
Legality of R&D Subsidies and Its Policy Framework under the World Trading System: The Case of Civil Aircraft Disputes[†]

Wonkyu Shin^{*} and Wonhee Lee^{**}

Abstract

Technology research and development (R&D) expenditures have increased as most countries recognize that technological innovation is a significant factor for continued economic growth. R&D subsidies by governmental entities were permitted in accordance with the Subsidy and Countervailing Measure (SCM) Agreement under the World Trade Organization (WTO) system. However, according to Article 31 of the SCM Agreement the provision for R&D subsidies have been terminated as of January 2000 and legal disputes over R&D subsidies are likely to increase. The aircraft industry has been the only industry where R&D subsidies have become an issue under the WTO. This paper examines international trade disputes within the aircraft industry in regards to measures by Canada and bilateral disputes between the U.S. and the European Communities (EC). In these cases, various R&D subsidies on civil aircraft are found to be inconsistent with WTO rules. This study summarizes the WTO decisions on various R&D subsidies disputed in the aircraft cases and examines the type of R&D subsidies found to be inconsistent (or consistent) with the WTO to provide guidelines for current and future R&D subsidy policies in high-tech industries. The *Canada-Aircraft* case indicates that R&D subsidies directly targeted towards near market R&D projects with a high export potential will likely be in violation of current WTO rules. Furthermore, findings from the *EC-Aircraft* and the *U.S.-Aircraft* cases suggest that the forms (or the methods) of R&D subsidy distribution were not a sufficient condition for the WTO ruling; instead, what ultimately mattered was whether and *specifically* to whom the benefits of the R&D subsidies are conferred by the government entities.

Keywords

R&D subsidies, WTO SCM Agreement, Canada-Aircraft case, US-EC Aircraft Disputes

[†] This paper was presented at the Seminar on International Commerce Law and Policy at Graduate School of International Studies of Seoul National University. The authors are very thankful to participants of the seminar and also deeply thank Dukgeun Ahn, Chongsup Kim, Yeongseop Rhee, Keun Lee, Patrick Messerlin, Walter G. Park, and Hyoyoung Lee for their comments and valuable discussions.

^{*} Associate Research fellow, the Science and Technology Policy Institute (STEPI) / Research Associate, Center for International Commerce and Finance, Seoul National University, Seoul, Korea, wkshin@snu.ac.kr

^{**} Associate Research fellow, the Science and Technology Policy Institute (STEPI), Graduate School of International Studies, Seoul National University, Seoul, Korea, wonhee07@gmail.com

1. INTRODUCTION

Technology constitutes an essential element of national competitiveness and as it is an engine of growth for the economies; therefore, through various governmental support and subsidies, industrialized countries have increased R&D expenditures in core technologies such as microelectronics, information technology, biotechnology, and new materials in order to promote technology levels (Davidson & Segerstrom, 1998). Under the World Trade Organization (WTO) system, R&D subsidies by governmental entities were permitted as a ‘non-actionable subsidy’ (i.e. allowable subsidies) in accordance with the Agreement on Subsidies and Countervailing Measures (SCM Agreement). However, the provision on the non-actionable subsidies terminated as of January 2000 according to the provision of Article 31 of the SCM Agreement.¹ The continuation of the provision became a stalemate due to the absence of negotiations on its extension.

Under the WTO regime, R&D subsidies have so far been challenged only in several cases.² Brazil brought complaints against Canada over Canada’s R&D subsidies to regional aircraft industries, and issues over R&D programs by both the European Communities (EC) and the U.S. were raised in the disputes between the EC and the U.S.³ All three WTO cases covered in this paper involve civil aircraft industries. In these cases, various R&D subsidies on civil aircraft industries were found to be inconsistent with WTO rules. In the Canada-Aircraft case, the WTO Panel found that the ‘Technology Partnerships Canada’ program constituted export subsidies prohibited under the WTO; subsequently, the decision was upheld by the WTO Appellate Body and the Canadian government had to revise their original government plan. In the EC-Aircraft case, many of the EC’s Research and Technological Development (R&TD) subsidies granted to Airbus were ruled as specific subsidies.⁴ In the *US-Aircraft* case, the Panel found that the National Aeronautics and Space Administration (NASA) and Department of Defense (DOD) have provided specific subsidies to Boeing and caused serious prejudices to the interests of the EC.⁵

¹ AGREEMENT ON SUBSIDIES AND COUNTERVAILING MEASURES, April 15, 1994, GATT URUGUAY ROUND AGREEMENTS (SCM Agreement) Article 31 (Provisional Application) stipulates as follows: “The provisions of paragraph 1 of Article 6 and the provisions of Article 8 and Article 9 *shall apply for a period of five years*, beginning with the date of entry into force of the WTO Agreement. Not later than 180 days before the end of this period, the Committee shall review the operation of those provisions, with a view to determining whether to extend their application, either as presently drafted or in a modified form, for a further period.” (Author’s emphasis)

² Unlike R&D subsidies, studies on general subsidies and CVDs at issue are quite many. Disputes explicitly including R&D subsidies have rarely occurred since the identification of such subsidies is difficult, and politically countries may feel uneasy to raise the issue of a government policy implemented by other countries. Moreover, R&D subsidies were permitted until 2000 and no dispute officially exists besides the aircraft disputes.

³ These cases are entitled as “Canada-Measures Affecting the Export of Civilian Aircraft” (referred to as ‘*Canada-Aircraft*’), “European Communities and Certain Member States-Measures Affecting Trade in Large Civil Aircraft” (referred to as ‘*EC-Aircraft*’), and “United States-Measures Affecting Trade in Large Civil Aircraft” (referred to as ‘*US-Aircraft*’). In the Canada-Aircraft case, the product at issue was small regional commercial aircraft; however, in the *US-Aircraft* and *EC-Aircraft* cases, the product at issue was large civil aircraft. The USITC report notes that large civil aircraft are traditionally defined as civil aircraft with more than 100 seats and weighing over 33,000 pounds (USITC, 1998). Regarding regional jets, the United States General Accounting Office notes that no uniformly accepted definition exists in its 2001 report.

⁴ *EC-Measures Affecting Trade in Large Civil Aircraft*, WT/DS316/R.

⁵ *US-Measures Affecting Trade in Large Civil Aircraft*, WT/DS353/R.

The aircraft industry has unique characteristics that require massive entry costs and high R&D investment; therefore, it has been a frequent strategic industrial policy target (Benkard, 2000). Governments consider the aircraft industry economically and politically significant. Economically, the industry generates dynamically increasing returns and contributes to the domestic economy through technology spillovers into other industries, creation of high-wage jobs, and exports. Politically, the industry is important because the national defense industry is closely linked with the civil aircraft industry technology (Wittig, 2010). These combined factors lead governments to support aircraft industries through means such as R&D subsidies.

The objective of this study is to introduce what types of R&D subsidies are found to be inconsistent (or consistent) with the WTO through an examination of the interpretations of the WTO Panel and Appellate Body rulings on various R&D subsidy programs disputed in the aircraft cases. An examination of the legality of R&D subsidies can provide helpful policy guidance for governments in their planning industrial R&D policies. For instance, several countries are planning to join or expand their markets in the civil aircraft industry through subsidies that may lead to lawsuits by other WTO members. Canada, China and Russia have regional jet manufacturing companies that plan to enter the large civil aircraft market, and these countries heavily subsidize their civil aircraft industries (Andersen, 2009). The R&D subsidy matter has not yet been raised in other sectors; however, such disputes can potentially occur in other high-technology sectors since those sectors are also in need of government R&D support. This study provides direction for government policies in regards to high-technology R&D subsidies through an investigation of WTO decisions on R&D subsidies and an examination of decisions on the EC-Aircraft and the *US-Aircraft* cases.

The paper is structured as follows. Section 2 reviews the evolution of agreements on subsidies including R&D subsidies and examines how the SCM Agreement stipulates rules on subsidies. For a better understanding of the disputes, Section 3 provides characteristics of civil aircraft industry and a background of the disputes over civil aircraft. In addition, it examines WTO disputes over R&D subsidies and conducts a legal analysis of the WTO rulings based on what types of R&D subsidies are found to be inconsistent and consistent with the WTO. Section 4 combines the analysis results of the previous section, provides implications, and suggests possible directions for R&D subsidy policies

2. THE DEVELOPMENT OF R&D SUBSIDIES UNDER THE WORLD TRADING SYSTEM

2.1. R&D Subsidies Policy as Industrial Policy

The development of advanced technologies (such as aerospace technology, biotechnology, and information technology) is an engine for mid and long-term economic growth. High-tech industries “may create benefits that spill over to other firms in the economy,” thereby playing a crucial role in the economic growth. In addition, R&D subsidies have been frequently used as government financial tools during the times of economic crisis (Ruttan, 2001). Aggarwal and Evenett (2010)

demonstrate that “the crisis has led to a revival of industrial policies” such as subsidies and biased government procurement policies that appear in forms unconstrained by existing WTO rules. For example, with an effort to develop high-tech energy sources and sustain economic growth rate, China promoted domestic wind turbine producers by offering research subsidies and awarding contracts mainly to domestic suppliers in bidding opportunities. In the Korean case, after the 1997 financial crisis, the Korean government provided incentives to the auto-industry that included increased lending liquidity, a reduced consumption tax and financial support for R&D technology. The U.S. has provided financial assistance to the wind power industry for job creation and for economic boost (Aggarwal & Evenett, 2010).

