas
18	omn	Minerals nec
19	cmt	Bovine cattle,sheep and goats horses meat products
20	omt	Meat products nec
21	vol	Vegetable oils and fats
22	mil	Dairy products
23	pcr	Processed rice
24	sgr	Sugar
25	ofd	Food products nec
26	b_t	Beverages and tobacco products
27	tex	Textiles
28	wap	Apparel
29	lea	Leather products
30	lum	Wood products
31	ppp	Paper products, publishing
32	p_c	Petroleum, coal products
33	crp	Chemical, rubber, plastic products
34	nmm	Mineral products nec
35	i_s	Ferrous metals
36	nfm	Metals nec
37	fmp	Metal products
38	mvh	Motors vehicles and parts
39	otn	Transport equipment nec
40	ele	Electronic equipment

41	ome	Machinery and equipment nec
42	omf	Manufactures nec
43	ely	Electricity
44	gdt	Gas manufacture, distribution
45	wtr	Water
46	cns	Construction
47	trd	Trade
48	otp	Transport nec
49	wtp	Water transport
50	atp	Air transport
51	cmn	Communication
52	ofi	Financial services nec
53	insr	Insurance
54	obs	Business services nec
55	ros	Recreational and other services
56	osg	Public administration and defence, education, health
57	dwe	dwellings

Note: "nec" is the abbreviation of "not elsewhere classified".

Appendix 4   Derivation of the unit factor requirement function

Following derivation procedure can be seen as the derivation of function (1), (2), (3), (21) and (22) in chapter 7.

For unit output, consider the following producer cost minimization, where we assume for a 2 inputs case.

$$\min \sum_{i=1}^{2} p_i x_i \qquad\qquad (1)$$

$$s.t \qquad 1 = \alpha (\sum_{i=1}^{2} \delta_i x_i^{-\rho})^{-1/\rho} \qquad\qquad (2)$$

in which,   - x_i is the input , p_i is the market price of the input,

-   α, δ_i, ρ are the parameters of the CES function.

-   $\sigma = \dfrac{1}{\rho+1}$, $\rho \geq 1$ σ is the elasticity of substitution

first order conditions are:

$$p_1 = \lambda \alpha \delta_1 x_1^{-\rho-1} (\sum_{i=1}^{2} \delta_i x_i^{-\rho})^{-\frac{1}{\rho}-1} \qquad\qquad (3)$$

$$p_2 = \lambda \alpha \delta_2 x_2^{-\rho-1} (\sum_{i=1}^{2} \delta_i x_i^{-\rho})^{-\frac{1}{\rho}-1} \qquad\qquad (4)$$

when we divide equation (3) by equation (4), we get,

$$\frac{p_1}{p_2} = \frac{\delta_1}{\delta_2} * (\frac{x_1}{x_2})^{-\rho-1} \qquad\qquad (5)$$

assuming the production is under constant return to scale, which is,

$$\delta_1 + \delta_2 = 1 \qquad\qquad (6)$$

we get equation (7) and (8),

$$p_1 = \frac{\delta_1}{1-\delta_1} * (\frac{x_1}{x_2})^{-\rho-1} * p_2 \qquad (7)$$

$$x_1 = (\frac{p_1}{p_2} * \frac{1-\delta_1}{\delta_1})^{\frac{1}{-\rho-1}} * x2 \qquad (8)$$

substituting equation (8) into equation (2), we get equation (9) ,

$$x_2 = \left[\frac{\delta_1(\delta_2 p_1)^{\rho/(1+\rho)} + \delta_2(\delta_1 p_2)^{\rho/(1+\rho)}}{\alpha(\delta_1 p_2)^{\rho/(1+\rho)}}\right]^{\frac{1}{\rho}} \qquad (9)$$

let:

$$p_{av} = (\delta_1^{1/(1+\rho)} p_1^{\rho/(1+\rho)} + (1-\delta_1)^{1/(1+\rho)} p_2^{\rho/(1+\rho)})^{(\rho+1)/\rho} \qquad (10)$$

then,

$$x_2 = \frac{1}{\alpha} * \left[(1-\delta_1) * (\frac{p_{av}}{p_2})\right]^{1/(1+\rho)} \qquad (11)$$

$$x_2 = \frac{1}{\alpha} * \left[\delta_1 * (\frac{p_{av}}{p_1})\right]^{1/(1+\rho)} \qquad (12)$$

X_1, X_2 are the unit factor requirements.

$$\Theta \qquad \sigma = \frac{1}{\rho+1}, \quad \rho \geq 1$$

$$\therefore \qquad x_1 = \frac{1}{\alpha} * (\delta_1 * \frac{p_{av}}{p_1})^{\sigma} \qquad (13)$$

$$x_2 = \frac{1}{\alpha} * (\delta_2 * \frac{p_{av}}{p_2})^{\sigma} \qquad (14)$$

Appendix 5   Derivation of price of the output function

Following derivation procedure can be seen as the derivation of function *"PP$_{ir}$"* in appendix 9.

From appendix 4, we know that unit factor requirement for the two inputs are:

$$x_2 = \frac{1}{\alpha} * (\delta_2 * \frac{p_{av}}{p_2})^{1/(\rho+1)} \qquad (1)$$

$$x_1 = \frac{1}{\alpha} * (\delta_1 * \frac{p_{av}}{p_1})^{1/(\rho+1)} \qquad (2)$$

in which, $\delta_1 + \delta_2 = 1$

Total cost for the unit output is:

$$P_t * 1 = p_1 * x_1 + p_2 * x_2 \qquad (3)$$

in which, p_t is the price of the output.

When substituting (1) and (2) into (3), we get,

$$p_t = p_1 * \frac{1}{\alpha} * (\delta_1 * \frac{p_{av}}{p_1})^{1/(\rho+1)} + p_2 * \frac{1}{\alpha} * (\delta_2 * \frac{p_{av}}{p_2})^{1/(\rho+1)} \qquad (4)$$

$$= \frac{1}{\alpha} * p_{av}^{1/(1+\rho)} * (\delta_1^{1/(\rho+1)} * p_1^{\rho/(\rho+1)} + \delta_2^{1/(\rho+1)} * p_2^{\rho/(\rho+1)}) \qquad (5)$$

Due to,

$$p_{av} = (\delta_1^{1/(\rho+1)} p_1^{\rho/(\rho+1)} + \delta_2^{1/(\rho+1)} p_2^{\rho/(\rho+1)})^{(\rho+1)/\rho}$$

We then have,

$$p_t = \frac{1}{\alpha} * (\delta_1^{1/(\rho+1)} p_1^{\rho/(\rho+1)} + \delta_2^{1/(\rho+1)} p_2^{\rho/(\rho+1)})^{(\rho+1)/\rho} \qquad (6)$$

Appendix 6   Derivation of export and the domestic supply function

Following derivation procedure can be seen as the derivation of function (4), (5) in chapter 7.

