EFFECT AND EFFICIENCY OF UNILATERAL POLICY ON TRADE: ANTIDUMPING AND COUNTERVAILING DUTIES AGAINST CHINA'S SUBSIDIZED EXPORTS

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To My Mother Hajar, and My Son Alfar

Table of Contents

Chapter IV. Econometric Evaluation and Estimation of the Subsidy Policy for the Machinery, Textiles and Base Metals Industries

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CHAPTER I. Introduction

1.1 Background and Objective of the Research

This research is an ex-post analysis of the impact of China's export subsidy policy on its economic development associated with its exports, and the USA policy change against China's exports. China's rapid economic growth will be analyzed with special consideration of worldwide Antidumping (AD) protectionism against its exports. Comparative statistical data on China's exports to the USA and the rest of the world (ROW) will be organized to evaluate the effect and efficiency of its export subsidy policy based on counterfactual analysis of the USA Countervailing duty (CVD) policy change against China's exports. The thesis is that distortion in the international trading system responds to WTO sanctioned AD and CVDs in a manner that depends on the price elasticity of demand and supply, as interpreted within a partial equilibrium framework.

The research empirically and theoretically assesses the structure of China's formidable economic development, and attributes it to its openness to international trade by WTO accession in 2001[1]. With regard to USA, China and the world economy, the emergence of China is the most important thing that ever happened economically and it became a main stream research topic (Mundell and Becker)[2]. Only ten years after its WTO accession, China's influence can be summarized by observing that just as the WTO has had a significant impact on the development of China's economy, at least by guaranteeing market access for its trade, China's accession has also made the organization stronger. The

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[1] Protocols on Accession for the People's Republic of China.
http://www.wto.org/english/thewto_e/acc_e/protocols_acc_membership_e.htm#china

[2] Mundell, Becker, Summer and Zoellick gave special Nobel speeches at the AEA annual meeting at Chicago, Jan 2012 on the topic of "United States and China in the World Economy" which is focused on the hegemony power of the USA and emerging power of China. Mundell focused on China's special economic structure and development pattern under guidance of its central government. Becker especially mentioned China's human capital accumulations and its role in the economic development process.

main interest and motivation is that despite receiving substantial AD and CVDs measures on its exports, China's GDP has grown rapidly. It was approximately 1/24th as large as the global GDP in 2001, growing to 1/14 as large as the global GDP in 2008, and to 1/12th as large in 2009, according to statistics published by the International Monetary Fund (IMF) and the United Nations (UN, 2010). From 2001 to 2010, China's exports rose by nearly 6 times to roughly $1.57 trillion, while imports rose by nearly the same order of magnitude to $1.39 trillion, making it the world's largest exporter and second-largest importer (WTO summary data base).

Abundant materials and interesting arguments have indicated that there is no precedent for an economic ascendancy as rapid as that of China, whether measured by its speed or value. Such an extraordinary transformation was probably unimaginable in the earlier days of China's reform and its WTO accession[3]. Hence, the most remarkable thing about China's economic development is openness to international trade and induces world level technology by its WTO accession. China's economic reform from 1978 and pre-WTO phenomenal growth are well analyzed by Arayama and Mourdoukoutas (1999). They attributed China's growth to its low-cost, mass-production capacity with imitated technology from overseas[4]. As commonly recognized in the traditional trade literature, trade has been a vehicle for prosperity in many regions and areas of the globe[5]. Trade offers new and diverse opportunities for all by promoting economic growth and higher incomes, and by offering access to better goods, services, capital, knowledge and

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[3] Lu, Ding, Guangzhong James Wen, and Huizhong Zhou (2003) have compared China's pre-WTO period and its post-WTO period and concluded that China's economy have been rapidly globalized through the WTO.

[4] See Arayama and Mourdoukoutas's in-depth analysis on China's economic structures from 1978 to 1999. This was China's Pre-WTO period and they mainly focused on China's low-cost manufacturing system and its imitated-technology-pattern from other developed countries. Their research is a complementary reference and source for the intended research to analyze China's economic infrastructure on the eve of its WTO accession. The authors were skeptical about China's expansion of its low-technique exports to the international trade due to lack of its own technological innovation.

[5] See Chacholiades's (1973) contributions on this literature; the pure theory of international trade.

technology[6]. In this same spirit, these aspects are particularly true and effective in the case of China by its WTO accession and joining the global trade system, esp. by its large scale and low-cost manufacturing system.

During the recent crisis, named the Great Recession, which hit the global economy in 2008-2009 and continues until now, China's relatively stable economy has been an important factor in keeping the global recession from widening and deepening, especially as developed countries needed to look to China for their export growth. Recent studies on the trade and global recession by Eaton and Kortum (2011) and others highlight the importance of trade in the global economic development[7]. They concluded that the Great Recession was the worst recession for the USA and Germany, but China and Japan had moderate contributions of trade decline. Even China showed high positive signs on its durable manufacturing productivities, whereas others showed negative signs.

Optimistic views by economists Lin, Cai and Li (1995) explicitly demonstrated that the "China Miracle" is mainly due to its comparative advantage-oriented development strategy, which improves efficiency and raises output. Garnaut (2006) and Lin (2002) estimated that China would likely overtake the USA to become the world's largest economy by 2020. Cooperation with the Chinese government is important for the USA to arrest the downward spiral resulting from its financial crisis. And the USA and China are pursuing coordinated approaches toward global issues though formal and informal "G-2" mechanisms [Bergsten et al., (2008), Zoellick and Lin (2009)]. At the other extreme, pessimists began to assume and believe that problems such as income inequality, bad

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[6] Gordon (1987) and Barro's (2008) theory on growth will be supportive to this literature.

[7] See Eaton, Kortum, Neiman and Romalis new research on the trade and global recession. They ran a special project to evaluate the Great Recession and its causation by analyzing trade as a percentage of the GDP, and concluded that 80% of the decline in this cross ratio was due to the decline in trade on durable manufacturing sectors. Compared to the Great Depression in 1930 -1937 which was caused by increased trade frictions, and the USA Recession in 2001, which was entirely explained by demand shocks, this Great Recession in 2008-2011 is attributed to four kinds of shocks, such as demand, trade frictions, deficits and productivity shocks.

financial assets, lack of intellectual property rights, environmental degradation, and corruption will result in an imminent collapse of China (Chang, 2001 and Pei, 2006). Uneven growth as a macroeconomic aspect may undermine the sustainability of China's economic growth in the near future (Chaudhuri and Ravallion, 2006). China exported its potential unemployment by practicing predatory pricing and dumping activities based on low-labor costs and state subsidies (Sarma and Lich, JEPA Nov., 2010). In general, the sustainability of the breakneck ascendancy and growth of China have become an interesting and challenging topic of major international debate. Nevertheless, China's exporting prowess and ballooning trade surplus have been eliciting increasing attention both from academic and policy circles. Based on this point, this paper focuses on the special case of China in combination with China's government subsidy policy as its research objective.

China's subsidies on its export sectors include direct and indirect components that affect both the top and bottom lines of industrial operation[8]. For example, China's currency manipulation is considered as a top level government subsidy and industrial input subsidy is considered as a bottom line subsidy. These subsidies in China have been reflecting governmental dominance of the economy and from various factors including the central, provincial and municipal governments' strategic goals, patronage, corruption and even

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[8] Chinese government uses subsidies for a variety of purposes, and subsidies come in a variety of forms. Targeted incentive-subsidies such as preferential tax rate, artificial foreign exchange rate, preferential lending and loans, and government grants for cheap land are the most common form of subsidies. These incentives are used to attract foreign firms, encourage research and development, restructure certain industries, prolong the life or transfer ownership of failing firms, encourage the use of domestic equipment, promote the development of selected industries, provide cheap inputs to favored companies so as to effectively create predatory dumping to market entry, to promote economic development in certain regions, and to counteract the adverse economic effects of price controls. And keeping the Chinese currency artificially low, which depresses the price of Chinese exports in the global market place and makes them even more competitive. The Chinese competitors from strategic and heavyweight industries could reflect government incentive and control. These subsidies can arise from central government sources, such as the Ministry of Finance or Ministry of Technology; from state-owned banks; and from local government entities. These subsidies have been continued to provide Chinese firms with a significant competitive advantage vis-à-vis in the world market, esp. USA firms.

environmental degradation. These factors also are the main reasons for the economic agglomeration in Southern China and serious political issues such as income inequality between Southern China and Big Western Resource Rich China in terms of this regionally-favored policy. Even though the subsidy as an incentive to favored-firms is prevalent in China, as a matter of prudence the real scale and size of the subsidy is not easy to measure. Predecessors of the optimal tariff and subsidy theories, such as Johnson (1968 and 1972), Corden (1971 and 1974) and Bhagwati (1963, 1991 and 1996), have well established that subsidy is a distortion, and economic waste is created because the cost of increasing output to expand exports exceeds the revenue earned from the exports[9]. If that is the case, one needs to ask what China's economy would be like in the absence of subsidies, and what is the strategic purpose of this costly subsidy? Despite being called the oldest topic in the theory of trade policy, little is known about quantitative analysis of the strategic subsidy and its real market effect and efficiency on the economy. As commonly recognized, political, sociological and other considerations play a role in economic policies in general and commercial policies in particular[10]. Failure of the lengthy Doha negotiation was mainly about nations cannot get a concession on the agricultural subsidies for the developing countries[11]. Therefore it is very valuable to consider the importance of the export subsidy and CVD versus broader policy issues.

This research presents a primary hypothesis that export subsidies, as endogenous protections, have played a major role in China's "export-led-growth" strategy, effectively creating price discrimination for entry into markets. This is the main source of the proliferation of dumping activities of China's major export industries. An approach, that

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[9] Bhagwati and Ramaswami (1963) argued about optimum solution for domestic distortions by equating the foreign rate of transformation, the domestic rate of transformation in production, and the domestic rate of substitution in consumption. They concluded that to equate them at the same time by using either tariff or subsidy is impossible.

[10] See political economy motivation of the commercial policy discussed by Bhagwati (1991)

[11] See Matsumoto analysis and Japanese view on the Doha Development Agenda (DDA) negotiations after Hong Kong Ministerial(2006).

involves sophisticated examination of products, industries, firms and regions faced with AD measures, and government subsidies they received, will be adopted respectively. Then the hypothesis is empirically evaluated via industry-exports and legal case-based constructed hybrid panel data sets. The second hypothesis, as a theoretical aspect of the research, is that conditional imposition of AD and CVDs are "Offsetting Duty Norms" and their results are "Level-Playing-Fields" which is alternative to the traditional optimal tariff theory "Beggar-Thy Neighbor".

Substantial literature has been dedicated to the optimal tariff and subsidy arguments as traditional theory of distortions by the above mentioned predecessors. But research concerning export subsidy versus CVD operations and arguments has been rare. Many WTO law case studies have intensively focused on worldwide proliferation of AD and CVD measures. However, economic research focused on the economic effect and efficiency of AD and CVDs on the distorted revenue is less common. Chang and Gayle (2006) ran an economic analysis for the ongoing continuation of dumping and subsidy offset acts. They have criticized costly WTO legal procedures; however, they did not shed light on the efficiency issue of these "Offsetting Duty Norms". Zhao and Wang (2008) have demystified the first USA CVD case on China with its special Non-Market economy status[12]. They only mentioned the CVDs will have a big economic impact on China's exports to the USA. A recent study by Kelly (2007) presented a simple arithmetic model of AD and CVDs with respect to their "Offsetting Duty Norms" features. His analysis was a purely non-calculus-type expression of the procedures of the legal rules, and he did not shed light on any consideration regarding economic effects of these trade policies. Therefore, as far as is

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[12] Non-Market Economy is a special topic in WTO AD law and CVD law implementations and WTO accession negotiations. These usually created two-tier membership especially with USA and EU. See Polouektov (2002) and Sohn (2005) critical analysis on these issues.

known, analyses of the intended research on the "Offsetting Duty Norms" from both geometric and mathematical approaches have not yet been done by others.

Multilateral trade liberalization is mainly about reducing tariffs so as to globalize the world economy. Meanwhile there are exemptions for utilizing WTO trade remedies as contingency measures, such as AD duty[13], countervailing duty (CVD)[14] and Safeguard as protection mechanisms in the WTO regulations. In times of economic turbulence and global growth slowdowns some have advocated globalization and more trade liberalism (Friedman, 1979; Ben-David, 1993; and Becker, 1971) while others have suggested more protectionism (Johnson, 1968 and 1971; Corden, 1974; Helpman and Krugman, 1989; Vousden, 1990; Bhagwati, 1999; and Stiglitz, 2005).

Trade remedy measures of the WTO have been taken against trade distorting and illegal commercial practices. The measures have frequently used AD laws, which counter dumping with offsetting duties, and CVDs laws, which counter unfair subsidies, to level the international playing field in goods[15]. An AD measure can be applied on a country-selective basis, and its application is discriminatory and flexible. Whereas Safeguards can be applied on a non-discriminative basis called the global Most-Favored-Nation (MFN) basis[16]. Furthermore, the "serious injury" standard for safeguard measures is higher than

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[13] GATT Article VI and the Agreement on Antidumping (formally the Agreement on Implementation of Article VI of GATT 1994) provide internationally agreed rules on the conduct of antidumping investigations and the application of antidumping measures. Imposition of AD measures is country-specific and case-specific, namely, its application is selective. Unlike Safeguard measures, the implementation of AD measures does not require the government to provide offsetting concessions or consent to countermeasures taken by the trading partner.

[14] Article XVI of GATT 1994 and Article VI of GATT 1994 deal with Subsidy and Countervailing Duty. The countervailing duty is a "special duty levied for the purpose of offsetting any subsidy bestowed directly or indirectly upon the manufacture, production or exports of any merchandise." (GATT Article VI.3). GATT In China's case, these Articles are accompanied with the Protocols on Accession for the People's Republic of China and China's Accession Working Party Report (2001). Such CVD actions are usually applied in tandem with ADs for the Non-Market Economy countries, such as China and Vietnam.

[15] See Vermulst (2005) detailed explanations on the trade remedy measures.

[16] Section 201 "Global Safeguard" is a good example for its non-discriminatory nature. Section 201 of Tariff Act 1974 (Escape Clause/Safeguard). Following is a well-known example: Steel 201 safeguards were established by the USA and applied to its imports globally, not to a specific country.

the "material injury" standard for AD measures. Therefore its investigation and application are very costly, and easily arouse criticism. These are the main reasons for the declining use of Safeguard measures and proliferation of AD measures. The latter is one main concern of this paper. As for economic downturns, experience shows that restrictive trade policies such as contingency measures function as a form of insurance for external circumstances, or as an instrument of economic adjustment. Economic adversity has been testing the policy ingenuity of governments both at the global and domestic level.

The research has identified the circumstances when there is an economic rationale to implement contingency measures, such as AD and CVD measures on unfair imports based on statistical analysis of WTO data. As explained above the purpose of the AD is to prevent a predatory market entry and monopoly, and CVD is to only offset a subsidy. This study treats the AD and CVDs as incentives for changing economic behavior of firms and industries, and also implies that discriminative monopolists exist only in imperfect competition. The WTO perspective on counterbalancing effects of CVDs usually ignores the influence of price elasticity of demand and supply. The pattern of analysis presented here, which incorporates the elasticity concept into the legal procedure, will provide better accurate information on markets; as a result, it can illuminate and quantify the effect and efficiency issue of the policy application.

1.2 Methodology

The central idea of the intended research falls within the interdisciplinary field of the philosophy of law and economics, and its focus is on multilateral trade-flows within the

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http://www.stewartlaw.com/stewartandstewart/PracticesServices/TradeRemediesPractice/Section201of theTradeActof1974/tabid/72/language/en-US/Default.aspx
http://www.usitc.gov/ext_relations/about_itc/us201.htm (visited at October 2007). As of November 2008 there are 67 AD cases, 34 Safeguard cases, and 17 Subsidy cases among 383 WTO cases in dispute.

WTO framework which have been considered as a distortion-contaminated system. Therefore the analytical framework of the research is a combined method as viewed from a law and economics perspective, in an effort to evaluate the economic significance of the real effects of the trade policies[17]. Such as Bhagwati (1996) says *"There is no other area of international cooperation and negotiation where economic and legal aspects are so much intertwined as in trade".* By interdisciplinary analysis of such behavioral sciences, the WTO helps the multinational system to eliminate distortions so as to reduce economic uncertainty and provide a systematic-guarantee to the creation of the long-run niche market. Without objective criteria and adjusting mechanisms, it is difficult to measure how far the distorted world is from the ideal situation, and how large is the distorted part. In the system, economic incentives of nations cannot go beyond the WTO regulations; namely, in order to fulfill their WTO commitments, all economic activities of member nations should be under this incentive-constraining framework. Under this concept, the distortion is usually one which goes outside the commitments. Therefore the key issues to understanding the role of the multinational system and its regulations are documentation of the incentives and how to measure them.

The primary goal of the WTO is to promote development of free and fair international trade by eliminating trade distortions and externalities. If the WTO regulations and its case laws, in addition to business morality requirements, represent how the nations would like the multilateral world system to work, then the trade flows between nations, as indicators of the real economy, demonstrate how the system actually does work. Using trade-flow data to examine a nation's economic behavior, and using case law data as information to observe a nation's legal behavior, and knowing what to measure, and how to measure it, are the keys to understanding what is really going on in the economic system and whole society as well.

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[17] See Posner (1995) contributions to this interdisciplinary studying on the law and economics.

The economic approach to the analysis of AD and CVD laws seeks to answer two basic questions about the WTO legal rules. One is a descriptive question; it concerns the effect of the laws on economic behavior and outcomes. For example, will imposition of the CVD and AD duties result in fewer disputes and cases by elimination of the trade transgression? Second is a normative question; what is the economic desirability of these legal rules for the establishment of social well-being via costly legal procedures versus tolerating distortions. Economist might ask whether the WTO rules on the conditional imposition of the AD and CVDs eliminate distortions the way they intended.

Approaches of the research involve three main line inquires. First, it presents empirical observations and arguments for the ex-post analysis of the policy issue. Second, it provides theoretical arguments for the impact of the commercial policy. Theoretical part of the research mainly addresses three questions: 1) Has the CVD functioned the way it was intended by returning the distorted world trade to a "world price" status of fair trade? 2) Why does research incorporate and emphasize elasticity approach to the policy concern? 3) What would be the change in the trade value with and without export subsidy? Third, the research conducts simulation and extrapolation techniques to combine the empirical judgment to the constructed-theory and find reasonable solutions to the policy implications. Therefore the whole process is a micro analysis of the macro data as a consequence.

In order to clarify and emphasize the rapid growth of China's economy and its influence on the world economy the paper first divides the global economy into two components; world without China and China itself by using a weighted-sum analysis approach. Then based on these two components, the proliferation of AD measures is analysed along with the economic growth and downturns respectively. Chinese GDP has been rising rapidly despite growing AD measures against its exports, and their correlation is positive, whereas

the world without China case shows a negative correlation. Then the research selects China's "Top Ten Industries" as its research base in terms of its national and international influences and empirically evaluates effects and efficiency of the subsidy policy. Nonetheless, for purposes of this empirical analysis, the industries will be discussed as a whole and the trade value of individual industries will be used in the simulation and extrapolation processes for the policy implication.

A method of comparative static analysis discussed by Mundell (1968) will be employed to describe a policy intervention on economic activities. His target was on the change in price with respect to the change in policy, whereas the research presented here extends Mundell's analysis of the change in price with respect to the change in policy to the subsidy elasticity of trade value which could provide an additional, but a straight-forward insightful result on the analysis of the efficiency of the policy. Comparative static analysis provides a theoretical framework for representing tariffs, such as AD and CVDs as offsetting norms, consistent with WTO principles of free and fair trade. The mathematical model allows derivation of the subsidy elasticity of trade value which can evaluate the effect and efficiency of export subsidies on the home country's revenue. The theoretically derived ratio of revenue with and without distortion suggests a method for estimating price elasticities of demand and supply. The main finding of the paper is a functional relationship between trade value, unilateral policy and the price elasticities of demand and supply, which is denoted as a "kappa" function for simplicity. The total differential of trade value with respect to subsidy and tariff helps to explain frequently arising tit-for-tat trade disputes among nations when tariffs are not functioning as offsetting norms. Then market effects and efficiency of these unilateral commercial policies will be theoretically evaluated in terms of the elasticity concept. Finally, the empirical analysis can be used to answer "what if" questions after estimation and extrapolation of the statistical data, relying on the

assumption that the past impact of a policy may give projections about what can be expected from a future change in policy.

