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**A Study on the Relationship between Chinese
International Trade and Environment: Based on
the Empirical analysis of Chinese Import and
Export Trade**

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ABSTRACT

Today, Environmental protection attracts a lot of attentions in the international stage. Environmental issues gradually shift from domestic issues to international issues. Environmental protection is moving toward the institutionalization and legalization, and gradually penetrates into the multilateral trade rules and national foreign trade policies and regulations. Thus, the phenomenon make closer link between international trade and environmental protection. In theory, international trade and environmental protection are unified, because their fundamental goal is to achieve sustainable human development. However, in practice, we found that due to the free development of trade, national environmental protection policies are not uniform, and some regulations unduly interfere with other's affairs, and the conflict will make the relationship more complex. This article is starting from the analysis of the relationship between international trade and environmental protection; to grasp the essence of the conflict between the two, seek coordination and feasible approaches to compromise the conflict between international trade and environmental protection.

This paper uses a combination of qualitative analysis and quantitative research methods to explore the relationship between international trade and environmental pollution. The main object of study is the world's largest developing countries - China. This paper uses the theory of "Externalities" to explain the relationship between international trade and environmental issues. On one hand, the two are in conflict with each other. The negative externalities are serious environmental pollution problems caused by the large-scale production because of international trade. At the same time, in order to avoid environmental contamination, there is a need to limit or control certain international trade. On the other hand, the two promote mutually. Countries are aims at seeking economic development through trade freedom, so that the natural resources are fully configured.

In the empirical analysis part, this paper uses the method of least squares analysis and Granger causality test and draws the conclusion that international trade is indeed one of the reasons for China's environmental problems. Therefore, China's international trade brings the economic growth rapidly at the expense of the ecological environment and natural resources. After referring to the principles and methods of

some domestic and international coordination, this paper discusses how to deal with the environmental issues and international trade. Combined with Chinese actual conditions, this paper proposes to levy widespread environmental taxes, and use emissions trading system as an auxiliary. This proposition not only overcome the 'Pigovian tax' information asymmetry defects, but also reduces dependence on market mechanisms by the implementation of the emissions trading system on the part of the property which is easy to define.

Key Words: International Trade, Environmental Protection, Externalities,
Green Barriers to Trade

Chapter 1 Introduction

1.1 Background and Significance of Research

1.1.1 Background

With the development of economic globalization, the content of international economic activities is enriched, and international trade also got a rapid development. At the same time, people began to realize that such a large-scale production and carry out globalization trade brought lots problem: Our ecological environment and natural resources suffered much irreversible damage. According to the World Bank's figures, the amount of CO₂ from fossil fuel burning and cement production emission has increased to 156 million tons in 2007, which is 50 million tons in 1960. Continuous increasing of CO₂ in the atmospheric made the earth's average surface temperature rose about 0.4-0.8 degrees Celsius, and the sea level rose 10-25 cm. What's more, global warming made the death toll (related with hot) increase dramatically. The air pollution diseases, the waterborne diseases and the bacteria source diseases all are changed. The incidence and mortality of extreme weather events (such as typhoon, storm, drought, floods) are also raised.

Thus it can be seen that, the global climate change, which cause by excessive exploration of natural resources and economic development, would have a severe negative impact on human life. Therefore, the scientific community and Governments have basically agreed, implementation of low carbon economy and environmental protection is an effective method to avoid catastrophic climate change and maintain the sustainable development of human beings. For example, the United States House of Representatives passed the American Clean Energy and Security Act in 2009, which permitted the US to impose carbon tariff on imports from countries without carbon reduction targets, included China, from 2020. Meanwhile, the European Union were preparing for promoting carbon tariff. French suggested imposing carbon tariff on imports from countries that do not have strict environmental regulations. The developed countries impose carbon tariff on imports from developing countries, its essence is to take developing countries ecological wealth to themselves, in order to hedge 'loss' which cause by 'immunity'. The consequence is damage the global cooperation reduction mechanism, then make global involved in a new round of trade protection of war. Other developed countries are following the US 'carbon tariff'

policy. For example, French and Canada are preparing to issue policy similar to America's 'carbon tariff', to carbon tariff on high carbon imports from developing countries, such as China.

The development of the international trade has been strictly limited by all kinds of green trade barriers. But whether these trade protection policies are the best solutions to deal with the environmental problems? It is of course not. It is very complex of the relationship between the international trade and the environmental protection, which will promote each other, as well as mutual conflict. From the literature existed, it is not hard to find that the relationship which has been mentioned above has called the common concern by all countries. And at the same time, the research of the clash between the international and the environmental pollution can't be dissociated with the international economic background, which is always been referred to unequal. Although, many developed countries in Europe and United States expect to protect the environment by constantly issuing on international trade policy, excessive limit may lead to worse result. As we know, it can be coordinated which is decided by the ultimate goal of the both.

1.1.2 Significance

With the concept of sustainable development, during the process of economic development, environmental problems become an important factor that should be taken into a serious consideration. The correct understanding and coordinate the relationship between environment protection and international trade and promote sustainable development, are becoming important task and research directions for the world. Therefore, the study of the relationship between international trade and environment problem is a significant and necessary activity.

First of all, we should clearly know the relationship between international trade and environment problem, then we can take effective measures to prevent environment's further worsening. With the rapid economic development, increase of population and the increasingly frequent intercourse of international economic, the effects of human activities to the natural environment are growing stranger, and natural environment continues to deteriorate. Environment problem has developed to a global serious problem from a domestic local pollution. What is the effect of international trade on environment pollution, positive or negative? We need to in-depth analysis this

question, so that we can balance the pros and cons of free trade, and take effective measures, to protect our common environment.

Secondly, it is advantageous to China to defend its own rights in international trade and environment problem. The essence of conflict between international trade and environment problem is conflict of interests and rules. In the final analysis, the conflict is a kind of conflict of interests in economic and environment, between developing countries and developed countries. As the world's largest developing country, China would definitely suffer a greatly influence in the conflict between international trade and environment problem. It is difficult to coordinate the great difference on environment regulations and standards between developed countries and developing countries. International, there are many different fuzzy and not harmonious places in the trade-related aspects of international environment treaty and environment-related aspects of trade agreement. It provides convenient for developed countries to defend themselves by using the various rules of environmental exception clause.

Finally, understand the essence of international trade and environment problem, is beneficial to establish a new international economic order, so as to realize the coordination between international trade and environment protect, and realize sustainable development of human beings. Now, some old international economic orders have made many adverse effects on international trade and environment protect. The main effects are as follows. The inequality and unreasonable resources transfer between developed countries and developing countries. The environment-unfit products, technology and material transfer to developing countries. In other words, the developing countries become 'pollution haven' for the developed countries. Therefore, in order to coordinate the international trade and environment protection, we need to know whether free trade makes developing countries environmental conditions fell sharply. Then take corresponding measures to change the old and unequal world economic order, build a new, fair and reasonable international economic order.

1.2 Contents and Ways of Research

This paper uses a combination of qualitative analysis and quantitative research methods to explore the relationship between international trade and environmental pollution. The main object of study is the world's largest developing countries- China.

The main indicators for empirical analysis are import and export trade volume, export trade surplus, scale of economy (GDP/AREA), population density (POPULATION/AREA) and pollutants, etc. (data comes from 1998 to 2008). In order to carry out the free trade's impact on environment, this paper chooses least squares multiple regression estimation to explain the mutual effect. Firstly, the paper does unit root test on the stability of time series for indicators, then uses granger causality to test the relationship between environment problem and free trade. At last, according to the above empirical test results, analyses free trade's influence on environment problem of China, and puts forward relevant opinions and suggestions.

The main research method of the paper is combination of theoretical and empirical. The research content refer to Chinese academic journal net, Wan fang data and other related database, government information network, the World Bank website, statistics office website, literature, government reports and statistical yearbook published on paper books. After obtain authority material and important information, we analyze the literature about urban poverty, in order to understand theory about environmental protection and other related content, such as the pollution haven hypothesis, to grasp the domestic and foreign latest research progress and conditions. And by reading large literature works, help to broaden the thinking and method of researching international trade and environmental pollution. At last, the paper does quantitative analysis and model building, uses Eviews statistical software for data processing, then combination of theoretical analysis to build regression model, and researches the causal relationships between variables.

Chapter 2 Literature Reviews of Relations between International Trade and Environment

2.1 the Issue's Raise and Evolution

It seems that there is no relationship between international trade and environmental protection. In fact, they are closely related. In recent years, the relationship has been one of the hot topics. As is known to all, the enterprise will involve to sources development and obtainment for getting production material. Therefore the rapid development of product trade has deeply relationship with environmental problems, which is an objective fact already exists.

The earliest research on international trade and environmental problem can be traced back to 17th century classical economists' discussion about relationship between economic growth and environmental resources. William Petty once proposed 'Labor is the father of wealth, land is the mother of wealth'. This 'land' means natural growth on the ground and underground. He thought resources environment is motive power of economic growth. Subsequently, in the book of *An essay on the principle of population*, Malthus expressed the close relationship between population and grain, land and food. And he came up with the theory of absolute scarcity. Malthus believed that resources are limited in physical quantity and scarce in economic. The two properties would not be changed even technology progress and social development. If human beings didn't realize the limitation of natural resources, and continued to excessive consume natural resources, the natural resources and environment would be destroyed, which can lead to disastrous decrease of population. ¹On this basis, David Ricardo put forward 'resources relative scarcity theory'. He though that economic growth may make specific resources appear temporary scarce, but would not have absolute constraint on economic growth. Combined with the former two views, Moller said in his static economics that, economic production is limited by capital and land. If human production activities were over the limit of nature, the society would appear imbalance. Malthus's 'resource absolute scarcity theory', David Ricardo's 'resources relative scarcity theory' and Moller's 'static economy theory', they were foundation of modern economic theory, and they all studied the relationship between

¹ Wang Changwen, Resource scarcity theory of sustainable development, Contemporary Economy, 2005 (4)

nature environment, population and wealth growth. Research on the relationship became one of the important contents of economic.

In the early 20th century, with the development of economic and the integration of related disciplines, people began to reflect on the classical economic theory and other questions, and had a new realize on international trade and environmental problem. For example, in <welfare economics>, Pigou pointed that economic externalities is the most fundamental reasons for causing environmental problems, only tax and subsidy could solve the environmental problem cause by economic externalities. Then research on economic externalities' effect on environment went deeper, such as social cost theory by Coase, inter-generational equity theory about environmental resource by Ed Vess, etc. The so-called inter-generational equity refers to the current and further generations are using natural resources to meet their own interests and strive for equal rights on survival and development. From the perspective of inter-generational development, a basic idea of sustainable development is that, development should not damage the interests of future generations, certainly can't damage the development of future generations.²

Although before the 1990s, the relationship between trade and environment had caused large attention of many scholars and international organizations, it became an international hot spots until two important event happened in international environmental protection and international trade filed in 1900s. One is Brazil held United Nations Conference on Environment and Development (UNCED) in 1992, which means a new upsurge of environmental protection movement. Another one is the completed of Uruguay-about-negotiates in 1994 and foundation of World Trade Organization (WTO), which mean the international trade liberalization reached a new height. The two great events reflect peak of two trends development in this world, one is trend of environmental protection, and the other one is trend of trade liberalization and economic globalization. Although the two trends' occurrence and development in the past are parallel and independent, however, with the development of economic globalization, as well as the intimate relationship between trade and environment, determine the two trends will happen cross and conflict in the near future, during the process of struggle, they also interfuse, finally fuse as a whole.