For unit output, consider the following producer profit maximization, where we assume for a 2 outlets of the output.

$$\max \sum_{1}^{2} p_i x_i \qquad (1)$$

$$s.t \qquad 1 = \alpha (\sum_{1}^{2} \delta_i x_i^{\rho})^{\frac{1}{\rho}} \qquad (2)$$

in which,   - x_i is the output , p_i is the market price of the output,

-   α, δ_i, ρ are   the   parameters   of   CET   function,   where

$$\sigma = \frac{1}{\rho - 1}, \qquad 1 < \rho < \infty$$
, σ is the elasticity of subsitution

first order conditions are:

$$p_1 = \lambda \alpha \delta_1 x_1^{\rho-1} (\sum_{i=1}^{2} \delta_i x_i^{\rho})^{1/\rho-1} \qquad (3)$$

$$p_2 = \lambda \alpha \delta_2 x_2^{\rho-1} (\sum_{i=1}^{2} \delta_i x_i^{\rho})^{1/\rho-1} \qquad (4)$$

when we divide equation (3) by equation (4), we get,

$$\frac{p_1}{p_2} = \frac{\delta_1}{\delta_2} * (\frac{x_1}{x_2})^{\rho-1} \qquad (5)$$

assuming the production is under constant return to scale, which is,

$$\delta_1 + \delta_2 = 1 \qquad (6)$$

we get equation (7) and (8),

$$p_1 = \frac{\delta_1}{1-\delta_1} * (\frac{x_1}{x_2})^{\rho-1} * p_2 \qquad (7)$$

$$x_1 = (\frac{p_1}{p_2} * \frac{1-\delta_1}{\delta_1})^{\frac{1}{\rho-1}} * x2 \qquad (8)$$

substituting equation (8) into equation (2), we get equation (9) ,

$$x_2 = \frac{(1-\delta_1)^{1/(1-\rho)} p_2^{-1/(1-\rho)}}{\alpha(\delta_1^{1/(1-\rho)} p_1^{-\rho/(1-\rho)} + (1-\delta_1)^{1/(1-\rho)} p_2^{-\rho/(1-\rho)})^{1/\rho}} \qquad (9)$$

let:

$$p_{av}^{-1/(1-\rho)} = (\delta_1^{1/(1-\rho)} p_1^{-\rho/(1-\rho)} + (1-\delta_1)^{1/(1-\rho)} p_2^{-\rho/(1-\rho)})^{1/\rho} \qquad (10)$$

then,

$$x_2 = \frac{1}{\alpha} * (1-\delta_1)^{1/(1-\rho)} * (\frac{p_2}{p_{av}})^{-1/(1-\rho)} \qquad (11)$$

$$x_1 = \frac{1}{\alpha} * \delta_1^{1/(1-\rho)} * (\frac{p_1}{p_{av}})^{-1/(1-\rho)} \qquad (12)$$

$$\Theta \qquad \sigma = \frac{1}{\rho-1}, \quad 1 \le \rho \le \infty$$

$$\therefore \quad x_1 = \frac{1}{\alpha} * (\frac{p_1}{\delta_1 * p_{av}})^{\sigma} \qquad (13)$$

$$x_2 = \frac{1}{\alpha} * (\frac{p_2}{\delta_2 * p_{av}})^{\sigma} \qquad (14)$$

Appendix 7　　Derivation of the consumption function

Following derivation procedure can be seen as the derivation of function (6) in chapter 7.

Assume the utility function of consumer is:

$$u(x) = \sum_{i=1}^{n} \beta_i \ln(x_i - \gamma_i) + \beta_s \ln(\frac{s}{cpi}) \tag{1}$$

in which, $x_i > \gamma_i > 0$, $\quad 0 < \beta_i$, $\beta_s < 1$, $\quad \sum_{i=1}^{n} \beta_i + \beta_s = 1$

then, we can write a consumer utility maximization function as:

$$\text{Max} \quad \sum_{i=1}^{n} \beta_i \ln(x_i - \gamma_i) + \beta_s \ln(\frac{s}{cpi})$$

$$\text{s.t.} \quad \sum_{i=1}^{n} (p_i x_i + s) = m \, 。 \tag{2}$$

in which, m is income, s is household savings, cpi is CPI indicator.

The first order condition of the above function are:

$$\frac{\partial L}{\partial x_i} = \beta_i (x_i - \gamma_i)^{-1} - \lambda p_i = 0, \quad i=1,2,\ldots,n \tag{3}$$

$$\frac{\partial L}{\partial s} = \frac{\beta_s}{s} - \lambda = 0 \tag{4}$$

$$\frac{\partial L}{\partial \lambda} = m - (\sum_{i=1}^{n} p_i x_i + s) = 0 \tag{5}$$

equation (3),(4) can be rewrite as:

$$\beta_i = \lambda p_i (x_i - \gamma_i) \tag{6}$$

$$\beta_s = s\lambda \tag{7}$$

Due to $\sum_{i=1}^{n} \beta_i + \beta_s = 1$, we have:

$$1 = \sum_{i=1}^{n} \beta_i + \beta_s = \lambda(\sum_{i=1}^{n} p_i x_i - \sum_{i=1}^{n} p_i \gamma_i) + \beta_s \qquad (8)$$

Rewriting equation (6), we have

$$\lambda = \left(\sum_{i=1}^{n} p_i x_i - \sum_{i=1}^{n} p_i \gamma_i + s \right)^{-1} = \left(m - \sum_{i=1}^{n} p_i \gamma_i \right)^{-1} \qquad (9)$$

Substituting (7) into (3),

$$\beta_i = \frac{p_i x_i - p_i \gamma_i}{m - \sum p_i \gamma_i} \qquad (10)$$

Rewrite equation (8),

$$\lambda = \left(\sum_{i=1}^{n} p_i x_i - \sum_{i=1}^{n} p_i \gamma_i \right)^{-1} = \left(m - \sum_{i=1}^{n} p_i \gamma_i \right)^{-1} \qquad (11)$$

$$p_i x_i = p_i \gamma_i + \beta_i (m - \sum_{i=1}^{n} p_i \gamma_i) \qquad (12)$$

γ_i basic demand of consumer; β_i: weight of super demand of consumer.