However, the problem is that the R&D effect often flows into firms that potentially compete in international markets. R&D subsidies as industrial policy might not produce gains for the world economy as a whole since additional profits are made at the expense of foreign competitors (Spencer & Brander, 1983). Thus, through the General Agreement on Tariffs and Trade (GATT) talks, bilateral agreements, and the WTO, countries have developed subsidy agreements to prevent ‘unfairness’ and ‘market distorting inefficiency’ in the world trading system by enforcing international rules and regulations.

2.2. International Agreements on R&D Subsidies

2.2.1. Historical Background of International Subsidy Agreements

The GATT 1947 and Tokyo Round 1979

In the early agreements under the GATT regime from 1947 to 1994, rules on subsidies were not restrictive and R&D subsidies were permitted. In the original GATT (created in 1947) subsidies were acknowledged to incur inefficiencies in international trade; however, the agreement placed no limits on subsidies and merely mandated that subsidies be reported (Fisher, 2002). In 1973, the Tokyo Round of the GATT tried to resolve the question on how much government support should be permitted. Around this time of the Tokyo Round, Airbus was founded and the issue on civil aircraft subsidies became contentious, and subsequently the civil aircraft subsidy issue was brought to the GATT framework (Fisher, 2002). However, the issue over subsidies was not addressed substantively because the topic was new to the parties and subsidies were considered to have positive effects (Meier-Kaienburg, 2006). At the end of the Tokyo Round in 1979, the Subsidies Code and the Agreement on Trade in Civil Aircraft were signed as part of the final agreement.⁶ Although

⁶ Subsidies Code refers to the Agreement on Interpretation and Application of Articles VI, XVI and XXIII of the General Agreement on Tariffs and Trade. The final agreement of the Tokyo Round included three nontariff areas: 6 codes, 4 framework agreements for developing countries, and 3 economic sector agreements. Subsidies Code was one of the six codes and civil aircraft agreement was one of the economic sector agreements; civil aviation was the only industry given a separate agreement at the conclusion of the Tokyo Round of the GATT in 1979 (Fisher, 2002).

the term subsidy is not clearly defined, the Subsidies Code provides a list of permissible subsidies while prohibiting export subsidies.⁷ In regards to R&D subsidies, Article 11 of the Subsidies Code allows signatories to use subsidies to “encourage research and development programs, especially in the field of high-technology industries”. The Civil Aircraft Agreement (regarding government support) notes that the Subsidies Code applies to trade in civil aircraft and acknowledges “widespread governmental support” in this area.⁸

1992 Civil Aircraft Agreement

While R&D subsidies were fully permitted at the Tokyo Round, the bilateral agreement between the U.S. and the EC began to implement restraints on government subsidies in large civil aircraft including R&D subsidies. The two parties signed the bilateral agreement in July 1992 to strengthen subsidy-related provisions of the 1979 Agreement on Trade in Civil Aircraft.⁹ The 1992 Civil Aircraft Agreement contains 13 articles that regulate various forms of government subsidies – direct subsidies, indirect subsidies, and loans. In regards to direct subsidies, the agreement prohibits the use of direct subsidies for production¹⁰ and places limits on direct subsidies for the development of new aircraft.¹¹ Article 4 limits the amount of direct development subsidies at a maximum of 33% of the total development costs; in addition, governments are only allowed to fund projects that are likely to repay the loan within 17 years. The agreement also regulates indirect subsidies for production and development of an aircraft. The agreement allows producers to receive indirect support amounting to a maximum of 3% of industry-wide annual commercial sales or 4% of annual commercial sales of a firm in each country.¹² The provision stipulates that benefits from indirect support are deemed to exist when cost reductions to a firm occur from government-sponsored R&D.¹³ The provision on indirect subsidies curtails the benefits received by Boeing from government-sponsored military and space program projects, and the provision on direct subsidies restrains European government funding of new aircraft launch costs (Pavcnik, 2002, p. 742). Lastly, the agreement restricts the government ability to help domestic aircraft producers offer financing to airlines.¹⁴

The Uruguay Round & the SCM Agreement

Prior to the Uruguay Round, the U.S. proposed the inclusion in the negotiation agenda of issues re-

⁷ Subsidies Code, Article 8 and 11.

⁸ The Agreement on Trade in Civil Aircraft, Article 6.

⁹ USITC (1998) at 3-32. The full name of the agreement is the Agreement between the Government of the United States of America and the European Economic Community Concerning the Application of the GATT Agreement on Trade in Civil Aircraft (1992 Civil Aircraft Agreement). After the bilateral agreement, the GATT Subcommittee on Trade in Civil Aircraft began multilateral negotiations in October 1992. Both the U.S. and the EC wanted more signatories to engage in the 1992 Agreement; however, the bilateral agreement was not included in the WTO due to a lack of support among non-signatories and continuous disagreement between the U.S. and the EC (USITC, 1998). Irwin and Pavcnik (2004) present a notable result of a study that aircraft prices increased by about 3.7% after the 1992 US-EU agreement that limited subsidies.

¹⁰ 1992 Civil Aircraft Agreement Article 3.

¹¹ 1992 Civil Aircraft Agreement Article 4.

¹² 1992 Civil Aircraft Agreement Article 5.2 (a) and (b).

¹³ 1992 Civil Aircraft Agreement Article 5.3.

¹⁴ 1992 Civil Aircraft Agreement Article 6

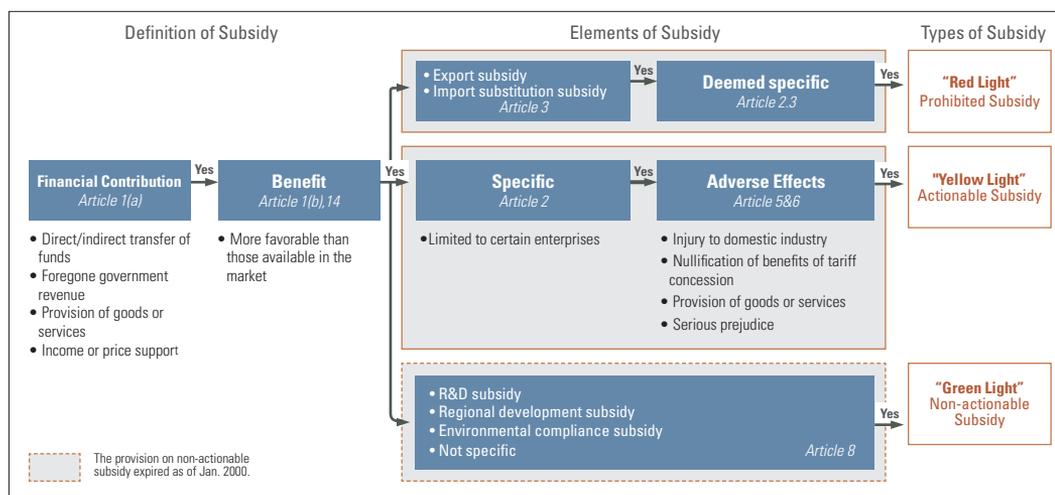
lated to trade in high-technology products in consideration of government policies on high-technology industries subsidies that significantly influenced trade flows. However, the EC considered the proposal as an initiative to control R&D subsidies and objected to its inclusion in the belief that the U.S. surreptitiously utilized them through defense spending (Low, 1993). This different negotiation stance on the permission of certain subsidies by the U.S. and the EC continued even during the Uruguay Round. The U.S. opposed establishment of a provision on permitted (non-actionable) subsidies while the EC suggested inclusion of a wider range of government aid in the non-actionable subsidy category. The Uruguay Round established the Agreement on Subsidies and Countervailing Measures (SCM Agreement) and the rules, stipulated in the SCM Agreement became the guidelines for current subsidy disputes under the WTO regime.

The following sub-section provides interpretations of the SCM Agreement and details on R&D subsidies.

2.2.2. Subsidies under the WTO agreement

Unlike the previous agreements in regards to government support, the SCM agreement defines the term subsidy and also classifies subsidies. Figure 1 illustrates the classification of a subsidy and the procedure to determine what constitutes a subsidy according to the SCM Agreement provisions. To attest that a government program is a subsidy that is inconsistent with the WTO, the program first has to meet the definition of a subsidy and it has to be “specific.”