1.3 Data Sources

Data on AD and CVDs cases law are from documentation of WTO trade sanctions, Chinese statistical year books for its industry-level data, and USA import statistics in specific trade sectors are the primary sources of data. Worldwide proliferation of the AD initiations and measures against China's exports will be collected by specific case law studies for the basic analysis of the research.

The research conducts comparative statistical analysis for China's exports to the USA and the ROW respectively in the three time periods, based on the time of the Chinese WTO accession and the CVD duties imposed on Chinese exports by the USA specifically. The three time periods are; Pre-WTO (before 2001), Post-WTO- Pre-CVD (from 2001 to 2006), Post-WTO-Post-CVD (from 2006 to 2008). A time series of data on trade flows from China to the USA from 1995 to 2008 reveals several trends that can be related to China's transitional time periods and its WTO accession.

The research presents hybrid panel data sets for China's "Top Ten Industries". Industry-based specialization and organization are used based on the international benchmark Harmonized-System (H-S) of tariff classification of the World Customs Organization (WCO) associated with its specific Chapters and Sectors, and its 2-digit H-S commodity set for the specific products which are subject to AD duty protectionism[18]. The

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[18]Harmonized Commodity Description and Coding System, generally referred to as Harmonized System or simply H-S, it is a multipurpose international product nomenclature developed by the World Customs Organization (WCO). It comprises about 5,000 commodity groups, each identified and arranged in a legal and logical structure and is supported by well-defined rules to achieve uniform classification. The system is used by more than 177 countries and economies as a basis for their Customs tariffs and for the collection of international trade statistics. The Harmonized System is governed by the International Convention on the Harmonized Commodity Description and Coding System.

hybrid panel data sets are comparatively useful and valuable work can be done at the aggregate level. These hybrid panel data sets for China's representative "Top Ten Industries" are constructed as sources of economic and legal information for the analysis of the policy issues in the real market situations. These industries are selected based on the frequency of AD measures against them, and they are examined based on their domestic output and exports.

The hypothesis of a strong causation between domestically subsidized industries and the "Top Ten Industries" that faced AD measures is examined. An approach that involves sophisticated examination of products, industries, firms and regions faced with AD measures, and government subsidies they received, will be adopted respectively.

1.4 Structure of Dissertation

The rest of the dissertation is organized as follows:

Chapter II contains empirical work for the background of China's industrial structures associated with export subsidies to its "Top ten industries". Then the research evaluates these policy-favored industries and their decomposition in China's economy. The result of this empirical work demonstrates national and international significances of these industries in the anatomy of China's economy. These findings as empirical judgments will provide a launching pad for the creation of the constructed-theory.

Chapter III formulates theoretical analyses of the empirical works in terms of a policy intervention. Theoretical analysis involves two kinds of approaches; a geometric approach and its corresponding mathematical approach. The first approach is a graphical analysis of the general theory of subsidy and CVD in a three-panel international trade diagram. WTO rules on the conditional imposition of the CVD against an export subsidy will be a rigorous assumption of this theory. Modeling these "Offsetting Duty Norms" in a semi-schematic

way is one of the main features of this research. Based on these norms an *ad valorem* CVD rate must be equal to the *ad valorem* subsidy rate.

The second approach is a mathematical model for exports from a single country in partial equilibrium. A criterion of the sensitivity of trade value with respect to the change in subsidy will be found, and then a solution of the sensitivity of the trade value with respect to the change in both subsidy and tariff simultaneously will be created. An illustration is provided by approximating the excess demand and excess supply functions as being of constant elasticity or so-called Cobb-Douglas preference. Mundell's (1968) recommendations for a method of comparative static analysis will be employed to evaluate and estimate general effects of the trade policy, more specifically, the effects of subsidy and CVD on the total revenue. For the estimation of the effect and efficiency issue, the research highlights a non-linear function of the demand and supply elasticities as its main feature. One of findings of this mathematical approach is a functional relationship among the value of trade, the export subsidy and its opposing CVD by employing an elasticity concept as a measurement of the effect of the subsidy and CVD on the value of trade. A simple model with constant price elasticities can indicate a solution to the ratio of trade value with and without subsidy, respectively. In this way, the constructed-model is useful to estimate the expected distorted revenue. The second finding is a non-linear and specific functional combination of the price elasticities of demand and supply, which is crucial for estimating market effects and efficiency of the trade policies. This function is denoted as a "kappa" for simplicity and it can be interpreted as a "*policy efficiency indicator*".

Chapter IV examines policy implications via simulation and estimation of the parameters such as demand and supply elasticities, net subsidy rate and distorted-trade values. This observation is an examination of the response of China's economy to the USA CVD policy. Simulation and estimation for three main industries, specifically machinery,

textiles and base metals, from the heterogeneous-mixture of the "Top Ten Industries" will be conducted. Based on the theoretical solution, the research empirically evaluates and estimates the effect and efficiency of the subsidy policy by calibrating trade value data and net subsidy rates for these symbolic three industries and draws out practical solutions for the policy implications. Finally, the empirical analysis can be used to answer "what if" questions after estimation and extrapolation of the statistical data, relying on the assumption that the past impact of a policy may give projections about what can be expected from a future change in policy.

Chapter V presents a general summary and conclusion.

CHAPTER II. Evaluation of China's Growth, Industrial Structures and its Export-Promotion Policy: Empirical Evidence from "Top Ten Industries"

2.1 Introduction

This chapter is an empirical analysis of China's economic growth and its core industrial structures in the context of proliferation of AD duties over the past two decades. The research mainly investigates the empirical evidence of real conditions both in legal case studies and economic statistical data. First, case law analyses will be conducted on the proliferation of the AD measures against China's exports in the framework of the WTO. In order to clarify and emphasize the rapid growth of China's economy and its influence on the world economy with its special economic structures, the paper first divides the global economy into two components, "world without China" and "China" itself by using a weighted-sum analysis approach. Then based on these two components, the proliferation of AD measures is analysed as protectionism. The frequency of protectionism during economic prosperity and downturns is illustrated and analyzed both at the global level and with respect to China separately[19]. Classification of China's export industries in the framework of the AD measures they received in relation to its rapid economic development is the main feature of this chapter. In this way the research will single out net AD and subsidy rates for the favored "Top Ten Industries" and empirically illuminate the national and international significances of these industries. This is a crucial finding and it is a launch-pad for the constructed-theory of the next chapter.

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[19] Hallworth and Piracha (2006) observations on the macroeconomic fluctuations and AD filings based on the evidence from a new generation of protectionist countries is a good reference for these intended observations on the "world without China" and "China".

2.2 Proliferation of AD Protectionism against Chinese Exports

Empirical studies show that China has become a leading dumping country and an object of anti-dumping duties (see Table1 below). Success in China's highly distorted trade is the combined result of the China's numerous industrial and commercial policies which exploit the tremendous Chinese excess production capacities in its goods. In such a situation, China's export industries encourage fierce price competition in the world market, esp. during downturns. The involvement of the government, which presses for keeping production lines widely open and workers employed, greatly accentuates this tendency. Sales in export markets below the price in the home market or sales below the cost is the most frequent result for dumping. Briefly, dumping occurs if a foreign firm sells its products at a price below what it charges in its domestic market or third countries (price discrimination), or below the cost of production. Dumping is considered as monopolistic price discrimination, or as an oligopolistic tactic to eliminate competition, or to enforce a cartel between international, national and regional markets. The consequences of dumping have resulted in market segregations and distortions, income disparities and unemployment due to unfair competition and monopolistic powers. There is no doubt that the final results of dumping activities are economic expansion, and it requires both economists and lawyers to solve these problems[20]. As Joan Robinson (1969) said "*Price discrimination could not exist under conditions of perfect competition, even if the market could be easily divided into separate parts*". The goal of the AD Agreement of the WTO is to protect domestic industries from unfair competition and monopoly[21].

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[20] See Prusa (2005) AD is a growing problem in international trade.

[21] Antidumping Agreement (ADA) Art. 1, Principles, Art 2. Determination of Dumping. For the purpose of this Agreement, a product is to be considered as being dumped i.e. introduced into the commerce of another country at less than its normal value, if the export price of the product exported from one country to another is less than the comparable price, in the ordinary course of trade, for the like product when destined for consumption in the exporting country.

Table 1. Worldwide AD Initiations and Measures among Nations (years 1995 to 2009)

					Unit: Number of Cases	
	China	Korea	U.S.A.	Chinese Taipei	Japan	Others
Initiations	761	264	205	198	155	2100
Measures	538	164	122	128	112	1010
Percentage of Measures	25.50	7.80	5.80	6.10	5.30	49.50

Sources: WTO summary database
*WTO summary statistics on ADs are compiled from semi-annual reports of WTO members. Available at: http://www.wto.org/english/tratop_e/adp_e/adp_e.htm

Data used to make Table 1 indicated that 42 countries out of 101 AD users imposed 538 AD duties against China. Table 1 shows that this proportion is 25.5 % of the totals 2074, and it demonstrate that China has been a major target of AD measures[22]. Korea, with 164, ranked second, is far behind China. However, despite receiving overwhelming AD measures on its exports, China's GDP has grown rapidly since its accession to the WTO as explained in the Introduction. This phenomenon is the interesting point and motivation of the research. Previous studies by Corden (1971) have focused on general aspects of economics and protectionism. He has expounded, reviewed and developed the normative theory of trade policy. His subject-matter was really the principle of government intervention in the economy at the micro-level, especially government subsidization on private industry[23]. However the authors mentioned above did not incorporate relative panel data sets for the quantitative analyses of the real effect of distortion on total revenue.

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[22] See Iyenger (2004) China tries to dump WTO Antidumping rules.

[23] Corden puts particular emphasis on the income distribution effects of trade policy on the fiscal implications of various kinds of government intervention, such as subsidy. He has shown that the case for free trade was developed simultaneously with the case for laissez-faire. The income distribution that is yielded by the laissez-faire solution may not be a desirable or just one, because it cannot guarantee full employment. He also shed light on the argument that a country can improve its terms-of-trade at the expense of other countries and so obtain net gains by some degree of trade restrictions. He used the geometric approach in the measurement of the domestic distortions also in the criteria of the twin concepts. His focus was on general aspects of economics and protectionism in the small country case and incremental export subsidy. Incremental export subsidy is a simple subsidy paid only on the increment in exports over some specified base, and it is largely motivated by a desire to reduce the size of the transfer

2.3 Weighted-sum Analysis Approach on World GDP Growth with and without China

In order to empirically demonstrate Chinese economic influence on the world discussed in the introduction, this section will employ a weighed-sum analysis approach. This methodology helps to separate GDP growth rates and AD protectionism into two components, and to analyze the main themes of a world case versus China's case. An estimate of world GDP growth rate, excluding China was made as follows:

Basic assumption: World Real GDP growth rate can be approximated as a weighted sum of China's contribution and the contribution of the "World without China."

$$\hat{g}_{w/} = k_c \cdot \hat{g}_c + (1 - k_c) \cdot \hat{g}_{w/o} \qquad \text{(a)}$$

$\hat{g}_{w/}$ is the World Real GDP growth rate with China.

k_c (weighting factor) is the ratio of China's GDP to World GDP (China's share of the World GDP).

$\hat{g}_c$ is China's Real GDP growth rate.

$\hat{g}_{w/o}$ is world real GDP growth rate without China.

Solve for $\hat{g}_{w/o}$:

$$\hat{g}_{w/o} = (\hat{g}_{w/} - k_c \cdot \hat{g}_c) / (1 - k_c) \qquad \text{(b)}$$

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from taxpayers to producers. The best documented case being the Australian Export Expansion Grants Scheme. (1978-1983); see Kleiman and Pincus (1981,1982).

Table 2. World and China's Real GDP Growth Rates

<div align="right">Unit: Percentage of the GDP</div>

Symbol	k_c	$\hat{g}_c$	$\hat{g}_{w/}$	$\hat{g}_{w/o}$	$\hat{g}_{w/} - \hat{g}_{w/o}$
	China's share of world real GDP	China's real GDP growth rate (%)	World real GDP growth rate with China (%)	World real GDP growth rate without China (%)	China's "ascendancy" in world GDP growth rate (%)
2001	1/24	8.30	1.50	1.20	0.30
2008	1/14	9.00	2.00	1.46	0.54
2009	1/12	8.70	−0.80	−1.68	0.88

Sources: United Nation (UN) database（2010）
*Annual GDP growth rates were obtained from the UN archive of World Development Indicators, available at: http://data.un.org.

Table 2 shows that China's GDP has grown rapidly from approximately 1/24th as large as the global GDP in 2001, to 1/14 as large as the global GDP in 2008, and to 1/12th as large in 2009. These empirical data in Table 2 provide quantitative evidence of China's emergence as a global economic power, and its growing to dominance in the international market. This is a typical shift-share analysis on GDP growth between the world and China by itself. This empirical evidence on the comparable data of global economic growth and proliferation of worldwide AD measures analysis will make the research distinct. In these two comparative categories, the research separates GDP growth rates and AD protectionism into two components, and applies them to the world with and without China cases, respectively. Distinctly different pictures emerge in the next section.

2.4 Economic Growth and AD Protectionism: China vs. World

This section analyzes World GDP growth rates without China in comparison with the total number of AD measures among nations excluding China.

Figure 1. World GDP Growth Rate & WTO AD Initiations (World without China)

Figure 1 shows the frequency of AD initiations and global GDP growth rate, where both data sources exclude China (see section 2.2 above for growth rate methodology). The AD initiations are by all WTO members against their trading partners, except China, and the Global GDP Growth rate also excludes China's contribution. The figure implies that the level of macro-economic business activity has been associated with how frequently AD duties are imposed. This is a typical explanation of the commonly recognized negative relationship between business cycle and protections[24]. The case of China is shown separately below. The relationship between these two variables, global growth rate without China and AD initiations against China, can be subjectively analyzed as a negative correlation, and it can also be tested by using a regression model in an objective statistical analysis.

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[24] Bagwell and Staiger (2003) contributions on this literature are supportive to this argument.

Figure-2. GDP Growth vs. AD Initiations (World without China)
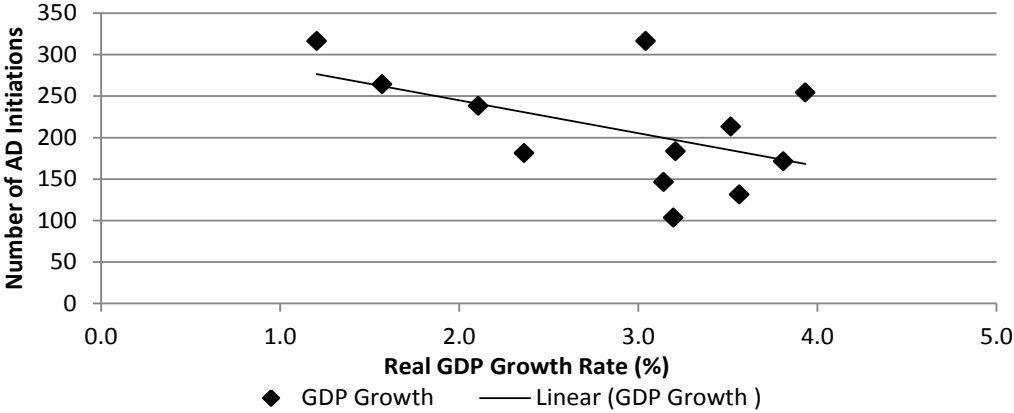
Sources: UN Data for global GDP growth rate, WTO summary database for AD

The simple correlation coefficient of these 2 variables is: r = -0.5. This simple correlation coefficient between global real GDP growth rate and global AD initiations excluded 2009, because this was an extreme case of global slowdown in GDP growth rate. By using this correlation coefficient, the illustration shows that global GDP growth rate has been negatively correlated with protective tariffs such as AD initiations and measures.

The AD initiations can also act as a threat, and may affect firm's "unfair" behavior, and thus market outcomes such as "market disruption" occur, even if the relevant legal instruments are not actually used. In this sense, protectionism policy can be treated as something which is exogenously determined. The interpretation of this correlation data could be that utilization of AD measures demonstrates countries' propensities to protectionism during economic downturns. The use of AD initiations has risen during the global economic downturns and fallen when the economy became better[25]. This is the

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[25] World Trade Report 2009: Trade Policy Commitments and Contingency Measures. General tendency of the world business cycle is that the use of AD initiations has risen during the global economic downturns andfallen when the economy became better. http://www.wto.org/english/res_e/publications_e/wtr09_e.htm [Accessed 7.3.2010]

typical cyclical nature of the protectionism. Compared to the world without China case, next is an analysis of China's relatively stable GDP growth rate in light of the AD initiations against its exports.

Figure-3. China's GDP Growth Rate & WTO AD Initiations
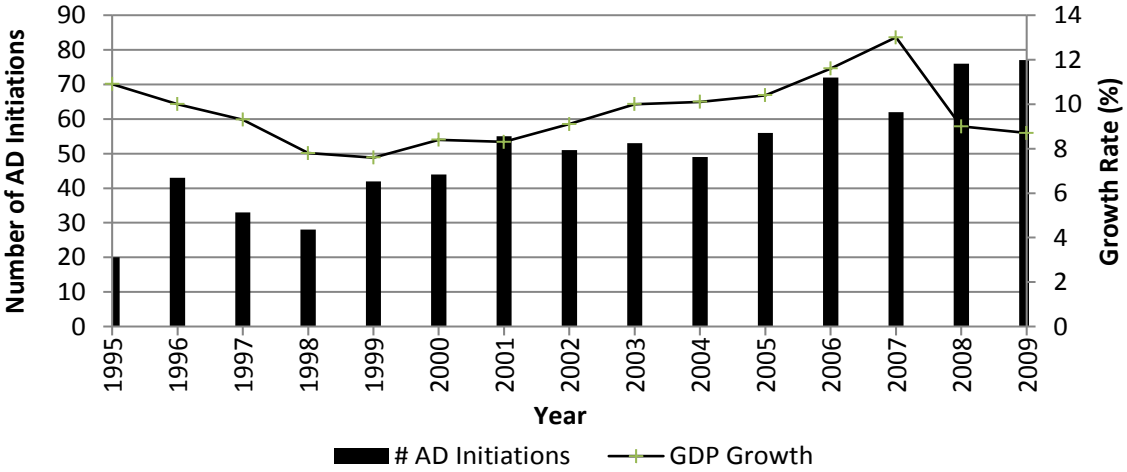
Sources: China Statistical Yearbook,　WTO summary database for AD

Figure 3 shows the frequency of AD initiations against China, and its GDP growth rate from the establishment of the WTO. Contrary to the global case, the relationship between these two variables, the GDP growth rate and AD initiations against China, can be visually analyzed as a positive correlation, and it can also be tested by using a regression model in an objective statistical analysis, as shown in Figure 4.