Appendix 8   Set definition

Region *r* (3):

    1. EU15, which includes Austria, Sweden, Finland, Belgium, Luxemburg, Denmark, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, Spain, UK

    2. China

    3. Rest of the world

Sector *i* (21):

    1. grains and oil seeds

    2. no grain crop

    3. livestock

    4. meat and milk products

    5. food processing

    6. tobacco and beverages

    7. forestry and wood products

    8. fishery products

    9. energy products

    10. mineral products

    11. textiles

    12. apparel

    13. leather and sporting goods

    14. other light manufacture

    15. manufacture intermediate

    16. motor vehicles and parts

    17. other transportation equipment

    18. electronic equipment

19. other machinery and equipment

20. trade and transportation

21. utility housing and construction

Factor f (5):

1. land,

2. capital,

3. unskilled labor, which includes: a) managers

b) administrators

c) professionals

d) para-professionals

4. skilled labor, which includes: a) trades-person

b) clerks

c) salesperson

d) personal service workers

e) plant and machine operators

f) drivers

g) laborers and related workers

h) farm worker

5. natural resources, which include coal, gas, oil and other minerals.

Appendix 9   Model file

Set definition

i: Sector, $i \in 1,2,\ldots\ldots,21$

r: Region, $r \in 1,2,3$

f: primary factor, $f \in 1,2\ldots 5$

Price

$$PP_{ir} = \frac{1}{A_{ir}}(\alpha^{\sigma_p}{}_{ir} * PN_{ir}{}^{(1-\sigma_p)} + (1-\alpha_{ir})^{\sigma_p} * PV_{ir}{}^{(1-\sigma_p)})^{1/(1-\sigma_p)}$$

$$PN_{jr} = \sum io_{ijr} * PA_{ir}$$

$$PV_{ir} = \frac{1}{B_{ir}}(\sum \beta^{\sigma_v}{}_{fir} * Pf_{fr}{}^{(1-\sigma_p)})^{1/(1-\sigma_p)}$$

$$PWM_{irs} = (1 + mtr_{irs}) * PWE_{irs}$$

$$PM_{ir} = \frac{1}{D_{ir}}(\sum \varphi_{irs}{}^{\sigma_m} * ((1 + tm_{irs} + tn_{irs}) * PWM_{irs})^{(1-\sigma_m)})^{1/(1-\sigma_m)}$$

$$PWE_{irs} = PE_{ir}(1 + te_{irs})$$

$$PA_{ir} = (PD_{ir} * DM_{ir} + PM_{ir} * IM_{ir}) / AD_{ir}$$

$$PINDEX_r = NGDP_r / RGDP_r$$

Firm behavior

$$VA_{ir} = \frac{1}{A_{ir}}(\alpha_{ir} * \frac{PY_{ir}}{PV_{ir}})^{\sigma_p} * YT_{ir}$$

$$VN_{ir} = \frac{1}{A_{ir}} \left[(1-\alpha_{ir}) * \frac{PY_{ir}}{PN_{ir}} \right]^{\sigma_p} * YT_{ir}$$

$$VF_{(f \in F)_{fir}} = \frac{1}{B_{ir}} (\beta_{fir} * \frac{PV_{ir}}{PF_{fr}})^{\sigma_f} * VA_{ir} \qquad \sum \beta_{fir} = 1$$

$$SE_{ir} = \frac{1}{C_{ir}} \left[\frac{PE_{ir}}{\gamma_{ir} * PT_{ir}} \right]^{\sigma_t} * YT_{ir}$$

$$SD_{ir} = \frac{1}{C_{ir}} \left[\frac{PD_{ir}}{(1-\gamma_{ir}) * PT_{ir}} \right]^{\sigma_t} * YT_{ir}$$

$$YT_{ir} = \frac{SD_{ir} * PD_{ir} + SE_{ir} * PE_{ir}}{PT_{ir}}$$

Household behavior

$$HC_{ir} = \eta_{ir} + \frac{\mu_{ir}}{PC_{ir}} (HD_r - \sum PC_{ir} * \eta_{ir})$$

$$HI_r = \sum_{f=F} \sum PF_{fr} * VF_{fir} + trans^{gov}_r - ES_r$$

F=(skilled labor, unskilled labor, land, capital, natural resources)

$$HD_r = HI_r - TXH_r$$

$$HS_r = HD_r - \sum HC_{ir} * PC_{ir}$$

Government behavior

$$GE_r = \sum GC_{ir} * PC_{ir} + trans_r^{gov}$$

$$GC_{ir} = \omega_{ir} * YT_{ir}$$

$$GR_r = TARRIF_r + TXE_r + TXF_r + TXP_r + TXC_r + TXH_r + TXI_r$$

$$TARRIF_r = \sum \sum tm_{irs} * PWM_{irs} * MS_{irs}$$

$$TXE_r = \sum \sum tx_{irs} * PE_{ir} * SE_{ir}$$

$$TXF_r = \sum \sum tf_{ir} * VF_{fir} * PF_{fr}$$

$$TXP_r = \sum tp_{ir} * PY_{ir} * YT_{ir}$$

$$TXC_r = \sum tc_{ir} * (GC_{ir} + HC_{ir}) * PA_{ir}$$

$$TXH_r = \sum th_{ir} * HI_{ir}$$

$$TXI_r = \sum ti_{ir} * PN_{ir} * VN_{ir}$$

International trade and investment

$$IM_{ir} = \frac{1}{E_{ir}} \left[(1 - \phi_{ir}) \frac{PA_{ir}}{PM_{ir}} \right]^{\sigma_a} * AD_{ir}$$

$$DM_{ir} = \frac{1}{E_{ir}} \left[\phi_{ir} \frac{PA_{ir}}{PD_{ir}} \right]^{\sigma_a} * AD_{ir}$$

$$MS_{ir} = \frac{1}{D_{ir}} (\varphi_{irs} * \frac{PM_{ir}}{(1 + tm_{irs} + tn_{irs}) * PWM_{irs}}) * IM_{ir}$$