FIGURE 1. Subsidy Classification and its Applying Process under the WTO SCM Agreement



Source: Authors based on the WTO SCM Agreement

A government measure should contain two basic elements to be defined as a subsidy: (a) a financial contribution by a government or any public body within the territory of a member country, (b) which confers a benefit.¹⁵ The forms of “financial contribution by a government” include (i) direct or potential direct transfers of funds (e.g. grants, loans, equity infusion, and loan guarantees), (ii) foregone government revenue that is otherwise due, (iii) the provision of goods and services, or (iv) any form of income or price support.¹⁶ Those forms of financial contributions by a government are defined as subsidies when benefits are conferred from the financial contributions to a recipient. It is necessary to demonstrate that “the recipient obtained an advantage which it could not obtain in the market place” to prove a conferred benefit (Matsushita, Schoenbaum, & Mavroidis, 2006). For instance, if a government provides goods and services at market prices, no benefit is conferred and thus no subsidy exists. On the other hand, it is considered a conferred benefit to the recipient if a government provides loans to a company at more favorable terms than those available in the market.¹⁷

If a program is defined as a subsidy, it also has to be proven specific in order to be subject to possible constraints under the WTO. Subsidies are specific when they are limited to certain enterprises or industries;¹⁸ however, it is not specific if a subsidy is available based on “objective criteria or conditions”.¹⁹ Even if the subsidies appear to be not specific on legal documents, it can still be specific if it is *de facto* specific, meaning that the subsidy is in fact granted to certain enterprises or industries.²⁰ In addition, a subsidy that is limited to certain enterprises in a particular region within the jurisdiction of the administering authority is defined as specific.²¹

The SCM Agreement governs subsidies by classifying them under the traffic light system – red light, yellow light, and green light subsidies. The “red light” subsidies are prohibited subsidies. The two types of prohibited subsidies are export subsidies and import substitution subsidies. Export subsidies are subsidies that are “contingent in law or in fact ... upon export performance,” and import substitution subsidies are the ones that are “contingent ... upon the use of domestic over imported goods”.²² These subsidies are deemed to be specific regardless of their forms.²³ When subsidies are found to be prohibited, the remedy is repayment or removal of the scheme (Meier-Kaienburg, 2006). The “yellow light” subsidies are actionable subsidies that are not prohibited outright; however, they can be challenged when they are specific and cause “adverse effects”.²⁴

¹⁵ SCM Agreement Article 1.1.

¹⁶ SCM Agreement Article 1.1.(a).

¹⁷ Further details on determination of the existence of a benefit and calculation on the benefit amount is stated in Article 14 of the Agreement.

¹⁸ SCM Agreement Article 2.1.

¹⁹ SCM Agreement Article 2.1(b) stipulates: “Where the granting authority, or the legislation pursuant to which the granting authority operates, establishes objective criteria or conditions governing the eligibility for, and the amount of, a subsidy, specificity shall not exist, provided that the eligibility is automatic that such criteria and conditions are strictly adhered to.” (Author’s emphasis included)

²⁰ SCM Agreement Article 2.1(c) stipulates: “If... there are reasons to believe that the subsidy may in fact be specific, other factors may be considered. Such factors are: use of a subsidy program by a limited number of certain enterprises...” (Author’s emphasis included)

²¹ SCM Agreement Article 2.2

²² SCM Agreement Article 3.1; Annex I of the SCM Agreement lists prohibited export subsidies.

²³ SCM Agreement Articles 3 and 2.3.

²⁴ SCM Agreement Article 5

The SCM Agreement lists three types of causing adverse effects to another member: (a) injury to a domestic industry, (b) nullification or impairment of the benefits of a tariff concession, or (c) serious prejudice to the interests of another member.²⁵ The “green light” subsidies (also known as “non-actionable” subsidies) are permitted and offer “countries a method for structuring subsidies to avoid attack under countervailing duty laws (Rosenthal & Vermeylen, 1999). A government can provide subsidies that fall under the above categories without fear of challenge or countervailing measures under the WTO system. The types of subsidies provisionally permitted were R&D subsidies, regional development subsidies, and subsidies to comply with environmental requirements.²⁶

This provision was temporarily in effect for five years²⁷ and expired January 2000. Since then, the provision has not been renewed, and R&D subsidies now can be challenged more under the WTO.²⁸

When a government subsidy program is challenged under the WTO Dispute Settlement Body (DSB), the DSB evaluates what constitutes a subsidy and identifies which subsidies are illegal under the WTO rules. The legality of subsidies is assessed by examining whether subsidies impose illegal conditions or distort trade through an adverse effect on free trade. In the Canada-Aircraft case, the R&D program at issue falls in the category of “prohibited” subsidies; on the other hand, in the Airbus-Boeing dispute, allegedly illegal R&D subsidies are “actionable” subsidies under the SCM Agreement.

2.2.3. Subsidies on Research and Development

The SCM Agreement 8.2(a) defines different types of R&D subsidies and provides rules on them. The provision does not place restrictions on a government to support independently conducted “fundamental research” activities not linked to commercial objectives; however, it does regulate the government assistance for research conducted by firms or by higher education or research institutions contracted with firms.²⁹ The research activity areas where government support is regulated under this provision are “industrial research” and “pre-competitive development activities”. The provision on R&D subsidies limits the amount of R&D subsidies to under 75% of the industrial research costs or 50% of the pre-competitive development activity costs.³⁰ In this context, industrial research means a planned search or investigation to discover new knowledge with the objective that such knowledge may be useful in the development or improvement of products, processes or services.³¹ Pre-competitive development activity indicates the transfer of industrial research findings

²⁵ SCM Agreement Article 5

²⁶ SCM Agreement Article 8.2.

²⁷ SCM Agreement, Article 31. According to SCM Agreement Article 31, the provision could be extended after the WTO members review it.

²⁸ As R&D subsidies on aircraft products were not in the scope of the green light subsidies (as stipulated in SCM Agreement Article 8.2.(a), note 24), they could be subject to challenge. Under the WTO jurisdiction, the issues over R&D subsidies only occurred in the aircraft industry.

²⁹ SCM Agreement 8.2(a) note 26.

³⁰ SCM Agreement Article 8.2(a); if the government R&D program covers both industrial research and pre-competitive development activity costs, then the total costs should not exceed 62.5%, which is the average of the allowable levels of the two categories. (*ibid.* note 30)

³¹ SCM Agreement Article 8.2(a) note 28.

into a plan or a design for new or improved products, processes or services that includes the creation of a prototype not applicable to commercial use. Pre-competitive development activity further includes a conceptual formulation or a design of products and an initial demonstration, yet these same projects are not for use by industrial applications or commercial exploitation.³² Government support is specifically limited to the costs of items such as personnel, instruments, equipment, and consultancy exclusively for the research activity.³³

The provision clearly determines the allowable level of assistance costs dependent on the R&D subsidy characteristics; however, ambiguity lies in distinguishing the type of R&D subsidy. It is consistent with the rules for governments to support fundamental research activities unrelated to industrial objectives. However, the results of general scientific research activities are often applicable to commercial purposes and it is difficult to know where to demarcate between the fundamental research and the industrial research activities. The WTO has not yet provided any standard to distinguish them.

3. WTO DISPUTES OVER R&D SUBSIDIES IN THE AIRCRAFT INDUSTRY

To understand the R&D subsidy disputes in the aircraft industry, this section details the industry characteristics that makes it inevitable for governments to provide R&D subsidies. In addition, an examination of the background of the Canada versus Brazil disputes and that of the EC versus US disputes reveals the elements that led to the bilateral disputes.

3.1. The Civil Aircraft Industry

The aircraft industry has a high entry barrier that requires massive upfront capital investment, high R&D costs for multiple and interlinked complex technologies, the organizational and technical ability to design and manufacture, and a global network to provide after-sales support.³⁴ These investments tend to be high-risk due to the uncertainty of aircraft certification and the number of years required to recoup the investment (USITC, 2012). The expenses on R&D are a substantial portion of the total production cost of any particular aircraft model (Baldwin & Krugman, 1988). The production of aircraft integrates many interrelated components and subsystems that utilize multiple technologies; therefore, a large part of the production cost pertains to the technology development embodied in design and manufacture. In addition to R&D expenses, the industry also requires costly after-sales

³² SCM Agreement Article 8.2(a) note 29.

³³ SCM Agreement Article 8.2(a)(i)-(v).

³⁴ For detailed information on the aircraft industry's characteristics, see the following reports by the USTIC: USITC (2012) "Business Jet Aircraft Industry: Structure and Factors Affecting Competitiveness," *USITC Publication 4314*, Washington, DC: U.S. International Trade Commission; USITC (1998) "The Changing Structure of the Global Large Civil Aircraft Industry and Market: Implications for the Competitiveness of the U.S. Industry," *USITC Publication 3143* Washington, DC: U.S. International Trade Commission.

support services that need to be provided globally.³⁵ After-sales services are provided by OEMs, suppliers and service partners, and the costs to provide services are substantial.³⁶

The production of aircraft is limited to only a few enterprises, and the aircraft market has imperfect competition due to the high barriers on new entrance and high operation costs. In the large civil aircraft industry, Boeing and Airbus are the two major producers that compete with each other in a duopoly market.³⁷ For small commercial jets, there is an oligopoly market with six leading producers headquartered in the U.S., Canada, France, and Brazil (USITC, 2012).³⁸

Despite the costly and risky characteristics of the aircraft industry, the governments of the developed countries are highly desired to support domestic aircraft industries due to their economic and political significance. From an economic viewpoint, it realizes dynamically increased returns through economies of scale and technology spillovers; subsequently, the industry expects an increased global demand. Once new aircraft are developed and production is cumulated, the R&D investment costs become spread over a larger base and the average cost steeply falls (Baldwin & Krugman, 1988). The aircraft industry also expects future growth with an increased demand for civil aircraft (Wittig, 2010). Future aircraft market growth drivers include the replacement of aircraft in service in mature markets, dynamic growth of population and economies in emerging markets as well as increased urbanization that drives wealth and traffic growth.³⁹ The industry also generates high-wage, high-skilled jobs, and exports that contribute to the economy. From a political viewpoint, the development of a commercial aircraft industry is strategic for national defense. Military aircraft and civil aircraft technologies are interrelated and there are technological innovation spillovers between commercial and military operations (Tyson, 1992). The national defense sector can benefit by providing support to the commercial aircraft sector due to this spillover effect.

