

Terms-of-Trade: A Criterion for Trade Disputes Settlement

Rosmy Jean Louis and Pumulo Roddy

December 2003

iisd International Institute for Sustainable Development
Institut international du développement durable

The International Institute for Sustainable Development contributes to sustainable development by advancing policy recommendations on international trade and investment, economic policy, climate change, measurement and indicators, and natural resources management. By using Internet communications, we report on international negotiations and broker knowledge gained through collaborative projects with global partners, resulting in more rigorous research, capacity building in developing countries and better dialogue between North and South.

IISD's vision is better living for all—sustainably; its mission is to champion innovation, enabling societies to live sustainably. IISD receives operating grant support from the Government of Canada, provided through the Canadian International Development Agency (CIDA) and Environment Canada, and from the Province of Manitoba. The institute receives project funding from the Government of Canada, the Province of Manitoba, other national governments, United Nations agencies, foundations and the private sector. IISD is registered as a charitable organization in Canada and has 501(c)(3) status in the United States.

Copyright © 2003 International Institute for Sustainable Development

Published by the International Institute for Sustainable Development

All rights reserved

International Institute for Sustainable Development
161 Portage Avenue East, 6th Floor
Winnipeg, Manitoba, Canada
R3B 0Y4
Tel: +1 (204) 958-7700
Fax: +1 (204) 958-7710
E-mail: info@iisd.ca
Web site: <http://www.iisd.org/>

I. Introduction	2
II. Background on Canada, the U.S. And EU In Relation To Trade-Related Subsidies	5
Affected Sectors	5
Sectoral Contribution.....	6
Sectoral Policies	7
III. Review of Trade-Related Subsidies - Their Rationale and Impacts.....	9
Trade-distorting Subsidies.....	9
Domestic Subsidies	10
Export Subsidies.....	12
Economic, Social and Environmental Impacts of Trade-Distorting Subsidies	17
Current Measures for Detecting and Resolving Trade Disputes.....	1
<i>Aggregate Measure of Support</i>	1
<i>Producer subsidy equivalent</i>	1
IV. Taxonomy of Trade-Related Subsidies	3
V. Terms-of-Trade: Proposed Indicator for Detecting and Resolving Trade-Related Disputes	24
Review of terms-of-trade	24
Simple Model	27
Comparison of the Current Measures with Proposed Terms-of-Trade Indicator	28
VI. Concluding Remarks	30
References.....	32
Appendix	36

Abstract

In this paper we review the existing studies on trade-distorting subsidies and their impact on trade in Canada, the U.S. and the EU15 as well as the measures that have been undertaken by the GATT and most recently, the WTO for detecting problems related to over subsidization and resolving trade disputes. In reviewing this literature we find that although the current measures—Producer Subsidy Equivalent (PSE), and Aggregate Measure of Support (AMS)—provide an adequate framework for settling trade-related disputes between countries, the indicators themselves are inadequate to address and resolve issues relating to subsidies and trade at the WTO.

We suggest the use of terms-of-trade as a better indicator for detecting and resolving trade disputes. To do so we first develop taxonomy of subsidies that captures all the relevant aspects of trade conflicts and that has the flexibility to incorporate existing taxonomies in the literature. We then present a two-good-two-country model, to illustrate how the proposed terms-of-trade indicator can be used as an alternative measure for detecting problems related to over-subsidization and settling trade disputes between/among trade partners. We provide a brief comparison between the current measures (PSE and AMS) and the proposed measure in order to determine to what extent they may be considered as substitute or complementary to each other.

Keywords: Subsidy, terms-of-trade, subsidy taxonomy and PSE.