² Fan Yong, Sustainable development: resource development and inter-generational equity concept of sublimation, Tangdu Journal, 2004(1)

2.2 Economics Explanation of the Relations between International trade and Environment

2.2.1 Theory of 'Externalities'

Although the concept of externalities appeared in economics relatively late, its influence in the field of economics is great, and it has become important theoretical basis for new classical economics to advocate government intervention. Externalities theory provides a theoretical basis for the economics explain of the relationship between international trade and environment.

Alfred Marshall, the founder of Cambridge school, put forward the concept of externalities. In the book of Principles of Economics published in 1890, he said: 'We may divide the economies arising from an increase in the scale of production of any kind of goods, into two classes -- firstly, those dependent on the general development of the industry; and, secondly, those dependent on the resources of the individual houses of business engaged in it, on their organization and the efficiency of their management.' We may call the former 'external economies', and the latter 'internal economies'. However, in economics, there is not a unified conclusion for the exact meaning of externalities. According to the different emphasis of analysis, economists made different definition for externalities, which can roughly classified into two categories. The first definition is defined from the production subject of externalities, for example, Paul A.Samuelson and William D.Nordhaus defined that: 'the externalities occur when firms or people impose costs or benefits on others outside the marketplace.' The second definition is defined from the accept subject of externalities, for example, Alan Randall thought externalities are used to expressed that, 'Some low efficiency phenomenon caused by a action's benefits or costs which did not considered by makers, that is, some benefits costs are imposed to people outside.'³

The above two kinds of definition for externalities are essentially the same, although the inspection angle is different. Externalities is a kind of external influence on an economic subject from another economic subject, and this kind of external influence can't be bought or sold by market price. Externalities can be divided into positive externalities and negative externalities. ⁴

³ Shen Manhong, He Lingqiao, Externalities theory evolution, Journal of Zhejiang University, 2002, Vol.32

⁴ Fang Wei, Li Zhiqing, Externalities and environmental pollution, Yunnan Daily, 2002(6)

2.2.2 Theory of 'Externalities' to Explain the Relationship between International Trade and Environment

In environmental economics, external analysis is the basic theory used to explain economic activities and cause of environmental problems. Externalities means to the non-marketing effect to producer or consumer from other producer or consumer, the interest brought by the beneficial effects or the loss brought by the harmful effects all are not gained or born by producer or consumer. So the effect on environment from international trade not only is negative external, but also is positive external.

1. Negative external effects on environment from international trade

The friction between international trade and environment is mainly due to the serious environmental problems leaded by external effect, which caused by the mass production for developing international trade. Traditional view says, environmental problems are caused by the hyperactivity or improper of human production and life activity, its essence is conflict between economic development and environmental protection, and imbalance of relationship between human and nature. However, according to economic theory, to a large extent, environmental problems are product of externalities. Environmental pollution is the manifestation of negative external effects, and the negative externalities are cause by market failure. Market failure means the market cannot efficiently distribute of goods and services. The specific performance of market failure is that, with the increasingly scarce of environmental resource, there are no property and price of environmental resource, so in the process of producing and consuming for goods and services, there are differences between private marginal benefit and social marginal benefit, private marginal cost and social marginal cost. Then leads to recklessly waste of environmental resource and continued reduced of environmental quality, and causes negative externalities.⁵ When there is an environmental externality problem, manufacture's profit maximization principle cannot lead to Pareto Optimality Condition of environmental resource configuration, so the market configuration for environmental resource lacks of efficiency. The environmental resources have no property rights or price, so the price of goods and services do not include their positive or negative effect on environment. Due to the non-marketability of external effect, the producers will not

⁵ Based on the scarcity of environmental resources and external property rights analysis, Modern Economic Research, 2008 (6)

initiatively take the external cost caused by their own production, of course they cannot get benefits from the external benefits created by them. What above leads the external diseconomy activities become excessive, so that the efficiency of markets allocate resource becomes less efficient, environmental pollution and ecological damage become more and more serious.

How to solve this problem? We can selective use Pigou's methods and Coase's methods to deal it. According to Pigou's external effect theory, the government can levy environment tax and provide environmental subsidy to control the market failure. Coase's method is to transform external problem to property right problem, that is to say the government should divide property right in advance.

2. Positive external effects on environment from international trade

For international trade's influence on environment, many people only see the negative influence, and ignore its positive side, that is because of development of free trade, the natural resources can be fully configured and used; economic development supported by trade can offer countries more income to protect and improve environment, etc. Specific points are as follow. First, according to international trade's development, developing countries can import advanced technology of developed countries. The advanced technology includes the green environmental protection products and high-tech environmental protection technology. In this way, developing countries can save various research cost and avoid going crooked road what other countries have gone. At the same time, developing countries can greatly reduce the gaps of technology development, what is beneficial to communication and common progress for developed countries and developing countries. Secondly, countries can make full use of domestic and foreign markets, as well as the national scarce resources, to form a new benign economic cycle, in order to achieve efficient allocation of resources, and promote the fast growth of economy. At the same time, trade can increase countries' fiscal revenue. A part of these increased income must be used for researching and developing environmental protection product and controlling pollution. Thirdly, international trade develops economic activities, at the same time, countries can communicate cultures and thoughts, what can make a wider and more positive spread of some countries' environmental protection consciousness. In the push of international green wave and strict green trade barriers standards, countries' environmental protection consciousness get constantly strengthen, many trades' green technical standard are gradually close to the international level.

The relationship between international trade and environmental protection is very complex, it can be said that the two promote and influence each other. From the above analysis, we can know, in the ideal level, the two should be promoted by each other. With the arrival of economic globalization, countries can seek economy development through free trade, so that natural resource can be fully configuration, and a trade with higher level of environmental protection would be freer. In the real level, the two are conflicting. There is a saying in China: ‘Hustling for benefit, all come; bustling for benefit, all leave.’ Just because of people’s interest tendency, develop free trade may lead over-exploited or improper-used of natural resource, cause environmental pollution and destruction, then cause a new round of environmental crisis. So in order to avoid environmental pollution, some international trade should be restricted or controlled.

2.3 Review of Chinese and Foreign related research

Industrial revolution in 1760s made the productivity of European countries get rapid development for different degree, it also caused a series of environmental problems at the same time. Today, in order to transfer the environmental problems, these developed countries use their advanced productive forces and technical to control industrial channel, they set up OEM factories and products processing bases in developing countries. The developing countries suffered great damage in environment when they enjoy the profit brought by trade. At present, in the great background of economic globalization, developing countries gradually participate in the fierce competition of international trade. However, developing countries often get limited for their pollution transfer or the developed countries’ green trade barriers. Sometimes, some developing countries even get severe accuse, and bear unwarranted charges. Therefore, it is quite necessary to research the international trade’s effects on environment of developed countries. This paper will mainly study the current state of research and development tendency about relationship between international trade and environment, from two aspects: foreign and domestic.

2.3.1 Current State of this Field and Theory’s Development Tendency Abroad

In the field of research for relationship between international trade and environmental

problem, foreign scholars go on the academic front. In the early 1990s, James A. Tobey (1990) put environmental assets as a kind of inputs that can be included in Heckscher-Ohlin factor endowment, and research environmental problems' effects on trade⁶. Magat and Viscusi (1990) verified whether environmental regulation would have effects on biological oxygen demand and suspended solid emissions of the United States and Canada's pulp and paper products enterprise. The research result showed that environmental regulation could reduce about 20% of enterprises' emissions⁷. Grossman and Krueger (1991) divided international trade's effect on environment into three levels: scale effect, structure effect and technology effect. What they studied establish the basic framework of the theory of international trade's effect on environment. Combined with this basic theory frame, they analyzed 42 countries' panel data, and found that the long-term relationship between environmental pollution and economic growth is an inverted 'U'-shaped curve⁸. Panayotou (1993) further proved this conclusion. Panayotou, Dasuptu and Maler used inverted 'U'-shaped curve to describe the inverted 'U'-shaped relationship between economic development and environment, and called it The Environmental Kuznets Curve (EKC)⁹. Durwood Zaelke et al. (1993) used theoretical analysis to analyze the relationship and operation mechanism between environment and trade, from political, legal and economic aspects¹⁰.

In current literature and research results, the most concerned theory should be PHH hypothesis. Copeland and Taylor (1994) proposed the hypothesis, when they research the relationship between North-South trade and environment. The import of PHH hypothesis is, under the condition of open economy, free trade will transfer high pollution industries from developed countries to developing countries. In the background of globalization, PHH hypothesis can be explained that, the loose environment control of developing countries will become a kind of relative comparative advantage. For foreign capital enterprises with intensive pollution

⁶ James A. Tobey, The Effects of Domestic Environmental Policies on Patterns of World Trade: An Empirical Test, *Kyklos*, 1990, Vol.431, 191-209.

⁷ WESLEY A. MAGAT and W.KIP VISCUSI, Effectiveness of the EPA's regulatory enforcement: The case of industrial effluent standards, *Journal of Law and Economics*, 1990.

⁸ Gene M. Grossman, Alan B. Krueger, Environmental Impacts of a North American Free Trade Agreement, 1991, NBER Working Paper, No. 3914.

⁹ Panayotou, Empirical Tests and Policy Analysis of Environmental Degradation at Different Stages of Economic Development, *Scientific Commons*, 1993.

¹⁰ Durwood Zaelke, Paul Orbuch and Robert F. Housman, Trade and the environment: law, economics, and policy, 1995.

industry, they can use this advantage to transfer their pollution industry, so as to avoid paying for high pollution control cost in their countries. That is to say, developing countries become the 'pollution haven'¹¹.

Van Beers and Vanden Bergh (1996) focus on the view of methodology to comment the relationship between international trade and environmental externalities¹².

AndréDua and Daniel C. Esty (1997) pointed that, as a result of global trade liberalization, countries would reduce their environmental quality standards to maintain or enhance their competitiveness, then would appear the so-called 'race to the bottom line'. Moreover, if a country has strict environmental policy, the serious pollution industry would be forced to transfer to another country with loose environmental control, thus developing countries would become 'pollution haven'¹³.

Copeland and Taylor (1998) compared the amount of SO₂ increase and decrease by economic activity, tried to explain the happen of international trade was good for improve environment. Although economic activity increase 1% would cause the concentration of SO₂ increase 0.3%, the income got from it could be use for developing technical, then made concentration of SO₂ decrease 1.4%. Overall, develop international trade and increase capital gains can help to improve environment¹⁴. Fung and Maechler (2007) thought intra-industry trade had gradually become the main form of international trade, so they used intra-industry trade as an example to study the relationship between trade liberalization and environment. They found free trade's impact on environment mainly depended on two aspects. Firstly, who produce pollution, the country's own or globalization? Secondly, how is the country's original condition, clean or dirty?¹⁵ Leonad F.S. Wang et al. (2008) used Fung and Maechler's intra-industry trade model to study the unilateral and bilateral trade liberalization's effect on production and environmental quality. They also used game theory to change order of decision-making and different competition mode, to study trade liberalization's effect on production and environmental¹⁶. Grether et al.

¹¹ Copeland, B.R. and M.S. Taylor, North-South Trade and the Environment, Quarterly Journal of Economics, 1994.

¹² Copeland, B.R. and M.S. Taylor, North-South Trade and the Environment, Quarterly Journal of Economics, 1994.

¹³ André Dua and Daniel C. Esty, Sustaining the Asia Pacific miracle: environmental protection and economic integration, 1997.

¹⁴ Brian R. Copeland, M. Scott Taylor and Werner Antweiler, Is Free Trade Good for the Environment, The American Economic Review, 1998.

¹⁵ Fung KC and Maechler AM, Trade liberalization and the environment: the case of intra-industry trade, 2007.