Figure 2 shows that aircraft exports represent a significant portion of the total exports in countries with WTO disputes (Canada, four countries in EC, U.S.). Especially, in the U.S. and France, exports of the single 6-digit HS code 880240 (which includes both military and civil large aircraft) represent 3.0% and 4.0% of total exports (respectively) over the past two decades.

³⁵ In regards to the importance of after-sale support, USITC Report (2012) quotes an industry analyst that ongoing service and support is the most important sales driver in the aircraft industry (even above price and technological innovation). The prior USITC report on the large civil aircraft industry from 1998 also notes that operating costs have become the primary factor that airlines use to choose LCA, and after-sales support is an “extremely important competitive marketing tool” for LCA manufacturers.

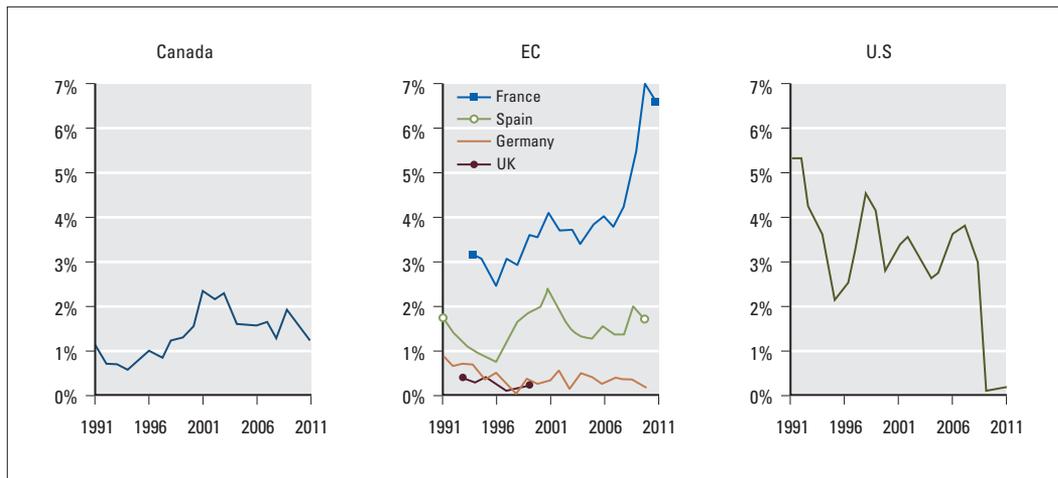
³⁶ Services include parts distribution, repair and overhaul services, rental equipment, equipment upgrades, software installations, logistics, and routine maintenance services, with most companies providing round-the-clock support near the locations where aircraft are based or at the intended destinations.

³⁷ Russia also produces; however, the industry is not globally competitive. (USITC, 1998 and 2001)

³⁸ The six manufacturers are Cessna (U.S.), Hawker Beechcraft Corporation (U.S.), Gulfstream (U.S.), Bombardier (Canada), Dassault (France), and Embraer (Brazil).

³⁹ Airbus Global Market Forecast 2011-2030. This report forecasts that global airline traffic is expected to double by 2028 and represents a market value of USD 3.1 trillion.

FIGURE 2. Share of Aircraft Exports (as a ratio of total global exports) of Canada, EC, and U.S



Source: Authors based on data from the UN Comtrade (United Nations Commodity Trade Statistics Database)
 Note: HS code 880240 (Airplanes and other aircraft, of an unladen weight exceeding 15,000 kg) includes both military and civil aircraft. For Canada, HS code 880220, 880230, 880240 are used since regional aircraft include weights below or above 15,000 kg.
 The recent exports of US aircraft has plunged dramatically from USD 25 billion (previous year's average) to USD 276, 572, and USD 938 million in the years 2009, 2010 and 2011 respectively.

Because R&D investment for business and technological innovation are critical to success in the aircraft industry, financial support for aeronautics R&D is provided by all governments to foster important national goals in addition to corporate R&D investment (USITC, 2012).

3.2. Overview of the Disputes

There have been three cases where disputes occurred over R&D subsidies under the WTO: *Canada-Aircraft*, *EC-Aircraft*, and *U.S.-Aircraft*. In the *Canada-Aircraft* case, the R&D subsidies at issue were found to be prohibited subsidies because they were contingent upon export performance. In the cases of *EC-Aircraft*, and *U.S.-Aircraft*, the R&D subsidies at issue were found to be actionable subsidies. Various government R&D programs were at issue for the EC and U.S. cases and some were found to be actionable subsidies and some were found to be consistent with the WTO rules (depending on the WTO's interpretation). We can understand the WTO's stance on R&D subsidies through analyzing the three unprecedented cases that deal with disputes over the R&D subsidies; subsequently, we draw policy implications based on the case analysis.

It is salient to compare the subsidy programs of the EC and the U.S. The R&D policies of the EC had a simple form where the governments directly provided grants or loans to Airbus and the WTO ruled all of them (except for one program) to be illegal. However, the policy was relatively indirect in the case of the U.S. and appeared to be market-based. U.S. subsidies were provided through a government-affiliated agency that entered into a contract or agreement with the aircraft company to provide funds to conduct aeronautics R&D research for the government. Some measures in the U.S.'s case were found to be illegal while some were found to be legal. These two cases emphasized

different legal issues that can provide a more comprehensive analysis of the legitimacy of the R&D subsidies. The focus of the WTO on the EC case was on the specificity issue in regards to whether the beneficiary was limited to a certain industry. In the U.S. case, the disputes concentrated on the determination of the financial contribution (how the R&D subsidy was distributed) and the specificity issue. Although the R&D subsidy policies of the EC and the U.S. are similar to some extent, their policy incentives have different structures, and the WTO rulings over those different types of R&D subsidies provide interesting implications for policy makers.

As governments are often compelled to provide R&D subsidies to promote strategic industries, this paper analyzes the findings on illegal and legal R&D subsidies and provides policy implications on the methods to provide subsidies that are not inconsistent with the WTO.⁴⁰

3.2.1. Canada-Aircraft Case

The dispute over the regional civil aircraft between Canada and Brazil originated from the firm-level rivalry between Canadian Bombardier and Brazilian Embraer that are major regional aircraft producers in the world. The dispute began in 1996 with a request by Canada for the establishment of a WTO Panel to investigate the legitimacy of the Brazilian PROEX program.⁴¹ Brazil filed a complaint against Canada the following year in regards to export-contingent production subsidies and R&D subsidies by Canada. In 1999, the WTO ruled that Canada and Brazil both provided export subsidies to regional aircraft producers and asked both parties to change their export subsidy programs to comply with the SCM Agreement (Pavcnik, 2002). After the WTO Panel rulings, both countries appealed the WTO Panel decision and twice requested for the establishment of a compliance panel.

Among the various subsidies by the Canadian government that Brazil alleged to be inconsistent with the WTO, R&D subsidies at issue were the funds provided to the regional aircraft industry under the Technology Partnerships Canada (TPC) program and its predecessor scheme Defense Industry Productivity Program (DIPP)⁴². Brazil argued that the TPC targeted conditionally repayable investments in project that result in a high technology product for export – beneficiaries were supposed to repay only when the business becomes commercially successful, and they did not have to repay if the technology development was unsuccessful.⁴³ Even if the project was successful, the rates of return that the firms had to repay were far below the market rate of return. Brazil further argued that the Canadian government provided subsidies to promote exports and thus were in the form of a prohibited export subsidy.

⁴⁰ In order to be actionable subsidies, it requires *adverse effects* to be found. However, the aim of the paper is to define the characteristics of subsidies found to be consistent or inconsistent with the WTO and provide implications for policymaking. The subsequent effects of the subsidies at issue are irrelevant to policy suggestions; therefore, the paper does not discuss rulings by the WTO Panel in regards to the adverse effects.

⁴¹ The PROEX program is a government export promotion scheme that provides subsidies to foreign consumers that purchase Brazilian regional aircraft.

⁴² Regarding DIPP, the WTO Panel said no relevant evidence was provided by Brazil; therefore, it is not further discussed in this paper.

⁴³ WT/DS70/R, para. 9.284.

Canada argued in defense that the TPC supported broad sectors and technologies in all industrial sectors of Canada. The basic objectives of the program were to establish industrial technology and skilled human resources for internationally competitive products. Canada asserted that the application documents of the TPC identify export performance as a condition for contribution eligibility and there is no requirement for products (that result from the R&D investment) to be exported.