I. Introduction

The agreement on Subsidies and Countervailing Measures (SCM Agreement) defines a subsidy as “a financial contribution by a government or any public body within the territory of a member which confers a benefit” (WTO 1994). The purpose of this agreement is to curb the use of government support that allows national governments to provide its producers with financial contributions giving the producers an advantage in the market place compared to other producers whose production is not subsidized. The agreement establishes two categories of subsidies- a) prohibited, and b) actionable (WTO 1994). **Prohibited subsidies** are those that are contingent upon i) export performance (*export subsidies*), and ii) the use of domestic over imported goods (*domestic subsidies*). These subsidies may be contested at the WTO because they tend to distort international trade and most likely end up hurting other trading partners.

Actionable subsidies on the other hand refer to subsidies that cause adverse effects on a given country’s interests and they include: damages to domestic industry in an importing country; damages to rival exporters from another country when the two compete in a third market; and damages to exporters trying to compete in the subsidizing country’s domestic market. These subsidies are not prohibited but are subject to trade action under the SCM Agreement and they are labelled as “amber light” subsidies.

Domestic support has long been considered as a policy instrument that governments use to either facilitate the growth of domestic import-competing industries (supported by the infant-industry argument) or to provide the poor with basic needs goods (supported by the food security argument) necessary for their survival (List 1942; Sen 1981). Protecting import-competing industries finds its justification in the growth of the industrial base of the domestic economy in order to ensure a lesser degree of dependence on foreign goods. Besides attempting to protect import-competing industries, many countries have opted to use export subsidies in order to gain international market shares [Salvatore (2002)]

Independently of the justification for either domestic or export subsidies, it is important to have information that shows what types of subsidies are most distorting and what activities might require discipline. To measure the distorting impacts of subsidies, different classifications that are both qualitative and quantitative have been used in the literature. The prohibitive and actionable classification discussed above is qualitative in nature. de Moor and Calamai (1997) and van Beers and de Moor (2001) categorize subsidies into *on-budget* and *off-budget*. This approach is quantitative and has been used mostly by the OECD. The taxonomy that we propose takes into consideration both the quantitative and qualitative aspects of determining the distorting nature of subsidies. As our proposed taxonomy demonstrates, whether subsidies are on-budget or off-budget they can be either prohibited or actionable by members in the WTO.

The current WTO framework for resolving trade disputes involves the use of various measures such as the PSE and the AMS.¹ Although these estimates allow for comparisons of gross transfers across countries (Cahill and Legg 1989; OECD 2001) they cannot measure trade distortion per se. For example, the PSE only tells us what countries of different sizes, socio-economic and environmental conditions spend in terms of support to farmers. This information does not really help in determining whether the practice is trade-distorting or not. We believe that this current framework is inadequate to resolve the different trade-related disputes pertaining to subsidies. It is in this context that our paper intends to make a valuable contribution by proposing the terms-of-trade as a suitable indicator that the WTO can use to resolve trade-related disputes among trading partners. Most importantly, we show that this indicator contains ample relevant information about differential levels of profits, output, and export subsidies across countries. By solely observing movement in this indicator we could infer whether there has been over-subsidization that is not justifiable and whether any disciplinary action needs to be undertaken.

The logic behind the terms-of-trade is the following. Nations normally conceive deterioration in their terms-of-trade as a setback for their well-being and therefore try their best to avoid it. However, a trade-distorting subsidy does just that, it worsens the terms-of-trade but at the same time it increases the exporter's revenue.² Yet, countries involved in unfair subsidies are still comfortable with the outcome. The key here is that once the terms-of-trade is below 100 (its base) there is a clear sign that trade has been distorted in a deliberate manner. As we will show later, arguments such as good luck, rainfall of past R&D investment, and even the food security argument does not constitute a good defence.