Figure-4. China's GDP Growth vs. WTO AD Initiations against China
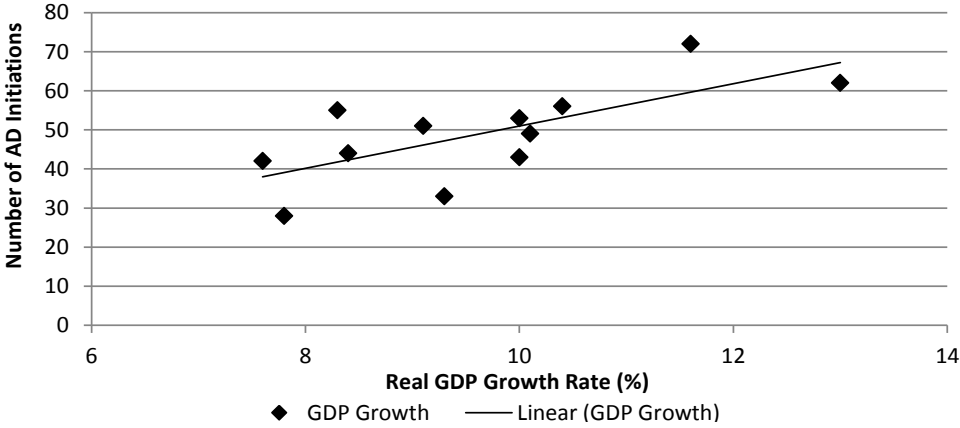
Sources: China Statistical Yearbook,   WTO summary database for AD

The simple correlation coefficient of these 2 variables is: r = 0.7. (excluding the 1995 beginning, and 2008 ending years). The result shows that China's relatively stable GDP growth rate does have a positive correlation with increasing protectionism against it. This can be interpreted as increasing Chinese exports receiving contingency measures more frequently to counter economic expansion via dumping activities.

How do we explain the differences between the Global Case and China's case? Empirical evidence shows that China's GDP has grown rapidly even during economic downturns, despite the fact that it has been receiving more than a quarter of total AD protectionism, making the answer to this question of particular interest.

The severe downturns of the past 15 years are: 1997-98 (Asian financial crisis); 2001-02 (bursting of the dotcom bubble, and terrorist attacks on the World Trade Center on 11th September 2001), and 2008-2009 (the Great Recession; the current extreme global economic crisis). As explained in the introduction, the Great Recession was the worst recession for the USA and Germany, but China and Japan had moderate contributions of trade decline. Even China showed high positive signs on its durable manufacturing

productivities, whereas others showed negative signs. That is the main reason for this research to pursue an in-depth analysis of China's growth and its commercial policy which resulted in exporting prowess and a ballooning trade surplus. Another indicator of China's ascendency in global trade is in the number of countries that have China as their largest trading partner, compared to the USA. Since 2006, when China had 70 such partners, compared to 127 for the USA, the numbers had almost reversed by 2011; 124 for China and 76 for the USA[26].

2.5 Hybrid Panel Data Sets for China's Export Industries that Faced AD Protectionism

In order to explain and document the domestic economic structures in which China's dumping activities are formulated, it is necessary to analyze its specific industries statistically. The China Statistical Yearbook reports domestic output and export trade values for the H-S economic sectors. These factors are used in this study to analyze patterns of economic and AD activities within China's industries. Export value data shows trade flows and their changes over time, not the reason for changes. Domestic output data shows industrial structures, but it cannot explain changes in the economy. AD data shows potential reasons for changes in trade flow, but not what actually happened in the economy. These data sets alone have limitations for measuring their influence on China's economy. Therefore a hybrid analysis of these three data sets was done to compensate for their respective weakness and effectively show their strengths in China's economy.

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[26] See the most recent news article on the China's ascendency by Joe McDonald and Youkyung Lee. They conducted a project and analyzed that in just five years from 2006, China has surpassed America's century-old status, as a trading partner for much of the world and this change is gradually translating into political influence. They concluded that this emergence is due to China's breakneck rise, rather than a US decline and this phenomena is the most abrupt global shift since World War II.   Available at: http://hosted.ap.org/dynamic/stories/A/AS_CHINAS_REACH_TRADING_PLACES?SITE=AP&SECTION=HOME&TE MPLATE=DEFAULT&CTIME=2012-12-02-11-05-45

2.5.1   China's All Export Industries under H-S and AD Category

Industry-based specialization and organization are used for these industry selections. The priority is given to all China's industries which are subject to AD measure protectionism in international trade. The uniqueness of this panel data set is that these industries are selected in the sub-category of a predation framework which has not yet been done by others. Therefore the construction of these tables can be considered as hybrid panel data sets derived from case law information and economic value data for the certain purposes and problems pertinent to this research.

Table 3. China's All Industries and AD Measures They Faced (year-by-year and totals)

Unit: Number of cases

Industry Name	WTO.HS Chapters	WTO HS-Sector	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Total
Animal	1–5	I						1					1
Vegetable	6–14	II	1				2	1		1			5
Oil/Fat	15	III											0
Foodstuff	16–24	IV	1	2		1			2		1		7
Mineral	25–27	V	1	1							2		4
Chemical	28–38	VI	7	6	7	10	12	9	3	6	16	5	81
Plastic/Rubber	39–40	VII			2	6	3	4	3	4	5	1	28
Leather	41–43	VIII							1				1
Wood	44–46	IX	1				1		2		1	1	6
Wood pulp	47–49	X			2	1		2	2		2		9
Textiles	50–63	XI		1	3	1	1	8	6	3	3	7	33
Footwear	64–67	XII	2	2					1	1			6
Stone/Cement	68–70	XIII	1		2	2	1	2	1	3	2	2	16
Precious Metals	71	XIV											0
Base Metals	72–83	XV	4	6	6	14	7	6	2	3	8	18	74
Machinery	84–85	XVI	2	3	3	3	2	3	2	3	4	9	34
Vehicles	86–89	XVII				1	3			2		1	7
Instruments	90–92	XVIII		1		1	1	1		1			5
Arms	93	XIX											0
Furniture/Toys	94–96	XX	3	1	7	2	6	2				2	23
Art	97	XXI											0
Special	98–99	…											0
Total			23	23	32	42	39	39	25	27	44	46	340

Sources: Global Antidumping Database (Bown, 2010) and WTO summary database (2010).
* The Global AD database contains details of AD actions that have been extracted from semi-annual reports of WTO members by Bown (2010). The database is updated from time-to-time.

Table 3 shows the number of AD measures received by all sectors (all industries), as defined by the WTO H-S benchmark associated with its Chapters and Sectors for the specific products. This information is shown by year and by number of AD measures. The

evidence shows that the AD measures are concentrated in certain sectors: chemicals, textiles, base metals and machinery, etc.

2.5.2 China's Symbolic "Top Ten Industries"

From Table 3 above, it is convenient to select the "Top Ten Industries" which are frequently subject to AD measures. The system has classified products into "2-digit H-S commodity" categories for its trade data.

Table 4. AD Measures against China's "Top Ten Industries" (year-by-year and totals)

Unit: Number of cases

Industry Name	WTO.HS Chapters	WTO HS-Sector	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Total
Chemical	28–38	VI	7	6	7	10	12	9	3	6	16	5	81
Base Metals	72–83	XV	4	6	6	14	7	6	2	3	8	18	74
Machinery	84–85	XVI	2	3	3	3	2	3	2	3	4	9	34
Textiles	50–63	XI		1	3	1	1	8	6	3	3	7	33
Plastic/Rubber	39–40	XI			2	6	3	4	3	4	5	1	28
Furniture/Toys	94–96	XX	3	1	7	2	6	2				2	23
Stone/Cement	68–70	XIII	1		2	2	1	2	1	3	2	2	16
Wood Pulp	47–49	X			2	1		2	2		2		9
Foodstuff	16–24	IV	1	2		1			2		1		7
Vehicles	86–89	XVII				1	3			2		1	7
Total			18	19	32	41	35	36	21	24	41	45	312

Sources: Global AD Database (Bown, 2010) and WTO summary database (2010).
* The Global AD database contains details of AD actions that have been extracted from semi-annual reports of WTO members by Bown (2010). The Database is updated from time-to-time.

Table 4 shows 312 measures for the "Top Ten Sectors", whereas table 3 showed 340 measures for all 22 sectors. The "Top Ten Sectors'" share of all industries' AD measures is

91.8 %, although they represent only 45% of the total 22 sectors. In this sense, these industries can be representative for the analysis of the research. The analysis is next extended in terms of the average tariff rates for each sector, their export and output values, and the ratio of exports to output values.

Table 5. Average AD Duty Rates (%) against China's "Top Ten Industries" (2000 to 2009)

Unit: Percentage of AD duties

Industry Name	WTO.HS Chapters	WTO HS-Sector	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Average
Chemical	28–38	VI	142		25	147	115	155	35	116	103	115	106
Base Metals	72–83	XV	50	176	23	80	81	38	47	8	119	95	72
Machinery	84–85	XVI	29	66				94	25	64	131	144	79
Textiles	50–63	XI		87	70			50	264	44	65	10	84
Plastic/Rubber	39–40	XI				46	50	32	18	38	107		48
Furniture/Toys	94–96	XX	69				304	198				86	164
Stone/Cement	68–70	XIII											
Wood Pulp	47–49	X			165			190	258		53		166
Foodstuff	16–24	IV	52	184									118
Vehicles	86–89	XVII					384			30			207
Average%			68	128	71	91	187	108	108	50	96	90	100

Sources: Global Antidumping Database (Bown, 2010) and WTO summary database (2010).
* The Global AD database contains details of AD actions that have been extracted from semi-annual reports of WTO members by Bown (2010). The Database is updated from time-to-time.

Table 5 lists average AD duties that were calculated for several products in several chapters of specific sectors. In Sector XIII, Stone/Cement industries' cases there were 16

price undertakings[27] other than AD duties for Chinese export firms. Even though the average AD duties rates are highly variable for each year, they are rather significant.

A question that might be asked is "how can China's economy be doing so well when its representative core industries are being confronted with these substantial AD duties? The question addressed next is why China's main export industries engage in sales below cost so as to be vulnerable to AD measures?

China has a series of interconnected and mutually reinforcing policies, esp. in its State Owned Enterprises (SOEs) sectors which are considered as main focuses of exports and domestic investment. That is the question the research considers next. Reforms over the period of 1992-2005 were an attempt to quicken the pace of economic growth, capital accumulation and creation of employment. In this period the priority of economic policy was mainly focused on accumulation of foreign capital via providing export subsidies as incentives for all export firms, including the private sector[28]. Under this subsidy-incentive policy, firms only pursued their efficiency in productivity and engaged in "price competition" rather than "quality competition" of their exports. In this period, the economic growth was gained by quantitative accumulation, and this development pattern can be considered as an "exogenous development pattern". Nevertheless, this price competition policy resulted in cheap prices and abundant low-quality exports so as to disrupt the international market. This was one of the main reasons for China's exports to become very cheap in international markets and vulnerable to AD measures.

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[27] Price undertakings function as AD duties.
[28] One of the obvious examples of export incentives was the 9% export reimbursement or refund for firms' exports. This was a nationwide declaration of the export subsidy policy, and it was considered as illegal and eliminated after China joined the WTO in 2001.

In the case of trade between China and the USA, a major change in trade policy took place in 2007 when the USA Department of Commerce reversed a 23-year old policy of not pursuing CVDs against NMEs countries by invoking WTO sanctioned CVDs against imports from China (World Bank Report 4560, 2008). The reality is that the USA filed a petition to the WTO in 2005 and alleged Chinese subsidized imports have caused significant impacts on world markets by encouraging excess production and trade, depressing world prices[29]. The cheap imports were injurious to their home manufacturers and they claimed to be losing their jobs and export earnings. As a result the USA levied a series of AD and CVD duties, which offset the effects of subsidies, simultaneously against China's subsidies on its export firms. Consequently after legal case studying, the research found that China's subsidies on its exports were functioning as a backup power against the intensive proliferation of AD duties against its exports world-wide. Therefore the answer for the above question came from this evidence of China's intensive subsidies on exports of its core "Top Ten Industries".

2.6 Sources of Price Discrimination

2.6.1 Export Subsidy

This section takes USA CVD duties against China's subsidized exports as empirical evidence to reflect and assess the nature and scale of China's government subsidies[30] policy, which is performing as a main tool in establishing state-monopoly.

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[29] See also Zhao and Wang (2008) detailed explanations on the first USA CVD case on China's exports.

[30] United States-China Economic and Security Review Commission reported on China's government subsidies to strategic industries known as "absolute control" and "heavyweight" industries. These industries were specified in a "guiding opinion" issued by China's State Council and State-Owned Assets Supervision and Administration Commission (SASAC) in December 2006. The State Council is the highest executive organ of state power, as well as the highest organ of state administration. The SASAC

Xin Huahao（辛华豪, 2011）overviewed China's formidable growth after its WTO accession and linked this growth with corporate strategy, monopoly strategy and many aspects of the industry abuse, etc in his book. He literally analyzed monopoly status of China's state-owned enterprises and considered the monopoly-behavior as a main culture of China's business ethics. Finally, he determined this culture as a serious problem for the future development. However, he neither specified any monopoly firms and type of government subsidies nor their impacts on the China's economic growth.

These subsidies have provided China's SOEs with a significant competitive advantage vis-à-vis both international and national markets. This section attributes the proliferation of Chinese export firm's dumping activities to the extensive government regime. Based on this point, this chapter focuses on the special case of China's government subsidy policy as its research objective. As explained in the introduction, the CVD is a special duty levied for the purpose of offsetting any subsidy bestowed directly or indirectly upon the manufacture, production or exports of any merchandise. The CVD duties were imposed by the USA on China's exports from 2006 to 2010 after the export subsidies were investigated and proven by the WTO rules.

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manages the Chinese Communist Party's efforts to control SOE, while increasing their "economic return and maintaining political returns to the government".

Table 6. Number of USA CVD Measures and Average CVD Rates against China's "Top Ten Industries" which have Frequently Faced AD Measures, after 2006

Unit: Number of Cases and Average CVDs in Percentage

Industry Name	WTO HS Chapters	Year WTO HS Sectors	2007	2008	2009	2010	Average CVD(%)
Chemical	28-38	VI			1		35.8
Base Metals	72-83	XV		3	2	2	83.1
Machinery	84-85	XVI		1	2		131.5
Textiles	50-63	XI		1		1	183.5
Plastics/Rubber	39-40	VII		1			7.2
Furniture	94-96	XX				1	414.7
Stone/Cement	68-70	XIII				1	100.8
Wood Pulp	47-49	X	1	1			59.8
Foodstuff	16-24	IV					
Vehicles	86-89	XVII					
		total	1	7	5	5	127.1

Sources: US International Trade Administration (ITA)
*The US International Trade Administration (ITA) publishes AD and CVDs Federal Register Notices under the Decisions and Data section of its Import Administration (http://ia.ita.doc.gov/frn/index.html). The Global AD Database (Bown, 2010) also contains AD and CVDs details.

Table 6 shows that 8 out of the "Top Ten Industries", which frequently faced AD measures, have been subsidized simultaneously by different subsidy rates. These case law data demonstrate that there is a strong causation between export subsidies and dumping activities; the more the subsidy, the more the dumping; namely, China's export subsidy policy was functioned as a backup power for the creation of the international price discrimination[31]. As we mentioned above, these industries accounted for 85% of all industrial domestic output and 87% of all Chinese exports in 2008. In this sense, these

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[31] Since USA Department of Commerce's preliminary decision, published 9 April 2007 (Coated Free Sheet Paper the People's Republic of China: Amended Preliminary Affirmative Countervailing Duty Determination, 72 FR 17484, 9 April 2007) to allow CVD cases against NMEs. Simultaneous CVD and AD cases against China have been filed, and initiated by the Department with respect to off-road tires, circulated steel tubing, rectangular steel tubing, and laminated woven socks. See <http://ia.ita.doc.gov>

export industries are crucial to the Chinese economic growth patterns not only from its industrial domestic output, but also from favored-export sectors as well, and they have been functioning as special-interest groups. Therefore China's trade policies in practice are dominated by these industries.

The practical interpretation of these subsidy rates is that, taking machinery for example, when a Chinese firm sells machinery to the USA for $100, the firm will receive a reimbursement of $131.5 dollars from the Chinese government. For the sake of analysis, the research only takes the three highest subsidy rates, such as machinery, textiles and base metals, as examples to explain and classify the government subsidies and their role in China's trades.

The most important point here is that there is a strong causation between domestically subsidized industries and the industries which are subject to AD measures. This relationship supports the hypothesis that subsidy, as an endogenous protection, is a main source of the proliferation of dumping activities by China's major industries[32]. And the subsidies for the "Top Ten Industries" are strategic, namely, they have facilitated predation to gain market entry. The export subsidies in the cases are factor market distortion, and it is a result from strategic government policies. Cost reductions for production and investment by factor market distortions are effective ways to boost production so as to promote GDP growth, at least in the short term. This is a macroeconomic consequence of cost distortion. It is the main cause of China's products being so cheap in the international market and vulnerable to AD duties. This is consistent with what Ethier (1982) said about new dumping theory. "*The modern theory considers dumping as an integral part of the relationship between domestic factor markets and*

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[32] See also Arkolakis, Demidova, Klenow and Rodriguez (2008) analysis on the gains from trade with endogenous variety.

international commodity markets in a world of uncertainty, changes in technological conditions and sluggish adjustment". This modern dumping theory criticizes the traditional one as excluding fundamental contemporary problems, namely, imperfectly adjusting factor markets by changing conditions of product demand, and completely ignoring the fundamental relationships of factor-market equilibrium. Factor-market equilibrium analysis requires more detailed data and more sophisticated methodologies. Low factor prices resulted in a distorted industrial structure and a bias towards heavy industries, such as chemicals, base metals and machinery, as a result of cheap capital.

One could argue that, to some extent, these Chinese industries have a cyclical character, and economically they are sensitive to economic downturns. Ethier (1982) also showed that dumping can be the response of firms even in perfectly competitive markets during economic downturns, because firms face sudden uncertainty in terms of demand for their output, and are unable to adjust their production processes quickly. His explanation also suggests that dumping may be more frequent in a cyclical industry that experiences regular fluctuations in demand and industries where it is difficult to adjust capacity.[33] Therefore, cyclical industries such as chemicals, base metals, machinery and wood pulp are sometimes subject to protective tariffs. This phenomenon may be part of the reason why China's exports are the target of AD duties.

One more applicable reason is that the overwhelming dumping activities can be a way for Chinese firms to gain valuable trading experience to increase their technological knowledge, learning by doing, thereby increasing economic efficiency. Technical know-how can only be acquired from engaging in production via the process of social learning. This process also implies that firms became better with social experience and it can induce

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[33] A type of industry that is sensitive to the business cycle, such that revenues are generally higher in periods of economic prosperity and expansion, and lower in periods of economic downturn and contraction. Many cyclical industries produce durable, commodity-like goods such as raw materials, cars, chemicals, construction, paper, steel, and heavy equipment.

agglomeration. If world demand is high enough, export firms with technical know-how can push down the world price below the opportunity cost of production, with the result that firms take part in dumping easily.

2.6.2 Centralized Form of Chinese Economic Structure

Another main reason for the overwhelming dumping activities of Chinese firms is the centralized status of the Chinese economy. It has also opened an effective way for the SOEs and relation-based private enterprises to execute their dominant and monopolistic power over domestic and international groups, by receiving special and strategic government subsidies[34].

Analysis of the Chinese special political and economic status, which is regulated as a Non Market Economy (NME) in the WTO regulation, is also taken into consideration here. One might argue that China's spectacular growth has been achieved by its centralized form of government and low labor costs in the manufacturing system. The early literature on this issue suggests that the centralized government plays a major role in achieving aggregate level. The basic argument is as simple as it is a general and straightforward one. Just as Keynes (1936) pointed out in his foreword to the German translation of the *General Theory*: "*the theory of aggregated production, which is the point of the* General Theory*,…can be much easier adapted to the conditions of a totalitarian state [eines totalen Staates] than the theory of production and distribution of a given production put forth under conditions of free competition and a large degree of laissez-faire.*" By "aggregated production," he seems to have meant private plus government production, the latter being

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[34] "An Assessment of China's Subsidies to Strategic and Heavyweight Industries" Submitted to the U.S.-China Economic and Security Review Commission, By Capital Trade Incorporated 1200 18th St., NW, Suite 601.

particularly important in a depression to take up the slack created by the drop in private demand for goods and services. The centralized form minimizes redundancy, maximizes top-down control, and is optimal for relatively simple, mature production processes that do not require constant innovation and flexible adaptation to a rapidly changing economic environment. Opposite to centralized forms, representative democracies are designed to diffuse rather than concentrate political power. The decentralized form of management accepts redundancy and loss of tight control as the price for fostering innovation and adaptation by granting a considerable measure of autonomy to its industries. Hence, autocracy is more conducive than democracy to economic growth at least in the short-run and centralized forms would have less social costs in their administrative systems than decentralized forms. In this sense, one could argue that low social costs by centralized government is supportive for China to gain economic ascendancy in its aggregate level. This is especially true at this time.