The WTO Panel found that the TPC was a prohibited export subsidy since the measure constituted a financial contribution, conferred a benefit, and was contingent upon export performance. In proving a subsidy, the panel acknowledged that the TPC contributions to the Canadian regional aircraft industry were a direct transfer of funds by the Canadian government and thus constituted a financial contribution.⁴⁴

In regards to if a benefit was conferred, the WTO Panel noted that at least three specific TPC contributions in the regional aircraft sector were negotiated on terms below the commercial rate of return.⁴⁵ Regarding whether TPC program was contingent upon export performance, the WTO Panel found that TPC assistance to the Canadian regional aircraft industry was in fact tied to export performance and therefore constituted export subsidies.⁴⁶ The WTO Panel applied a “but for” test to determine the export contingency of the subsidy and examined if TPC assistance to the Canadian regional aircraft industry would not have been granted *but for* anticipated export opportunities or export earnings.⁴⁷ Some of the evidence that the WTO Panel took into consideration was:

- Canadian aerospace sector exports a large proportion of its output
- TPC Business Plan notes that the approach of the TPC in the aerospace and defense sector is to directly support near market R&D projects with a high export potential
- TPC Annual Report states that the TPC is proud to be an investment partner in the export-oriented success story
- Industry Canada press released quotes Minister of Industry John Manley stating that TPC’s investment in these projects will help increase the global competitiveness of this industry, while supporting jobs in Montreal, in Halifax and across the country, generating economic growth and export dollars
- TPC statistics and the public statements recount and emphasize the amount of export

⁴⁴ The details of the financial contributions are: i) USD 87 million granted to Bombardier to assist the development of Bombardier’s 70-seat Canadair Regional Jet project, ii) USD 57 million contribution to de Havilland to develop a 70-seat “stretch” version of Dash 8; USD 100 million TPC contribution to Pratt and Whitney Co., iii) USD 12.7 million to Allied Signal for the development of the power management generating system for the Dash 8-400, and iv) USD 9.9 million contribution to Sextant Avionique Canada Inc. for the development of the avionics system for the Dash8-400 and the CRJ-700 flight control system.

⁴⁵ WT/DS70/R, para. 9.307.

⁴⁶ Subsidies are prohibited when subsidies are either in law or in fact contingent upon export performance (SCM Agreement, Article 3.1), and the TPC program of Canada was alleged to be in fact contingent upon export performance rather than in law.

⁴⁷ WT/DS70/R, para. 9.340. SCM Agreement Article 3, note 4 states that subsidies are contingent in fact upon export performance when “the facts demonstrate that the granting of a subsidy... is in fact tied to actual or anticipated exportation or export earnings”.

sales generated by these contributions

The WTO Panel concluded that the TPC assistance to the Canadian regional aircraft industry was linked to anticipated export opportunities or export earnings and therefore contingent upon export performance.⁴⁸ On appeal, the WTO Appellate Body upheld the findings of the WTO Panel although it disapproved the Panel's use of "but for" test to determine the export contingency of the subsidy.⁴⁹

TABLE 1. WTO Panel Findings on Canada's R&D Subsidies Whether They Constitute an "Export Subsidy"

Legitimacy	Programs at Issue	Contingent upon export performance		Reason
		<i>de jure</i>	<i>de facto</i>	
Illegal	Technology Partnerships Canada (TPC)	-	Yes	Conditional repayable loans for near-market projects with high export potential

Source: Authors based on the legal analysis on the WTO Panel reports (*Canada-Aircraft Case*)

3.2.2. EC-Aircraft Case

Similar to the Canada versus Brazil dispute, the dispute between the U.S. and EC over large civil aircraft also began as a firm-level dispute between Boeing and Airbus. Created in 1916, Boeing traditionally dominated the global aircraft market (until the creation of Airbus) and started to expand its market share.⁵⁰ Airbus was formed in 1969 as a consortium owned initially by independent aircraft companies in France and Germany that were later joined by Spanish and British firms (Chanda, 2011). Airbus has been subsidized by these European governments and each subsidizing country participated in the manufacture of different aircraft parts.⁵¹ Airbus successfully entered the market and accelerated its market entry after its successful sale of the A300. Airbus became as a rival to Boeing after Airbus announcing its plan to develop the A320 as an alternative to the Boeing B737 and B757 that were Boeing's best selling products.⁵² As Airbus entered the U.S.-dominated large civil aircraft market in the late 1970s to 1990s, political and domestic pressure on the U.S. government rose to limit subsidies (Levick, 1992).

The costly dispute over subsidies between Airbus Industries and Boeing has lasted for decades. The first dispute occurred in 1978 when Boeing accused Airbus of predatory pricing, and the U.S. brought the matter to GATT and argued that Airbus benefited from European government subsidies.

⁴⁸ WT/DS70/R, para. 9.341.

⁴⁹ For more details on the Appellate Body decisions (WT/DS70/AB/R) and the compliance issues (*Canada - Measures Affecting the Export of Civilian Aircraft Recourse by Brazil to Article 21.5 of the DSU*, WT/DS70/RW and WT/DS70/AB/RW).

⁵⁰ There were two other U.S. aircraft manufacturers – Lockheed and McDonnell Douglas; however, with a rise of Airbus in the world market, Lockheed was forced to shut down in the early 1980s and McDonnell Douglas merged with Boeing in 1997 (Chanda, 2011).

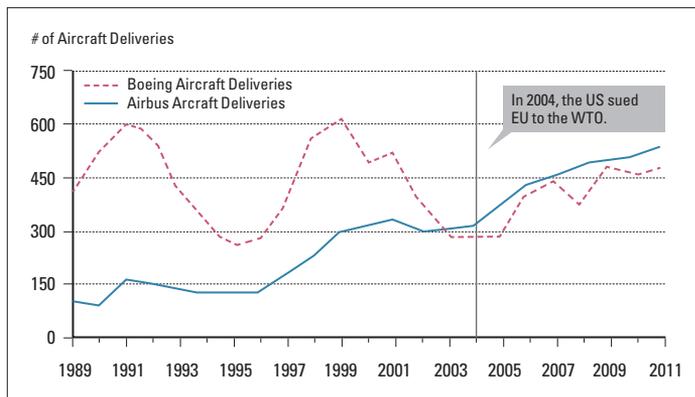
⁵¹ Middle parts are manufactured in France, front and ending parts are made in Germany, main wings are made in England, and Spain manufactures the tail wing and certain parts. Those parts are assembled at the Airbus headquarters in France.

⁵² The Boeing B737 and B757 are narrow-body single-aisle aircraft for short to medium-range flights.

After the U.S. turned to the GATT in regards to EC aircraft subsidies, the EC requested the negotiation of a bilateral agreement concerning that the dispute would adversely affect the EC-US relationship. The dispute ended with a bilateral agreement between the U.S. and EC in 1992.

The second dispute closely examined in this paper occurred in 2004 as the market share of Airbus exceeded that of Boeing. Even after the 1992 Civil Aircraft Agreement, the Airbus market share steadily grew and Airbus began to deliver more aircraft than Boeing in 2003 (Figure 3).⁵³ The emergence of Airbus became a significant concern to Boeing and the U.S. government. In the fall of 2004, trade representatives from the U.S. and the EU began negotiations to modify the 1992 agreement, yet the negotiations failed (Carbaugh & Olienyk, 2004). The U.S. unilaterally terminated the 1992 Civil Aircraft Agreement and requested consultations with the EC to the WTO in October 2004, alleging that the European consortium had violated WTO rules by providing illegal subsidies to Airbus.⁵⁴ On the same day the U.S. requested the initiation of WTO dispute settlement proceedings against the EC, the EC counter-sued to the WTO that the U.S. government provided subsidies to Boeing.⁵⁵ Starting in 2004, the bilateral dispute under the WTO lasted for eight years until the recent Appellate Body rulings.

FIGURE 3. Aircraft Delivery Trends of Boeing and Airbus (1989 -2011)



Source: Authors based on data for Commercial Airplane Deliveries of Airbus and Boeing 1989-2011
<http://www.airbus.com/company/market/orders-deliveries>, <http://active.boeing.com/commercial/orders/index.cfm>

It took significantly longer for WTO Panel rulings to be issued due to the scale of the dispute. The WTO Panel circulated its report on European government subsidies in June 2010, five years after the creation of the WTO Panel. In addition, WTO Panel decisions on the U.S.-Aircraft case were

⁵³ Figure 2 shows the number of deliveries includes all types of civil aircraft produced by Airbus and Boeing besides large civil aircraft.

⁵⁴ Figure 2 shows that the complaint by the U.S. occurred promptly after aircraft deliveries of Airbus exceeded those of Boeing.

⁵⁵ The product at issue in the disputes is large civil aircraft that weigh over 15,000 kg and are designed to transport 100 or more passengers and/or a proportionate amount of cargo (Tariff classification heading 8802.40).

established one year later in 2011. The EC appealed the WTO Panel decision in April 2011. The U.S. also appealed the WTO Panel rulings the same month after the EC's appeal.