The purpose of this paper is, therefore, to explore the trade-related subsidy literature and to develop a methodology that can be used by organizations like the WTO to resolve trade disputes between countries. The rest of the paper is structured as follows: Section two provides background information on Canada, the U.S. and the EU. The third section provides a brief literature review on trade related subsidies from the

¹ PSE is an indicator of the annual monetary value of gross transfers from consumers and taxpayers to agricultural producers, measured at the farm-gate level, arising from policy measures that support agriculture, regardless of their nature, objectives or impacts on farm production or income. It includes market price support and budgetary payments, i.e. gross transfers from taxpayers to agricultural producers arising from policy based on: current output, area planted/ animal numbers, historical entitlements, input use, input constraints, and overall farming income. CSE is an indicator of the annual monetary value of gross transfers to consumers of agricultural commodities, measured at the farm-gate level, arising from policy instruments that support agriculture, regardless of their nature, objectives or impacts on consumption of farm products. If negative, the CSE measures the implicit burden placed on consumers by agricultural policies, from higher prices and consumer charges or subsidies that lower prices to consumers. The % CSE measures the implicit tax (or subsidy, if CSE is positive) on consumers due to agricultural policy as a share of expenditure at the farm gate. The AMS is a measure of all domestic subsidy programs that are currently disciplined by an agricultural trade liberalization agreement. It reflects current policy preferences and differs from the PSE in that its calculation of domestic support does not allow for fluctuations of world prices [Taken from OECD (2002) and Nelson (1997)].

² The increase in revenue which we will later call the Revenue effect is substantial only in intra- but not in inter-industry trade.

perspective of Canada, the U.S. and the E.U with the view to understanding a) why countries use trade-distorting subsidies, b) the economic, environmental, and social impacts of trade-related subsidies and c) the adequacy of current measures for detecting and resolving trade disputes. The taxonomy of subsidies as it relates to trade issues and disputes is discussed in section four. The proposed terms-of-trade measure is presented in section five. A simple model is presented to illustrate how the terms-of-trade framework can be a valuable tool in detecting and resolving trade-related subsidy disputes at the WTO. In this section we also provide a comparison of the current methodology and the proposed methodology. Concluding remarks are provided in section six.

II. Background on Canada, the U.S. And EU In Relation To Trade-Related Subsidies

There is no doubt in today's world, with the globalization of markets, that disturbances and policies in one country necessarily have effects on other countries. Canada, the U.S., and the EU are no exception to that new order. However, the extent to which a country is affected depends on the degree of openness of its economy, and how widespread its trading partners are as indicated by the value of its total exports. According to the Direction of Trade Statistics of the International Monetary Fund (IMF), Canada is the most important trading partner of the United States (a relationship that runs both ways) and the EU comes in fourth place. The EU is the world's largest importer and the world's second largest exporter of agricultural products whereas the U.S. is the world's largest net exporter of agricultural products. The size of the U.S and EU economies are large relative to that of the Canadian economy. Furthermore, the U.S. and EU are the largest users of export subsidies. For example in 2000-02 average PSE was below 25 per cent in Canada and the U.S., and was 35 per cent in the EU (OECD 2003). It is therefore not surprising to frequently observe conflicts between these nations on subsidy issues in the various sectors particularly agriculture, transportation, energy and natural resources.

Affected Sectors

Although a number of sectors (such as industry, energy, transportation) in all three countries have been affected to some extent by subsidies, the agricultural sector appears to be the most affected and the most controversial. Each of these regions have subsidized some of these sectors at one point or another and in the process distorted trade between them leading to disputes. Four general reasons why government subsidies are introduced in these sectors have been advanced in the literature (see Grossman 1990; Ford and Suyker 1990). These are to: 1) stimulate domestic growth in a specific sector; 2) protect employment and investment; 3) reduce external dependency; and 4) reduce poverty by providing food security, and entitlements (Sen 1981). Governments, however, also advance reasons specific to each sector as Table 1 indicates.

Table 1: Why governments subsidize

	Industrialized Countries	Developing Countries
Water	(farm) production growth	
Agriculture	Maintain farm income Domestic supply	Support the poor Provide access (farm) production growth
Energy	Protect employment and investments Domestic supply	Economic development Support the poor
Road transport	Economic development	Economic development Provide access
Source: de Moor and Calamai (1997:51).		