¹⁶ Leonad F.S. Wang, YaChin Wang and Lihong Zhao, Trade liberalization, intra-industry

(2008) studied emission of SO₂, to analyze relationship between international trade and environment. He analyzed the change of global production and trade flow based on the past ten years, found that emission of SO₂ was slightly reduced. However, without considering other factories, develop international trade still had a negative effect on environment. If consider emission of SO₂ increased by logistics, which is the important link in international trade, the situation would be worse¹⁷.

When most economists used the United States as a main research object, Matthew A.COLE et al. (2010) changed to concern another developed country-Japan as research object, to test whether trade flow would be effected by trade restraint, labor constraints and environmental control. He mainly used fixed effect to test estimation equation, the result showed that the environment and industry control would have a significant effect on Japanese imports. At the same time, for developing countries, environment and industry control had important effect on trade flow¹⁸.

It is not difficult to find that, although there are many foreign economists study the relationship between international trade and environment, most of them use developed countries like US or Japan as research object. Judith M. Dean (2002) used simultaneous equation model to measure China trade openness' effect on water pollution. He found in short term, trade liberalization would make the deterioration of environment, but trade liberalization can help to reduce pollution in long term¹⁹. YU Huichao and WANG Limao (2010) studied the change of China and the US' international trade and carbon emission. Combining economic, energy, trade three aspects, they used input-output analysis to build carbon emission transference model of international trade. They found China made a great contribution for the US' carbon emission. Although on the surface, China consumed a lot of natural resources and emission a lot of CO₂, the fact was that, as the development of international trade, China received the pollution gas from developed countries like the US. These developed countries not only avoid the pollution of environment, but also get some capital²⁰.

trade and the environment: competition mode and the order of firms' moves, Springer-Verlag, 2008.

¹⁷ Jean-Marie Grether, Nicole A. Mathys and Jaime de Melo, Global Manufacturing So2 Emissions: Does Trade Matter? , Review World Economics, 2008.

¹⁸ Matthew A.COLE, Robert J.R ELLIOTT and Toshihiro OKUBO, Trade, Environmental Regulations and Industrial Mobility: An Industry-Level Study of Japan, Research Institute for Economics and Business Administration, 2010.

¹⁹ Judith M. Dean, Does trade liberalization harm the environment? A new test, [J] Canadian Journal of Economics, 2002, 819–842.

²⁰ YUHuichao and WANG LimaoCarbo, Emission Transfer by International Trade: Taking

Most of the foreign literatures are based on the perspective of developed countries. The developed countries have more experience on foreign trade, economic development and environmental problems. However, the literatures content have some limitation in explaining the developing countries' problems of international trade and environment. Now developing countries are facing contradiction between development and environment. In general, the literatures content still provide a good reference for us to analysis the problem.

2.3.2 Current State of this Field and Theory's Development Tendency in China

Compared with the western mature economies, China's relevant research about international trade and environmental problems is relatively lags behind, because the time of China's reform and opening-up and integration into the world economy is late. China's reference for this field is less than western. After reading some related academic literature, we find that China scholars mostly use different gas emissions as indicators to analysis China's environment change after developing international trade.

In the 1990s, Li Shantong (1999) built a Chinese economy-environment computable general equilibrium (CGE) model with dynamic recursion, to analyze the development of international trade's effect on China's environment. The conclusion was that, economic growth was the reasons for pollution growth, but trade would not lead the rapid deterioration in China's environment²¹. From the perspective of elastic coefficient, Ma Li and Liu Weidong (2003) analyzed the 1998-2001 years' data of 12 coastal provinces and cities, and they found that foreign investment and international trade are the main contribution to alleviate the pressure on resources and environment of China's coastal area²². Deng Bosheng and Song Deyong (2008) analyzed 1995-2005 years' panel data of 13 provinces and cities. The conclusion was that, FDI was benefit for improving China's environmental quality, but foreign trade had deteriorative effect on China's environment²³. By building a model of relationship

the case of Sino-U.S. Merchandise Trade as an Example, *Journal of Resources and Ecology*, 2010.

²¹ Zhai Fan, Li Shantong, Medium-term economic growth and structural change -recursive dynamic general equilibrium analysis, *System engineering theory and practice*, 1999 (2)

²² Ma Li, Liu Weidong, Liu Yi, Foreign investment and international trade on China's coastal resources and environment of *Natural Resources*, 2003 (18)

²³ Deng Bosheng, Song Deyong, Research on the relationship between domestic foreign

between FDI and environmental standard, Zhao Zhe and Luo Yongming (2008) got a conclusion that, environmental regulation's effect on FDI was significant but small in statistically, China did not become the world's 'pollution haven'²⁴.

Most scholars use different pollution indicators as research object to study the relationship between environmental pollution and international trade. Zhang Lianzhu (2003) analyzed SO₂ emission's panel data in 2000 of 31 provinces and cities. The result showed that trade liberalization was beneficial to China's environmental protection²⁵. Li Xiufang and Zhang Ting (2004) used CO₂ emission as indicator, to analyze China export growth's effect on environment from 1981 to 1999. They got similar conclusion that export growth and trade liberalization had reverse correlation with China's CO₂ emission²⁶. Shen Songshan (2006) used water organic as pollution indicator, to analyze 34 developing countries' trade. They found that trade liberalization had a negative scale effect, but with driven of the effect of the technology, environmental pollution could be reduced²⁷. Chen Honglei and Chen Qiufeng (2007) used SO₂ emission as indicator, to do empirical analysis and study about openness of China's international trade's effect on environment. The result was the pollution emission could be reduced by the combined action of foreign trade scale effect, structure effect and technology effect²⁸.

Through the above analysis of literature of China and abroad, it is not difficult to find that, for the relationship between international trade and environment, most researches, empirical studies and conclusions are from abroad. Chinese scholars often just use foreign model and analysis method, and then apply to the practical domestic trade and environmental problems. What's more, at present, development of international trade's effect on environment in less developed areas is more than developed countries. Most researches of the relevant international trade and environment problem focus on developed countries and areas, just a little researches focus on developing countries and areas. Therefore, this paper focus on analyzing the

trade, FDI and environment pollution, International trade problem, 2008(4)

²⁴ Zhao Zhe, Luo Yongming, Empirical test of the pollution haven hypothesis in China. Ecological economy, 2008 (7)

²⁵ Zhang Lianzhong, Zhu Tan, Free trade based on the impact of environmental pollution in China, Economic Research, 2003(3)

²⁶ Li Xiuchun, Zhang Ting, An Empirical Analysis of the impact of export growth on our environment - CO₂ emissions, international trade, 2004 (7)

²⁷ Shen Rong Shan, Trade liberalization of environmental effects of empirical research, international trade issues, 2006 (7)

²⁸ Chen Honglei, Chen Qiufeng, An empirical analysis of the environmental effects of trade liberalization in, International trade problem, 2007(3)

developing countries and areas, hope to summarize some previous experience and research methods, then provide some solutions and suggestions for solving the problem about developing countries' international trade and environment.

Chapter 3 Interrelationships Between International Trade and Environment

In the last chapter, we review Chinese and western's research and economics explain about international trade and environment. How do international trade and environment influence each other?

Industrial Revolution in eighteenth century ever brought people infinite joy and hope. When people were still fascinated in the great victory of industrial revolution, ecological destruction and pollution problem had got accelerating development, especially the problem of environmental pollution. Free trade had further expansion with the deepening of industrialization and gradually forms of global economic integration, at the same time, the ecological environment was suffering unprecedented crisis. Many factors made global catastrophic climate often appear, such as Arable land fertility degradation; forest area's decreasing; energy production, energy usage and CO₂ emissions' constant rise; etc. People's survival environment and health and had been seriously harmed. People can't help but ask, whether the international trade and environment would influence each other? Do they have internal relationship?

3.1 International Trade's Influence on Environment

3.1.1 International Trade's Positive Influence on Environment

First of all, international trade can promote countries' domestic economic development and increasing the gross national product, and also provide financial support for environmental protection. Throughout the history of the developed countries, it can be found that when a country economic prospers to a certain degree, the environmental pollution problems will tend to reduce. For example, the world's first Industrial Revolution, that originated in Britain and then spread to Europe and the US, built a solid material foundation for new capitalist system, and made Europe and America countries realize industrialization. After amassing great sums of wealth, on one hand, they realized the enormous damage and serious consequences to environment by economic and trade's development, which should be timely managed. On the other hand, they had economic strength to improve and protect their own natural resources and environment.

Secondly, international trade brings the spread of environmental protection

technology. Free trade, is not only simply exchange of goods and services between countries, is a communication and transmission of technology and thought. It can make the latest and most advanced environmental protection technology spread from one country to another country. Especially for the developing countries, through the development of free trade, they can gradually introduce the developed countries' advanced environmental protection products and technical services. It can help developing countries develop in technology, and can great save development cost, also can avoid going crooked road through by other countries. At the same time, with the development of trade activities, there is a communication of all kinds of thoughts and culture. Some countries' advance awareness and concept of environmental protection can be communicated and shared. In the push of international green wave and strict standards of green trade barriers, national's awareness of environmental protection gradually gets increased.

3.1.2 International Trade's Negative Influence on Environment

Trade liberalization's influence on environment is a double-edge sword, it can give environmental protection some support of technology and financial, at the same time, it may produce huge negative influence on environment. Development of free trade's negative influence on environment is as follow:

1. International trade causes natural resources over-exploitation and environmental degradation.

Compared with developed countries, developing countries mainly export primary products. Primary products are refer to unprocessed products and slightly processed products. That is the products people directly get from nature through labor, and products need further process or have been simply processed. Obtain of primary products come at the cost of devastating exploitation to nature resource. Primary products have a relatively lower price, and this advantage depends on the free use of he domestic natural resources elements. With the development of the global economy integration and the deepening development of global free trade, countries' demand for primary products increase. Then in order to developing economic, developing countries have to devastatingly exploit domestic natural resources, and exacerbate the problems of resources' devastating exploitation and environmental pollution.

2. International trade indirectly causes resource plundered

In international trade, the developed countries buy primary products from developing countries, and the price they buy is often lower than the actual value. Developed countries use the primary products to make manufactured products, and then they sell the product to developing countries with high price, to gain high profits. Its essence is that, developed countries plunder and freely use environmental resource of developing countries. Therefore, trade liberalization makes one country depend on another country's environmental resources. Its essence is developed countries with higher environmental protection standard, import large cheap raw materials and primary products from developing countries, which indirectly form resource-plunder.

3. International trade causes environmental pollution

As we known, transport is an important link on international trade. However, transport of international goods would produce some negative influence on environment. On one hand, international transport needs to consume large amounts of energy, which causes natural resources' over-use and waste. For example, energy consumed by international air and ocean transport accounts for about an eighth of global oil consumption. The energies are mostly non-renewable energies. So international trade exacerbates natural resources' dry up. On the other hand, in the process of international transport, most transportation use fossil fuel for driving force, it is inevitable to release a great deal of gases and other pollutants. At the same time, offshore oil transportation often happens oil leakage accident, which can lead to serious ocean pollution for large areas, and threaten environment of coastal state.

3.2 Environmental Problems' Influence on International Trade

3.2.1 Limit of Environmental Protection on International Trade

1. Limit of green trade barriers

Industrial civilization gives human enormous material wealth, but also causes great destruction of ecological environment. Environment cost of industrial civilization not only causes the decline of environmental civilization, but also affects the entire human survival foundation. As these environmental problems become more and more serious, the governments are beginning to legislate environmental protection laws and regulations, and observe these laws and regulations to realize the goal of economic development. With the beginning of the wave of environmental protection, public awareness of environmental protection keeps increasing. Protect the ecological environment, natural resources and human health; walk the way of sustainable

development, has become a trend of society.