The U.S. and the EC have had a long-lasting and high-stake dispute over their civil aircraft industries. Huge economic interests and political differences exist behind this unresolved dispute. Economically, Airbus and Boeing play crucial roles in their respective domestic economies and significantly contribute to export shares. Politically, the U.S. and Europe have different attitudes towards subsidies that are derived from historically different ideologies on a market economy, “liberal, free-enterprise America” versus “state-supported Europe.”⁵⁶

EC's subsidies were alleged to be actionable subsidies and different from the Canadian R&D policy measures that were challenged as prohibited export subsidies. Various R&D support to Airbus by individual governments (France, Spain, Germany, and the UK) and the EC were at issue. The WTO examined each program in detail and all but one were found to be inconsistent with the WTO because they were provided to a certain industry, which is the aeronautics industry in this case. Most illegal programs were grants or loans provided directly to the aeronautics industry by the central or local governments. Programs that fall under this type were French government grants, Spanish government loans, German government grants, and UK grants under the Civil Aircraft Research and Development (CARD) program. The EC Framework Program and Spanish PROFIT were programs that contained sub-programs to support specific industries. The one program found to be legal was grants provided through an open competition for R&D activities in various industries (Table 2).

TABLE 2. Panel Findings on EC R&D Subsidies Whether They Constitute “Specific Subsidies”

Legitimacy	Programs at Issue	Specificity		Reasoning
		<i>de jure</i>	<i>de facto</i>	
Illegal	<ul style="list-style-type: none"> • French government grants • German government grants • German sub-federal grants (Bavaria, Hamburg, and Bremen) • Spanish PTA loans • UK CARAD grants 	Yes	-	Grants/loans designed and provided to a specific industry
	• EC Framework Programs	Yes	-	Grants/loans with a sub-budget dedicated to a specific industry
	• Spanish PROFIT loans	No	Yes	Adverse inference from insufficient information provided by the EC
Legal	• UK Technology Program	No	-	Grants through open competition

Source: Authors based on the legal analysis on the WTO Panel reports (EC-Aircraft Case)

⁵⁶ Meier-Kaienburg (2006) provides discussions on this historically different trade paradigm between Europe and the United States – European governments have frequently supported private sectors since the World War II to boost up the war-stricken economy while the U.S. has considered subsidization as a hindrance to free market.

There was minimal dispute over whether the measures at issue were subsidies. The government contributions took the form of “grants involving direct transfers of funds” or “loans,” and were found to be financial contributions. In addition, they were found to confer benefits upon Airbus because they were provided on terms more favorable than what would have been provided in the market.

The WTO Panel focused on determining if the beneficiaries of the subsidies were specific. Each government subsidy was found to be specific because they were directed at civil aeronautics research activities and granted to aeronautics manufacturing companies that included Airbus. To determine the specificity of the subsidies, the WTO Panel based their reasoning on various documents (such as government reports, websites, and press releases) that indicated that the objectives of the programs were to promote the aeronautics industry. The following are the evidence that the WTO Panel considered⁵⁷:

- French government grant
 - The French Senate report indicates that the funding was provided to the aeronautics companies (Aerospatiale-Matra, Dassault Aviation, and L’Onera).
 - More than half of the support provided for research and studies for 100-seat-and-above range of aircraft were provided to Airbus.
- German federal government grant
 - The budget plans indicate that the objective was to support the competitiveness of the aviation industry in Germany.
- German sub-federal government grants (City of Bavaria)
 - DLR website describes that the grants were available for civil aviation research in Bavaria in close coordination with the federal government aeronautical research program and available for companies from Bavaria’s aviation industry.
 - The document from the Bavarian Parliament indicates that the grants were made to help develop aeronautics and aerospace technologies.
- German sub-federal government R&T grants (Bremen)
 - The Memorandum of the Bremen City Parliament and State Parliament indicates that funds were allocated to pursue research and development to strengthen Bremen as an aircraft construction site.
 - The website of the Fraunhofer Institute for Manufacturing Technology and Applied Materials Research in Bremen indicates that the purpose of the program was to use the know-how of public institutions for the Airbus plant and develop this for the needs of aircraft construction.

⁵⁷ WT/DS70/R, para. 7.1504–7.1609

-Press releases issued by the Senator of Economics of the City of Bremen indicates that aircraft construction is traditionally one of the key industries in Bremen and through the funds, the Senate expected to contribute significantly to improve the performance and competitiveness of the Bremen Airbus Plant.

- German sub-federal government R&T grants (Hamburg)
 - German Aerospace Center website indicates that the projects are to encourage Hamburg's aerospace industry and develop new technologies (i.e. to strengthen the technological productivity of Hamburg's aerospace and supply industry).
- UK government grants under the Civil Aircraft Research and Development Program (CARAD)
 - UK Department of Trade and Industry (DTI) provided aeronautics-related research grants to Airbus research consortia under the CARAD program.
 - Innovation Budget Guidelines to officials of the CARAD that set out the procedures to be followed on CARAD projects was used as evidence.
- Spanish Plan Tecnológico Aeronáutico (PTA) loans
 - Eligible participants for the program were aircraft manufacturing/design/supply/maintenance enterprises and research institutions related to aeronautics technology.
 - A letter from the European Commission to the Spanish Ministry of External Relations indicates that the objective of the program was to support the competitiveness of the aviation industry in Spain.

Unlike the aforementioned government subsidies, the EC Framework Programs provided contributions to a broad range of industries, yet contained sub-programs specifying the eligible industries that could receive funds. In deciding whether the EC Framework Programs were specific subsidies, the WTO Panel noted that the program as a whole is considered specific if sub-budget under the sub-program is allocated to a certain industry. The overall aims of the Framework Programs were expressed as advancing EC R&TD activities in general; however, the funding was specifically allocated to aeronautics research related work under sub-programs. The aeronautics sector was the only sector where a specified amount of funding was allocated. Regarding the EC's Framework Programmes, the WTO Panel used legislation as evidence for their decision. The EC argued based on the reasoning of the WTO Panel that subsidies allocated to a variety of research areas would always constitute a specific subsidy. The WTO Panel noted that enterprises could receive subsidies under different sub-programs; however, the amount set aside for Airbus was not equally accessible to other enterprises. The granting authority limited access to subsidies by allocating the budget to companies undertaking research in the aeronautics sector, and thus the subsidies under the Framework Programs were found to be specific.

The PROFIT loans under the Spanish government also had a structure that supported overall industries as a whole with sub-programs designed for specific industries. However, the WTO Panel could not determine if the program was a specific subsidy due to a lack of evidence on whether the sub-

budget was allocated specifically to the aerospace industry. Because the EC submitted insufficient information to the WTO Panel, the Panel drew an adverse inference from the non-cooperation of the EC and ruled that the program is de facto specific.

Among the challenged subsidies granted by the EC to Airbus, the only program that was found to be legal was the UK Technology Program. The UK Technology Program was a research program intended to fund R&TD activities and funding was provided through competition. Grants provided to Airbus under the UK Technology Program were found to be not specific since the TP is a research program intended to fund R&TD activities across a broad range of economic sectors. Funds were awarded through open competitions and the research themes varied from year-to-year. The research themes were seven key technology areas (e.g. Bioscience and Healthcare Technology, Emerging Energy Technology, Information and Communication Technology) and not focused on particular economic sector. In addition, the brochure explicitly identified various sectors as potential beneficiaries that included the aerospace, automotive, construction, etc.

3.2.3. US-Aircraft Case

While the EC's R&D subsidies were in the form of direct grants or loans, the R&D assistances provided by the U.S. to Boeing were indirect, provided through a co-project between the government agency and Boeing. The U.S. government provided payments under different types of R&D arrangements such as procurement contracts and assistance instruments. Procurement contracts are used when the government acquires goods or services for the direct benefit of the government and assistance instruments (which include grants, cooperative agreements, technology investment agreements) are used when the government transfers a thing of value to the recipient.⁵⁸

The EC alleged that the U.S. has provided subsidies to assist the research by Boeing on the development, design, and production of large civil aircraft through the National Aeronautics and Space Administration (NASA)⁵⁹, US Department of Defense (DOD), and Department of Commerce (DOC) aeronautics R&D programs.⁶⁰ The WTO Panel found that Boeing had received actionable R&D subsidies from NASA and the DOD through R&D programs and general support. The WTO-incompatible NASA and DOD subsidies were found to cause serious prejudice to the interests of the EC.⁶¹ While these specific measures were found to be illegal subsidies, several other measures were found to be consistent with the WTO – DOD aeronautics R&D contracts, DOC Advanced Technology Program, and waiver of patent rights by NASA and DOD (Table 3).

⁵⁸ WTO, WT/DS353/R, para 7.945, 7.1115; “cooperative agreement” means the same kind of relationship as a grant and a “technology investment agreement” is made when purpose of the project is to support research for the benefit of the government.

⁵⁹ NASA is a U.S. government agency responsible for space and aeronautics research and programs.

⁶⁰ WTO, WT/DS353/R, para. 4.60.

⁶¹ The NASA and the DOD aeronautics R&D subsidies were found to cause significant price suppression, significant lost sales and threat of displacement and impedance of exports from third country markets, with respect to the 200-300 seat wide-body LCA product market (Wittig, 2011 at pg. 150).