$$DI_{ir} = \varpi_{ir} * YT_{ir}$$

Economic definition

$$NGDP_r = \sum PC_{ir} * (HC_{ir} + GC_{ir} + DI_{ir}) + BOT_r$$

$$RGDP_r = \sum PC_{ir,0} * (HC_{ir} + GC_{ir} + DI_{ir}) + BOT_r$$

$$BOT_r = \sum PE_{ir} * SE_{ir} - \sum PM_{ir} * IM_{ir}$$

$$AD_{ir} = HC_{ir} + GC_{ir} + DI_{ir} + VN_{ir}$$

$$ES_r = \sum dr_r * \overline{F_1 S_{fr}} \qquad F_1 = (capital \quad stock)$$

General equilibrium

$$\sum VF_{fir} = \overline{FS_{fr}}$$

$$GR_r = GE_r + GS_r$$

$$\sum DI_{ir} * PI_{ir} = HS_r + GS_r + ES_r - BOT_r$$

Variables

AD_{ir}: total domestic demand in region r

BOT_r: balance of trade in region r

DI_{ir}: investment demand in region r

DM_{ir}: domestic product demand in region r

ES_r: enterprise saving in region r

GC_{ir}: government consumption in region r

GE_r : government expenditure in region r

GR_r: government revenue in region r

GS_r: government savings in region r

HC_{ir}: household consumption in region r

HD_r: household disposable income in region r

HI_r: household income in region r

HS_r: household saving in region r

IM_{ir}: aggregate import in region r

MS_{irs}: region r's import from source region s

$NGDP_r$: GDP calculated from income account in region r

PA_{ir}: price of composite goods in region r

PC_{ir}: consumer price in region r

PD_{ir}: price of domestic goods sold at home country in region r

PE_{ir}: export price in region r

PF_{fir} : factor price in region r

PI_{ir}: price of investment in region r

$PINDEX_r$: GDP index in region r

PM_{ir}: import price in region r

PN_{ir} : price of aggregate intermediate inputs in region r

PP_{ir}: average producer cost in region r

PT_{ir}: output price after tax in region r

PV_{ir} : price of value added in region r

PWM_{irs}: world import price of commodity i from region r to region s

PWE_{irs}: world export price of commodity i from region r to region s

PY_{ir} : output price before tax in region r

$RGDP_r$: GDP calculated from expenditure account in region r

SD_{ir} : domestic sales in region

SE_{ir}: domestic product sold at international market in region r

$TARIFF_r$: tariff in region r

TXC_r: consumer taxes in region r

TXE_r: export taxes in region r

TXF_r: factor taxes in region r

TXH_r: household income tax in region r

TXI_r: intermediate taxes in region r

TXP_r: indirect taxes in region r

   VA_{ir} : value-added input in region r

   VF_{fir} : factor demand in region r

      VN_{ir} : intermediate input in region r

YT_{ir} : sector output in region r

Parameters

$A_{ir}, B_{ir}, C_{ir}, D_{ir}, E_{ir}$ are parameters.

dr_r :depreciate rate

io_{ijr}: I-O coefficiency

mtr_{irs}: Transport cost margin

tc_{ir} : consumer tax rate in region r

tf_{ir}: factor tax rate in region r

th_{ir}: household income tax rate in region r

tk_{ir}: intermediate input tax rate in region r

tm_{irs}: Tariff on import goods from region s in region r

tn_{irs}: Other import protection on import goods from region s in region r

tx_{ir}: export tax rate of commodity i in region r to region s

tp_{ir} : indirect tax rate in region r

ϖ_r : share of investment in total output

$\alpha_{ir}, \beta_{ir}, \gamma_{ir}, \varphi_{irs}, \phi_{ir}$ Share parameters

$\rho_p, \rho_g, \rho_v, \rho_t, \rho_m$ Substitute elasticities

η_{ir} : basic demand of consumer

μ_{ir} : weight of super demand of consumer

ω_{ir}: The share of government consumption in total output

Exogenous variables

$\overline{FS_{fr}}$: Factor supply

$trans_r^{gov}$: government transfer

Appendix 10   Substitutes used in the S-EU CGE model

*Parameters from the GTAP Version 5 Pre-release

** Elasticity of Substitution Between Domestic and Import Goods (unit)

Industry	China	EU15	Rest of the world
GRN	2.200	2.200	2.200
NGC	2.200	2.200	2.200
LIV	2.625	2.625	2.625
MET	2.200	2.200	2.200
FOD	2.200	2.200	2.200
BER	3.100	3.100	3.100
FRS	2.800	2.800	2.800
FSH	2.800	2.800	2.800
ENG	2.099	2.099	2.099
COM	2.800	2.800	2.800
TEX	2.200	2.200	2.200
CLT	4.400	4.400	4.400
LEA	4.400	4.400	4.400
LMF	2.800	2.800	2.800
INT	2.226	2.226	2.226
MVH	5.200	5.200	5.200
OTN	5.200	5.200	5.200
ELE	2.800	2.800	2.800
MAH	2.800	2.800	2.800
TSV	1.900	1.900	1.900

**Elasticity of Substitution Between Intermediate and Value-added Inputs (unit)

Industry	China	EU15	Rest of world
GRN	0.628	0.628	0.628
NGC	0.628	0.628	0.628
LIV	0.628	0.628	0.628
MET	0.628	0.628	0.628
FOD	0.628	0.628	0.628
BER	0.978	0.978	0.978
FRS	0.628	0.628	0.628
FSH	0.628	0.628	0.628
ENG	1.147	1.147	1.147
COM	1.147	1.147	1.147
TEX	0.978	0.978	0.978
CLT	0.978	0.978	0.978
LEA	0.978	0.978	0.978
LMF	0.978	0.978	0.978
INT	0.978	0.978	0.978
MVH	0.804	0.804	0.804
OTN	0.804	0.804	0.804
ELE	0.804	0.804	0.804
MAH	0.804	0.804	0.804
TSV	0.321	0.321	0.321

Elasticity of Substitution used in the Value-added Function (unit)

Industry	China	EU15	Rest of the world
GRN	0.243	0.243	0.243
NGC	0.243	0.243	0.243
LIV	0.243	0.243	0.243
MET	1.120	1.120	1.120
FOD	1.120	1.120	1.120
BER	1.120	1.120	1.120
FRS	0.910	0.910	0.910
FSH	0.200	0.200	0.200
ENG	0.514	0.514	0.514
COM	0.972	0.972	0.972
TEX	1.260	1.260	1.260
CLT	1.260	1.260	1.260
LEA	1.260	1.260	1.260
LMF	1.260	1.260	1.260
INT	1.260	1.260	1.260
MVH	1.260	1.260	1.260
OTN	1.260	1.260	1.260
ELE	1.260	1.260	1.260
MAH	1.260	1.260	1.260
TSV	1.408	1.408	1.408

**Elasticity of Substitution Among Import Goods From Different Regions (unit)

Industry	China	EU15	Rest of the world
GRN	4.400	4.400	4.400
NGC	4.400	4.400	4.400
LIV	5.483	5.483	5.483
MET	4.400	4.400	4.400
FOD	4.400	4.400	4.400
BER	4.200	4.200	4.200
Frs	4.600	4.600	4.600
fsh	4.600	4.600	4.600
ENG	4.939	4.939	4.939
COM	4.600	4.600	4.600
TEX	4.400	4.400	4.400
CLT	5.200	5.200	5.200
LEA	5.000	5.000	5.000
LMF	5.600	5.600	5.600
INT	4.424	4.424	4.424
MVH	5.400	5.400	5.400
OTN	5.400	5.400	5.400
ELE	4.600	4.600	4.600
MAH	5.600	5.600	5.600
TSV	3.800	3.800	3.800