Sectoral Contribution

The services sector is the single most important economic activity in all three countries accounting for over two thirds of GDP and employment while industry is the second largest, followed by agriculture (Table 2). Normally, as prudent management policy dictates, we would expect to find a direct correlation between subsidy disbursement and the contribution of a sector to the overall economy. Based on Table 2, common sense would point to industry and services as the sectors deserving subsidies, for combined, they represent over 95 per cent of GDP and employ over 95 per cent of the labour force in all three countries. Surprisingly, the share of agriculture to GDP averages 2.4, 1.8, and 2.5 per cent for Canada, the United States, and the European Union, respectively. The percentage of labor force accounted for by this sector is a negligible three per cent on average for each country. Yet agriculture remains the single largest subsidized sector in these economies. Available statistics indicate that in 2001 the three countries provided the largest support to agriculture measured in terms of the PSE in 2001 (see Table 2).

Table 2: Overall Sectoral Contribution

	Agriculture	Industry	Services
Canada 2001-20002			
Share of GDP	2.4	30.7	66.7
Employment Rates	3.0	22.6	77.4
PSE (Million \$US), 2001	3,977		
U.S. 2000-2001			
Share of GDP	1.8	21.5	76.7
Employment Rates	3.0	23.0	74.0
PSE (Million \$US), 2001	51,683		
EU15 2000-2001			
Share of GDP	2.5	29	69.5
Employment Rates	3.75	25.6	70.65
PSE (Million \$US), 2001	87,734		
Sources: Statistics Canada			

Sectoral Policies

The U.S. 2002 Farm Security and Rural Investment Act (FSRI) “increases support, extends coverage to a greater number of commodities, accentuates the link between payments and production parameters, and provides an income safety net which together, ---- may result in reduced price risk to farmers, increased production, and lower world prices” (OECD 2003, p. 41). However, reduction in the level of support and the improvement in the composition of support have been marginal (OECD 2003).

The EU Common Agricultural Policy’s (CAP) interest is the strengthening of funding for rural development measures, including agri-environmental programs over the 2006-2012 period (OECD 2003). Level of support in the EU has fallen marginally with great progress made in reducing the most distorting forms of support (OECD 2003, p.17).

Canada’s Agriculture Policy framework features a range of new environmental policy initiatives (see OECD 2003). While there has been progress in Canada “in reducing the overall level and in the use of the most distorting forms of support, there has been less progress to reducing the variation in support between commodities, reflecting the continued relatively high level of support for milk production” (OECD 2003, p. 17).

According to the neo-liberal analysis,³ there may be no justification for such disbursement to agriculture since it contributes little to GDP and hence income. As van Beers and de Moor (2001) point out, OECD countries spend U.S. \$335 billion in support to agriculture. The EU takes the lead with \$142 billion while the U.S. follows with \$97 billion in 1998. However, the multifunctional nature of agriculture advocated by the EU may seem to be far more important than the monetary value of subsidies.⁴ It may also be the case that different sectors have different needs and therefore different methods and amounts of subsidization are appropriate. Table 3 summarizes the policies relevant to the sectors according to van Beers and de Moor's classification.

Table 3 Summary of Relevant Policies by Sector

Sectors	Selected Policies
Agriculture	Market price support; insurance, disaster, and area payments; explicit or implicit farm support such as farm credit, fertilizer, R&D, etc.
Water	Price support, tax exemptions, and low-interest loans for investments in irrigation systems.
Forestry	Subsidy from poorly designed forest concession policies, tax break, credit subsidies, and freight subsidies.
Fisheries	Support for fleet renewal and modernization, port facilities, payments to access foreign fishing grounds, credit at low interest rates, loan guarantees, exemption of fuel taxes for fishing fleet, accelerated depreciation for vessels, and deferral of income tax for fishermen.
Mining	Absence of royalties, sale of land for mining below cost, and tax benefits.
Energy	Direct grants, consumer support, tax breaks, cheap loans, R&D support, etc.