Even though China introduced an anti-trust law on August 1, 2008, its establishment came so late and its enforcement has been rather random, as the government gave priority to economic growth, rather than regulation on the economic and social system. As Deng Xiaoping proclaimed, *"White cat, black cat, only the one which can catch the mouse is the best cat."* This philosophy became a national guideline for Chinese business entrepreneurs, and provided them formidable encouragement and incentives, and enabled them to compete with one another without market regulations. Another of Deng's quotes is *"Let some people and some areas get rich first, and then help other people and other areas get rich together"*. This regionally biased open policy associated with government subsidies resulted in very rapid export-based economic growth in coastal regions. In the meantime, the rapid growth also resulted in political problems such as large income and wealth disparities which are considered as domestic distortions between regions. Therefore,

China's economic ascendancy and unbalanced economic structure have been subject to criticism and skepticism regarding its economic and political sustainability.

During the reform period, the Chinese government focused on reform of product markets, including abandoning policy intervention in domestic markets and liberalizing trade in goods and services. Although product prices are determined in free markets now, in contrast, factor markets, including markets for labor, capital, land, energy, and the environment remain highly distorted. In addition, outside the property sector, land prices are artificially determined by government. These distortions generally push factor prices, and, therefore, production costs below levels that they otherwise would be determined by the market environment. In other words, these cost distortions are equivalent to production and investment subsidies, and they artificially increase production profits, raise investment returns, and strengthen the international competitiveness of Chinese products.

2.7 China's Economic Agglomeration with Respect to Subsidy Policy

This section will shed light on Chinese economic agglomeration which is resulting in serious political problems, such as income and wealth inequality in China. In addition to the significances of the subsidies on China's total output and exports, they also demographically influenced China's economy with their regional bias characteristics. The intended research attributes this agglomeration to the province and industry-favored subsidy policy.

Figure 5. Provinces and Firms Receiving USA CVD in China (2000– 2010)
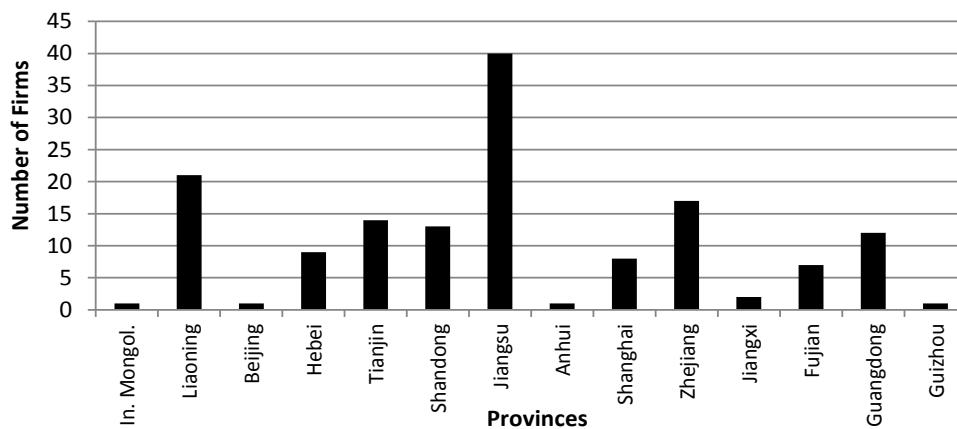
Sources: USA International Trade Administration (ITA)

Figure 5 shows the number firms which have received CVD duties and the provinces they belong to. After case law studies, we know that among the 147 firms indicated in Figure 5, 73 firms exported Furniture and Toys (Sector XX). They were mainly in coastal areas from Jiangsu, Liaoning, Hebei, Zhejiang and Shanghai and all received 437.11% net subsidy rate assessments by the USA International Trade Administration (ITA) on its income tax exemption subsidies. Another 36 firms had exports in sector XV, 16 firms had exports in sector XVI, 8 firms in sector XI and 6 firms had exports in sector X. As for Jiangsu 23 export firms received subsidies in Sector XX (Furniture, Toys and Miscellaneous), and 13 firms in sector XV (Base Metals and articles thereof) Liaoning: 17 firms in sector XX, 2 firms in sector XV and 2 firms in sector XIII (articles of Stone/Cement, Glass). Zhejiang: 7 firms in sector XX, 6 firms in sector XV and 3 firms in sector XVI (Machinery). Tianjin: 4 firms in sector XX, 9 firms in sector XV, 4 steel product firms received 615.92% net subsidy rates, the highest subsidy rates in this period on their income tax exemptions and reductions. Shandong: 4 firms in sector XI (Textiles). They received 352.82% net subsidy rate. 4 firms in sector XVI, 2 firms in sector XX and 2 firms in sector XV. Guangdong: 7 firms in sector XVI, 3 firms in sector X (Wood Pulp-Paper industry). Average net subsidy rates for those exports items are 239.38% based on their income tax exemption and reduction rates[35].

[35]These subsidies were reimbursed and distributed in the form of income tax reduction for the favored industries. In addition to these subsidy cases, there is a special provincial program for Guangdong and Zhejiang to Rebate Antidumping Fees.

Table 7. Number of firms and Net Subsidy Rates by Industry (USA CVDs; 2006 to 2010).

Unit: *Ad valorem* subsidy rate

	Industry	Chemicals	Plastic Rubber	Wood Pulp	Textiles	Stone Cement	Base Metals	Machinery	Furniture Toys	Total
	Location\Sector	VI	VII	X	XI	XII	XV	XVI	XX	
1	In. Mongolia						1			1
2	Liaoning					2	2		17	21
3	Beijing								1	1
4	Hebei		1						8	9
5	Tianjin		1				9		4	14
6	Shandong	1			4		2	4	2	13
7	Jiangsu	1		1	1		13	1	23	40
8	Anhui	1								1
9	Shanghai			1				1	6	8
10	Zhejiang				1		6	3	7	17
11	Jiangxi						2			2
12	Fujian			1	2				4	7
13	Guangdong			3			1	7	1	12
14	Gui zhou		1							1
	Total	3	3	6	8	2	36	16	73	147
	Average Net subsidy rates (%)	35.84	7.23	59.84	183.50	100.78	83.08	131.47	414.69	

Sources: USA International Trade Administration (ITA)
*The USA International Trade Administration (ITA) publishes AD and CVDs Federal Register Notices under the Decisions and Data section of its Import Administration (http://ia.ita.doc.gov/frn/index.html). The Notices contain details on firms and CVD rates against them. The Global AD Database (Bown, 2010) contains concise AD and CVD information extracted from national reports by WTO members.

Table 7 shows specific industries that received subsidies and the provinces they belong to. The empirical evidence demonstrates that government subsidies have implicitly focused on certain industries, like machinery, base metals and textiles etc. which are frequently subject to AD duties, mentioned above in Table 4. In addition to certain industries, the

Table 7 also demonstrates a regionally biased character of China's government subsidies. Based on this information, we could specify the locations of these state-favored firms as below.

Figure 6. Locations of Firms Receiving USA CVDs in China (2000 – 2010)

Sources: USA International Trade Administration (ITA)

Figure 6 shows numbers and locations of the firms receiving USA CVD. Obviously, the firms receiving export subsidies are all agglomerated in the coastal regions. These factors are one of the main reasons for the economic agglomeration in Southern China and serious political issues, such as income inequality between Southern China and Big Western Resource Rich China in terms of this regionally-favored subsidy policy. In this way, Table

7 and Figure 6 strongly implied that China's "export-led-growth" policy has a geographically biased nature in its domestic economic structure. This geographically polarized development pattern of China will be a future concern of this research. This unbalanced industrial structure and development pattern across provinces have provoked criticism and skepticism about the sustainability of China's great ascendancy.

2.8 China's "Top Ten Industries" and its Significances on Growth

This section illuminates the role of China's subsidy policy as being important in both national and international levels by analyzing decompositions of the "Top Ten industries" in the anatomy of China's economy. Industrial revenue of these symbolic industries in terms of their domestic output and export values will be examined. Being large manufacturers and pillars of the China's economy, these industries are highly traded sectors among others. First, at the national level these subsidized industries have substantial influence on China's industrial outputs.

Table 8. Gross Industrial Output Value of China "Top Ten Industries" (2000 to 2008)

Unit: USD 100 million

Industry Name	WTO.HS Chapters	WTO HS-Sector	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Chemical	28–38	VI	1769	1686	1873	2394	3441	4283	5523	7561	9428	37958
Base Metals	72–83	XV	1266	1320	1496	2106	3614	4374	5908	8665	11120	39869
Machinery	84–85	XVI	2443	2544	3059	4147	6339	7179	9408	12942	16014	64075
Textiles	50–63	XI	1177	1183	1339	1622	2351	2567	3230	4318	5057	22844
Plastic/Rubber	39–40	XI	363	366	429	529	882	883	1149	1589	1946	8136
Furniture/Toys	94–96	XX	132	135	158	204	353	354	459	620	768	3183
Stone/Cement	68–70	XIII	495	486	551	683	1202	1118	1477	2134	2886	11032
Wood Pulp	47–49	X	301	308	351	425	722	728	941	1350	1747	6873
Foodstuff	16–24	IV	1121	1117	1302	1560	2195	2472	3126	4447	5838	23177
Vehicles	86–89	XVII	719	782	1010	1355	1757	1911	2569	3723	4601	18427
Total			9786	9927	11568	15025	22856	25868	33789	47350	59405	235574

Sources: China Statistical Year Book (2001 to 2008)
*Available at http://www.stats.gov.cn/english/statisticaldata/yearlydata/

Table 8 shows that industrial output of the machinery industry is the largest among other industries, which are subject to AD protectionism. Second is base metals, and then chemicals, foodstuff and textiles. In 2008, these "Top Ten Industries" accounted for 85% of all domestic industrial output[36]. Next let's exam their industrial value in terms of their exports.

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[36]Total industrial output values in 2008 were 69917.6 US dollar (100 million). *China Statistical Year Book* (2001 to 2009)

Table 9. Export Value of China's "Top Ten Industries"（2000 to 2008）

Unit: USD 100 million

Industry Name	WTO.HS Chapters	WTO HS-Sector	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Chemical	28–38	VI	116	128	146	185	246	319	378	511	689	2718
Base Metals	72–83	XV	166	161	189	251	437	571	853	1155	1440	5223
Machinery	84–85	XVI	729	849	1159	1723	2478	3221	4140	5288	6108	25695
Textiles	50–63	XI	494	498	578	733	888	1076	1381	1658	1797	9103
Plastic/Rubber	39–40	XI	79	83	100	125	169	233	296	365	414	1864
Furniture/Toys	94–96	XX	182	189	240	295	367	470	576	690	833	3842
Stone/Cement	68–70	XIII	40	42	55	69	93	123	155	183	226	986
Wood Pulp	47–49	X	19	20	23	30	38	51	69	92	104	446
Foodstuff	16–24	IV	52	58	67	77	94	112	138	165	182	945
Vehicles	86–89	XVII	93	94	105	156	210	284	384	550	707	2583
Total			1971	2122	2664	3646	5020	6459	8371	10657	12499	53409

Sources: China Statistical Year Book (2001 to 2008)
*Available online at http://www.stats.gov.cn/english/statisticaldata/yearlydata/

Data in Table 9 shows that machinery, textiles and base metals are the leading three manufacture industries among exports which are subject to AD protectionism. Based on the same methodology used in Table 4, in 2008, these "Top Ten Industries" have accounted for 87% of all Chinese exports[37]. This ratio demonstrates that these subsidized industries have substantial influence on China's exports. After combining the information from all eleven tables above, the "Top Ten Industries" defined in terms of AD protectionism are also important in terms of their values of domestic output and exports. Therefore, there is no doubt that these industries are the main pillars for China's economic development, and their proportions in its GDP are rather substantial. Eaton and Kortum (2011) also

[37]Total industrial export values in 2008 were 14306.9 US dollar (100 million). *China Statistical Year Book* (2001 to 2009)

highlight the relationship between trade and GDP in the Great Recession[38]. Therefore, exports in these "Top Ten Industries" are critical to the functioning of the China's economy, while exports in the other sectors do not matter too much, so that trade openness to these crucial industries is very important and costly with high subsidy rates.

2.8.1 National Significance

This section illuminates the role of China's subsidized "Top Ten Industries" as being important in the national level. Growth rates of domestic output and exports values of the core industries faced AD measures are calculated based on Tables 8 and 9, respectively.

Figure-7. Growth Rates of Domestic Output and Exports: "China's Top Ten Industries"
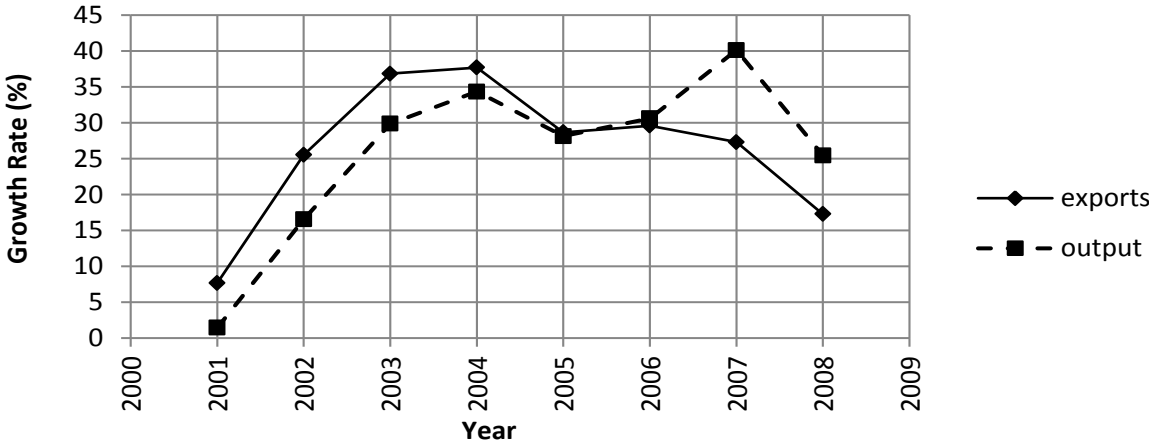
Sources: China Statistical Year Book, WTO Data Summary Database

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[38] See the Eaton, Kortum, Neiman and Romalis (2011) supportive analysis on the importance of trade in the 2008-2009 global recession which concluded that the changing composition of the GDP can largely account for the decline in trade relative to the GDP.

Figure 7 clearly illuminates that the growth rates of domestic output and exports of the "Top Ten Industries" have switched places after 2005 when the domestic output growth rate began to exceed the export growth rate. Figure 7 also clearly highlights the nature of China's growth rate pattern of its domestic output in terms of the identical industries whose exports faced AD and CVD measures. At the beginning of the period of its WTO accession, the export growth rate of the "Top Ten Industries" was higher than their domestic output growth rate. This is consistent with and crucial to China's opening policy process as an economy with a high proportion of exports with "export-led-growth" of its GDP. In pursuit of this objective, China's "Top Ten Industries" were designed mainly as export-oriented industries and they have been engaged in predation in their exports. Moreover, table 4 mentioned above also demonstrates that the "Top Ten Industries" share, in the total 22 China's industries' AD measures they received, is 91.8%, although they represent only 45% of the total 22 sectors.

This is a shift in China's two-growth-rate pattern; a shift from higher export growth rates before 2005 to the higher domestic output growth rates after 2006. The research attributes this shift to the USA policy factor which impeded Chinese transactions to the USA. As a matter of fact, this is the shift from an "export-led-growth" to the domestic "consumption-led-growth" pattern which is the symbolic pattern now. The export-led nature of Chinese economic growth suggested that the profitability of Chinese exports have acted to speed up the transformation of China from traditional to modern production, which was the essence of Chinese growth. An additional benefit was increased employment for millions of unskilled workers.

At the primary development stage, China's export subsidy policy was mainly used to promote exports to get hard foreign currency and import capital goods which were the urgent needs of the Chinese first development process. Therefore, government rationally

used subsidy as an incentive to its SOE, regardless of its efficiency. The core "Top Ten Industries" have been acting primarily to penetrate foreign markets with their enormous quantity of cheap and low-quality exports with the return with hard currency. Economic growth was initially achieved by quantitative accumulation. That is the main reason that Chinese products have been criticized as "market disruption" worldwide. China has maintained a persistently large positive trade balance in order to maximize employment in its favored regions and accumulate a huge balance of foreign currency, particular US dollars, by exporting to the world much more than its imports, especially regarding the USA. To some extent, some government subsidies on exports probably were costly with the only target of accumulating foreign currency for the further international market access. In this sense, we can say that providing a subsidy with high costs is an economic loss, but a political gain for a certain purpose. In this primary development stage, the industries' cheap-export behaviors might not be analyzed in the framework of monopoly, because these industries were still price takers. Specifying these industries in the predation framework will help the research to distinguish and quantify government subsidy-favored industries and their decomposition in the China's economy.

Based on Tables 8 and 9, in 2005, exports were 25% as large as domestic output. In 2008, this ratio had decreased to 21 % due to increased emphasis on domestic output. Comparing this phenomenon to the relatively stable Chinese GDP growth rate shown in Figure 3, the interpretation could be that Chinese export sectors have been increasing more slowly after 2005. This phenomenon can be considered as a transformation point for China's exports not only competing with price, but also competing with quality by its standardized product regulations under WTO consistency. On the national level, charging China's export firms with high AD and CVD rates might show a positive outcome. First, those firms that have extended low-quality dumped exports would be effectively penalized,

and encourage them to refrain from this unfair behavior in the future. It also would encourage them to build stronger domestic markets with high-quality products. The prediction from this figure could be that China's "Top Ten Industries" dumping frequencies will have a shrinking tendency in the future. On the other hand, the Figure 7 also implies that expanding domestic demand by increasing domestic output, investment and income has become the main feature of Chinese GDP growth after 2005. This development pattern can be considered as an "endogenous development pattern" based on investment and consumption-led growth in the scenario of China's current economic policy.

2.8.2 International Significance

This section illustrates the role of China's subsidized "Top Ten Industries" as being important at the international level. These subsidized industries have substantial influence on China's exports as analyzed in Table 8. After initiation of the investigations and imposition of the CVDs, the result has been a trade deflation of Chinese exports from the USA to the ROW in the international market as shown in Figure 8 below. Another reality is that because of this policy change from USA to the China, there are substantial circumventions of these high AD and CVDs from China's export firms[39].

The impact of these trade-remedy measures can be inferred by examining time series of exports from China to the USA as reported by the USA and from China to the ROW as reported by China[40]. Figure 8 vividly shows a change in the direction of the Chinese industries' exports to the USA but not to the ROW. Initiations of the investigations for the

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[39] Circumvention of the AD and CVDs are that in order to avoid to paying the duties, the export firms have change their export pattern such as assemble line exports or invest in the importing country as a manufacturer. See Yu (2007) circumvention and anti-circumvention in AD practice: a new problem in China's outbound trade.

[40] The combined analysis of reports from both China and the USA is necessary, because reports from China used here did not provide industry level data of its exports to each specific country. The consistency between Chinese and American reports was encouraging.

CVD measures actually began from 2005 by the USA ITC, and such initiations by themselves function as a threat of the imposition of duties on the commodities under investigation. This is one kind of positive role of the existence of the WTO regulations and rules.