**Elasticity of Transformation Between Domestic Sales and Exports (unit)

Industry	China	EU15	Rest of the world
GRN	3.900	3.900	3.900
NGC	3.500	3.500	3.500
LIV	3.500	3.500	3.500
MET	3.500	3.500	3.500
FOD	3.500	3.500	3.500
BER	7.200	7.200	7.200
FRS	3.500	3.500	3.500
FSH	3.500	3.500	3.500
ENG	3.500	3.500	3.500
COM	3.500	3.500	3.500
TEX	7.200	7.200	7.200
CLT	7.200	7.200	7.200
LEA	7.200	7.200	7.200
LMF	7.200	7.200	7.200
INT	7.200	7.200	7.200
MVH	3.500	3.500	3.500
OTN	3.500	3.500	3.500
ELE	3.500	3.500	3.500
MAH	3.500	3.500	3.500
TSV	2.100	2.100	2.100

**Expenditure Elasticity of Consumer Demand

Industry	China	EU15	Rest of the world
FRS	1.33758068	0.76228005	1.299131298
FSH	0.80928129	0.14079923	0.265809886
TEX	0.90042818	0.26818773	0.466124453
LEA	1.33758068	0.84111521	1.323133802
MVH	1.08540666	1.03513536	1.431147377
OTN	1.08540666	1.17730558	1.438105714
ELE	1.48183703	0.49261423	0.759661576
GRN	0.34608236	0.01473632	0.141862839
NGC	0.80928129	0.01502510	0.246379593
LIV	1.10562939	0.01916686	0.223424699
ENG	1.32950928	0.88689987	1.296778290
COM	1.33758068	0.80688865	1.296187621
MET	1.07416006	0.02036222	0.214221847
FOD	0.63193391	0.01534379	0.220045359
BER	0.9535529	0.32274948	0.547497129
CLT	0.90042818	0.24252929	0.469225075
LMF	1.48183703	0.56507074	0.741290634
INT	1.33758068	0.81352382	1.309412836
MAH	1.48183703	0.55236960	0.764017892
TSV	1.07929621	1.43510774	1.459391655

Appendix 11   SAM for China, E15, Rest of the world in 1997

1. SAM for China in Year 1997   unit: million US$

	total	Activities	Commodities	Factors	Enterprises	Private household
total		2126077	2128624	680988	313602	595770
Activities	2126077		1886524			
Commodities	2128624	1334422				408499
Factors	680988	680988				
Enterprises	313602			313602		
Private household	595770			367386	228383	
Government	102485	110667	26765			-63491
Capital	309897				85219	250762
Rest of the world	215335		215335			

+	Government	Capital	Rest of the world
total	102485	309898	215335
Activities	-1865		241418
Commodities	101769	283935	
Government	2581	25963	
Capital			-26083

2.　　SAM for the EU in Year 1997　　　　unit: million US$

	total	Activities	Commodities	Factors	Enterprises	Private household
total		14367690	14296220	7010060	3067689	6063947
Activities	14367690		13250900			
Commodities	14296220	6946078				4513140
Factors	7010060	7010060				
Enterprises	3067689			3067689		
Private household	6063947			3942372	2121575	
Government	1496690	411551	32228			912968
Capital	1487529				946114	637839
Rest of the world	1013093		1013093			

+	Government	Capital	Rest of the world
total	1496690	1487528	1013093
Activities	7270		1109517
Commodities	1431323	1405682	
Government	58097	81846	
Capital			-96424

3. SAM for the rest of the world in Year 1997   unit: million US$

	total	Activities	Commodities	Factors	Enterprises	Private household
total		35876360	36115550	17331890	6959388	15076750
Activities	35876360		34776760			
Commodities	36115550	16961220				12263720
Factors	17331890	17331890				
Enterprises	6959388			6959388		
Private household	15076750			10372510	4704245	
Government	2748595	1583248	98819			742046
Capital	4448632				2255143	2070981
Rest of the world	1239974		1239974			

+	Government	Capital	Rest of the world
total	2748595	4448631	1239974
Activities	-17864		1117467
Commodities	2654302	4236305	
Government	112156	212326	
Capital			122508

Appendix 12   Comparative advantages

<div align="center">unit:%   year:1997</div>

	China	E15	Rest of the world
Share of the world			
Population	21.1	6.6	72.3
Land	9.0	5.6	85.4
Unskilled labor	14.1	10.3	75.6
Skilled labor	18.8	16.1	65.1
Capital	2.6	28.8	68.6
Other resources	7.3	10.2	82.5
Factor intensity			
Capital/Labor (1000 US$/Labor)	2.9	129.8	29.7
Land/Labor (hectare/Labor)	0.2	0.4	0.6

Appendix 13   Net export

unit: million US$ year:1997

Industry code	China	E15	Rest of the world
grains and oil seeds	-34.8	-58.3	29.4
No grain crop	13.1	-197.5	96.3
Livestock	2.4	-22.0	1.1
Meat and milk products	-4.0	81.2	-146.5
Food processing	-26.5	-79.1	-110.0
Tobacco and beverage	-6.4	103.1	-174.9
Forestry and wood products	17.0	-54.5	-18.4
Fishery industry	4.8	-13.8	4.0
Energy products	-51.7	-821.4	743.3
Minerals products	-6.3	17.3	-107.4
Textile	-21.8	-48.4	-112.2
Apparel	222.6	-254.2	-121.7
Leather and sport goods	182.6	-43.0	-233.0
Other light manufacture	196.2	-11.1	-303.1
Manufacture intermediate	-302.8	571.8	-744.6
Motor vehicles and parts	-35.5	367.6	-468.8
Other transportation equipment	-14.6	35.4	-60.7
Electronic equipment	-4.5	-463.8	264.3
Other machinery and equipment	-160.3	918.6	-1174.2
Trade and transportation	-7.8	-40.5	-39.8
Utility housing and construction	-9.0	-4.9	13.1

References

Aderson, J.E. and P.Neary (1994), "Measuring the restriction of trade policy", *World Bank Economic Review*, 8(1),pp151-169.

Alho, Kari E.O. (2002), "The impact of regionalism on trade in Europe", ETLA, The Research Institute of the Finnish Economy.

Arjan, Lejour and Elena Ianchovichina, Will Martin and Emiko Fukase (2000), "Assessing the implications of merchandise trade liberalization in China's accession to WTO" World Bank Washington, D.C.

Armington, P (1969), "A theory of demand for products differentiated by place of production", *IMF Staff Papers*,16,pp,159-78.

Arndt, Channing and Sherman Robinson (2001), "Parameter estimation for a computable general equilibrium model: a maximum entropy approach", TMD discussion paper No. 40.