Source: van Beers and de Moor (2001)

³ Those who believe in free market and the comparative advantage doctrine.

⁴ This is the argument put forward by the European in Doha to justify the continuing support to the agricultural sector. Agriculture is considered multifunctional because it is the engine of the rural economy, produce food for the entire population etc. More details are provided below.

III. Review of Trade-Related Subsidies - Their Rationale and Impacts

The insights gathered from the literature seems to suggest that much of government supports (both in terms of export and domestic subsidies) have given rise to conflicts and are prone to trade wars as they have been found to distort world prices and quantities of various commodities. The Uruguay Round on multilateral trade agreements completed in 1993 sought to address these issues (see Schott 1994; Meilke and Sarker 1997). The negotiation phase between nations was considered an important step towards a new international trade order, where sectors such as agriculture, textiles, and clothing were given full consideration, trade in services (e.g., telecommunications, construction, transportation, tourism, financial services, and professional services) was first explored, and a dispute-settlement process was put in place.

Following the Uruguay Round, there have been new developments in the arena of trade-distorting subsidies both at the academic and political level. Researchers have devoted time trying to understand and prescribe solutions to the trade liberalization debate, while governments have been retaliating against unfair trade practices. The sectors that have received much attention and that seem to have been at the forefront of most of the discussions are agriculture and industry. Subsidies to forestry and fishery have also come under attack. However, there has not been much analysis on the distorting effects of these subsidies due to lack of data. Therefore much of the discussion in this section will be on agriculture and industry and where possible on fishery and forestry.

Trade-distorting Subsidies

As Jackson (2000) points out “[the] problem of subsidies in international trade policy is perhaps the single most perplexing issue of the current world trading system, and one that is very complex” (as quoted in von Moltke 2003:3). Consequently, identifying government subsidies in all their forms remains a mystery and problematic. This may in part explain why different authors have different views on the same subject. Some have called for complete removal (see Wolfson 1996; OAS 1998) while others have been more cautious in recommending a negotiated solution (see Barg 1996, for example) where stakeholders are likely to favour a solution on the grounds of either environmental awareness, fiscal prudence, or trade policy. This is what van Beers and de Moor would call a *win-win* solution. The controversy that surrounds the reform of a subsidy may be due to the fact that economists themselves have not come to a consensus on a proper definition of subsidies (de Moor (1997).

As already mentioned above the WTO defines a subsidy as “a financial contribution by a government or any public body within the territory of a member which confers a benefit” (WTO 1994) while Krugman and Obstfeld (2002) and Carbaugh (1995), define a trade-distorting subsidy as a subsidy (export or domestic) that

can directly or indirectly influence the world price. Since this paper is primarily concerned with subsidies that are trade-distorting- i.e. domestic and export subsidies that could be either actionable or prohibited- we adopt Krugman and Obstfeld's (2002) and Carbaugh's (1995) definition.

Domestic Subsidies

Trade-distorting domestic subsidies lead to an inducement of an oversupply of products and keep resources in one sector (e.g. agriculture) that could otherwise be employed more profitably elsewhere, (e.g. industry). In the Uruguay Round Agreement on Agriculture (URAA) an important distinction has been made between domestic agricultural support that significantly distorts production and trade (amber box subsidies), and those subsidies that were agreed to have minimal or no distorting impacts (green box subsidies). However, only amber box subsidies were to be disciplined (Burfisher 2001).