TABLE 3. Panel Findings on U.S. R&D Subsidies Whether They Constitute “Specific Subsidies”

Legitimacy	Measures at Issue	Financial Contribution	Specificity		Programs at Issue
			<i>de jure</i>	<i>de facto</i>	
Illegal	NASA R&D Contracts and Agreements	Yes	Yes	-	Under the procurement contracts and agreements with Boeing, NASA funded Boeing to conduct research for the benefit of Boeing
	DOD RDT&E Assistance instruments	Yes	-	Yes	DOD provided payments and access to facilities under assistance instruments to conduct research for dual-use technologies
Legal	DOD RDT&E Contracts	No	-	-	DOD provided payments under contract to Boeing to conduct research for the benefit of the government (improving defense systems)
	DOC Advanced Technology Program	Yes	No	-	DOC provided funding to various high technology industries.
	Intellectual Property Right Waivers by NASA & DOD	-	No		In all cases, the contractor or partner owns patent rights from performing research funded by the U.S. government

Source: Authors based on the legal analysis on the WTO Panel reports (US-Aircraft Case)

NASA R&D Support Through Procurement Contracts

The provisions by NASA for payments and access to government facilities for civil aircraft-related R&D under contracts and agreement were found to be illegal because the research was conducted for the benefit of Boeing and was limited to Boeing. When examining the measures at issue, two questions were raised i) whether purchases of services are excluded from the scope of the definition on subsidy, and ii) whether NASA’s R&D contracts are characterized as *purchases of services*. To the first question, the WTO Panel judged that the purchases of services were excluded from the scope of the definition of the subsidy.⁶² To be defined as the purchases of services, the WTO Panel noted that it depended on the nature of the work that Boeing was required to perform under the contracts and whether the R&D that Boeing was required to conduct was for its own benefit or if it was for the benefit and use of the U.S. Government.⁶³ Evidence used was statements made by NASA officials and NASA program budget reports and documents. The evidence indicated that the work under the aeronautics R&D contracts with the NASA was for Boeing’s own benefit and the NASA program was ruled as a financial contribution. The WTO Panel also noted that the eight aeronautics R&D programs conferred benefits to Boeing since no commercial entity would have paid another to perform R&D that was principally for the benefit of the beneficiary.

In regards to the specificity issue, the EC alleged that the subsidies were explicitly limited to enterprises that participated in aeronautics-related R&D and industries that satisfied the objectives of the

⁶² WTO, WT/DS353/R, para. 7.955-958; One of the reasoning was that the SCM Agreement stipulates government provision of goods or services or purchase of goods as a financial contribution but the provision omits the purchase of services.

⁶³ The Panel considered the following five elements to determine if the contracts were for the purchase of services: i) the legislation authorizing the programmes, ii) types of instruments entered into between NASA and Boeing, iii) whether NASA had any demonstrable use for the R&D performed under the programmes, iv) allocation of intellectual property rights, v) whether the transactions at issue had the typical elements of a purchase of services.

Space Act that initiated the programs. Evidence provided by the EC was that Boeing received all contracts awarded by NASA and that the active participation of Boeing at the highest levels of the NASA Advisory Council enabled NASA to grant subsidies based on the needs of Boeing. The U.S. provided evidence that rebutted only the part of the EC argument. The WTO Panel ruled that the NASA's measures were specific because the U.S. did not provide sufficient evidence to rebut the EC's argument.

DOD R&D Support Through Assistance Instruments

The DOD provided payments and access to facilities to Boeing through 23 programs; in addition, the transaction arrangements between the DOD and Boeing were procurement contracts and assistance instruments. However, only the support provided through assistance instruments were found to be illegal. The EC argued that the DOD made payments to Boeing to perform R&D related to dual-use technologies by allowing the US LCA industry to participate in DOD-funded research and by enabling it to exploit the research results. Among the 23 programs under which Boeing performed R&D for the DOD, two of the programs were for research on the development of dual-use technologies for military and commercial aircraft. These programs were funded through a cooperative agreement – a type of the assistance instruments.⁶⁴ In addition, according to the U.S. law, the government is supposed to acquire only limited rights over data that results from a co-project when the arrangement between the government and a company is an assistance instrument. Based on this evidence, the WTO Panel ruled that the work Boeing performed under the R&D assistance instruments with the DOD was principally for the benefit and use of Boeing. Therefore, the assistance instruments were not purchases of services but were provisions of goods or services.

The WTO Panel then examined the question of if a *benefit* was obtained from a DOD assistance instruments measure. The WTO Panel concluded that the program conferred a benefit based on the reason that no commercial entity would provide payments and access to its facilities to another to perform R&D activities principally for the benefit and use of the recipient entity.⁶⁵

To determine the *specificity* of the program, the WTO Panel noted the evidence that almost half of all DOD R&D funding went to five enterprises (all of which are in the aircraft industry). Subsequently, the WTO Panel ruled that the subsidies were sufficiently limited to a group of enterprises or industries and thus constituted specific subsidies.⁶⁶

DOD R&D Support Through Procurement Contracts

In contrast to DOD support programs under the assistance instruments that were found to be illegal subsidies, support under the procurement contracts between the DOD and Boeing were found to be consistent with the WTO. According to the mission description statements of each R&D support

⁶⁴ WTO, WT/DS353/R, para. 7.1148.

⁶⁵ WTO, WT/DS353/R, paras. 7.1183-7.1184.

⁶⁶ WTO, WT/DS353/R, paras. 7.1197-7.1198.

program (except for the two programs under assistance instruments), the programs under the contracts were to conduct R&D to advance national defense or to reduce their costs. Their purposes did not demonstrate that the DOD aimed to transfer technology to Boeing. The WTO Panel ruled that the work that Boeing performed under the R&D contracts with the DOD was for the benefit and use of the DOD and characterized them as a purchase of services instead of as financial contributions.

DOC Aeronautics R&D Advanced Technology Program⁶⁷

The EC argued that Department of Commerce (DOC) made payments to Boeing to perform R&D under the Advanced Technology Program (ATP) and that the subsidy was specific. The EC based the argument on three reasons. First, the subsidy was available only for a sub-set of US-produced goods that performed research on “high-risk, high pay-off, emerging and enabling technologies” according to the purpose written in the ATP Rule. Second, the program emphasized, “solving generic problems of specific industries” as stipulated in the ATP statute. Lastly, the eight projects under the ATP were limited to a group of enterprises and industries.

The WTO Panel noted that a subsidy is specific when it is provided to a “sufficiently limited group of enterprises or industries” and not when it is limited in any way at all. The WTO Panel looked at each argument by the EC. To the first argument, the WTO Panel stated that “high-risk, high pay-off, emerging and enabling technologies” does not appear to be limited to a group of enterprises or industries. The WTO Panel also looked at where the ATP funding was directed at and found that the funding was spread across various fields that included advanced materials and chemicals, biotechnology, electronics, and computer hardware. To the second argument, the WTO Panel noted that the statement “solving generic problems of specific industries” is included under the broader context in which the program is supposed to “aid industry-led United States joint research and development ventures.” Reading the full provision, the WTO Panel found that ATP funding is not limited to “specific industries.” To the third argument, the WTO Panel said that specificity must be analyzed at the level of the subsidy program (at the level of the entire ATP in this case). In order for the Panel to examine the subsidy at the level of individual payments provided, the complainant needs to provide reasons. The EC failed to prove that the ATP as a whole was specific and did not provide reasons to examine specificity at an individual project level. Based on these reasons, although the ATP is a subsidy, the WTO Panel found that it is not an illegal subsidy since it is sufficiently broadly available and not specific.

Intellectual Property Right Waivers by NASA and DOD

In regards to waivers and transfer of patent rights by NASA and the DOD, the WTO Panel ruled they are consistent with the WTO. Assuming that the allocation of patent rights under NASA and DOD R&D contracts and agreements with Boeing is a subsidy, the WTO Panel first examined the specificity of the measure and stated that allocation of patent rights is uniform under all U.S. government R&D contracts, agreements and grants. In all cases, the contractor or partner owns any

⁶⁷ WTO, WT/DS353/R, paras. 7.1211-7.1257.

inventions that resulted from research funded by the U.S. government; therefore, the WTO Panel ruled that the measure was not specific and therefore consistent with the WTO.

3.3. Summary of Key Findings of the Disputes

This paper has reviewed and analyzed various R&D subsidies disputed under the WTO in order to understand the different characteristics of illegal and legal R&D subsidies according to WTO rulings. Illegal R&D subsidies were in the form of grants or loans that were granted based on export earnings or specifically limited to a certain enterprise or industry. In the *Canada-Aircraft* case, the illegal R&D subsidies were in the form of conditional repayable loans to aircraft development projects and directly supported near market R&D projects with a high export potential. The illegal subsidies in the *EC-Aircraft* case were direct grants or loans specifically limited to Airbus or the European aircraft industry. In most of the cases, the programs at issue were solely designed to promote aeronautics technology. However, it is important to note that in the case of the EC Framework Programs, even though the programs themselves supported research activities in various sectors, it was judged as a specific subsidy because a certain amount of budget was allocated to aeronautics R&D at the sub-level of the programs.

In the *US-Aircraft* case, the R&D support measures were more sophisticated in that the subsidies were indirectly provided by government agencies through different transaction arrangements. While the funding by the EC was clearly a direct transfer of funds, funding by the U.S. was granted to Boeing to conduct research under the transaction arrangements of procurement contracts and assistance instruments and the WTO Panel examined these transactions to determine whether it was a subsidy or not. In regards to the procurement contracts, there was a dispute over if it was a purchase of services; however, it was not considered as a subsidy by the WTO Panel. According to the WTO Panel, if the benefit of the research went to the government then the funding through the contracts would be considered a purchase of service. Therefore, the support granted by NASA to Boeing to conduct research through the procurement contracts and assistance instruments was found to be illegal because the research was conducted for the benefit of Boeing and was limited to Boeing. Even though the procurement contracts were to acquire services for the benefit of the U.S. government, the support through the procurement contracts was found to be for the benefit of Boeing since the function of NASA is to promote the aerospace industry. The support by the DOD for R&D through assistance instruments was found to be illegal because the research was for dual-use technology where the result could be exploited by the government as well as by Boeing; in addition, the government had limited rights over the research data having limitations in their use or the distribution of data.