Auboin, Marc and Sam Laird (1997), "EU import measures and the developing countries", WTO, Staff Working Paper TPRD-98-01.

Auswärdiges Amt des Bundesrepublik Deutschlands, Federal Foreign Office (2002), "Task of German foreign policy".

Bach, Christian F. and Will Martin (1997), "China and the WTO: tariff offers, exemptions, and welfare implications", World Bank.

Balassa, Bela (1966), "Tariff reduction and trade in manufacture among the industrial countries", *The American Economic Review.*

Baldwin, Robert E. (1960), "The effect of tariffs on international and domestic prices", *Quarterly Journal of Economics,* 74, No.1, p65~78.

Bennett, David, Xiaming Liu, David Parker, Fred Steward and Kirit Vaidya (2000), "Technology transfer to China: a study of strategy in 20 EU industrial countries*,* RP0006, ISBN No: 1 85449 354 X.

Bergstrand, J.H (1985), "The gravity equation in international trade: some micro-economic foundations and empirical evidence" *Review of Economics and*

Statistics, 67, pp474-81.

Bhagwati, J. and H.G. Johnson (1961), "General theory of the effects of tariffs on the terms of trade", *Oxford Economic Papers*, 1961, p225~253.

Blackorby, Charles and R. Robert Russell (1989), "Will the real elasticity of substitution please stand up?" *The American Economic Review*, Vol. 79 No.4.

Broadman, H.G. and X.L Sun (1997), "The distribution of foreign direct investment in China", Policy Research Paper No. 1720, The World Bank, Washington, D.C.

Cabestan, Jean-Pierre (2001), "Frances's Taiwan policy: a case of shopkeeper diplomacy" Paper presented on the international Conference.

Cai, Fangbo (2004), "Three periods in Sino-France relationship", accessed at www.cass.net.cn/webnew/file/2004031813267.html (in Chinese).

China Business (1998), "The reason of success and failure of German enterprise in China" 24,02,1998. (in Chinese).

China Daily (2000), "Summary of Sino-US bilateral WTO Agreement" accessed at 25, March 2000 www.chinadaily.com.cn.net.

China Economic Information Network (1999), "Progress of China's WTO entry negotiations", accesses at www.cei.gov.cn (in Chinese).

Colatei,Diego and Jeffery I Round (1999), "Poverty and policy: experiments with a SAM-based CGE model for Ghana", Paper presented to the XIII International Conference on Input-Output Techniques,21-25 August 2000, Macerata, Italy.

Corden, W. Max (1957), "The calculation of the cost of protection" *Economic Record*, 33, 29-51.

Customs General Administration PRC (1997), "Regulation of the People's Republic of China on Import and Export Duties in 1997" (in Chinese).

Customs General Administration PRC (2002), "Regulation of the People's Republic of China on Import and Export Duties in 2002" (in Chinese).

Das, Dilip K. (2001),"China's accession to the World Trade Organization: issues and implications". working paper 01-1 of Asia Pacific School of Economics and Management.

Davidson, R. and J.G. MacKinnon (1981), "Several tests for model specification in the presence of alternative hypotheses." *Econometrica*, 49, pp. 781-93.

Davidson, R. and J.G. MacKinnon (1982), "Some non-nested hypothesis tests and the relations among them." *Review of Economic Studies*, 49, pp. 551-65.

Deardorff, Alan V. and Robert M. Stern (1997), "Measurement of non-tariff barriers", Economics Department, University of Michigan Working Paper No. 179.

Dervis, K., J.de. Melo, S.Robinson (1982), "General equilibrium models for development policy", Cambridge University Press.

DFI International for the Bureau of Export Administration (2002), "US commercial technology transfers to the People's Republic of China".

Dimaranan, Betina., Robert. McDougall and Thomas. Hertel (1997), "Behavioral parameters" (18.1–18.22). In: McDougall, R.A., "Global trade, assistance, and protection – the GTAP 3 data base". Purdue.

Dixon, P.B., B.R. Parmenter, and M.T. Rimmer (1997), "The Australian textiles, clothing and footwear sector from 1986-87 to 2013-14: analysis using the Monash model". September, Centre of Policy Studies and IMPACT Project. University of Monash..

Editorial Board of the Yearbook of World Economy (2001,2002), "Yearbook of world economy", Economic Science Publish House.

Egeln, Juergen and Uwe Klann (1997), "Die antidumpingpolitik der Europaeischen gemeinschaft", Nomos Verlagsgesellschaft, Baden-baden.

Embassy of the People's Republic of China in the United Kingdom of the Great Britain and Northern Ireland (2000), "China and Europe-partners with common interest 2000", accessed at
http://www.chinese-embassy.org.uk/eng/dsjh/t27155.htm.

EU (1994), "Towards a new Asia strategy ", COM(94) 314 final, Brussels.

EU (1995), "A long term policy for China-Europe relations" , COM(1995) 279/final.

EU (1997), " The European Union and Hong Kong: beyond 1997", COM(97) 171 final, Brussels,23,04,1997.

EU (1998), "Building a comprehensive partnership with China", Brussels, COM(1998) 181.

EU (2000), Report on the Implementation of the Communication "Building a Comprehensive Partnership with China" COM (1998) 181-Brussels, COM (2000) 552.

EU (2000,2001,2002,2003), Interim report: "Statistics covering the year 2000,2001,2002,2003".

EU(2000), " The EU's relations with China-an overview", The European Commission External Relations, accessed at
http://europa.eu.int/comm/external_relations/china/intro/index.htm.

EU (2001), "Strategy towards China: implementation of the 1998 communication and future steps for a more effective EU policy", COM(2001) 265 final.

EU (2003), " A maturing partnership - shared interests and challenges in EU-China relations", Commission Policy Paper for Transmission to the Council and the European Parliament, Brussels, 10/09/03 COM(2003) 533 fin.

EU (2003), "External and intra-European Union trade-statistical yearbook". Office for official publications of the European Communities.

Francois, J.F., Hans H. Glismann and D.Spinanger (2000), "The cost of EU trade protection in textiles and clothing", Kiel Institute of World Economics, Working Paper No. 997.

Francois, J.F. and D. Spinanger (2000), "Hong Kong's textile and clothing industry: the impact of quotas, the UR and China's WTO accession". Kiel Institute of World Economics.

Frondel, Manuael and Christoph M. Schmidt (2000), "The real elasticity of substitution—an obituary", University of Heidelberg.

Garbaccio, Richard F., Mun S. Ho and Dale W. Jorgenson (1999),"A CGE model for analyzing CO2 emissions reduction strategies in China," Harvard University And U.S. Environmental Protection Agency.

Gehlhar, Mark J. (1996), "Reconciling trade data for use in GTAP". GTAP Technical Paper No. 10.