Figure 8. A time series of exports of the "Top Ten Industries": Exports from China to the ROW and USA (with and without subsidy) from 2001 to 2008.
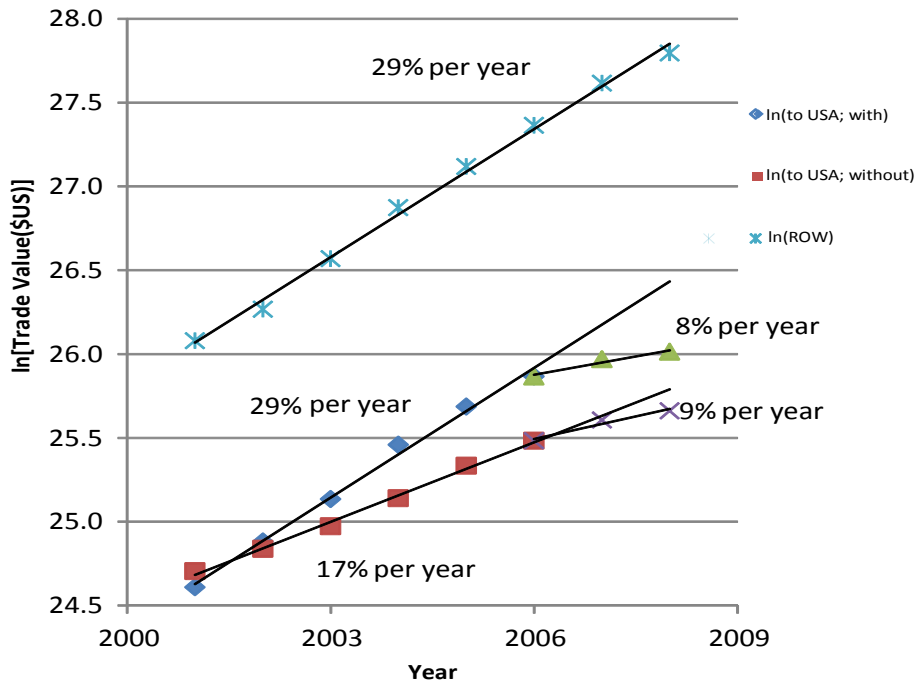
Figure 8 shows time series of exports from China (ln[Trade Value($)]) to the USA and the ROW from 2001 to 2008. The upper line shows a consistent growth rate of 29% per year for the entire period for ROW (blue asterisks), and a linear-regression fit to the data, indicating a growth rate of 29% per year throughout the period from 2001 to 2008. The

correlation coefficient is very high (0.99). China's exports to the USA, shown by the lower data series in Figure 8, have followed a more complex pattern, and it has not been monolithic. Subsidized exports (with; blue diamonds), to the USA also grew at 29% per year from 2001 to 2006, whereas non-subsidized exports (without; red squares) grew at 17% per year over the same period. Beginning with the investigations of the CVD duties in 2005 and after their imposition in early 2007 on subsidized imports, the growth rate fell to 8% per year (with; green triangles) while the growth rate of the non-subsidized (without; purple Xs) imports fell to 9% per year. One factor we could note is that there are probably other effects. Growth rates were determined by linear regression between time and the logarithmic values. Correlations exceeded 0.98 in all cases.

Imports into the USA from China, as reported by the ITC of the USA were separated into two groups and two time periods, based on the CVD information summarized in Table 6 above. The first group included industries that were receiving export subsidies according to the findings of ITC CVD investigations initiated in 2005, and as a result received CVD measures after 2006 and 2007[41]. A time series of the logarithm of trade value ($US) for the first group was further divided into two sections, from 2001 to 2006 and from 2006 to 2008 as shown by the blue diamonds (denoted ln(with-subsidy)) and green triangles in Figure 8. Those determined to be subsidized, as explained in the text, (blue diamonds and green triangles) and non-subsidized (red squares and blue Xs), and two time periods: 1) before the beginning of a new CVD policy by the USA (Pre-CVD period from 2001 to 2006) to be determined as with-subsidy period; 2) and after the beginning of the new policy (Post-CVD period from 2006 to 2008) to be determined as without-subsidized period. This is a typical counterfactual or retrospective analysis approach to estimate the effects of the

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[41] USA imports from China in specific sectors and products http://tse.export.gov/TSE/TSEHome.aspx
International Trade Administration (Trade Stats Express™)
China exports to USA and ROW   http://www.stats.gov.cn/english/statisticaldata/yearlydata/
National Bureau of Statistics of China

subsidy on the trade value. The growth rate of this first group decreased from 29% per year to 8% per year after the beginning of the CVD Measures era. The second group of industries included those not subjected to CVD measures after 2006 are considered as non-subsidized industries; they were also divided into two sections, from 2001 to 2006, and from 2006 to 2008, as shown by the red squares (denoted ln(without) and purple xs in Figure 8. The growth rate of this second group was 17% per year, lagging behind the first group, and then decreased to 9% per year after the beginning of the CVD measures era. It appears that the CVD not only influenced subsidized industries but also influenced the non-subsidized industries a little. Here we can say that probably there were some other reasons for the change in growth rates of the non-subsidized industries.

The trade value statistics shown in Figure 8 indicate responses to trade policies of an exporting country China, and an importing country USA. For example, the difference in short-term growth rates between subsidized and non-subsidized exports would be expected to depend on the amount of subsidy and the price elasticities of demand for, and supply of, the commodities in question. It may be reasonable to assume that the difference in growth rates is in direct response to the subsidy, because after the USA imposed WTO sanctioned trade-remedy measures on China's exports in 2006 and 2007, the growth rates of both categories fell to approximately the same amount. The decrease in growth rates from 29% per year to less than 10% per year suggest a 20% effect of subsidy on trade value, assuming an exact counter-balancing effect of the trade remedy on the subsidy, as required by WTO regulations. Alternatively, one could assume that the growth rate of the non-subsidized commodities would have increased from 17% per year to 29% per year, if they had been subsidized to the same degree and if their price elasticities were comparable. A combined analysis of Figures 7 and 8 highlighted the impact of USA policy change against China's exports. In the national level, this policy shock influenced China's endogenous

development pattern and created a clear shift between "export-led-growth" and "consumption-led-growth" pattern. In the international level, this policy shock resulted in trade deflation for China's exports from the USA.

Summary

This section has shown empirically that China's GDP growth rate and the frequency of protectionism against China have a positive correlation, whereas the world economy without China shows a negative correlation. It also disclosed that, in contrast to world GDP growth, China's GDP growth has been raising despite the proliferation of AD measures as protectionism against China. The global experience of economic growth and the frequency of global AD measures indicate a policy reaction and propensity to protectionism, which is an increase in the utilization of AD measures during economic downtowns. The objective is to protect domestic industry from unfair competition while being consistent with WTO regulations. The "Top Ten Industries" of China were chosen in terms of the number of AD measures they received. Using data analysis from China's "Top Ten Industries" that faced AD measures and its domestically subsidized firms respectively, the paper evaluated the hypothesis that there is a strong causation between domestically subsidized major industries and the "Top Ten Industries" that face AD measures. This is the main reason for the proliferation of AD measures against China. It was found that the "Top Ten Industries" were subsidized by government, and they have been engaging in significant dumping activities during periods of economic growth and downturns. This chapter infers that China's trade policies are dominated by these special-interest industries and they can represent both the national and international level development.

CHAPTER III. Theoretical Analysis of the Subsidy and CVD Policy

3.1 Introduction

This chapter first introduces an excess supply "shock" caused or disturbed by a parameter which is considered as China's distortionary export promotion policy. The specific form of this promotion policy is export subsidies on China's crucial "Top Ten Export Industries" as discussed in Chapter II above. Then analysis will be on the imposition of the AD and CVDs from USA against China's dumped exports so as to offset the effect of the export subsidy. The principle of "Offsetting Duty Norms" and the elasticity approach are considered to be the essence of this chapter. Explaining the effects and efficiency of the policies via an elasticity concept is the main feature of this chapter and the whole research. This elasticity model will show that the percentage change in trade value is a function of the percentage change in subsidy with a dependence on the price elasticities of demand and supply.

3.2 Demystifying AD and CVDs as Offsetting Duty Norms under WTO Regulations

Trade remedy measures of the WTO as contingency measures, imposed by the use of exception and escape clauses, are being substituted for the traditional tariff as a result of trade liberalization. The traditional tariff has its "optimum" property, and the main purpose and result of the tariff is "Beggar-Thy-Neighbor". It goes beyond the protection function and mainly maximizes one country's welfare at the expense of other countries. However, WTO sanctioned trade-remedy measures, such as AD and CVD duties are conditionally imposed and functioning as offsetting norms against unfair trade. The AD duties are measured against an unfair export price which is considered as "selling-below-

cost", while CVDs are measured against illegal subsidies which can accelerate predatory dumping to gain a foreign market entry. The duties offset the level of trade transgression only, restoring the distorted-trade price to initial free and fair world price, which is the ultimate goal of the WTO. This result of this process is called a "Level Playing Field" so as to guarantee Pareto-Optimality in the world point of view. Therefore, the offsetting norms function only as a method of protection.

The main concern of this chapter is the offsetting-norm property of AD and CVD duties, as this property is extremely important for presenting the essence of economic arguments. Unlike traditional tariffs which have created distortions in trade, the AD and CVD duties are viewed as a response to the unfair trade, and they cannot create distortions in trade. Instead rather as a norm; they precisely correct a distortion-contaminated trading system. Being unilateral commercial policies, their role in the GATT/WTO negotiations have been increasingly important in recent decades[42].

Krugman (1997) found that trade policy debates and disputes within the WTO framework had nothing to do with the optimal tariff argument. And also Ossa (2011) established a new theory on GATT/WTO negotiations by providing economic logics which are linked to trade policy debates[43]. On the other hand, other economists, especially free-trade advocates, disagree with the view that AD and CVDs cannot create distortions in

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[42] See an alternative analysis by Ronald, Cass and Richard, Boltuck, they even recommend that AD and CVD laws can be applicable to deal with "environmental dumping" by their offsetting duty norms features. See Fair Trade and Harmonization (1996). pp. 352

[43] The author attributed GATT/WTO negotiations mainly to nation's unilateral trade policies. His new theory builds on a rationale for unilateral protection policy. In his model, the higher the import tariff, the larger is the number of domestic manufacturing firms; the larger is the number of domestic manufacturing firms, the lower is the domestic price index; and the lower is the domestic price index, the higher is domestic welfare. He concluded that, this new trade theory can be viewed as a response to politically motivated protectionism, and the theory can also evaluate GATT/WTO rules on production subsidy.

trade and criticize them as a political distortion to free trade[44]. Despite critics against these measures, the AD and CVD have become the most prominent expression of trade protections permitted under WTO rules, and applications of the measures, enjoying their special political status, have proliferated. Nevertheless, the measures also can be utilized as a tit-for-tat strategy for trade flows among nations, especially between China and the USA[45]. Keyimu (2009) also illustrated abusive utilizations of the AD measures for the tit-for-tat purpose, especially between the USA and China. Subramanian and Wei (2007) and Chaudhuri and Ravallion (2006) also criticized the WTO as it promotes trade strongly, but unevenly.

3.3. Comparative Static Analysis of the Export Subsidy and CVD

3.3.1 Diagrammatic Approach

This section diagrammatically analyzes the effect of an export subsidy and CVD on the value of trade. A three panel diagram of international trade is useful for understanding the application of the export subsidy from the Home country (China), and imposition of an equivalent rate of CVD from the Foreign country (USA). Its result ends up as returning the distorted trade price to its initial free and fair world price as discussed in the Introduction. The linear forms used to construct the diagrammatic approach assume an *ad valorem* subsidy rate σ, and *ad valorem* CVD rate μ[46]. Based on empirical case law findings in Chapter II, WTO rules on the conditional imposition of the CVD against an export

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[44] See Kyle Bagwelland Robert W. Staiger (2006), for an analysis of the logic of GATT/WTO rules regarding export subsidies. Their results indicate that the new WTO subsidy rules may ultimately do more harm than good to the multilateral trading system.

[45] USA imposed AD and CVDs simultaneously on Chinese "Top Ten Export Industries", such as, machinery, textiles and base metals, etc, in 2007 in different high tariff rates.

Then China also imposed AD and CVD duties simultaneously on Chicken imports from USA in 2009 and on Grain Oriented Flat rolled Electrical Steel in 2010.

Ministry of Commerce of the People's Republic of China ("MOFCOM") has imposed AD and CVDs on certain automobiles from USA in Nov 20, 2011, including any and all annexes.

[46] See Hirshleifer and Clazer (2005) Price Theory and Application and they explanations on the *ad valorem* tax rates and Mankiw (2007) Principle of Economics.

subsidy, namely, that the *ad valorem* CVD rate must be equal to the *ad valorem* subsidy rate, is a rigorous assumption of this theory. The CVD can be analyzed in more condensed fashion than general unit tariffs which were analyzed by Johnson (1968, 1972), Corden (1971), Krugman (1994) and Feenstra and Taylor (2008). Moreover, schedule-based analysis of an *ad valorem CVD* rate that is the equivalent of the subsidy rate makes this research more sophisticated and complicated. Modeling these "Offsetting Duty Norms" in a semi-schematic way is one of the main features of this research which has not yet been done by others. The benchmark of this modeling process is the standard modern theory of tariff which is recommended by Krugman (1994).

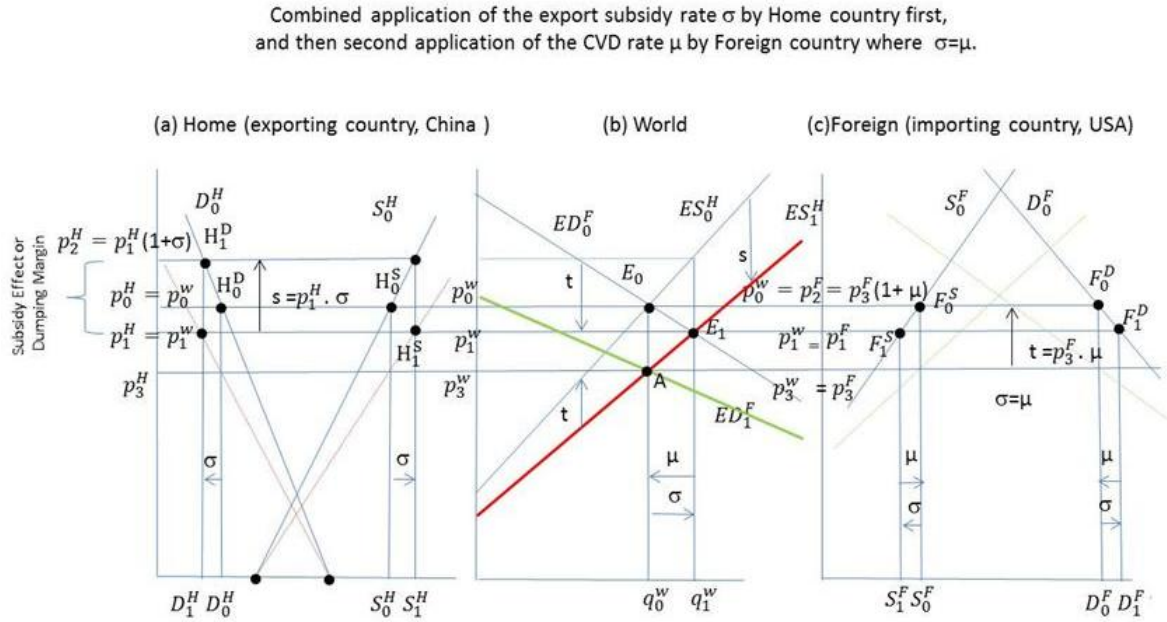Figure 9. China's Export Subsidy and USA CVD against It: Two Large Country Case

Figure 9. A three panels international trade figure with linear demand and supply curves, price levels, and corresponding quantities for; a) an exporting Home country that provides an export subsidy, b) world excess demand and supply under this export subsidy shock, and c) an importing Foreign country and its imposition of subsidy equivalent CVD.

The modeling exercise undertaken here replicates the "Level-Playing-Field" rationale for AD and CVDs by restoring the distorted-world prices (p_1^H and p_3^F) to its initial free trade world price(p_0^W). Figure 9 shows how excess supply from an exporting country and excess demand from an importing country change when the exporting country adopts a trade promotion policy through a subsidy on its exports. When this subsidy σ applies, Home supply increases from S_0^H to S_1^H because of an increase in the Home producer's price from p_0^H to $p_1^H(1+\sigma)$, which is the Home country market price for its producers after subsidy, thereby causing output to rise and increasing exports as shown in panel (a) above. However, industries export at price p_1^H which is lower than the world equilibrium price p_0^W. After their whole export process, China's government will reimburse a subsidy for the industries in the amount of $p_1^H \cdot \sigma$ as shown in panel (a). In China's market, consumers are hurt by this high price. However, producers in the "Top Ten Export Industries", as a special-interest group discussed in Chapter II, gain and government loses because it must expend money on this subsidy program. The function of this subsidy is a cost reduction from p_0^H (*normal cost or value*) *to* p_1^H for the export-manufacturing industries in the Home country, therefore this phenomena is a "sell-below-cost"[47]. It influences the excess supply curve and shifts it to the right as shown in panel (b), increasing equilibrium excess quantity to q_1^W and decreasing equilibrium price to p_1^W at the new equilibrium E_1. Note that for this linear model the export subsidy decreases the slope and intercept of the excess supply function. Corresponding changes in import demand of the foreign country USA, are shown in panel (c) from $(D_0^F - S_0^F)$ to $(D_1^F - S_1^F)$.

The effect of the subsidy is to create a distorted-supply curve ES_1^H by creating price discrimination between Home price p_2^H in the Home country and import price p_1^F in the

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[47] Analysis of the relationship of domestic subsidies and cost in the normal value calculation incorporates two material assumptions: that normal value based on constructed value, that is, purely on costs rather than on sales, and that the subsidy affects proportionate CVD and the proportionate cost of production for normal value equality.

Foreign country, and obviously it shows that $p_2^H > p_1^F$. Based on WTO rules on price comparison, this is so called international price discrimination, namely, a dumping price in the Foreign country[48]. This price discrimination is effectively a predatory price to gain a market entry in the foreign market. After this price distortion, the Foreign country's excess demand for imports increases due to attraction of its cheap price. In the Foreign country, USA, original consumers who have been consuming their domestic supply for the identical goods shift their tastes to the cheap imported goods at price p_1^F. The cheap imports "sell-below-cost" causing a material injury to the manufacturing industry in the Foreign country. If the situation continues, the Foreign manufacturing industry will face competition by this dumped-import, and furthermore the factories will stop manufacturing so that its workers will lose their jobs. In the long run, the consequence of the predation will be a creation of a monopoly by the exporters. Based on WTO rules, this situation is considered as "unfair-competition" caused by dumping. The foreign country USA has authority to impose a tariff, t, to protect its manufacturing industry by offsetting distorted-trade value by the export subsidy s. This offsetting tariff t must be in the form of *ad valorem* CVD, and its rate should not exceed the rate of the home country's *ad valorem* subsidy rate.

The traditional theory of optimal tariff and subsidy is well established by Johnson (1972) and Corden (1971) and Bhagwati (1963 and 1991). Tariffs are the oldest form of trade policy and have traditionally been used as a source of government income. They are imposed by a country arbitrarily and unconditionally, and its main purpose is to maximize the nation's welfare at the expense of others. Effect of this optimal tariff is shown on the excess demand side, and it primarily shrinks the tariff-imposing country's demand for the imports.

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[48] See Czako. Human and Miranda (2003) detailed explanations of the dumping price and its legal investigations, due process and timing

As a modern theory of tariff, Caves and Jones (1985), Vousden (1990), Krugman and Obstfeld (1994), and Feenstra and Taylor (2008) have analyzed the revenue effect of tariff and also extended its effect to the domestic protection side and emphasized the latter effect as tariff's principle objective. This effect is shown on the excess supply side as an alternative theory for the quantity-restriction-tariff. In this modern theory, the purpose of the tariff is not only to provide revenue but also to protect particular domestic sectors. However, the AD and CVD duties, being trade remedy measures for a victim country, have been imposed conditionally and contingently when importers found and legally proved "injuries" to their manufacturing industry from the subsidized-cheap imports (World Trade Reports 2009).