As a kind of value orientation, environmental protection is positive and good.

However, if it were used inappropriately, it would become negative. In the area of international trade, a lot of environmental protection measures both have environmental protection aspect and trade protection aspect. The green trade barrier is the primary contradiction of international trade and environmental protection. The green trade barrier, means in international trade, importing countries make a series of measures to restrict imports, in order to protect natural resources, ecological environment and human health.

The pursuit of economic interests always is countries supreme goal. In today's highly competitive international trade, green barrier becomes measure to protect trade for some countries, who want to protect their national economic interests. Competition of international trade is a war without gunpowder. In early time, in order to protect national trade and economic growth, countries set all sorts of tariff barriers. With the signed of the GATT, countries began to advocate free trade, and carried out multilateral negotiations for cutting tariffs. Now tariff barriers measures have been banned in the member states. However, in recent years, some emerging developing countries have a rapid development in economic, they occupy the international market share of developed countries. In order to protect trade and economic interests, some developed countries are actively seeking for new trade protection measures, non-tariff barriers. As a kind of non-tariff barriers, green barrier restrict trade in the name of to protect the world resources, environment and human health. As developed countries have advantages in world political, economic and technology, the green barrier will exist for long time in international trade.

2. Limit of laws and regulations

With the increasingly serious of environmental problems, all countries have paid attention to the long-term development of economic model, and abandon some tradition ways that ignore environmental protection. Some countries, regions and international organizations legislate more and more laws and regulations, in order to protect endangered wildlife species, control of hazardous waste transfer, etc. These laws and regulations had limitation and obstacles for the international trade activities in old system. For example, the US and Mexico' tuna and dolphins rivalry is one case of this kind of laws and regulations on international trade. In the eastern Pacific area, tuna and dolphins are in symbiosis state, tuna often active in lower water than dolphin.

Fishermen can find tuna group across dolphin, use trawl to catch all tuna. This fishing method is fast and effective, but at the same time, the fishermen also kill a large number of dolphins. Then, in 1972, the US legislated the Marine Mammal Protection Act. The law set, if a commercial fishing method causes by accidental death or injury of marine mammals, and the casualty rate is more than the death standard allowed by United States law, the fish or fish products will be banned import. Mexico was one of the most closely trade partners with the US, but as it used trawl method in the eastern Pacific area, its tuna export to the US was banned.²⁹

It is common to see such conflicts and disputes in international trade, if we don't work hard to coordination international trade system and environmental protection standard, make them gradually unify and promote each other, it would be difficult to solve the conflicts and disputes brought by green trade barriers, and also difficult to break the conflict between international trade and environmental protection, then difficult to appear the win-win situation.

3.2.2 Promotion of Environmental Protection on International trade

Many countries advocate environmental protection, to a large extent it limits the deeply of international trade liberalization and hinder the normal development of the international trade. But at the same time, it creates opportunities for the development of international trade, promotes new growth of international trade from another hand. Promotion of environmental protection on international trade mainly has the following two aspects:

1. Environmental mark increase international competitiveness

Environmental mark is a kind of graphic symbol printed or pasted in the product or packaging. It is a special mark means the product has a certificate issued by government department or public and private groups, and it can prove the product's process of production and disposal can meet the environmental requirement, the product is friendly or little harm to environment, and it is helpful to the regeneration and recycle of resource. Environment mark system is not only a kind of effective method to promote environmental protection, and is also a kind of method to improve product international competitiveness.

²⁹ Bie Tao, International environmental trade disputes caused by tuna ——Mexico v. United States tuna / dolphin trade dispute Comment, Green view, 2005(2)

As the ecological environment continues to worsen and gradually threat to the survival and development of human beings, majority people begin to recognize the environmental protection has more strategic significance than economic growth. According to a public opinion survey of developed countries, when two similar products have equal quality, most customers would prefer to buy the one with high environmental standard. In China, according to a survey to Guangzhou area, of the 23085 people surveyed, 81.7% were completely willing to pay more money to buy products that is beneficial to the environment, especially the bedroom environment and diet environmental; 15.5% preferred to buy environmental mark products within their economic conditions; only 2.8% said it doesn't matter.³⁰ So the enterprise and manufactures should adjust the industrial structure; develop technology which beneficial to environment; use cleaning technology; produce environmental friendly products. It is the main trend of this world, and it can lay a solid foundation for the long-term development of enterprises.

2. Environmental mark improve international trade structure

From the point of rational using of resources and promoting economic development, environmental mark can improve countries export trade structure, and makes the structure can go with the sustainable development direction. At present, the world green consumption has more than 250 billion dollars. In the future 10 years, the green trade will grow by 12%-15% for expecting. According to statistics, 47% of Europeans are more like to buy green food, in it, 67% of Dutch people and 80% of German people would consider environmental factories when buying.³¹ For enterprise, international competition is not only the competition of quality; performance; service; promotion, but also the competition of environmental standard. In addition, more and more countries use environmental standard to forbid the entering of products which are not good for environmental. Especially after Copenhagen Conference in 2007, the world trade structure is constantly changing. The proportion of low-energy consumption and low pollution products is increasing, and the proportion of high-energy consumption and high pollution products is decreasing. Therefore, through a series of environmental standards, the international trade is going to a direction of low consumption, low pollution and sustainable development. This not only protects the living environment all over the world, but also highly responses to

³⁰ 《环境标志在全球范围的作用》，《福建纸业信息》，2004(20)

³¹ Qin Dianjun, Guo Xiaojing, Low-carbon economic impact on trade patterns, Technology and industry, 2002, Vol.10 (12)

our generations.

From the above analysis, we can see that the environmental protection limit economic development's negative effect on environment, so in a certain extent, environmental protection will block or limit the freedom development of trade. Development of international trade requires eliminating trade barrier, so as to realize trade liberalization and economic development. In order to develop domestic economic, countries' resource often be excessive consumed, even the environment be polluted seriously. On the face of it, it seems that the oppositional relationship between environmental protection and international trade is difficult to coordinate. As long as one is developed, another one would be damaged. That is to say, the more strict environmental regulation, the more hinder for development of free trade. Or the further trade liberalization, the more serious for the problem of environmental pollution and nature resource destruction. The contradiction is sharpened and complicated by the unequal international economic order and the huge differences in economic and technology between developing countries and developed countries.

From the view of essence and long-term point, international trade and environmental protection not only have contradiction, but they also can promote each other. Because the fundamental purposes of environmental protection and international trade all are improving the quality of people's life and increasing social welfare. Specifically speaking, the goal of environmental protection is trying to change or stop some production; consumption and exchange ways which are negative to environment, to achieve a more reasonable allocation of resources, and to promote the sustainable development of the economy and international trade. The goal of international trade is to through international exchange, to achieve a more reasonable allocation of resources, to improve productivity, to promote economic development and improve quality of people life. Thus it can be seen, the basis goals of trade policy and environmental protection policy are all improving quality of people life through the efficient allocation of natural resources. They are complementary, compatibility and unit.

Chapter 4 Empirical Analysis about the Relations between International Trade and Environment

4.1 Current Environment Problems of China

Environment refers to the total of natural or function closely related to human daily life, it provides necessary resources and conditions for our survival and development. With the development of social economic, environmental problems have become increasingly prominent, fertility degradation of arable land, decrease of forest area's, increase of energy usage and CO₂ emission, etc. They lead the appearance of catastrophic climate change, which has seriously harm human survival environment and healthy. Observe the nature laws and social development law, use modern science and technology and system control law, reasonable allocation resources, actively coordinate social relationship and ecological relationship, realize stability and prosperity of biosphere, have already become the important task for government social management. For China, adhere to the people-oriented, set up a comprehensive; coordinated and sustainable development, promote the all-round development of economic society and human, is China's important development strategy.

At present, the main problems for China's environment are serious pollution and ecological deterioration.

4.1.1 Environmental Pollution Problems

The problem of pollution is the main environment problem we face, it is also the inevitable outcome of human activities. Although after managing for many years, the increasing trend of environment pollution has basically been controlled in China, the environmental pollution is still quite serious. According to the 'First Financial Daily', environmental protection department published 'report of China's environmental economic accounting for 2009'. The report showed that, the cost of environmental pollution caused by economic development continued to rise. Pressure of environmental pollution control increases day by day, the cost of environmental degradation raised to 970.11 billion from 511.82 billion in 2004, cost of environmental degradation in 2008 is 894,76 billion. As significant pollution accidents happen occasionally, China has already been high-incidence of

environmental pollution. These problems seriously affect people's production and life, and become obstacles that restrict the sustainable development of China.

Table 1 Index of China's environmental pollution

Year	2001	2005	2009
Beijing	0.04	0.054	0.025
Tianjin	0.034	0.375	0.045
Shanghai	0.117	0.503	0.089
Guangdong	0.188	0.249	0.342
National average	0.128	0.174	0.194

Data source: Lan Qingxin, Hanjing, Research on China's environment effect on economic development——Based on the empirical analysis of the inter-provincial panel data

It can be found from table 1 that, from 1999 to 2009, index of environmental pollution in most areas have an increase in different degrees. Decline of some areas' index, such as Beijing, Shanghai, is closely related with the their particular events. The 2008 Olympics in Beijing, the 2010 World Expo in Shanghai, they are all very important for reducing the region environmental pollution level.

4.1.2 Ecology Deterioration

The ecological environment means the total resources influence human's survival and development, which include water resources; land resources; biological resources and climate resources. The scope of China's ecological environment destruction is expanding. The main expressions are as follow. 1. China's land degradation is serious. According to Xinhua news agency, the area of national soil erosion is 3670,000 square kilometers, about 38% of total land area. Area of land desertification is 2620,000 square kilometers, and will increase 2460 square kilometers every year. 2. Forests have suffered serious man-made destruction, which leads to the weak ecological function. In addition, there are 2 million hectares of land back to non-forest land, open land or shrub land, because of the non-stopping forests destroying and woodland occupying. 3. Water ecological system is unbalanced, and degree of water environmental safety declines. Drought and flood frequently happen, the phenomenon of river draught-up aggravates, many lakes shrink, natural oases disappear, storage of existing reservoir reduces, wetland suffers seriously destroyed and level of ground

water falls because of groundwater's gravely overdraft in some areas, which leads to large funnel area. 4. Area of wild animals and plants continues to diminish, habitat environment deteriorates, phenomenon of over-hunting and excessive digging continues to be a problem, number and diversity of wild animals and plants sharply reduce, and biological diversity suffers terribly damaged. Deterioration of ecological environment seriously affects the coordinated development of China's economic and society and security of natural ecological environment.

Environmental problems is not a single social problem, it is closely related to human society's political; economic; technology. Environmental pollution and ecological deterioration largely are the inevitable outcome of human social development. The western countries have entered the post-industrial society, and they gradually realize the huge harm to environment by industrialization initial stage. China is on socialist modernization and experiencing transition from agricultural society to industrial society, so we need to accumulate capital. But we absolutely cannot go the old road of 'Polluting first, harnessing later' for western countries, we should go ahead of the scientific development road and promote the harmony between human and nature. This is sum up for historical experience and lessons, and also is the inevitable choice we are faced with.

4.2 Empirical Analysis of International Trade's Influence on China's Environment

This paper selects data from 1988 to 2008 of China to make an empirical analysis. The main analysis indicators are import and export trade volume, export trade surplus, scale of economy (GDP/AREA), population density (POPULATION/AREA) and pollutants, etc. In order to carry out the free trade's impact on environment, this paper chooses least squares multiple regression estimation and Generalized method of moments, then uses Granger causality to test the relationship between environment problem and free trade.