Government of Pakistan (1998), "Import regulations in the European Union". Accessed at www.smeda.org.pk.

Hansen, L.P., and J.J. Heckman (1996), 'The empirical foundations of calibration" *Journal of Economic Perspectives* 10: 87-104.

Harrison, W.J. and K.R. Pearson (1994), "An introduction to GEMPACK", Second edition.

He, Juhuang (2000), "Analysis of consumption function", Social Sciences Publishing House (in Chinese).

Heberer, Thomas (2002), "China's domestic development, China-EU relationship, and EU-China policies", University Duisburg.

Hertel，Thomas (1997), "Chapter 1 Structure of GTAP model" in "Global trade analysis: modeling and applications", Cambridge University Press.

Hertel, Thomas, E. Ianchovichina and B.J. McDonald (1997), "Multi-region general equilibrium modeling". In "Applied methods for trade policy analysis, a handbook" edited by Francois, J.F and K.A Reinert (1997). Cambridge University Press.

Hoekman, Bernard M. and Aaditya Mattoo (2002), "Development, trade and the WTO: a handbook", World Bank.

Horridge, J.M, B.R.Parmenter and K.R.Pearson (1998), "ORANI-G: a general equilibrium model of the Australian economy" Edition prepare for course in practical GE modeling.

Huang,Yiping, and Song, Ligang (2001), "Applied quantitative economics", Shang Hai People Publishing House (in Chinese).

Huff, Karen etc. (1999), "Contributing input-output tables to the GTAP data base", GTAP Technical Paper No. 1.

Ianchovichina, Elena and Will Martin (2001), "Trade liberalization in China's accession to the World Trade Organization". accessed at www1.worldbank.org/wbiep/trade.

Ianchovichina, Elena and Will Martin (2002), "Evaluating accession to WTO by China and Chinese Taipei", GTAP resource 1093.

Johnson, Harry G. (1960), "The cost of protection and the scientific tariff". *Journal of Political Economy*, 68, 327-45.

Johnson, Harry G. (1969), "The standard Theory of Tariffs", *Canadian Journal of Economics*   2 no.3, p333~352.

Kawai, Hiroki and Iwao Tanaka (1996), "Measuring the cost of protection in Japan, 1990", IDE-APEC Study Center Working Paper Series 95/96-No. 1.

Klepper，Gernot et al (2003), "Quantitative Models for trade impact analysis" Deutsche Gesellschaft fuer Technische Zusammnenarbeit, Trade Programm working paper, Accessed at http://www.gtz.de.

Kmenta, J. (1967), "On estimation of the CES production function", *International Economic Review*, Vol.8, pp180~189.

Kol, L.B.M. Mennes (1986), "Intra-industry specialization: Some observations on concepts and measurement", *Journal of International Economics*, 21: 173-81.

Kwan, Chi Hung (2002), "The rise of China and Asia's flying-geese pattern of economic development: an empirical analysis based on US import statistics" NRI papers No.52.

Lardy, N. (1991), "Foreign trade and economic reform in China, 1978-1990". Cambridge University Press.

Lee, Xinzhong and Seung Rok Park (2003), "The effects of foreign direct investment on China's international trade" Korea Economic Research Institute.

Leeuwen, Nico Van (2000), "Protection data for China", Paper presented at the conference "Great China and the WTO", March 2000, Hong Kong.

Leontief, Wassily W. (1966), "Input and output economics", New York Oxford University Press.

Li, Shangtong and Wang, Zhi etc (2000), "WTO: China and the world", Chinese Development Publishing House (Zhong Guo Fa Zhan Chu Ban She). (in Chinese).

Li, Shangtong and Zhai, Fan (1996), "Status of China's tariff: level, structure and tariff exemption", *World of Management*, No.5,1996 (in Chinese).

Li, Shangtong and Wang, Zhi and Zhai, Fan (1996), "Tariff reduction, substitution of domestic taxes and its distribution effects of income", *Economic Study*, No. 12, 1996 (in Chinese).

Li, Shangtong and Zhai, Fan (1997), "China: taxation policy in transmission economics", in "China's taxation toward 21 century", Xiaosong, Yu (eds), China Economic Publishing House (in Chinese).

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

Li, Zhijun (2003), "Situation and character and TBT involved in China's export products", Development and Research center of State Council of China (in Chinese).

Lloyd, Peter and Xiao-Guang Zhang (2001), "Models of the Chinese economy", Edward Elgar Publishing Inc.

Löfgren, Hans，Rebecca Lee Harris and Sherman Robinson (2002), "A standard computable general equilibrium (CGE) model in GAMS", International Food Policy Research Institute.

Ma, Jun (2002), "Mainland-Hong Kong economic integration: impact of WTO entry and FTA", paper accessed at www.palgrave.com/pdfs/0333625994.pdf.

Mamsir, A. and Whalley, J (1984), "Numerical specification of applied general equilibrium models: estimation, calibration, and data", Chapter 3 in H. Scarf and J. Shoven (eds.) "Applied general equilibrium analysis" Cambridge University Press.

Maskus, Keith E. (2003) ," Encouraging international technology transfer", working paper of UNCTAD/ICTSD, Capacity Building Project on "Intellectual Property Rights and Sustainable Development".

Messerlin, Patrick A. (2001), "Measuring the costs of protection in Europe. European commercial policy in the 2000s", Institute for International Economics, Washington.

Messerlin, Patrick A. (2002), "China in the WTO: anti-dumping and safeguards" , Institute for International Economics, Washington.

Metzler, Lloyd A (1949), "Tariff, terms of trade, and the distribution of national income", *The Journal of Political Economics*, Vol. LVII, Feb. 1949, Number1.

P1~29.

Metzler, Lloyd A (1949), "Tariff, international demand, and domestic prices", *The Journal of Political Economics*, 57, no 4, p345~351.

Ministry of Foreign Affairs of the People's Republic of China (2003), " China's EU policy paper". Accessed at http://www.fmprc.gov.cn/eng/zxxx/t27708.htm.

MOFTEC (Ministry of Foreign Trade and Economic Cooperation, PRC), "Compilation of the legal   instruments on China's accession to the World Trade Organization",   accessed at   www.moftec.gov.cn/moftec_cn/wto_menu.html.

MOFTEC (Ministry of Foreign Trade and Economic Cooperation, PRC). "Protocol on the accession of the People's Republic of China" (in Chinese).

MOFTEC (Ministry of Foreign Trade and Economic Cooperation), "WTO semi-annual report" G/ADP/N/92/CHN, 11 September.

MOFTEC (Ministry of Foreign Trade and Economic Cooperation), "Foreign investment statistics" series (in Chinese).