Based on this modern theory the CVDs reduce the tariff-imposing-country USA's excess demand in panel (b) by increasing the price of imports and its domestic supply from S_1^F to S_0^F as shown in panel (c). The CVDs also restrict the Home country's excess supply quantity by making its import price costly, and this restriction shows its offsetting effect on the supply of the cheap subsidized-imports. China and USA are two large trading countries, therefore, the imposition of the CVD will influence world price and create a new world price p_3^w at point A, which is directly below the point E_0, by exactly the amount of the t. This is the net-of-tariff price for the exporter, with effects of the export subsidy rate σ and CVD rate μ.

Under the domestic protection policy of an import tariff t, the cost of delivering imports to the consumers in the importing country increases by the amount of a tariff price $p_3^w \cdot (1 + \mu)$. This price is the world price of p_o^w, and the tariff shifts the distorted-excess supply curve to the left proportionally and creates a "Level-Playing-Field" effect by returning the distorted world price to its initial free trade price which is the ultimate goal of the WTO. A specific net-of-tariff price can be calculated as $p_3^w = p_0^w/(1 + \mu)$. This "Level-

Playing-Field" effect of the CVD decreases the equilibrium excess quantity from q_1^W to q_0^W in panel (b). Corresponding changes in import demand in Foreign country is from D_1^F to D_0^F as shown in panel (c). The economic logic here is that a tariff CVD from the Foreign country protects its home supply so as to guarantee continuation of their manufacturing system by eliminating unfair price competition and trade transgression. The consumers, who have shifted their tastes to the cheap imports, now shift back their tastes to the home products due to the costly imports after the tariff. Being a tariff, the CVD also shifts the Foreign excess demand curve proportionally to the right as shown in panel (b) and creates a tariff revenue for the Foreign country in panel (c).

What we observe from these three panel diagram is Home country, China is always losing by providing export subsidies to its special-interest groups for the certain purpose. The result of the analysis suggests that export subsidy policy in practice is dominated by special-interest politics rather than consideration of national costs and benefits. The three panel diagram is an analysis of simulated economic world based on a schedule model which is not executed in practice yet. In this simulated economic work, Home's activity is distorted and its real effects depend on the price elasticity of demand and supply. This would be a next concern of the research. What we know from this analysis is that the WTO really deals with the simulated economic world rather than what is actually happening.

3.3.2 Corresponding Mathematical Approach

In this section, the general structural form of the demand-and-supply functions will be explained as mathematical versions of the visual model in Figure 9. The analysis and construction of the model will follow Mundell's (1968) comparative static analysis on a shift in policy and its impact on the economy. He has analyzed a policy intervention issue on the demand schedule and demonstrated a "demand-side-effect" of this intervention on

the economic structure which was suitable for the USA "consumption-led development pattern". Mundell's target was, first, on the change in price with respect to the change in policy to determined excess demand and then translate it into the appropriate income or price elasticity [49]. Arayama (2009) also employed a comparative static analysis on Toyota subsidies on Eco-car, and he found the price elasticity of car service revenue. Likewise, the research presented here follows a method of comparative static analysis, to compute the sensitivity of excess supply to a parameter which is considered as an export subsidy policy of China. Compare with Mundell's focus, the research analyzes the other blade of the scissor. Therefore this export-promotion pattern is considered as a "supply-side-effect" of this subsidy intervention on the economic structure which is suitable for the China's "export-led development pattern". This policy was the best solution and practical choice for China to encourage and increase the supply under the advice of the great economist Mundell (1996). Consequently, China has been successfully performing its "supply-side-effect" economy in the international market. Also Joseph Stiglitz has noted and mentioned several times that *"the real dilemma is not to find a perfect solution or a single one for all affected countries, but it is to choose between demand side and supply side policy"*.

The mathematical model described below assumes these economic behaviors are "non-linear", with constant price elasticities of demand and supply. Then the model is reduced with the purpose of determining a new equilibrium price and quantity so as to find a

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[49]Mundell (1968) has utilized policy approach on the condition of the comparative statics and determined the effect of the policy changes on the terms of trade or domestic price ratio. In order to derive the effect of the policy, he has recommended two kinds of approaches;

1) to directly differentiate the balance-of –payment equation with respect to the change in policy so as to get sensitivity of change in balance-of-payment to the change in the relative policy.

2) a more intuitive way of getting the criterion is to employ a device implicit in all comparative-static analysis. This is to compute the excess demand caused by the policy change, *on the assumption that the adjusting variable is constant,* and to equate this excess demand to the excess supply created by the actual change in the adjusting variable.

solution for the distorted-trade value. The elasticity approach introduces both richness and complexity in its effect and efficiency estimation. Becker's (1971) elegant explanation of the importance of the elasticity issue is on the effect of a change in price on total expenditure of the consumers. Becker has been advocating and highlighting the convenience and accuracy of the proportional propensity of the elasticity approach on the measurement of total revenue both from the responses of the consumers and producers viewpoint[50]. In the same spirit but in a different channel, the main interest and concern of the research here is on the effect and efficiency of the export subsidy, as a shadow price, on the total revenue of the producers. These ideas are two sides of the same coin. Marquez (1994) has also empirically analyzed of the importance of the elasticity on the behavior of USA imports. Consequently, the model with constant price elasticities can indicate a solution to the ratio of trade values with and without subsidies, respectively. Then the analysis infers that price elasticities as a policy efficiency indicator are crucial to the impact of the subsidy policy on the value of trade.

Under a parallel analytical structure, the research presented here extends Mundell's analysis of the change in price with respect to the change in policy to the subsidy elasticity of trade value[51]. Subsidy elasticity of trade value could provide an additional, but a

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[50] Becker (1971) has also demonstrated a negative relationship between the elasticity concept and industrial organizations, namely, industrial organizations are more likely to collude and develop other monopolistic policies when they predict relatively inelastic demand at their competitive equilibrium positions.

[51] Mundel (1968) has considered a Marshallian demand-supply system, and analyzed demand-side-effects of the intervention, namely, the demand schedule (function) depends on price and a policy parameter, such as α in the below. The policy parameter causes a shift in the demand schedule. The supply schedule depends on price only. A shift in the demand schedule caused by the policy parameter will affect prices. The effect on prices can be determined by the Method of Comparative Statics. By this intuitive way, then he found criteria for the change in price caused by change in the parameter under consideration;

(1), $D(p, \alpha) = S(p)$. The partial derivative of the demand functions with respect to the policy parameter gives the sensitivity of demand to the parameter at constant price. When this sensitivity is multiplied by the change in the policy parameter, the result is the excess demand caused by the shift at constant price. He first determined the excess demand caused by the shift at constant price; this equals

(2), $\frac{\partial D}{\partial \alpha} d\alpha$. The excess supply caused by an increase in price is equal to

straight-forward insightful result on the analysis of the efficiency of the policy. Then the research also finds criteria for the change in trade value with respect to both change in subsidy and CVD. These are specific theoretical contributions of the research. Kelly (2011) presented a simple arithmetic model of AD and CVDs with respect to their "Offsetting Duty Norm" features. His analysis was a purely non-calculus-type expression of the procedures of the legal rules, and he did not shed light on any consideration regarding economic effects of these trade policies. As far as is known, this analysis of the intended research on the "Offsetting Duty Norms" in both geometrical and mathematical approaches has not yet been done by others.

There are two countries; Home country is the exporter and Foreign country is the importer, and both countries are large enough to influence the world price as shown in Figure 9 panel (b). For simplification transportation costs for both countries and elasticity of substitution in the Foreign country are assumed to be ignored.

Let the excess demand for imports of commodities into the Foreign country (USA) be:

1) $q_D = f(p, y)$,   y refers to other influences on demand, which could be a single variable such as income in the U.S., or it could refer to a vector of variables.

The excess supply of exports of commodities from Home country (China) is:

2) $q_s = g(p, z)$, and z refers to other influences on supply, which could be a single variable such as China's GDP, or it could refer to a vector of variables.

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(3), $\left(\frac{\partial S}{\partial P} - \frac{\partial D}{\partial P}\right) dp$. The excess supply required to offset the excess demand and to determine the difference between changes in supply and demand caused by changes in price. Therefore, the effect of the demand-shift on price, caused by the policy parameter, can be determined. At the new equilibrium the excess demand must be offset by an equal excess supply, so he got the criterion to find his target; change in price by change in policy based on change in demand,

(4), $\frac{dp}{d\alpha} = \frac{\frac{\partial D}{\partial \alpha}}{\left(\frac{\partial S}{\partial P} - \frac{\partial D}{\partial P}\right)}$

By approximating the excess supply and demand functions as being of constant-elasticity or so-called Cobb-Douglas form, and under a *ceteris paribus* assumption, an illustration is provided as follows:

The structural form of excess supply equation: China's excess supply of exports of 2-digit H-S commodities is of the following multiplicative exponential form[52].

$$q_S = b \cdot p^{\varepsilon_{ch}^s} \cdot z^\delta \tag{1}$$

where q_S is the quantity supplied at price p, and b is the constant of proportionality. Here I assume $\delta = 0$, so that z has no effect.

The structural form of excess demand equation: The USA excess demand for imports from China of the 2-digit H-S commodities is of a similar multiplicative exponential form:

$$q_D = a \cdot p^{-\varepsilon_{us}^d} \cdot y^\eta \tag{2}$$

where q_D is the quantity of the commodity demanded by the USA importers at price p, and a is the constant of proportionality. Here I assume ɳ=0, so that y has no effect.

Equations (1) and (2) represent the structural form of a 2-equation system of demand for imports and supply of exports. The free-trade equilibrium world price where $p = p_0^w$, is found at E_0 and results in an equilibrium trade value as follows:

$$p_0^w \cdot q_0^w = \left[a^{\varepsilon_{ch}^s + 1} \cdot b^{\varepsilon_{us}^d - 1} \right]^{\frac{1}{\varepsilon_{us}^d + \varepsilon_{ch}^s}} \tag{3}$$

The $p_0^w \cdot q_0^w$ in (3) is considered as the derived form of a non-distorted trade value before subsidy.

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[52] 2-digit H-S trade data will be plugged in this formula later.

3.4   A Solution for the Trade Value with Subsidy and Tariff

3.4.1   Represent an *ad valorem* Subsidy and *ad valorem* Tariff in the Structural Forms

The excess supply of exports to USA consumers, represented by the excess supply function, $g(p, z)$, can be influenced by subsidy and countervailing duty policy decisions of the Chinese and USA governments as follows:

Suppose the home producers (China) of the exported commodity receive an *ad valorem* subsidy rate, σ, from their government, allowing them to increase the quantity supplied at every price and shifting the supply curve to the right as shown in Figure 9 panel (b) above. A generalized subsidized price, as a shadow price at any point of the excess supply function, can be represented as $p_\sigma = p + s(p, \sigma)$ [53].

Therefore, the excess supply equation in (1) becomes a subsidized-excess supply equation. Let σ be the subsidy to Chinese exports expressed in *ad valorem* terms, i.e. $\sigma = s/p$, where s is the amount of subsidy at a specific price $p_\sigma = p \cdot (1 + \sigma)$. The excess supply function, ES_1^H in the diagrammatic Fig. 9 panel (b), becomes:

$$q_S' = b \cdot [p \cdot (1 + \sigma)]^{\varepsilon_{ch}^S} \tag{4}$$

An interpretation of this equation is that the quantity that can be supplied at price p is increased by the amount of the subsidy, and this new excess supply curve is considered as a distorted-supply equation. Therefore this export-promotion pattern is considered as a "supply-side-effect" of the subsidy on the economic structure which is suitable for the China's export-led development pattern.

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[53] Based on the 3 panel diagram in Fig.9 panel (a), this price is consistent with the specific subsidized price in Home country, China: $p_2^H = p_1^H + s(p_1^H, \sigma)$.

Now consider the tariff effect, here as a specific CVD duty, on the excess supply function in Figure 9 panel (b). The subsidized-excess supply q_S' in equation (4) is found as the C.I.F price of the 2-digit H-S imports at the port of entry by first solving the distorted-supply equation for price, including the rate of subsidy(σ), then applying an *ad valorem* CVD (μ) to this distorted price function, and then solving for the reshaped-supply function as q_S'', and expressing it with both subsidy and CVD together. First, inversely solve for p, from this distorted-supply equation (4), which is the Home subsidized price.[54]

$$p(pre - cvd) = \left(\frac{q_S'}{b}\right)^{\frac{1}{\varepsilon_{ch}^S}} \cdot \frac{1}{(1+\sigma)} \tag{5}$$

This is not a particular price, but it is a general price equation along the distorted-supply function and it implies how price changes when quantity changes along this distorted-supply function. In this general subsidized price equation, the price is a function of quantity. Therefore, the specific pre-CVD price, the price which the importers pay in the diagram Fig. 9, could be any price along the distorted supply function in panel (c), it depends on the equilibrium conditions or amount of the subsidy. The amount of the subsidy and CVD is a function of the price while the subsidy and tariff rates are fixed, and s and t depend on where the prices are on the curve. Based on the general effect of a tariff on the two large trading-countries, after imposition of the CVD, exporters always get less than what the importers pays[55]. Thus the exporter receives the net-of-tariff price p_3^W in the diagram which is directly below the point E_0, by exactly the amount of t.

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[54] This process is important because this is the Home subsidized price p_1^H in its specific form in the 3 panel diagram Fig. 9, and this price is at the same time equal to the p_1^W world price and p_1^F import price in the Foreign country.

[55] General effect of tariff on the two large trading-countries is that a tariff of t (dollars) raises the price on importers, by less than the amount of the tariff t as compared with the initial world price; while it decreases the price on exporters. Because part of t is reflected in a decline in exporters price. This is not passed on to importer's consumers. This is the normal result of any tariff and of any trade policy that limits imports. Krugman (1994), pp. 199

Second, next apply the *ad valorem* cvd μ on this general subsidized price p (pre-cvd), This process shows the mathematical nature of μ as an "offsetting duty norm" for the distorting-effect of the subsidy. It is the post CVD price, $p(post-cvd)$ with the expression of both σ and μ simultaneously[56].

$$p(post-cvd) = \left[\left(\frac{q_{S'}}{b}\right)^{\frac{1}{\varepsilon_{ch}^S}} \cdot \frac{(1+\mu)}{(1+\sigma)}\right] \tag{6}$$

From (6) we can solve for q_S' the distorted-supply equation again with the expression of both *ad valorem* subsidy σ by the exporting country, and *ad valorem* CVD μ by the importing country. That is the general expression for the new and reshaped supply equation that we are looking for, and we denote it as q_S'', because it can be easily seen when subsidy and CVD are equal, the equation (7) below reverts to (1), the initial non-distorted-supply function[57].

$$q_S'' = b \cdot \left[\mathrm{p} \cdot \frac{(1+\sigma)}{(1+\mu)}\right]^{\varepsilon_{ch}^S} \tag{7}$$

General equation (7) explains that quantity supplied is a function of price with the parameters of subsidy rate and CVD rate. Comparing (4) with (7), we can easily see that the quantity of (7) increases with the subsidy and at the same time decreases with the tariff. Note that for $\sigma = \mu$, exactly, the CVD μ is functioning as an offsetting norm, and the new supply function in equation (7) returns to the supply function in equation (1) at the initial world supply function.

$$q_S'' = q_S = b \cdot p^{\varepsilon_{ch}^S} \tag{8}$$

Equation (8) shows that the trade-remedy measure, the CVD duty, is functioning as an offsetting norm against unfair trade; namely, the duty offsets price effects of the subsidy or

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[56] This price is consistent with world initial free trade price p_0^w or p_2^F in the diagram Fig 9, panel (c).
[57] This is consistent with the initial supply function ES_0^H in the diagrammatic Fig. 9

dumping margin caused by the subsidy. This process returns the distorted-world price to the initial free and fair world status and restores the distorted-trade to a "level playing field" so as to guarantee Pareto-Optimality in the world point of view. This is the ultimate and desirable goal of the WTO.

3.4.2 Reduced-form Equation for Trade Value

Now let us reduce the structural forms to the specific condition in the 3 panel diagram Fig.9 and solve for trade value as a function of subsidy and CVD. Set the reshaped excess supply equation in (7) equal to $q_S'' = q_D$ at the new equilibrium condition at E_1 where price is denoted as p_1^w.

$$b \cdot \left[p_1^w \cdot \frac{(1+\sigma)}{(1+\mu)} \right]^{\varepsilon_{ch}^S} = a \cdot p_1^{w - \varepsilon_{us}^d} \tag{9}$$

After simplifying we can get the reduced-solution for a new equilibrium price p_1^w and inversely the quantity q_1^w with the expressions of both σ and μ. Next we find a solution for the new equilibrium trade value.

It is given as $p_1^w \cdot q_1^w$.

$$p_1^w \cdot q_1^w = a^{\frac{\varepsilon_{ch}^S + 1}{\varepsilon_{us}^d + \varepsilon_{ch}^S}} \cdot b^{\frac{\varepsilon_{us}^d - 1}{\varepsilon_{us}^d + \varepsilon_{ch}^S}} \cdot \left\{ \frac{(1+\sigma)}{(1+\mu)} \right\}^{\frac{\varepsilon_{ch}^S \left(\varepsilon_{us}^d - 1 \right)}{\varepsilon_{us}^d + \varepsilon_{ch}^S}} \tag{10}$$

This is the solution for the trade value with subsidy and tariff; namely, it is a criterion for the reshaped-distorted-trade value which is also considered as total revenue. The solution consists of three products in equation (10). They involve the constants of proportionality, a, b and a ratio of the subsidy and tariff. These products are raised to different powers which are composed of different functional combinations of the price

68

elasticities of supply and demand. The main concern of the paper is the effects of subsidy and tariff, and the elasticities of supply and demand, therefore we look for quantities that emphasize the last products of the equation, a ratio of the subsidy and tariff rates, and ignore the constants of proportionality.

Note that (10) illustrates mathematically that the trade value increases with the subsidy σ, and decreases with the CVD μ. But the equation has a deep normative implication and can create different scenarios in reality. When $\mu = 0$, this equation is a criterion for distorted-revenue with the subsidy, and under another condition of $\sigma = \mu$, and $(1 + \sigma)/(1 + \mu) = 1$, then there will be an offsetting scenario, the tariff rate μ, as a CVD rate, exactly offsets the effect of the export subsidies on the export revenue as required by WTO regulations. If the third condition is $\sigma = \mu = 0$, then also $(1 + \sigma)/(1 + \mu) = 1$, this is the free-trade world price condition. Mathematically, the result of these two conditions is the same, but in reality the latter condition is superior to the former one, the offsetting scenario.

The offsetting scenario is built on heavy social costs from both home and foreign countries, such as costs of the subsidy and the costs of the CVDs. They also represent a deterioration of the home country's terms-of-trade and default creation of the deadweight loss[58]. A fourth scenario is that $\mu > \sigma$, which is considered as a violation of the WTO rules. In this way the tariff μ would have its optimality because it has no rate ceiling, and it will function as traditional optimal tariff. In real disputes, however, the μ represents both the AD plus CVDs. ($= CVD + AD > \sigma$). This is the overlap applications of the duties when the

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[58] These costs are well analyzed as a standard and default results of the distortions in many literatures of the international economics. Corden (1971) has analyzed the deadweight loss, and called it as "by product effects" of the tariff and subsidy.

dumping margin and subsidy effect are found simultaneously, and this scenario has become more frequent especially between the USA and China[59].