4.2.1 the Purposes of Empirical Analysis

Due to modern industrial civilization, mankind could create enormous material wealth, but at the same time this also cause enormous damage of the ecological environment for human survival. It can be said that the human wealth is achieved by

over-exploitation and plunder of nature. Today, the world is experiencing an unprecedented ecological disaster, the destruction of the ozone layer, the greenhouse effect, acid rain disaster, water pollution, destruction of forests, soil erosion and land desertification intensified, a large number of wild plant and animal species to extinction, and so on. According to data released by the World Bank, 2011, China's total trade in 1988 to \$ 102.79 billion, an increase of 20 times in just 20 years, the 2008 China's total trade volume of \$ 2,563,260,000,000. But such rapid economic growth should make great sacrifices. In recent years, acid rain continues to spread, not only affects Chinese mainland, but also affect the Hong Kong and Macao and the neighboring countries. In China, the consumption of energy is mainly in coal, accounting for about three-quarters of the total energy consumption. Coal is a dirty energy; combustion produces a lot of dust, carbon dioxide and other pollutants, and is also the main material result in the growing problem of air pollution in China.

The growth of economics led to the overexploitation of natural resources and global climate change, human life will be a serious negative impact. Therefore, it is very necessary to study the relationship between international trade and environmental pollution, to find out whether international trade will cause air pollution or not.

4.2.2 the Economic Model of Empirical Analysis

There are many factors that have impacts on environmental pollution. In the paper, the analysis of the main factors and the main variables of the model selected are as follows:

1. Import and export trade volume: development of international trade is at the expense of predatory exploitation of the natural resources and at the advantage of a relatively low price and relative scarcity of resources to get access to foreign markets. The developed countries use its technological advantages to control industries channels and use international trade as a means to set up factories and products processing of raw materials bases. In developing countries like China enjoy trade profit; at the same time the environment has been a great deal of damage.
2. Economic growth: the rapid growth of a country's economy maybe caused by over-development and inappropriate use of natural resources which will result in pollution and destruction of the environment and environmental crisis. The rapid economic growth will inevitably increase the consumption of natural resources and the pressure of environmental protection. The development and utilization of natural

resources will increase the emissions of industrial pollutants, environmental degradation and resource depletion.

3. Population density: the excessive growth of the population causes environmental pollution and destruction. Population growth will lead the amount of CO₂, NO₂, SO₂ and other gases discharged into the atmosphere increasing, and then causing the greenhouse effect, photochemical smog, acid rain and other environmental degradation. In addition, the excessive growth will lead to a lack of resources per capita, but there was a dramatic increase in total energy consumption.

4. Lag one period residual pollutant: In order to reflect the situation of environmental changes, we choose CO₂ as explanatory variables. It will emit a lot of CO₂ gas, because of the consumption of resources, population growth, trade transport pollution to the environment. Considering the one period lag pollution emissions will have an impact on environment pollution. Therefore, the instrumental variable of CO₂ (-1) is selected as the explained variable.

According to the above analysis, we chose gross fixed capital formation, the ration of the gross domestic product (GDP) and the total land area as the explanatory variables. The total population divided by total land area measures the population density. The extent of international trade is measured by the total amount of import and export trade as an explanatory variable.

Following the research literature, we are developing the next research hypothesis: There is a negative sign between international trade and pollution effects.³² The emissions increase with the level of production.³³ The economic size has a positive effect on environment pollution.³⁴

³² Cole, M.A., R.J.R. Elliott & T. Okubo, Trade environment regulations and industrial mobility: An industry-level study of Japan, Ecological Economics, 2010.

³³ Gene M. Grossman&Alan B. Krueger, Environmental Impacts of a North American Free Trade Agreement, 1994,NBER Working PaperNo. 3914.

³⁴ Cole, M.A., R.J.R. Elliott & T. Okubo, Trade environment regulations and industrial mobility: An industry-level study of Japan, Ecological Economics, 2010.

Table 2 Date of Empirical Analysis

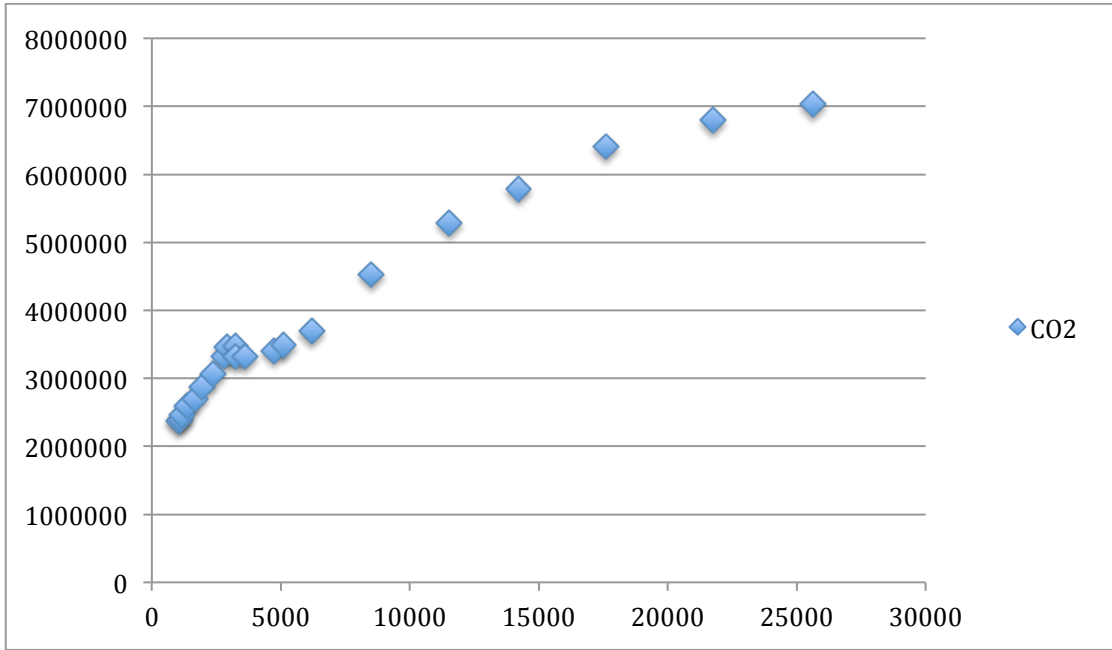
year	Land area (sq. km)	CO ₂ emissions (kt)	Total energy consumption (10kt)	Population density	Gross fixed capital formation	SCALE (GDP/AREA)	Total value (hundred million)	Trade surplus (hundred million)
1988	9327420	2369501.7	92997	118.10661	31.2568139	33184.163	1027.9	-77.5
1989	9327420	2408540.6	96934	119.93134	26.0082508	36877.6875	1116.8	-66
1990	9327420	2460744	98703	121.70407	25.8616441	38267.4846	1154.4	87.4
1991	9327420	2584538.3	103783	123.37602	27.8690632	40683.1317	1356.3	80.5
1992	9327420	2695982.1	109170	124.89735	31.6218174	45313.8079	1655.3	43.5
1993	9327420	2878694	115993	126.34147	37.6669431	47226.4462	1957	-122.2
1994	9327420	3058241.3	122737	127.77756	35.9200297	59954.9186	2366.2	54
1995	9327480	3320285.2	131176	129.17262	34.3538886	78049.7197	2808.5	166.9
1996	9327480	3463089.1	135192	130.53365	33.7865253	91780.9236	2898.8	122.2
1997	9327480	3469510	135909	131.87646	32.8783255	102133.984	3251.6	404.2
1998	9327480	3324344.5	136184	133.14797	33.848724	109296.25	3239.5	434.7
1999	9327480	3318055.6	140569	134.30584	34.041393	116138.328	3606.3	292.3
2000	9327480	3405179.9	145531	135.36829	34.112334	128488.609	4743	241.1
2001	9327480	3487566.4	150406	136.35516	34.4302048	142032.673	5096.5	225.5
2002	9327480	3694242.1	159431	137.2718	36.259557	155864.988	6207.7	304.3
2003	9327480	4525177	183792	138.12948	39.3827232	175927.339	8509.9	254.7
2004	9327480	5288166	213456	138.95232	40.7295327	207091.769	11545.5	320.9
2005	9327480	5790017	235997	139.77194	40.139481	241962.737	14219.1	1020
2006	9327480	6414463.1	258676	140.55458	40.6603025	290855.717	17604.4	1775.2
2007	9327480	6791804.7	280508	141.29057	39.1063091	374598.063	21765.7	2643.4
2008	9327480	7031916.2	291448	142.01639	40.7853097	484785.525	25632.6	2981.2
2009	9327480		306647	142.73737	45.9602544	535113.064		
2010	9327480		324939	143.42834	45.4133218	635812.617		
2011	9327480				44.4332123			

Data source: <http://www.worldbank.org/>, <http://www.stats.gov.cn/>

Model Specification: $\log CO_2 = a + b * \log \text{scale} + c * \log \text{trade value} + d * \log \text{energy}(-1) + f * \log \text{population}$

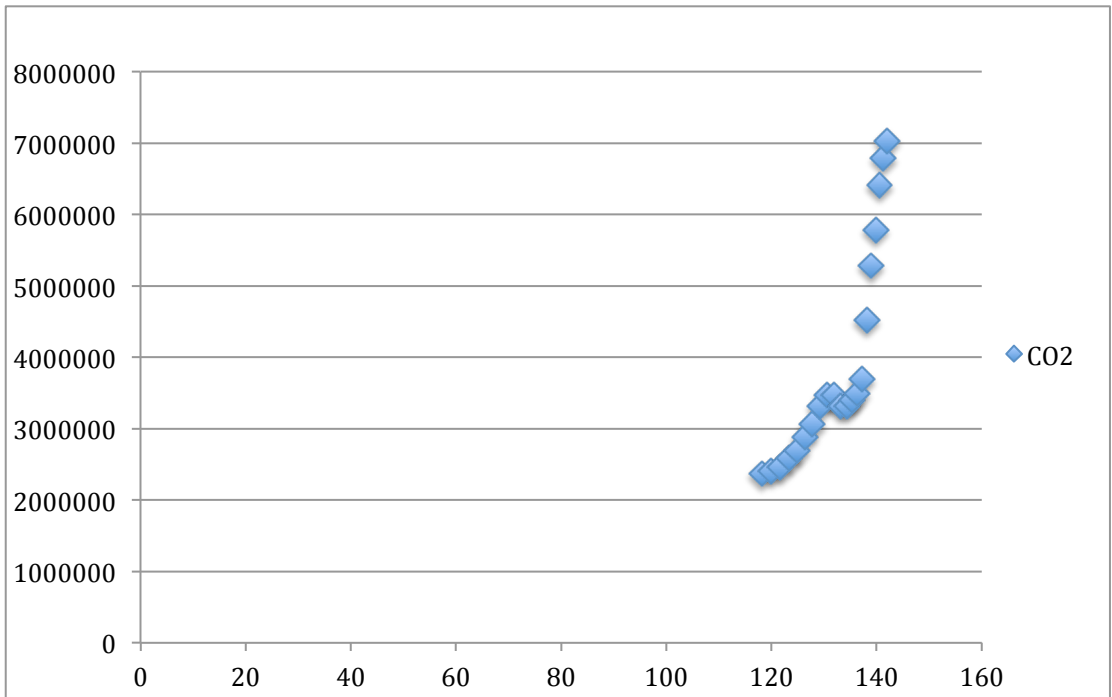
4.2.3 Parameter Estimation

Processing data by statistical software Eviews:



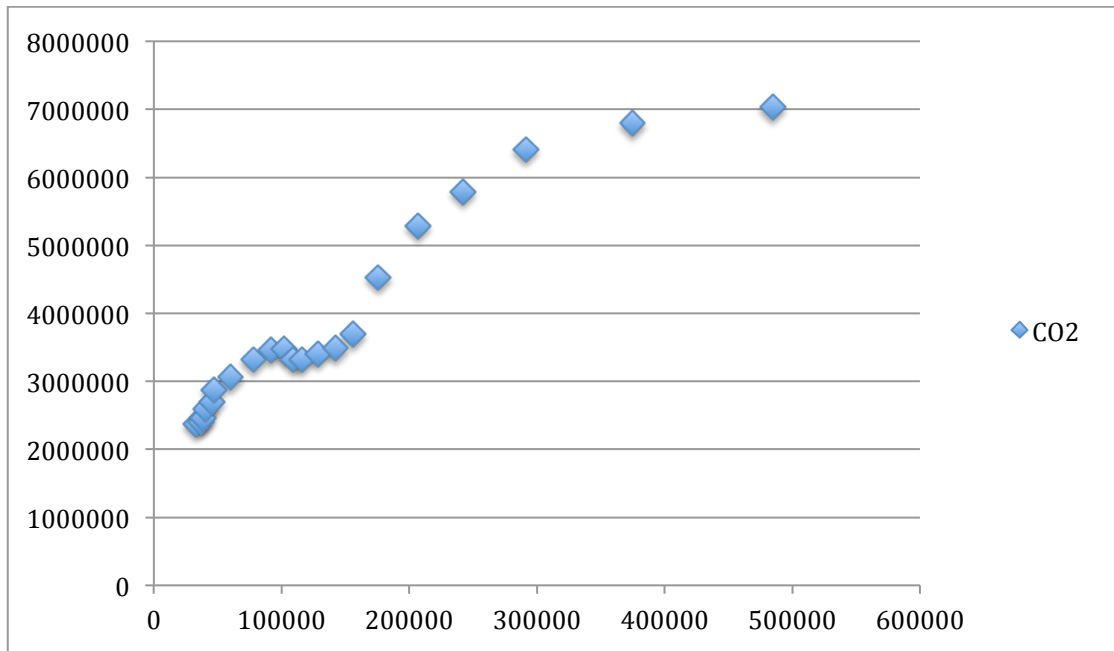
Graph 1 Scatter Plot of CO2 on the Total Volume of Trade

The scatter plot shows that CO2 emissions increased with the total volume of trade.



Graph 2 Scatter Plot of CO₂ on the Population Density

As it can be seen from the scatter plot, CO2 emissions also increased with the population density.



Graph 3 Scatter Plot of CO₂ on the GDP

It can be shown from the scatter plot that CO₂ emissions increased with the GDP.

Dependent Variable: logCO ₂		Included observation: 20 after adjusting endpoints		
Sample (adjusted): 1989-2008		Method: Least Squares		
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.252427	2.692614	1.579293	0.1351
log scale	-0.191544	0.118072	-1.622264	0.1256
log trade value	0.283270	0.084158	3.365923	0.0042
log energy(-1)	0.747177	0.265689	2.812221	0.0131
log population	-0.753918	1.053652	-0.715528	0.4853
R-squared	0.989831	S.D. dependent var	0.147184	
Adjusted R-squared	0.987119	S.E. of regression	0.016705	
Sum squared resid	0.004186	Durbin-Watson stat	0.917834	
F-statistic	365.0038	Prob (F-statistic)	0.000000	

Table 3 the Estimated Result of OLS

the Regression Equation: $\log CO_2 = 4.252 - 0.191 \log \text{scale} + 0.283 \log \text{trade value}$
(1.58) (-1.62) (3.37)
+ 0.747 log energy (-1) - 0.754 log population
(2.81) (-0.72)

4.2.4 Model Testing

1. Economic Significance Testing

According to the estimation result of OLS, in the case of assuming that all other variables constant, once the volume of trade increase 1%, carbon dioxide emissions will has a corresponding increase of 0.282%. Case assuming that all other variables constant, as the population increase 1%, carbon dioxide emissions will decrease 0.754%. Case assuming that all other variables constant, while the economies of scale increase 1%, carbon dioxide emissions will be reduced by 0.191%.

2. Statistical Significance Testing

1) Goodness of Fit. R-squared is 0.9898, and the correction coefficient of determination of R-squared is 0.9871, which shows high goodness of fit of the model sample. The overall linear relationship of the samples is significant.

2) F test. The estimation result shows that Prob (F-statistic) is almost zero, which indicates that the test rejects the null hypothesis that all the coefficients are zero. It is said that the combination of the economies of scale, the total volume of trade, population density, and energy consumption has a significant linear relationship with carbon dioxide emissions in general.

3) T-test. As can be seen from the OLS estimation method, the P value of the total volume of trade is 0.0042, which shows that the total volume of trade has a significant impact on the CO₂ emissions. The P value of energy consumption is 0.013. Similarly, it also has a significant impact on the carbon dioxide emissions. And the P value of the economies of scale is 0.126, the null hypothesis is not significant to zero, the impact of carbon dioxide emissions is not significant.

4.2.5 the Analysis of Test Results

According to the data from 1989 to 2008, the empirical results show that the total amount of import and export trade has a significant impact of CO₂ emissions. It can be inferred that the developing of the international trade and the rapid growth of economics bring about the industrial pollution, transportation pollution, all these pollution exacerbate the problem of domestic environmental pollution. In the process of industrialization in China, over-exploitation of domestic natural resources, vigorous development of the secondary industry, and the transfer of polluting from the multinational corporation, to respond to the demand of the international market are causing a serious impact on China's environmental pollution. (Note: All these

conclusions are drawn by the data from 1989 to 2008)

4.3 the Causality Analysis of the International Trade and Environmental Issues

The relationship between international trade and environmental protection are quite complex. It can be said that the two are mutually promote and conflict with each other. From the ideal point of view, the two should be mutually reinforcing with each other. With the advent of economic globalization, the liberalization of international trade makes the allocation of resources more efficient, so as to promote the flow of a variety of goods and services internationally, and the technical and ideological culture of the countries can also be effectively distributed. The two have a major impact on the world economic structure and development. International trade can not only support economic development and growth, but also provide more capital and advanced technology to countries to improve and protect the environment.

The aims of using Granger test of causality are: Firstly Granger test of causality help us to verify whether the international trade is one of the reasons for the increase of carbon dioxide emissions; Secondly, it help us to verify whether the changes in the carbon dioxide emissions will also affect the development of the international trade. A prerequisite of Granger test of causality is that the time series must be smooth; otherwise it may appear spurious regression problem. Therefore, before conducting Granger test of causality, we need to conduct unit root test to verify the smoothness of each indicator. We choose ADF test as the tool of unit root test total. It could verify whether the data of volume of trade and carbon dioxide emissions is stable. If these two time series are stationary series, the Granger test of causality can be conducted efficiently. Conversely, if they are not stationary series but the same integrated order, we need to conduct the Engle-Granger test to determine whether the sequence are cointegrated time series, and As long as they are cointegreded time series, Granger test of causality can be conducted.

4.3.1 Stationary Test of the Time-Series Data

Augmented Dickey-Fuller Unit Root Test on D(log CO ₂ ,2)			
ADF Test Statistic	-3.208879	1% Critical Value	-3.8877
		5% Critical Value	-3.0521
		10% Critical Value	2.6672
Augmented Dickey-Fuller Unit Root Test on D(log trade value,2)			
ADF Test Statistic	-4.692790	1% Critical Value	-3.8877
		5% Critical Value	-3.0521
		10% Critical Value	2.6672

Table 4 Stationary test of the time-series data

The result of stationary test on the total amount of import and export trade and the carbon dioxide emissions are shown on the table. Through the ADF test of the carbon dioxide emissions at the 5% significance level, the critical value is -3.05 and t value is 3.21, therefore it rejects the null hypothesis. It can be concluded that Carbon dioxide emissions is an integrated of 2 time series. And After conducting ADF test of the total amount of import and export trade at the 5% significance level, the critical value is -3.05 and t value is -3.75, so the total amount of import and export trade is also an integrated of 2 time series. From the above results, it shows that the two variables are the integrated of 2 time series. Therefore, if the two non-stationary time series are cointegrated, Granger causality test is also effective.

4.3.2 Engle – Granger Test

Using the method of OLS: $\log \text{CO}_2 = a + b \cdot \log \text{total trade value}$

Dependent Variable: logCO2		Included observations: 21		
Sample (adjusted): 1988-2008		Method: Least Squares		
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.339476	0.049361	108.1717	0.0000
log trade value	0.338671	0.013556	24.98319	0.0000
R-squared	0.970458	S.D. dependent var	0.149888	
Adjusted R-squared	0.968904	S.E. of regression	0.026432	
Sum squared resid	0.013274	Durbin-Watson stat	0.364025	
F-statistic	624.1599	Prob (F-statistic)	0.000000	

Table 5 the Estimated Result of OLS

Augmented Dickey-Fuller Unit Root Test on E			
ADF Test Statistic	-3.112673	1% Critical Value	-3.8572
		5% Critical Value	-3.0400
		10% Critical Value	2.6608

Table 6 ADF Test on Residuals

Unit root test on the residuals shows that at the 5% significance level, the critical value is -3.04 and the t value is -3.11, it rejects the hypothesis of the existence of the unit root hypothesis, which indicates that the residuals are stable. Therefore, the total import and export trade and carbon dioxide emissions are cointegrated of (2,2). In other words, there is long-term and stable "equilibrium" relationship between the two variables. So we can conduct the Granger test of causality.

4.3.3 Granger Test of Causality

Pairwise Granger Causality Tests			
Sample: 1988-2008	Lags: 2		
Null Hypothesis:	Obs	F-Statistic	Probability
log trade value does not Granger Cause log CO2	19	4.29347	0.03515
log CO2 does not Granger Cause log trade value	19	2.95208	0.08517

Table 7 Granger Test of Causality

According to the concomitant probability, at the 5% significance level, the first P value is 0.035, so it reject the assumption that the total amount of import and export trade is not the Granger cause of carbon dioxide emissions, the second P value is 0.085, which does not reject the hypothesis that the carbon dioxide emissions is not the Granger cause of the total amount of import and export trade Granger reason. Therefore, the total import and export growth bring about the growth of carbon dioxide emissions, but the increase in carbon dioxide emissions are not the reasons for the growth of the import and export trade.

It can be seen through the empirical analysis: during this period (from 1989 to 2008) in china, international trade does cause an increase in carbon dioxide emissions and is one of the reasons that cause environmental pollution.

Chapter 5 Coordination of International Trade and Environment

Through the empirical analysis of the previous chapter, we can conclude that the in-depth development of international trade and the increase in the total amount of import and export trade are all based on the sacrifice of the environment. The increase in trade not only promotes the economic growth, but also overuses of natural resources in China and serious damages to the ecological environment. Nevertheless, as this article analyzes above, trade policy and environmental protection policies are both aim at allocating of natural resources effectively and improving the quality of human life, so they are complementary, compatible and unified with each other. Their ultimate goal is to achieve sustainable development. However, the reality is often in conflict with the theory. Because developed and developing countries have different positions and attitudes, the relationship between international trade and environmental protection has become especially complex. How to coordinate the development of international trade and environmental protection are very important for the maintenance of free trade and the protection of the human environment so as to eventually realize sustainable development. This chapter from the perspective of a developing country attempts to explore how to deal with the relationship between environmental protection and international trade under the guidance of the overall goal of achieving sustainable human development.