The WTO Appellate Body (AB) mooted the decision by the WTO Panel that the purchase of services are excluded from the scope of a subsidy (i.e. questions on the issue raised by the WTO Panel have no legal effect even if any judgment is made according to the rules). Instead, the Appellate Body considered the transactions under NASA contracts and the assistance instruments of the DOD as a joint-venture and viewed their funding as equity. The AB ruled the support provided by NASA and DOD as a subsidy because they conferred benefits to Boeing vis-à-vis an equity infusion that is regarded as a financial contribution.

4. POLICY IMPLICATIONS AND CONCLUSION

Our findings are case-specific and must be interpreted cautiously; however, the information is current and inclusive of all relevant aircraft cases. We can draw several implications based on the subsidies found to be illegal. First governments should be cautious in making R&D support policy programs that would not be directly targeted towards near-market R&D projects with a high export potential. For example, policy makers should be careful to use terms and the explicit use of language such as “export promotion,” “near market”, “commercialization,” and “specific region and firm. Second, the government should avoid programs that directly provide grants or loans targeted on a certain industry. A sub-budget can be a problem if a ring-fenced budget is allocated to a specific industry even if the program as a whole does not specifically support a certain industry. For instance, the plan and its sub-plans that have lists of R&D subsidies to be conferred with relation to the small number of a certain industry or the targeted regions can be regarded as *de facto specific*. Third, the benefit of the research should not be solely for the industry when a government agency conducts a co-project on R&D with firms from a certain industry. The logic of the market is a simple measure to test if a subsidy program is consistent with WTO rules. However, the use of seemingly market-driven instruments is an insufficient criterion for WTO inconsistency or consistency according to the findings of the *US-Aircraft* cases. What is most important is who benefits *specifically* from the subsidies by the government.

What are the types of R&D subsidy policies that are consistent with current WTO rules? Implications can be drawn from our analysis on government R&D assistance measures that were found to be consistent with the WTO. The R&D support programs found to be legal were provided to a wide range of industries. In the *EC-Aircraft* case, the UK Technology Program was found to be consistent, not just because the grants were provided through open-competition, but because the grants were targeted towards a wide variety of industries. In addition, the DOC Advanced Technology Program was found legal in the *US-Aircraft* case since it provided funding to various high technology industries. Another legal measure was the government support where the results from the government-funded R&D projects were used for the benefit of the government. For instance, the U.S. DOD RDT&E contracts (where the results were primarily for the government benefit) were consistent with the WTO. Lastly, it was found in compliance with WTO rules if patent rights (that resulted from the co-project between a government and industries) were waived equally to any participant of the project.

In order to support industries in a way that is consistent with the WTO, a government can consider planning R&D subsidies targeted towards technology rather than a specific industry if the subsidized technology is used in broad sectors of industry. In addition, a government can fund a firm to conduct research when the result is solely for the government such as improving national defense. Lastly, allocating intellectual property rights equally to any participants can be legitimate when a government is involved in a R&D co-project.

New government-financed competitors from China, Japan, South Korea, and Russia are trying to enter the civil aircraft market; subsequently, their domestic subsidy policies (or the subsidized firms) can be subject to a WTO complaint once they successfully produce and export commercial

aircraft. Thus, it is salient for a government to review subsidy policies in order to be consistent with the WTO.⁶⁸

The policy suggestions mentioned in this paper do not guarantee that a government will be able to avoid litigation, even though it adopts what is suggested as policy implications. Litigation over R&D subsidies has been a minor issue; however, this study illustrated how countries (especially developing countries) can provide R&D subsidies that are consistent with the WTO and suggest the proper criteria for R&D subsidies.

⁶⁸ Some may argue that the WTO R&D rules are somewhat “overreaching” and raise fundamental issues on whether certain national R&D policies in what sense should be illegal or undesirable to the world trading system (Sykes, 2003). This line of thought may be extended to the possibility of the established incumbents abusing the WTO legal framework (such as SCM measures) to impede other countries from using R&D policies to promote indigenous technologies.

REFERENCES

- Aggarwal, V. K., & Evenett, S. J. (2010). Financial Crisis, “New” Industrial Policy, and the Bite of Multilateral Trade Rules. *Asian Economic Policy Review*, 5(2), 221-244.
- Aggarwal, V. K., & Evenett, S. J. (2012). Industrial Policy Choice during the Crisis Era. *Oxford Review of Economic Policy*, 28(2), 261-283.
- Andersen, P. A. (2009). *New Civil Aircraft Competitors on the Horizon?* USITC Executive Briefings on Trade.
- Baldwin, R., & Krugman, P. (1988). Industrial policy and international competition in wide-bodied jet aircraft. In R. Baldwin (Ed.). *Trade policy issues and empirical analysis* (pp. 45-78). Chicago: University of Chicago Press.
- Benkard, C. L. (2000). Learning and Forgetting: The Dynamics of Aircraft Production. *The American Economic Review*, 90(4), 1034-1054.
- Carbaugh, R. J., & Olienyk, J. (2004). Boeing-Airbus subsidy dispute: A sequel. *Global Economy Journal*, 4(2), 6.
- Chanda, S. (2011). The Battle of the Big Boys: A Critical Analysis of the Boeing Airbus Dispute Before the WTO. Available at SSRN 1944588.
- Davidson, C., & Segerstrom, P. (1998). R&D Subsidies and Economic Growth. *The RAND Journal of Economics*, 29(3), 548-577.
- Fisher, D. I. (2002). Super Jumbo Problem: Boeing, Airbus, and the Battle for the Geopolitical Future. *Vand. J. Transnat'l L.*, 35, 865.
- Irwin, Douglas A. & Nina Pavcnik (2004). Airbus versus Boeing revisited: International Competition in the Aircraft Market,” *Journal of international economics*, 64(2), 223-245.
- Levick, M. J. (1992). 1993 Harold A. Shertz Award Winner: The Production of Civil Aircraft: A Compromise of Two World Giants. *Transp. LJ*, 21, 433.
- Low, P. (1993). *Trading free: The GATT and US trade policy*: Twentieth Century Fund Press New York.
- Matsushita, M., Schoenbaum, T. J., & Mavroidis, P. C. (2006). *The World Trade Organization* (Vol. 127): Oxford University Press.
- Meier-Kaienburg, N. (2006). WTO's Toughest Case: An Examination of the Effectiveness of the WTO Dispute Resolution Procedure in the Airbus-Boeing Dispute over Aircraft Subsidies, *The. J. Air L. & Com.*, 71, 191.
- Pavcnik, N. (2002). Trade Disputes in the Commercial Aircraft Industry. *World Economy*, 25(5), 733-751.
- Rosenthal, P. C., & Vermynen, R. T. (1999). WTO Antidumping and Subsidies Agreements: Did the United States Achieve Its Objectives during the Uruguay Round, *The. Law & Pol'y Int'l Bus.*, 31, 871.
- Ruttan, V. W. (2001). *Technology, Growth and Development: An Induced Innovation Perspective*: Oxford University Press.
- Spencer, B. J., & Brander, J. A. (1983). International R & D Rivalry and Industrial Strategy. *The Review of Economic Studies*, 50(4), 707-722.
- Sykes, A. (2003). The Economics of WTO Rules on Subsidies and Countervailing Measures. U Chicago Law & Economics, Olin Working Paper(186).
- Tyson, L.D. (1992). *Who's Bashing Whom? Trade Conflict in High Technology Industries*. Washington, DC: Institute for International Economics.
- United States International Trade Commission (USITC) (1998). *The Changing Structure of the Global Large Civil Aircraft Industry and Market: Implications for the Competitiveness of the U.S. Industry*. USITC Publication 3143, Washington,

DC: U.S. International Trade Commission.

United States International Trade Commission (USITC) (2012). *Business Jet Aircraft Industry: Structure and Factors Affecting Competitiveness*. USITC Publication 4314, Washington, DC: U.S. International Trade Commission.

Wittig, S. (2010). The airbus-boeing dispute: Implications of the WTO boeing decision. *Intereconomics*, 45(5), 262-263.

GATT/WTO Documents

Agreement on Interpretation and Application of Articles VI, XVI and XXIII of the General Agreement on Tariffs and Trade ("Subsidies Code").

Agreement on Trade in Civil Aircraft.

The General Agreement on Tariffs and Trade 1947.

WTO, *Canada—Measures Affecting the Export of Civilian Aircraft*, WT/DS70/R, WT/DS70/AB.

WTO, *European Communities and Certain Member States—Measures Affecting Trade in Large Civil Aircraft*, WT/DS316/R, WT/DS316/AB

WTO, *United States—Measures Affecting Trade in Large Civil Aircraft*, WT/DS353/R, WT/DS353/AB