By taking the ratio of equation (10) a reshaped-distorted-trade value, and equation (3) a non-distorted trade value, we can calculate a net distorted-trade value which is created by the subsidy and tariff rates and also influenced by the price elasticities of demand and supply as noted above. The ratio will help us to judge the performance of the distortions on the trade value. The model formulation allows this ratio expression which is consistent with the Marshallian view that ratios of economic quantities can be more accurately expressed than their absolute values.

$$\frac{p_1^W \cdot q_1^W}{p_0^W \cdot q_0^W} = \left\{ \frac{(1+\sigma)}{(1+\mu)} \right\}^{\frac{\varepsilon_{ch}^s \left(\varepsilon_{us}^d - 1 \right)}{\varepsilon_{us}^d + \varepsilon_{ch}^s}} \tag{11}$$

It is interesting to note that in the ratio of the distorted trade value (10) to the free-trade trade value (3) the constants of proportionality (a, b) do not appear. This concise ratio shown above (11) isolates the influence of the subsidy, CVD, and non-linear function of elasticities of demand and supply on trade value. This simplest model with constant price elasticities analyzed here can indicate a solution to the ratio of trade values with subsidies ($\mu = 0$) and with perfectly countervailed subsidies ($\mu = \sigma$), respectively. Hence, equation (11) can be interpreted as an "all-or-nothing" equation expressed by subsidy σ and its equivalent counterbalancing tariff[60]. The power-coefficient of this ratio in equation (11) can be defined as a "kappa" function for simplicity which is a specific functional combination of the price elasticity of demand and supply and it can have an amplifying effect on the result of the ratio. Therefore, the interpretation of the "kappa" and knowledge on the price elasticities of demand and supply are crucial.

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[59]The New York Times: "China moves to retaliate against US" the international economics ; US tire tariffs by imposing AD and CVD simultaneously against China. September 13th 2009.
[60] In a linear model, as shown in Fig. 9, all model constants appear in the ratio expression, and the elasticities of demand and supply depend on price.

3.4.3   Crucial Analysis of the "Kappa" Function: a "*Policy Efficiency Indicator*"

The influence of the "kappa" function, the power-coefficient of the expression for the ratio $(p_1^w \cdot q_1^w)/(p_0^w \cdot q_0^w)$ in equation (11), can be clarified by assuming that the CVD rate is zero ($\mu = 0$). In this case, estimated gains from subsidized-trade can be greatly magnified by this "kappa" function. But it can also decrease the value of trade depending on the values of price elasticities of demand and supply. The "kappa" function shown as a power-coefficient and by this special function, it can be interpreted as a "*policy efficiency indicator*". The bigger the kappa, the bigger the benefit from the export subsidy before imposition of μ. The "kappa" function can be analyzed in many scenarios as follows:

1) When excess demand is relatively elastic, ε_{us}^d>1, kappa will show two scenarios; bigger than one is a super-efficient condition for the given subsidy; less than one is an inefficient condition for the given subsidy. In a special case of $\varepsilon_{us}^d = \varepsilon_{ch}^s = 3$, kappa will be equal to one and revenue will increase in proportion to the subsidy rate.

2) When excess demand is relatively inelastic, $0 < \varepsilon_{us}^d < 1$, kappa will be shown as negative and the result of the ratio will be less than one. In this sense, the subsidy will be counterproductive, namely, it reduce the value of trade.

3)   When excess demand is unit elastic, the % change in quantity demanded is same as the % change in price, therefore there is no change in revenue; $\varepsilon_{us}^d = 1$, kappa will be zero and the trade value is not depend on the subsidy; namely, subsidy will have no effect on the value of trade, it will be just a loss.

4) When excess demand is perfectly inelastic, $\varepsilon_{us}^d = 0$, kappa will be minus one, and it will be an extreme limit for the counterproductive subsidy.

5) When excess demand is perfectly elastic, $\varepsilon_{us}^d = \infty$, kappa will be equal to ε_{ch}^s, price elasticity of supply, namely, the exporter will be in charge of the market.

These scenarios imply that the role of the "kappa" function mainly depends on the price elasticity of demand. Therefore the knowledge on the price elasticity of demand is crucial in terms of the policy implication for the export subsidy. In terms of the convenience for the elasticity estimation process, Table 10 is constructed based on the specific analysis of the "kappa" function.

Table 10. Price Elasticity of Demand on the Effect and Efficiency of the Export Subsidy via the "kappa" Function

Price elasticity of demand	Description	kappa function "*policy efficiency indicator*".	Effect of subsidy on trade value	Efficiency of subsidy on trade value
$1 < \varepsilon_{us}^d < \infty$	Relatively elastic	$1 < $ kappa	Increase Ratio >1	Super-efficient (Positive effect)
		kappa $= 1$	Increase Ratio $= 1 + \sigma$	Efficient (Same as subsidy) (Positive)
		$0 < $ kappa < 1	Increase Ratio > 1	Inefficient (Positive effect)
$\varepsilon_{us}^d = 1$	Unit elastic	kappa $= 0$	No effect Ratio $= 1$	Zero
$0 < \varepsilon_{us}^d < 1$	Relatively inelastic	$-1 < $ kappa < 0	Decrease Ratio < 1	Counter productive (Negative effect)
$\varepsilon_{us}^d = 0$	Perfectly inelastic	kappa $= -1$	Decrease Ratio < 1	Counter productive (Negative effect)
$\varepsilon_{us}^d = \infty$	Perfectly elastic	kappa $= \varepsilon_{ch}^s$	Increase Ratio depends on ε_{ch}^s.	Inefficient if $\varepsilon_{ch}^s < 1$
				Same as subsidy if $\varepsilon_{ch}^s = 1$
				Super-efficient if $\varepsilon_{ch}^s > 1$

Further discussion of the influence of the "kappa" function is presented in the section on subsidy elasticity of trade value below.

3.5 Subsidy Elasticity of Trade Value

In order to further demonstrate the function and influence of the price elasticity of demand (ε_{us}^d) and the price elasticity of supply (ε_{ch}^s), the subsidy elasticity of trade value is

derived next. The subsidy elasticity of the trade value can provide a straight-forward insightful result; namely, it is a sensitivity of the trade value to the change in subsidy.

From the general definition of the elasticity we know that:

$$\frac{\partial(p \cdot q)}{\partial \sigma} \cdot \frac{\sigma}{p \cdot q} = \text{the subsidy elasticity of trade value} \tag{12}$$

The expression to be differentiated is the subsidized trade value:

$$p_1 \cdot q_1 = a^{\frac{\varepsilon_{ch}^s + 1}{\varepsilon_{us}^d + \varepsilon_{ch}^s}} \cdot b^{\frac{\varepsilon_{us}^d - 1}{\varepsilon_{us}^d + \varepsilon_{ch}^s}} \cdot (1 + \sigma)^{\frac{\varepsilon_{ch}^s (\varepsilon_{us}^d - 1)}{\varepsilon_{us}^d + \varepsilon_{ch}^s}} \tag{13}$$

This equation is derived from equation (10), when μ = 0 and $\sigma > 0$; namely, this is a distorted- trade value with subsidy on it. Take the partial derivative of (13) with respect to subsidy, and get a subsidy elasticity of trade value as follows:

$$\frac{\partial(p_1 \cdot q_1)}{\partial \sigma} \cdot \frac{\sigma}{p_1 \cdot q_1} = \frac{\varepsilon_{ch}^s (\varepsilon_{us}^d - 1)}{\varepsilon_{us}^d + \varepsilon_{ch}^s} \cdot \frac{\sigma}{(1 + \sigma)} \tag{14}$$

Consider the standard interpretation of elasticity: percentage change in trade value given a percentage change in subsidy. However, the subsidy elasticity of trade value for this model depends on the value of σ, through the $\sigma/((1 + \sigma))$ term, increasing as σ increases. That is, the marginal gain in trade value increases as the subsidy increases. This is in contrast to the price elasticities of demand and supply, which are constant and do not depend on price, due to the mathematical forms of the demand and supply functions (equations 1 and 2).

Note that in this sensitivity equation (14), if $\varepsilon_{us}^d = 1$, then trade value is not sensitive to a change in subsidy. In this sense, it can be analyzed that in order to get a market effect of the export subsidy, import demand elasticity for the subsidized-imports should be high. The multiplying coefficient function $(\varepsilon_{ch}^s \cdot (\varepsilon_{us}^d - 1))/(\varepsilon_{us}^d + \varepsilon_{ch}^s)$ in (14) is exactly the same as

the power-coefficient function in equation (10) which is called the "kappa" function for simplicity. However, it is important to note that this partial derivative case discussed here applies to small changes in subsidy, whereas the ratio case discussed previously can be used to compare the effect of any subsidy rates on trade value.

In this subsidy elasticity of trade value, the percentage change in total revenue given a percentage change in subsidy depends on this "kappa" function, which could have a multiplier effect on the subsidy, if the "kappa" is greater than one. This condition indicates that the percentage change in trade value would be greater than the percentage change in subsidy, which is a highly desirable result from efficiency of the policy viewpoint. An alternative of "kappa" is less than one, but greater than zero, implying an inefficient subsidy, whereas $\varepsilon_{us}^d < 1$ implies a counter-productive subsidy. Namely, the efficiency of the subsidy in increasing trade value is a function of the "kappa" term, making it a parameter or coefficient to characterize the subsidy. It is always better to achieve any given policy at a lower cost than at higher cost. The "kappa" function increases monotonically when ε_{us}^d and ε_{ch}^s both are greater than zero. Therefore knowledge of ε_{us}^d and ε_{ch}^s is critical in terms of the dynamic efficiency of the subsidy.

3.6 Sensitivity of Trade Value as a Function of both Subsidy and CVD

The previous section intuitively demystified the function of CVD duties as offsetting norms by eliminating the trade transgression and returning the distorted-trade to the world fair and free trade status. But in reality the CVD may not always function as an offsetting norm, rather its rate may be bigger than the subsidy. And this situation became a new source for retaliations and tit-for-tat utilizations of the trade remedy measures, especially between China and the USA. Commitment to the free market and imposing

tariffs as a strong national defense in the WTO framework are almost always complementary[61]. But this complementary relationship between free markets and strong defense is not so clear when considering American rivals, such as China. In this case, change in the total trade value becomes sensitive to changes in both subsidy and CVD. The method of comparative statics analysis is also used to estimate the sensitivity of trade value to changes in an export subsidy from the home country and an import CVD from the foreign country.

Let $g(p, \sigma, \mu)$ represent the aggregate excess supply of exports from the home country (China), where $p, \sigma, and \mu$ represent world price, *ad valorem* subsidy rate provided by the home country, and *ad valorem* countervailing duty rate assessed by the importing country, respectively. Let $f(p)$ represent the aggregate excess demand for imports in the foreign country (USA). Equilibrium conditions are specified by equating $g(p, \sigma, \mu)$ and $f(p)$ where the quantity (q) supplied and demanded are equal. The focus in this section is on equilibrium trade value $(p \cdot q)$ and its sensitivity to small changes in σ and μ. The method of comparative statics (Mundell 1968) will be used to provide insights through an analysis of the total differential of $p \cdot q$ as follows:

$$d(p \cdot q) = p \cdot dq + q \cdot dp \tag{15}$$

where solutions for dq and dp in (1) are determined by equating the total differentials of $g(p, \sigma, \mu)$ and $f(p)$ as follows:

$$g_p dp + g_\sigma d\sigma + g_\mu d\mu = f_p dp \tag{16}$$

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[61] Matsushita, Schoenbaum and Mavroidis (2004) explained WTO's law practice and its policy issues in terms of free market access and national defenses.

Partial derivatives of the excess supply and demand functions are represented by g_p, g_σ, g_μ, and f_p , respectively. The solution for dp obtained from (16) is used in the total differential of the demand function to obtain a solution for dq.

Solutions for dq and dp result in the following:

$$d(p \cdot q) = p \cdot \left[\frac{f_p \cdot g_\sigma}{(f_p - g_p)} d\sigma + \frac{f_p \cdot g_\mu}{(f_p - g_p)} d\mu \right] + q \cdot \left[\frac{g_\sigma}{(f_p - g_p)} d\sigma + \frac{g_\mu}{(f_p - g_p)} d\mu \right] \qquad (17)$$

A solution for (17) in terms of the price elasticities of excess supply and demand can be obtained by assuming the Cobb-Douglas-type multiplicative exponential forms for the excess supply and demand functions shown in equations (1) and (2) above.

The sensitivity of trade value to small changes in σ and μ is then expressed as follows:

$$\frac{d(p \cdot q)}{p \cdot q} = \frac{\varepsilon_{ch}^s (\varepsilon_{us}^d - 1)}{\varepsilon_{us}^d + \varepsilon_{ch}^s} \left[\frac{d\sigma}{(1+\sigma)} - \frac{d\mu}{(1+\mu)} \right] \qquad (18)$$

Fractional changes in trade value are determined by the product of two terms: The first term is a non-linear function of the price elasticities of excess supply (ε_{ch}^s) and excess demand (ε_{us}^d), previously identified as the kappa function, while the second represents the counter-balancing effects of changes in subsidies (σ) and countervailing duties (μ).

Note that the first term in equation (18) is zero if $\varepsilon_{us}^d = 1$, and then trade value is not sensitive to a change in subsidy nor CVD. The second term is zero when the subsidy and countervailing duty terms are equal. If the terms $d\sigma/(1+\sigma)$ and $d\mu/(1+\mu)$ are equal, then changes in the subsidy and CVD offset each other, resulting in no change in trade value. When the term CVD is greater than the subsidy term trade value, namely, trade revenue decreases, and vice versa. A potential consequence of the former case is that if $\mu > \sigma$ it results in another violation from a tariff imposing country to the rule of the Agreement on Subsidy and Countervailing Duty. Possibly the μ will function as an

"optimal tariff". Consequently the exporter makes counter claims against the importer about this situation. This is one of the main sources of the ongoing proliferation of the disputes and tit-for-tat utilizations of the trade-remedy measures. This scenario includes more legal procedure on its implementations than the second case so as to create heavy social costs to the offsetting scenario and world welfare system as well. In this sense, we can say that the proliferation of these measures illustrates the ongoing trade wars among nations are intense[62]. As a result it is unlikely that countries could gain by practicing these measures as retaliation tools against each other. The practices are only for reciprocal protectionism, and criticism against the WTO dispute settlement mechanism is also increasing. That is why the $\sigma = \mu = 0$ condition is an ideal goal of free-trade and the over-arching objective of the WTO in this globalization period. However, reaching this over-arching objective is almost impossible in this multilateral practices and its lengthy negotiation process, and these criticisms open a door for the increasing preferential trade agreements[63].

Summary

This chapter followed a method of comparative-static analysis, to find a solution for the excess supply caused by a shift in a parameter which is considered as an export-subsidy policy. The constructed-theory in the chapter is based on empirical observations both from the WTO cases studies data on subsidies and trade values of Chinese exports to the USA in different time periods. The chapter illustrated a functional relationship between value of trade and subsidy by employing an elasticity approach as a measurement of the effect of the subsidy on the value of trade. A derived model, with constant price elasticities, can

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[62] See an alternative contribution for this *Trade War* literature, Ossa, R (2012) "Trade Wars and Trade Talks with Data". He highlights the ongoing trade war (from 1995 to 2009) among nations from the proliferations of the optimal tariffs viewpoint, and concluded that USA optimal tariff rates against China is the highest among other nations.
[63] See Estrella, Gobby and Horlic(2006) discussions on this new topic.

indicate a solution to the ratio of trade values with and without subsidies, respectively. The main finding of this chapter is to identify a "kappa" function in the constructed model of distorted-trade. The function appearances in the three different expressions: ratio of distorted-trade to the free trade, the subsidy elasticity of trade value and the total differential of the trade value. These appearances demonstrate that this function is a fundamental characteristic of the distorted revenue scenarios. The "kappa" function, as a "*policy efficiency indicator*" is crucial for estimating the efficiency of the effect of the government policies on the total revenue. Based on this finding, the intended research can infer that the efficiency of the subsidy policy is most sensitive to the price elasticity of the demand in the foreign market.

CHAPTER IV. Econometric Evaluation and Estimation of the Subsidy Policy for the Machinery, Textiles, and Base Metals Industries

4.1 Introduction

This chapter isolates and analyzes some individual Chinese industries such as machinery, textiles, and base metals from the heterogeneous-mixture of the "Top Ten Industries". Data shows evidence as empirical judgment and constructed theory provides additional insights into the effect and efficiency of subsidies and CVDs as offsetting norms, and these documented changes in trade policy can be seen in trade value data in Chapter II. As emphasized, one of the main themes of the research is these hybrid data sets and their ex-post analysis that holds them as fundamental truths to evaluate policy changes. Based on the theoretical solution derived from Chapter III, this chapter empirically evaluates and estimates the effect and efficiency of the subsidy policy by calibrating trade value data and net subsidy rates for these symbolic three industries and draws out practical solutions for the policy implications. Details of China's subsidy policy have been revealed by WTO trade remedy investigations initiated by the USA. As a result the USA imposed WTO sanctioned CVDs against several of China's export industries (see Table 8). Figure 8 in Section 2.7.2 presented a general overview of import growth rates for subsidized and non-subsidized industries. In this chapter the time history of USA imports from China for the "Top Ten Industries", as specific subsidized industries, will be contrasted for time periods before and after the CVD policy began.

4.2 China's "Top Ten Industries" Exports to the USA

Specific WTO H-S chapters and sectors that correspond to the trade value of China's "Top Ten Industries" were extracted and presented in Chapter II based on Chinese statistical data sources. The ITC in the USA maintains a detailed database on international trade in a convenient format for use in market analysis and research. USA CVDs on China's crucial exports were shown in Table 8 above. More detailed statistics of China's exports to the USA on specific H-S 2-digit commodities are presented here.

Table 11. USA Imports from China's "Top Ten Industries" Pre and Post-WTO periods (1995 to 2008)

Unit: USD 100 Million

Industry Name	Chemical	Base Metals	Machinery	Textiles	Plastic & Rubber	Furniture & Toys	Stone & Cement	Wood Pulp	Foodstuff	Vehicles	
WTO HS Chapters	28-38	72-83	84-85	50-63	39-40	94-96	68-70	47-49	16-24	86-89	
WTO HS Sector	VI	XV	XVI	XI	VII	XX	XIII	X	IV	XVII	Total
1995	9.1	17.3	115.1	58.0	17.6	85.4	8.1	3.3	2.3	5.6	321.8
1996	10.9	19.6	133.8	60.8	19.1	102.8	9.4	3.7	2.7	5.9	368.7
1997	12.7	24.2	165.6	73.8	22.0	128.5	11.6	4.4	3.2	7.8	453.8
1998	14.5	30.6	203.9	71.2	23.8	150.4	12.8	5.8	3.0	9.8	525.8
1999	17.1	37.3	252.5	74.0	28.6	173.8	15.2	7.3	3.4	11.6	620.8
2000	18.6	47.1	329.3	80.2	33.8	203.3	19.0	10.0	3.7	20.6	765.6
2001	19.6	49.7	334.5	82.7	37.2	205.6	20.5	10.8	4.6	17.0	782.2
2002	22.9	60.2	446.3	95.9	44.5	252.9	23.9	14.0	6.4	20.8	987.8
2003	28.9	71.9	587.1	120.3	51.5	289.8	26.2	17.7	8.3	26.9	1228.6
2004	36.5	105.7	840.4	149.5	64.5	328.6	29.4	22.4	10.2	36.5	1623.7
2005	46.8	136.4	1058.2	224.5	85.3	376.2	34.0	27.7	12.7	46.4	2048.2
2006	53.2	185.5	1271.7	264.3	99.4	418.5	39.9	32.8	16.9	57.1	2439.3
2007	63.4	207.9	1407.4	311.9	113.4	483.0	43.2	38.7	20.2	67.3	2756.4
2008	96.6	240.9	1455.0	314.9	122.9	484.6	42.7	41.6	24.4	70.4	2894.0
Total	450.9	1234.3	8600.8	1982.0	763.9	3683.5	335.8	240.1	121.9	403.7	17816.9

Data sources: USA ITA data base, WTO summary database
*The USA ITA maintains an online archive of National Trade Data in its Trade Stats
Express (TSE)   (http://tse.export.gov/TSE/).