5.1 the Coordination Principles of International Trade and Environmental Protection

In order to better coordinate international trade and environmental protection, we need to follow some international principles:

5.1.1 the Principle of Common but Differentiated Responsibility

The principle, ‘Common but differentiated responsibilities’, first identified as one of the International Environmental Cooperation principle in the United Nations Conference on Environment and Development in 1992. This principle can be understood as countries in the world share the responsibility to protect and improve the environment, because of the integrity and relevance of the worldwide ecosystem.

But due to the historical, cultural, economic and other factors, the obligations of each country should have difference. The developed countries should bear more responsibility than developing countries.³⁵ Because in the early process of industrialization, the developed countries is lacking in experience and short of environmental awareness, they cause a lot of pollution and irreversible impact on the global environment, such as the chemical composition of the soot in the air, waters, holes in the ozone layer. The saturation became very serious problem even before the developing countries start to establish their countries. Now, developed countries' immature and prudent behavior at that period still have strong influence on the environment and ecosystem. For example, in, the amount of the copper mining in 1877 was less than 39 tons. After 10 years, it soared to 2,515 tons. Such large-scale development and utilization of natural resources will inevitably lead to a series of environmental problems. In the late 19th century, Japan Ashio introduced a new smelting method from Europe and the United States which result in the nearby mountains and crops, and the surrounding region polluted by highly toxic arsenic compounds and non-ferrous metal dust and a village in the center of the victims forced to transfer.³⁶ So due to the excessive demand to the natural resources lead to environmental problems, the developed countries supposed to have more responsibility for global environmental problems.

5.1.2 the Principles of Environmental Integrity

This principle mainly refers to that the free trade should focus on and help maintain the integrity of the environment, which involves conscious human activities including transformation and impact on the natural environment. In the process of formulation and implementation of the development strategy, all the countries should focus on maintaining the integrity of the environment so as to maximize the protection of the environment. Especially in the international trade, countries should actively promote environmental protection, pay attention to the various constraints on the regenerative capacity of the ecosystem, and take action to avoid irreversible negative impact on natural resources, ecological environment.³⁷

³⁵ Shen Zhanchang, On the common but differentiated responsibilities, World economy, 2004 (1)

³⁶ Jiang Chunyun, Ecological evolution and governance strategy, Ecological evolution of human civilization, China Agriculture Press, 2004

³⁷ Zhou Jie, Zhang Zitai, Trade and environment in the WTO system under legal

5.1.3 the Principle of International Cooperation

In recent years, the various countries have communicated and cooperated with each other in the part of international trade and international economic, and gradually have established the long-term cooperation and development relationship. In order to comply with this trend, the principle of international cooperation require developed and developing countries should strengthen cooperation with each to help developing countries to improve their quality of the environment. The principle of international cooperation call for strengthening of inter-country cooperation at all levels including the environment, development and trade policy. Because there are a lot of common resources between nations and countries are closed linked with each other, the pollution problem cannot be completely shut the door outside. Therefore, all countries in the world should work together to jointly solve the environmental problems on the planet, and to seek the method to improve the quality of the global environment. This requires developed countries support developing countries in terms of capital, technology, equipment, and etc. full cooperation in the protection of endangered species, the improvement of the quality of the environment, the development of new energy sources, the use of recycled material. This is not only an inevitable requirement of the International Institute for sustainable development, and also one of the goals of the new order of the international economics. Despite the different countries have different geographical location, different political systems, different levels of economic development; they need to be a mutual communication and international cooperation.

5.1.4 the Principle of Scientific Precautionary

The principle of Scientific precautionary requires positive development to science and technology, which will facilitate the coordination of the interests among trade, environment and development, especially the ecological and environmental sciences. It all requires the study of human social development activities, especially the interaction and relationships between international trade and environmental evolution to seek the co-evolution of human society and the environment and the ways of sustainable development. In the event of unforeseen circumstances, lack of scientific guidance and preventive measures in the decision-making will result in serious

consequences. So we should identify problems and take immediate measures before the damage occurred. All countries should make joint efforts to establish new scientific information system for scientific prediction and prevention.³⁸

5.1.5 the Principle of Openness

From the perspective of coordinated development of environmental protection and international trade, the principle of openness contains two meanings. The first is that all affected parties can be timely, comprehensive public information to facilitate mutual communication. The second is that the public can participate in the decision-making process, so that we can compare the pros and cons of all aspects between environmental protection and international trade and they can be better coordinated. To enhance the degree of openness among countries can be a very good solution, and will ultimately achieve the sustainable development of the global economy and environmental protection.

These principles have a guiding role in dealing with international trade and environmental issues. If we take into account the above principles, we can achieve a completely different effect and could better coordinate the relationships between international trade and environmental issues and will promote the coordinated development of trade and the environment.

5.2 Approach to Coordinate the International Trade and Environmental Protection

According to coordination principle of the international trade and environmental protection, some methods can be concluded to solve the problems of international trade and the environment.

5.2.1 the Establishment of a New International Economic Order

The old international economic order is build up in accordance with the will and need of the developed capitalist countries and the developing countries had no rights and place in the international stage, Its main content and features is that the international production system is based on unreasonable division of labor; international trade

³⁸ Pu Yanfang, International trade and environment protection, 1998

system is not based on exchange of equal value; international financial system is dominantly occupied by international monopoly capital; the field of international production and circulation is monopolized by international economic institutions controlled by a few developed countries. There are several impacts of the old economic order on the environment. Firstly, environmentally unfriendly products, material transfer to developing countries. Secondly, the international trade develops based on inequality and irrational transfer of resources between developed and developing countries. Thirdly, trade liberalization exacerbates old international economic order on the negative impact of the human Environment. Therefore, in order to coordinate the relationship between international trade and environmental protection, it is necessary to change this old, unequal international economic order and establish a new, fair and reasonable international economic order.

The establishment of an equitable new international economic order will strengthen environmental protection. At the same time it will have a more far-reaching impact on developing countries. As long as we establish a new international economic order, developing countries can get a fair full development and eradicate poverty so that they can invest more money and efforts to govern their own environment, improve the level of environmental protection in the country, and even have the ability to participate in international environmental governance to solve the environmental problems of global concern. In addition, only if developing countries get stronger and full development, the original structure of the import and export trade can get fundamentally change. And then, it will be possible to change the interest-driven and excessive predatory exploitation to natural resources, which result in environmental deterioration and ecological imbalance. However, if the developing countries want to truly get a fair development, the existing international economic order will be a great obstacle. We must change this irrational international economic order, and establish a new international economic order. In order to achieve the coordination of international trade and environmental protection and sustainable development, all countries should make joint efforts to build new, fair international economic order, strengthen the ability of developing countries, help all countries participate in international trade and environmental protection.

5.2.2 to Improve International Law and Coordinate International and Domestic Law

There are still some shortage and deficiency of the current international legislation to coordinate the international trade with the environment protection, such as some conflicts between the two rules, the general and ambiguous of the terms of the rules, and lack of feasibility and operability. The relationship between international trade and environmental issues become more complex and diversified, as the existing treaties and rules are no longer able to solve disputes between the trade and environment. Therefore, the relevant international organizations are suppose to take the responsibility to improve relevant international law, coordinate the relationship between international trade and environmental protection and actively deal with new emerging issues. In addition to improve international law, States domestic law, particularly in developing countries should also make a corresponding adjustment to international law and some multilateral agreements should be transferred in the form of domestic law to well fulfill its international obligations. Free trade cannot be developed at the expense of the sacrifice of the environment. On the contrary, environment cannot be protected at the cost of the economy "zero growth". We could achieve the dual goals of economic development and environmental protection, while at the same time we realize the economic globalization and the trade liberalization. Therefore, we should actively promote 'clean production and technologies', and the development of green products and environment-friendly industry. We should continue to improve regulations of international trade and environmental protection, promote ISO14000 international standards, develop and improve the foreign investment regulations. Through the implementation of a series of measures, we can better coordinate the relationship between international trade and environmental protection, and ultimately we will achieve free trade and of environmental protection simultaneously.³⁹

5.2.3 to Strengthen the Cooperation Between Environmental Organizations and WTO

Undoubtedly, there exists mutual influence and mutually reinforcing relationship between international trade and environmental protection. Therefore, in order to coordinate the relationship between trade and the environment, it is necessary to

³⁹ Yu Yonghong, International trade and environmental conflicts, real and legal harmonization, Economic and social development, 2004, Vol.2 (3)

strengthen cooperation between the multilateral environmental organization and WTO.

WTO is an international trade organization. Given the impact of international trade on environmental protection, WTO has actually impact on the international environmental protection and the implementation of multilateral environmental agreements through its practice. So it could be said that WTO is an organization related to environmental protection. WTO has set up specific institutions to study the relationship between international trade and environmental protection, such as WTO's Trade and Environment Committee. Many national environmental organizations have got the qualification as CTE observers who have the rights participate in the discussion of international trade and environment issues. Secretariats of multilateral environmental organization hold much information so that they can provide information support to member states. Through cooperation and communication with CTE, they can study the impact of trade on environmental issues together, such as coordination of multilateral trade rules and dispute settlement. Specifically, multilateral environmental agreements, institutions and the WTO cooperation can be carried out in the following ways:

1. Information exchange. MEAs institutions can inform the relevant WTO organizations and trade-related information in the environmental treaties according to the information exchange program developed by WTO; Similarly, the relevant WTO organizations can consult relevant environmental institutions about their own trade measures that may affect the environment. Through the exchange of information, both two institutions can reach agreement in trade and environment coordination.
2. Establish observers. One of the cooperation methods between WTO and the Secretariat of MEAs is to award the organization of MEAs the status of observer in the WTO. Organization of MEAs o can apply for more observer status in accordance with their characteristics and needs. By this way of cooperation, multilateral environmental agreements can better participate in the discussion of trade and environment issues within the WTO system, which provides a good platform for better coordination of trade and environment issues.
3. WTO and MEAs institutions jointly set up an expert book. When the dispute settlement divisions of WTO arbitrate disputes about trades and environment, the experts in environmental organizations often speak out their advice. MEAs organization dedicated to the study of certain environmental problem, often gathered

leading experts in the field of the environment. If WTO and MEAs organization can unite to build the environmental issues associated with the roster of experts ready to provide expert advice when necessary, will effectively prevent the friction between the trade and environment, and to promote adjust solution of the trade and environment disputes.⁴⁰

The states should strengthen international cooperation to jointly take over the environmental problem caused by international trade. There are borders between the import and export trade, but the environmental problem has no borders among the countries, to protect the environment is the common interests of human beings, so international cooperation is particularly important to protect the Earth's environment. For developing countries, they should take full advantage of the preferential policies and treatment from the international organizations and international conventions , to gain more technology, capital and personnel training assistance to enhance their capacity of environmental protection, pollution control, etc. For developed countries, they should make the common interests of human beings as a starting point, taking the problem of technological backwardness and lack of funds in developing countries into account, to give them some help to jointly solve the environmental problem caused by international trade.

5.3 Policy Recommendations for the Coordination the Relationship of International Trade and Environment Problem

5.3.1 Recommendations on China's Foreign Trade Policy

1. to Strengthen International Cooperation in Environmental Protection, Improve the Level of Environmental Protection.