Möller, Kay (1998), "U.S.-German relations and U.S.-China irritations: an AICGS at issue report", Speech on conference entitled "Managing Conflict, Building Consensus: Germany, the United States and the People's Republic of China: Challenges for German and American Foreign Policy".
Accessed at www.aicgs.org/at-issue/ai-mueller.shtml.

NBS, National Bureau of Statistics of China, "China statistical yearbook" series. Statistical Publishing House (in Chinese).

NBS, National Bureau of Statistics of China, "China foreign economic statistical yearbook" series. Statistical Publishing House (in Chinese).

NBS, National Bureau of Statistics of China (2002), "References material of research" Vol.14, 2002 (in Chinese).

NBS, National Bureau of Statistics of China, "Price statistical yearbook of China (Wujia Nianjian)", Statistical Publishing House, various years (in Chinese).

NBS, National Bureau of Statistics of China, "Input-Output table of China-1981, 1987,1992,1997" (in Chinese).

Noland, Marcus and Sherman Robinson, etc. (1998), "Global economic effects of the

Asian currency devaluations", Institute for International Economics, Washington.

OECD (1997), "Indicators of tariff and non-tariff trade barriers", Paris.

O'Toole, Ronnie and Alan Matthews (2002), "General equilibrium, partial equilibrium and the partial derivative: elasticities in a CGE model", Trinity College Dublin. Paper presented to the International Conference on Global Modeling, EcoMod 2002, Brussels, July 4th to 6th, 2002.

Patten, Rt Hon Chris (2002), "China and Europe: an important partnership", Speech/02/540. accessed at:
http://europa.eu.int/comm/external_relations/news/patten/sp02_540.htm.

Pei, Changhong (2000), "EU and China: assessment on prospect of bilateral trade", Social Sciences Literature Publishing House (She Ke Wen Xian Chu Ban She) (in Chinese).

People's Daily, (30,12,2000), " China to cut overall tariff rates". Accessed at http://english.people.com.cn/english/200012/30/eng20001230_59192.html.

People's Daily (2004) , "EU's environmental barriers to Chinese appliances", accessed at http://english.peopledaily.com.cn/.

Peter Lloyd and Xiao-Guan Zhang (2001), "Models of the Chinese economy", Edward Elgar Publishing. Inc.

Robinson, Sherman and Hans Loefgren etc (2001), "A standard computable general equilibrium (CGE) model in GAMS". TMD discussion paper No. 75.

Robinson, Sherman (2003), CGE Models in GAMS: History and Current State of the Art, accessed at http://www.gams.com/presentations/birthday_robinson.pdf.

Rose, A.K. and van Wincoop, E. (2001), "National money as a barrier to international trade: the real case for Currency Union", *The American Economic Review*, Vol. 91, No. 3, 386-390, May.

Rutherford, Thomas and Sergey Paltsev (1999), "From an input-output table to a general equilibrium model: assessing the excess burden of indirect taxes in Russia", http://debreu.colorado.edu/papers/exburden.pdf.

Salvatore, Dominick (1995), "International economics", Prentice-hall Inc.

Sankar, Ulaganathan (1970), "Elasticities of substitution and returns to scale in India manufacturing industries", *International Economic Review*, Vol.11, No.3, Oct. 1970.

Schubert，Gunter (2001), "The European dimension of German-Taiwanese relations-a critical assessment", Protestant Institute for Interdisciplinary Research, Heidelberg, Germany. Paper presented at the international conference: "The role of France and Germany in Sino-European Relations", 22-23 June 2001, Hong Kong Baptist University.

Schuknecht, Ludger (1992), " Trade protection in the European Community." Harvood　Academic Publishers.

Shi Guangsheng (1999), China's News Agency (in Chinese).

Shoven, J.B. and Whalley J.(1992), "Applying general equilibrium" Cambridge University Press, Cambridge.

Soloaga, Isidro and Winters, L. Alan (1999), "How has regionalism in the 1990s affected trade?" Policy Research Working Paper No. 2156; Washington: World Bank.

Sun Keqin (2002), "Sino-German relations: a success story" European Research Section under China　Modern International Relations Institute, paper accessed at www.china.org.cn/english/2002/apr/30487.htm.

Tuan, Chyau and Linda F.Y. Ng (2002), "FDI in China and regional development from institutional reform to agglomeration economies perspective", Presentation on the First International Conference on Nation States and Economic Policy: Conflict and Cooperation, Organized by Japan Economic Association.

Urban, Mag Waltraut "Important steps in the relations EU-China", Wienna Institute of International Studies, accessed at :www2.big.or.jp/~yabuki/doc7/urban.htm.

Vollrath, Thomas L. and Paul V . Johnston (2001), "The changing structure of agricultural trade in North America, pre- and post-CUSTA/NAFTA: what does it mean?", working paper series.

Walkenhorst, Peter (2002), "Agro-food products and technical barriers to trade: a survey of issues and concerns raised in the WTO's TBT Committee" COM/TD/AGR/WP(2002)70/FINAL.

Wang, Yi (2004), "Three elements in strategy on Sino-France relation", Access at www.beijingreview.com.cn/2004-03/200403-world1.htm (in Chinese).

Wang, Zhi (2002), "WTO accession and economic integration among Taiwan, Hongkong and China", accessed at:
http://faculty.washington.edu/karyiu/confer/adb02/papers/.

Willenbockel, Dirk (1994), " Applied general equilibrium modeling—imperfect competition and European integration", John Wiley & Sons Publishers.

Wong, Reuben (2002), "French foreign policy, Asia and Europe", accessed at www.lse.ac.uk/Depts/intrel/pdfs/ EFPUfrenchforpolasiaeurope.pdf.

World Bank (1997), "China 2020: Development Challenges in the new Century, China 2020 Series", The World Bank.

WTO (2000), "The European community, trade policy review mechanism".

WTO, "International trade statistics 2000,2001,2002" accessed at www.wto.org.

WTO (2000,2001,2002,2003), Committee on Technical Barrier to Trade, "Annual review of the implementation and operation of the agreement series",2000,2001,2002,2003.

WTO (2001), "Market access: unfinished business. Post-Uruguay Round inventory and issues" Special Studies 6; Geneva: World Trade Organization.

WU, Xiaoling et.al (1994), "China's reform and development report (1992~1993)─new breakthrough and new challenge", China financial publishing house (in Chinese).

Yang, Shengming (1997), "China's tariff regime reform", Chinese Social Sciences Publishing House (in Chinese).

Yearbook Editorial Board, the Institute of the World Economics and Politics, Chinese Academy of Social Sciences (CASS), "The yearbook of world economy" 1999/2000,2001,2002/2003.

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

Zhang, Shuguang, Zhang, Yansheng and Wan, Zhongxin (1999), "Measuring the costs of protection in China" Washington: Institute for International Economics.

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