Table 11 shows trade values of USA imports from China's "Top Ten Industries" from

1995 until 2008. The database will be used to calculate growth rates of several major

industries during three separate time periods:

　　1) 1995-to-2001 denoted as Pre-WTO period;

　　2) 2001-to-2006 denoted as Post-WTO Pre-CVD period;

　　 3) 2006-to-2008 denoted Post-WTO Post-CVD period.

Quantitative comparisons of growth rates in the latter two periods contain policy

implications that will be linked to the constructed theory detailed in Chapter III. While

the data in Table 11 is a subset of total US imports from China, these "Top Ten Industries"

account for the majority of imports. Explicitly subsidized chapters grew faster than others

until 2006 as shown in Figure 8 in section 2.7.2 above.

4.3 China's Machinery, Textiles and Base Metals Industries Exports to the USA and their
　　 Policy Implications

Significant differences in growth rates for the 3 time periods of interest can be found in

data on machinery, textiles and base metals industries, respectively. These industries are

leading industries among the crucial "Top Ten Industries".

Figure 10. Time Series of Machinery, Textiles and Base Metals Exports from China to the USA from 1995 to 2008, Pre-WTO and Post-WTO periods (without and with CVD).

(a) Machinery Exports   (b) Textiles Exports   (c) Base Metals Exports
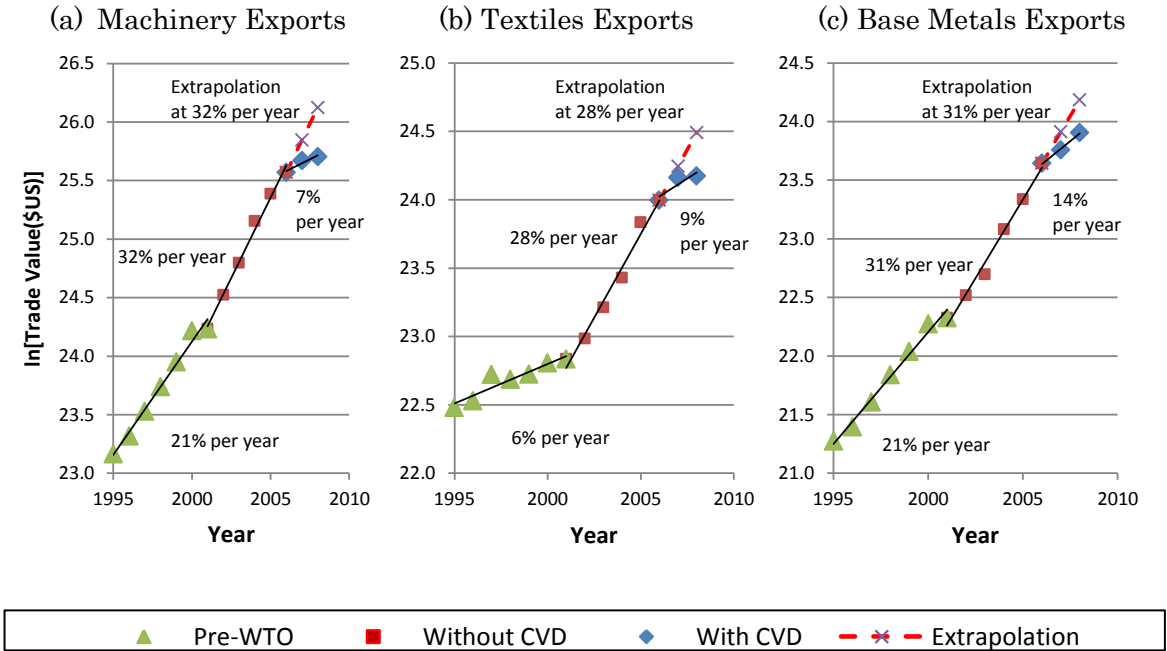
Data Source: USA International Trade Administration (ITA)

Figure 10 shows time series of the logarithm of machinery, textiles and base metals exports ($) from China to the USA based on 2-digit H-S Sectors and their Chapters. The data for machinery (Fig. 10a), H-S Sector XVI, Chapters 84-85, textiles (Fig. 10b) Sector XI, Chapters 50-63, and base metals (Fig. 10c) Sector XV, Chapters 72-83 are from table 9 above from 1995 to 2008. These time intervals encompass 3 important periods when the ex-post growth rates, determined by OLS regression, changed: In the Pre-WTO period from 1995 to 2000 growth rates were 21% per year for machinery, 6% for textiles and 21%

for base metals. In the Post-WTO Pre-CVD period from 2001 to 2006 growth rates increased for all three industries, 32% per year for machinery, 28% for textiles and 31% for base metals, when China's export subsidy policy was not directly challenged by the USA. In the Post-WTO Post-CVD period after 2006 the growth rates decreased for all three industries too, 7% per year for machinery, 9% for textiles and 14% for base metals, when the USA imposed WTO sanctioned CVDs on these imports from China. Figures 10, (a), (b) and (c) also show extrapolations of the Pre-CVD period growth rates for these 3 industries into the Post-CVD period. The extrapolated growth rates will be used in "what if" scenarios, by assuming that the Post-WTO Pre-CVD period growth rates would have continued without the counterbalancing effect of the CVD policy. Comparison of extrapolated and observed trade values after 2006 will be used in the constructed theory to estimate ε_{us}^d and ε_{ch}^s, the excess demand and excess supply elasticities for machinery, textiles and base metals industries, respectively, in the next section.

4.4 Estimations of the Total Distorted-Revenues and Price Elasticities for the Three Industries

In order to find the distorted revenue with subsidies during the Post-WTO Pre-CVD periods, the CVD (μ) is assumed to be zero. From the definition of price elasticity of the quantity supplied or demanded and based on the partial derivative form: $\frac{\partial q}{\partial p} \cdot \frac{p}{q}$, price elasticity of the quantity demanded (USA) is given by $-\varepsilon_{us}^d$, and price elasticity of the quantity supplied (China) is given by ε_{ch}^s, respectively. In that case the ratio of subsidized to counterbalanced trade value in equation (11)

$$\frac{p_1^W \cdot q_1^W}{p_0^W \cdot q_0^W} = \left\{\frac{(1+\sigma)}{(1+\mu)}\right\}^{\frac{\varepsilon_{ch}^s\left(\varepsilon_{us}^d - 1\right)}{\varepsilon_{us}^d + \varepsilon_{ch}^s}} \tag{11}$$

becomes:

$$\frac{p_1^W \cdot q_1^W}{p_0^W \cdot q_0^W} = (1 + \sigma)^{\frac{\varepsilon_{ch}^s(\varepsilon_{us}^d - 1)}{\varepsilon_{us}^d + \varepsilon_{ch}^s}} \tag{19}$$

Note that equation (19) represents an "all-or-nothing" comparison of the subsidized trade value to the non-subsidized trade value. This is in contrast to the subsidy elasticity of trade value (equation 14) and both subsidy and CVD effects on trade value (equation 18) which quantifies the sensitivity of trade value to a small change in subsidy and CVD, at a given subsidy rate. The $p_1^W \cdot q_1^W$ term is estimated by extrapolating the Pre-CVD growth rates from 2006, and $p_0^W \cdot q_0^W$ is found from the Post-CVD growth rates after 2006.

Recall the discussion on the "kappa" function in Chapter III and Table 10 on the simplest ratio model with constant price elasticities. As analyzed here, equation (19) can indicate a solution to the ratio of trade values with subsidies ($\mu = 0$) and with counterbalanced subsidies ($\mu = \sigma$) respectively. Hence, equation (19) is all-or-nothing equation expressed by subsidy σ only. From the Table 10, we know that the role of the "kappa" function mainly depends on the price elasticity of demand. Therefore the knowledge on the price elasticity of demand is crucial in terms of the policy implication for the export subsidy[64].

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[64] Duffy, Wohlgenant and Richardson (1990) have estimated the elasticity of export demand for US cotton. They also emphasized the importance of the price elasticity of demand on the US export policy.

Table 12. List of Parameters Used to Estimate ε_{us}^d and ε_{ch}^s, for Machinery, Textiles and Base Metals

General Method	Machinery	Textiles	Base Metals
$x = p_1 \cdot q_1 / p_0 \cdot q_0$	1.32/1.07=1.23	1.28/1.09=1.17	1.31/1.14=1.15
cvd(σ)	1.31	1.83	0.83
$\ln(x)$	0.207	0.16	0.139
kappa=ln(x)/ln(1+σ)	0.247	0.154	0.230
assume	solve	solve	solve
ε_{ch}^s	ε_{us}^d Machinery	ε_{us}^d Textiles	ε_{us}^d Base Metals
0.50	2.46	1.67	2.28
0.75	1.86	1.45	1.77
1.00	1.66	1.36	1.60
1.25	1.55	1.32	1.51
1.50	1.49	1.29	1.45
1.75	1.45	1.27	1.42
2.00	1.42	1.25	1.39
2.25	1.40	1.24	1.37

Table 12 listed parameters used to estimate ε_{us}^d by assuming a value for ε_{ch}^s, and using the value of kappa for each particular industry as a constraint. Take the machinery industry for example; for a one year extrapolation from 2006 to 2007 the subsidized value becomes 1.32 times larger than the 2006 value, while the observed trade value is only 1.07 times larger after the USA CVD policy. This makes the left-hand side of equation (11) equal to 1.23, as shown in Table 12 above. This procedure assumes that all machinery imports were subject to a subsidy of 131% up to 2006 and the prices of all machinery imports were counterbalanced after that by equivalent CVD duties. The resulting ratio for the distorted-revenue of the machinery industry is 1.23. This value can be combined with the known subsidy value of 1.31, from Table 3 in Chapter XX, to obtain a value of 0.247 for the kappa function, $\varepsilon_{ch}^s(\varepsilon_{us}^d - 1)/(\varepsilon_{us}^d + \varepsilon_{ch}^s)$. The non-linear kappa function will be solved

for ε_{us}^d by assuming values of ε_{ch}^s, as shown in Table 12 above. From equation (19) it is apparent that the efficiency of the subsidy in increasing trade value is governed by the kappa function. Recall the discussion on the kappa function in Chapter III, the percentage change in total revenue given a percentage change in subsidy depends on this kappa function which could have a multiplier effect on the subsidy, if kappa is greater than one. From Table 10, it is known that in the case of kappa between zero and one, the subsidy is inefficient. Table 12 shows kappa = 0.247 for the machinery industries, and the subsidy of 131% to be in the inefficient category. The effect of the 131% subsidy in this case is estimated to increase trade value by only 23%, a low level of efficiency.

In the case of textiles industries, all textiles imports were assumed to be subject to a subsidy of 183% up to 2006 and the prices of all textiles imports were assumed to be counterbalanced after that by equivalent CVD duties. The resulting ratio (1.28/1.09) is 1.17. This value can be combined with the known subsidy value of 1.83, from Table 3, to obtain a value of 0.154 for the kappa function, $\varepsilon_{ch}^s(\varepsilon_{us}^d - 1)/(\varepsilon_{us}^d + \varepsilon_{ch}^s)$. The non-linear kappa function can be solved for ε_{us}^d by assuming values of ε_{ch}^s, as shown in Table 12 above. From equation (19) it is apparent that the efficiency of the subsidy in increasing trade value is governed by the kappa function. For kappa between zero and one, the subsidy is inefficient, as the case in Table 12 shows kappa = 0.154, and the subsidy of 183% to be in the inefficient category. The effect of the 183% subsidy in this case is estimated to increase trade value by only 17%, also a low level of efficiency same as machinery industries.

In the case of base metals, all base metals imports were assumed to be subject to a subsidy of 83% up to 2006 and the prices of all base metals imports were assumed to be counterbalanced after that by equivalent CVD duties. The resulting ratio (1.31/1.14) is 1.15. This value can be combined with the known subsidy value of 0.83, from Table 3, to obtain a value of 0.23 for the kappa function, $\varepsilon_{ch}^s(\varepsilon_{us}^d - 1)/(\varepsilon_{us}^d + \varepsilon_{ch}^s)$. The non-linear

kappa function can be solved for ε_{us}^d by assuming values of ε_{ch}^s, as shown in Table 12 above. For kappa between zero and one, the subsidy is inefficient, as the case in Table 12 shows kappa = 0.23, and the subsidy of 83% to be in the inefficient category. The effect of the 83% subsidy in this case is estimated to increase trade value by only 15%, also a low level of efficiency same as the machinery and textiles industries. Questions might arise here; is there any relationship between growth rates of these three industries and their subsidy rates? Is there any correlation? Which industry has benefitted more from the subsidy policy and WTO accession?

From these statistical comparative analysis, the research can observe that the textiles industry had the biggest jump of a factor of 4.67 times in its growth rate after WTO accession, from 6% to 28%, and also had the biggest subsidy rate of 183%; after the CVD policy its growth rate fell by a factor of 3.1 from 28% to 9% per year. Machinery had less than a doubling (1.52 times) in its growth rate after WTO accession, from 21% to 32% per year. In the Post-CVD, its growth rate had the steepest decline by a factor of 4.5, from 32% to 7%, and this is the biggest decrease among other industries. Base Metals growth rates also less than doubled at 1.48 times from 21% to 31% per year. In Pre-CVD, its growth rate fell by a factor of 2.2 from 31% to 14% per year. The result of these calibrations is consistent with the theme of the constructed-theory. Being an efficiency coefficient, the bigger the kappa, the bigger the benefit from the export subsidy, in this sense, the machinery industry benefited more from subsidy policy, whereas textiles benefited more from WTO accession. In general, all these three industries cases consistently show inefficient subsidies in data analysis.

Summary

The constructed model is calibrated by utilizing OLS analysis, case law studying and trade data on China's machinery, textiles and base metals exports to the USA during different time periods; the first is a Pre-WTO period, the second is a Post-WTO Pre-CVD period, and the third is a Post-WTO Post-CVD period in terms of China's exports with and without subsidies. This chapter empirically infers that price elasticity of demand is primarily crucial to analysis of the effect and efficiency of the subsidy via the "kappa" function. Price elasticity of supply also influences the value of trade in a secondary way. Empirical evidences show that effects of the subsidies on these three industries; machinery, textiles and base metals are positive but the subsidies efficiency are low.

CHAPTER V.   Conclusions

The research primarily inferred that the effect and efficiency of a unilateral commercial policy differs based on various market situations. The elasticity concept has significant policy implications for the distorted economic system, especially on the market efficiency of the export subsidy and tariff classifications. The research is not pure theory which leads to breakthrough insights, but a constructed-theory based on empirical judgment.

Traditional theory of an optimal tariff is that it is the best tool for a nation to maximize its welfare arbitrarily at the expense of others. Hence, its result is "Beggar-Thy-neighbor". In addition to this result, the modern theory of tariff incorporated protective effects of the tariff for certain sectors. Contrary to the traditional tariff theory, trade remedy measures of the WTO only protect domestic industries from unfair completion. Hence, they have been imposed conditionally based on WTO regulations, and their results will be "Level-Playing-Fields" with respect to maintaining free and fair trade. In the case of AD and CVDs, they have functioned as "Offsetting Duty Norms" against the effects of the dumping and export subsidies, respectively. This aspect of the AD and CVDs are the focal point of the research, and they have shown different effects and results from the traditional optimal tariff" arguments.

The first empirical finding and an evaluation of a hypothesis is that China's export subsidy and its special economic structures are the main sources of the proliferated dumping activities of its main industries. The research first analyzed the global economy by dividing it into two components; China and the world without China, and then it

explained China's rapid growth after its WTO accession. Consequently, the research infers that China placed its international trade as an engine of the growth. Hybrid panel data sets for China's crucial "Top Ten Industries" were constructed for the analysis of the economic anatomy of China. The "Top Ten Industries" which are frequently charged by AD duties account for 87% of total exports and 85% of outputs. Therefore the research selected these industries as main contributors to China's exports and symbolic for its whole economy. It also disclosed that, in contrast to world GDP growth, China's GDP has been rising despite the proliferation of AD measures as protectionism against its exports. The main idea is that China's worldwide trade openness by its WTO accession is critical for its breakneck economic growth, and this growth was mainly gained by China's crucial "Top Ten Industries". These industries were the initial beneficiaries of China's WTO accession. With government guidance, these industries were used as devices to get hard currency at China's primarily development stage. Ultimately, then these targeted industries were turned into powerful and influential exporters.

The second finding is attributed to the empirical-based constructed theory of the research. It incorporates unilateral commercial policies of nations as imperfect competitions into its constructed-theory. The theory followed comparative static analysis to evaluate impacts of the subsidy policy on the total trade value by focusing on USA imports from China. As a matter of legal judgment, the reality of China's subsidized exports, and USA AD and CVDs against it fits the theory of the WTO trade remedy measures. Main contribution of the research is to prove the offsetting hypothesis of the WTO trade remedy measures by following Krugman & Obstfeld (1994) "two large-country partial equilibrium" approach.

The first finding from the theory part is a derived model, with constant price elasticities, that can indicate a solution to the ratio of trade values with and without subsidies,

respectively. Consequently, the research also found a "kappa" function in the constructed model which shows a functional relationship between trade value, commercial policy and price elasticities of demand and supply. A functional combination of these variables acted as a *"policy efficiency indicator",* and it is crucial for estimating the efficiency of the effect of the subsidy on the trade value. Therefore the "kappa" function is a fundamental characteristic of the distorted revenue scenarios. Based on these findings, the intended research can infer that the efficiency of the subsidy policy is most sensitive to the price elasticity of the demand for foreign imports. The empirical-based constructed-theory can explain what would have happened if policy had not been changed. The constructed-theory suggests that the CVD functioned the way it was intended to by returning the distorted-trade to a "world price" status of fair trade. Another finding is that when the CVD rate exceeds the subsidy rate, it cannot function as an offsetting norm, and it tips the balance toward protectionism. This situation is a source for tit-for-tat utilization of the AD and CVDs, especially between the USA and China. One obvious thing is that China (and others) are not even truly market economies, and abusive imposition of the AD and CVDs are rising worldwide, making true free trade virtually impossible, even in theory.

Lastly, the study evaluates impacts of the subsidy policy on the total trade value by focusing on USA imports from China. The constructed model is calibrated by utilizing OLS analysis, case law studying and trade data. Estimation and extrapolation are made for three of China's large industries such as machinery, textiles and based metals exports to the USA during different time periods; the first is a Pre-WTO period, and the second is a Post-WTO Pre-CVD period, third is a Post-WTO Post-CVD period in terms of China's exports with and without subsidies. The results suggest that, if the USA had not initiated CVDs around 2006 then China's exports could have maintained their growth. Based upon this simulation, extrapolation and estimation analysis, the study infers that the USA has

a strong interest in countering dumped and subsidized China's imports. It would likely result in a desirable and efficient market outcome. Without question, at the same time with the USA policy change, Chinese commodity markets entered a period that requires substantial adjustments. Namely, there was a shift from an "export-led" growth pattern to a "consumption-led" growth pattern. And this process requires substantial adjustments, at least to the closure of the least competitive Chinese low-quality exports, a desirable market outcome for future development.

On the other hand, by utilizing a quantitative trade model with constant elasticity, the research evaluated the effect and efficiency of the subsidy policy, and also found that the subsidy policy was inefficient on Chinese gains from its export trades. China's subsidy policy functioned as endogenous protections for the specific industries for the certain political purpose, especially during it's primarily development stage. In this sense, the research also inferred that protectionism results in economic loss but a certain political gain. An exception would be with a high foreign demand on a commodity. But China's subsidy policy associated with the nation's main purpose was to get foreign exchange earnings rather than the real market situation.

The whole analysis infers that even though there has been a substantial reduction of traditional optimal tariffs within the framework of WTO commitments and negotiations, the proliferation of flexible AD and CVDs demonstrates that they have become substitutes for traditional tariffs. Protectionism is as vital as it has ever been. This situation invoked criticisms against the WTO regulations and opens a door to the increased regional trade agreements.

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