In recent years, there are more and more conflicts between the development of international trade and the protection of the environment, in the name of protecting environment, many countries take measures to restrict the import trade caused also rude disputes and friction increasingly. So, to understand and study the differences of developed and developing countries in international trade and environmental issues, it is necessary to strengthen exchanges and cooperation with the United Nations

⁴⁰ Bian Yongmin, Research of international trade rules and environmental measures in law, Publishing House of mechanic industry, 2005

Environment Programme (UNEP) and other international environmental organizations participate in a variety of trade and environment, with positive attitude issues of bilateral and multilateral negotiations. On one hand, the state should actively participate in international science and technology cooperation in environmental protection and to encourage its own environmental experts to strengthen academic exchanges with foreign countries, and actively develop environmental friendly products, at the same time actively introduce foreign advanced applicable environmental technology and equipment to enhance their level of environmental protection; another hand, the state should take full advantage of the protection clause to protect developing countries from developed countries, and restrictions on the international fight for their legitimate rights and interests. Also actively cooperate with the vast majority of developing countries to learn from each other, work together to upgrade the level of environmental protection, unite to negotiate with developed countries work together to obtain the terms and conditions conducive to the interests of developing countries. Government should make efforts to promote the mutual recognition of eco-labeling and environmental standards between countries to help China's export enterprises through certification.

2. To achieve export products internalization of environmental costs

One of the reasons of environmental degradation is market failure. The so-called market failure, is that the market can not efficient allocate the resources, simple rely on the rules of the market, can not pricing environmental asset properly, which lead to over-exploitation of natural resources and abuse, resulting in deterioration of the environment. The competitive advantage of China's export products in the international market is relatively cheap prices for export commodities, primarily commodity-based, entirely at the expense of our environment, and the prices of these commodities form does not include the environmental costs. In other words, the deterioration of the environment caused by the conduct of trade in China, did not obtain compensation through the transfer of environmental costs to foreign consumers, foreign consumers enjoy free access to the scarcity of natural resources and ecological environment, and our people have to suffer the consequences of environmental degradation. It is the inevitable trend of history to consider the environmental cost in the cost of the product. Therefore, the state should take measures as soon as possible to achieve the export products internalization of environmental costs. The uses of sewage charges, environmental taxes, permit trading deposit, environmental damage

liability insurance and other means of economic regulation, and encourage enterprises to change their polluting behavior, reduce costs, and improve the competitiveness of the environment, and promote the coordinated development of trade and environment.

5.3.2 Recommendations on Domestic Policy

Countries in the world are actively exploring policies suit to their own nation policy. Nowadays in the practice of environmental pollution controlling, most countries follow the Pigou's "polluter pays" principle; many countries have adopted the levying pollution emission as the key economic means and achieved certain results in the field of environmental protection. Of course, there are also some countries follow Coase's "clear property rights, improve the market" principle, adopted the emissions rights trading system.

In the implementation process, the actual operation of both methods has some difficulty. For Pigou's perspective, the enterprises' external marginal cost depends on the government and the implementation of the tax or subsidy policies. However, due to the presence of asymmetric information, the government is difficult to judge the difference between the social marginal cost, marginal private net income, as well as the gap value accurately, especially in the case of a large number of enterprises discharging, it is more difficult to obtain information. Therefore, the cost to formulate and implement subsidy policy or levy Pigovian tax is very high. For Coase's perspective, the implementation costs mainly involved the cost of defining property rights as well as private negotiations. Cost of defining property rights actually is the cost of government intervention. For example: an environmental pollution projects, the Government must first define the rights of the parties, to determine the contents, including the volume of emissions or emissions rights. However, in fact, A lot of pollution we can not define the origin, such as the dust storms in the northern region, not only from domestic but also from abroad; not only due to historical reasons, but also realistic reasons, these pollution origins can not be clearly defined. The pollution may also leads to huge cost because of many enterprises and person involved, such as a polluted river has many tributaries, many enterprises and person settled along the river, in this case, it costs a lot to define emissions rights. The private negotiations cost As Coase said is actually the cost of implementing market mechanisms, named transaction costs, which closely related to how perfect the market mechanism is.

To a country, to levy pollution emission or emissions rights trading system, need to stand on the point of view of national interests to consider. In contrast, for the country with imperfect market mechanism, to levy pollution emission has more feasibility; For developed countries, the market mechanism is more perfect, emissions rights trading system is better. In addition, we will encounter the case that we cannot determine the emissions rights. Moreover, the environmental pollution problem related to people's livelihood, there is no definition of pollution rights in some pollution projects, should take measures such as non-sewage directly. These special cases limit the implementation of the emissions trading system. Therefore, it is more feasible to levy sewage fees or environmental taxes.

From the above analysis, the two opinions are both difficult to implement, touching upon the costs, information symmetry or not, whether market mechanisms is perfect and so on. Combining with the actual situation in China, as a developing country, there is a certain lack on the effectiveness of intervention by the Chinese government and the perfection of the market mechanism, so we can use emissions trading system in certain zones with defined emission rights, based on widespread levying environmental taxes. We can set the environmental tax rate in a lower level, hope it can play a role to the protection of environment, each of the enterprises or individuals is responsible for environmental pollution as taxpayers. Not only can raise funds for environmental pollution controlling, but also put environmental protection concepts into the interests of the taxpayer's economic ties. Setting low tax rates, the government doesn't need to ensure that the marginal private net income of each firm and the marginal external cost exactly the same, to avoid the problem of asymmetric information. At the same time, on the basis of widespread levying environmental taxes, use emissions trading system in certain zones with defined emission rights. The reason we use this system, is that lower environmental taxes and can not achieve the optimal allocation of resources, there will still be part of the enterprises occupied social resources, generate negative external effects. By the arrangement of the emissions trading system, implement the high efficiency of market mechanisms to achieve the goal of optimal allocation of resources; economic development and control of pollution coexist. For the fields cause serious harm to people's daily life, should directly stop pollution.

In the above solutions, they overcome the problem of information asymmetry in Pigovian tax, but also implement the emissions trading system in certain fields, partly

rely on market mechanisms, develop the economy, reduce dependence on market mechanisms. This programs, taking into account economic development, to maximize the protection of the environment. In addition, change the export structure, increase the public propaganda are also effective methods. The main methods are:

1. Advance the supervision of the enforcement of environmental protection departments.

Nowadays, there are ineffective law enforcement and regulatory phenomenon in China's environmental protection work in many environmental protection departments. For some government departments, they should pay more attention to the issue of environmental protection, and increase environmental protection expenditure to strengthen the regulatory part of the environmental enforcement. Environmental protection departments should also enhance environmental awareness, recognize the importance of environmental protection, focusing on the long-term interests, rather than short-term benefit. From the overall situation, to implement the environmental protection, use the environmental protection funds wisely. To do environmental law enforcement and regulatory needs the attention and cooperation of all parties, format the mechanism of the masses trinity of multi-channel; make the law really play a role of environmental protection.

2. Regulate the production of domestic enterprises, to encourage the development of environmentally friendly products.

In accordance with the rules of the WTO, China needs to learn from the experience of developed countries, according to China's actual situation to further improve our system of environmental trade measures, planning of the development of China's environment rationally. We should evaluate China's current trade policy, to further improve the mechanism for coordinated development between trade and environment, to solve the relationship of protecting the environment and promoting the development of trade while implementing environmental access system for export enterprises, through the establishment of higher environmental and resource consumption standards and further expand the taxable range of export and other measures to reduce the expansion of production capacity, the enterprises can not reach the standard should be closed down, by publishing environmental blacklist and other forms, inform foreign importers the bad behavior of polluting enterprises, such measures to stop imports of its products not only in favor of domestic environmental

protection, but also help to establish a good image of our country in the international trade, and to reduce the pressure of international opinion.

3. To promote environmental protection industrial technology and innovation

At the same time with Strictly limited environmental standards, and should actively guide and encourage domestic enterprises to carry out technological innovation activities, and enhance the scientific and technological content of environmental protection industry, the green industry is mainly from the current to the end of the treatment, gradually which aims to change the direction of providing clean production services to all industries. Therefore, the state can set up a special environmental protection industry technology research institutions, to help enterprises carry out scientific research and innovation, and to increase research funding and research and development efforts, to introduce environmentally friendly products that contain a higher level of technology, promote environmental industries continue to progress. The same time, in order to encourage innovation and R & D enterprise, given certain tax incentives in some areas.

4. To raise public awareness of environmental protection

To have significant improvement in the environment, only through the efforts between government departments is not enough, environmental protection needs the participation of all citizens and the implementation of all aspects of people's lives. To raise the environmental awareness of all the people, and the most important is to first improve the basic quality of the masses, especially the behaviors in public occasions. Only to improve the general quality, we can encourage the citizens to participate in environmental protection, will promote environmental protection as a basic morality and a symbol of modern civilization, and the public to become the backbone of the supervision of the government and enterprises to implement environmentally friendly behavior, concerted efforts toward an ecological direction. To develop a new type of consumer attitudes is particularly important to buy green products, gradually changing the mode of corporate R & D, production, processing, and makes the whole industry chain cleaner, more green, more environmentally friendly.

The importance of international trade for economic development is needless to say, if there is no international trade, the economic development will be hard to imagine, but we cannot ignore the negative effects on the risk of environmental pollution. In the process of international trade and environmental protection, to protect the environment meanwhile to enhance the market competitiveness of the international

trade under the trade protectionism, and to maintain the healthy development of international trade, ultimately makes the goal of sustainable development.

Chapter 6 Conclusion and Outlook

International trade and environmental protection is no longer a new topic, since its produce has experienced 30 years of ups and downs. Along with the acceleration of the economic globalization and the global ecological environment deteriorating, the debate on international trade and environmental protection attract more and more attentions. Environmental protection wave has swept the globe, spread to every corner of the world, have had a profound impact on a country's political, economic, social and other aspects.

International emphasis on trade and environment issues are also growing, international organizations and governments is to make unremitting efforts to resolve the problems of international trade and environmental protection. Some international environmental organizations attempt to coordinate the conflict between trade and environment through the development of multilateral environmental agreements (MEAs). The purpose of the pursuit of trade liberalization under the WTO multilateral trading system also focus on the link between trade and environment issues. The organization which the establishment of specialized agencies (such as the WTO Trade and Environment Committee) under WTO is to specifically address trade and environmental disputes, international trade and the environment the relationship between the protection of the advance to a new stage of development. In addition, governments attach great importance to trade and environment issues, and actively participate in the trade and environment issues: by 'American Clean Energy and Security Act' provisions of the U.S. House of Representatives in 2009 from 2020, the United States reserves the right to impose carbon tariffs on imported products within the countries implement carbon emission reduction quotas. The EU is also in full swing for the technical aspects of the preparation to promote carbon tariffs. France, starting in 2010, will impose carbon tariffs on imported products for less than the EU's strict national environmental legislation. Thus, governments try to promote the improvement of the global environmental problems through participation in international environmental protection organizations. In addition, governments make domestic development of environmental policy and environmental regulations to improve their level of environmental protection. To some extent, we can say that

international trade and environmental protection are coordinated through the efforts made by the governments all around the world.

However, the fact is not just as one wish. There are some real contradictions which is difficult to mediation in the process of coordinating the relationship between international trade and environmental protection, such as the conflict of the existing rules, the imperfections of the Dispute Settlement Body, the interests of both developed and developing countries, differences and so on. The biggest problem is the divergent interests of developing and developed countries on the issues of free trade and environmental protection. On a specific topic, trade and environmental issues involved in a very wide range of different countries, the home has different interests and needs, especially between developed and developing countries. The main problem is that the developed countries whose economics and development has reached a certain height level pay more attention to this serious problem of environmental protection. In contrast, developing countries pay more attention to the development due to their own economic, technical, scientific and technological level lags behind, cannot afford to go take up half the sky environmental protection. We should try to stand in the global interest perspective, taking into account the factors of history and reality, taking into account the different interests and needs of both developed and developing countries, and to explore the feasibility of co-ordination of international trade and environmental protection approach, in order to be better in practice.

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