The OECD in its evaluation of the implementation of trade agreements among OECD countries, (OECD, 2001) has acknowledged that domestic support is highly concentrated in a few developed countries, especially the European Union, Japan, and the United States which together account for over 90 per cent of total domestic support in the OECD countries. The EU accounts for 56 per cent of world price distortions related to domestic agricultural subsidies while the U.S. and Canada account for only 25 per cent and two per cent, respectively (Burfisher 2001). Thus the EU and the U.S. together account for over 50 per cent of the global distortions related to domestic producer support. Although the U.S., EU and Canada employ a different mix of price distorting policies, Export subsidies remain an integral part of the EU's domestic support system. The EU has reduced its expenditure on export subsidies. However, these subsidies still account for more than 90 per cent of global export subsidy expenditures (Burfisher, Diao, and Somwaru 2001). These figures can easily be explained because less-developed countries usually do not have the resources to help the integrating sectors of their economies, and normally tend to extract funds from farmers.

Suranovic (2003) points out that more countries have turned their attention to domestic subsidies to influence trade when they realized that with the signing of the General Agreements on Trade and Tariffs (GATT) they would no longer be able to use trade policies such as tariffs, quotas, voluntary export restraints, export taxes and subsidies to alter the flow of goods and services. However, the use of a number of domestic policies to foster prosperity has become a matter of concern. Many countries have claimed that subsidies give rise to overuse of natural resources, hence degradation of the environment, and thereby giving countries with lenient environmental, and occupational safety regulations a competitive edge in international markets.

In the agriculture sector, these concerns were dealt with during the URAA, also known simply as the Agreement on Agriculture (AoA). The resolution reached between nations to address the domestic subsidy issue can be summarized into the following three pillars (Beierle 2002):

- conversion of all non-tariff into tariff barriers and reduction of tariffs over time;
- complete recognition that export subsidies are unfair and needed to be reduced accordingly;
- gradual reduction of domestic support policies that are trade-distorting in nature.

The third pillar deserves further elaboration. In order to distinguish between trade and non-trade-distorting domestic policies, the URAA classifies domestic supports into three categories or “boxes”, namely, the **Amber**, **Green**, and **Blue** boxes. Programs that belong to the Amber box are considered mostly trade-distorting and are the only ones subject to reduction under URAA, for they involve payments to farmers that lead to alteration of foreign prices, production levels and/or welfare. These include market price supports, input subsidies, and direct per-unit payments.

The Green box policies are seen as minimally trade-distorting and are subdivided into two subcategories: 1) “decoupled” policies that provide payments to farmers independently of their production decisions; and 2) “minimally-trade-distorting-publicly-funded” programs that provide assistance for environmental protection, research, and disaster relief.

The Blue box policies are similar to the Amber box policies except that they also contain policies that limit production and thereby create less friction in the international market. Based on this classification of domestic subsidies, it has been found that most of Europe’s policies fall under the Amber box while those of the United States and Canada fall under the Green box. As Beierle (2002) points out, although Green and Blue policies are regarded as trade-distorting, URAA does not envisage their elimination for they are primarily destined to sustain an economically and environmentally-sound agricultural sector.

It is with no surprise that the provisions in the URAA do not include LDCs and developing countries, which were even given the opportunity to reduce Amber programs by 13.3 per cent over a period of ten years.

Developed nations on the other hand were committed to reduce Amber box policies by 20 per cent over a period of six years from 1986-1992 (Beierle 2002). A new deal was reached to reduce these subsidies further in 1994 for another 6 year period from 1995-2000 (Diao, Somwaru and Roe 2001).

From the discussion above, it could be argued that domestic, environmental, social, and trade issues drive the reform of domestic subsidies. However, there were at least three caveats to this initiative: 1) the ability of developed nations to disguise Amber box policies as Green or Blue box policies; 2) the lack of authority of an organization to enforce the commitments; and 3) the proper definition of what constitutes “*substantial*” reduction of domestic support. Nelson (1997) also noted that the fact that support was calculated on the basis of the AMS, which is in turn a by-product of the PSE calculation, makes the URAA’s pronouncements on

domestic policies nothing more than an administrative construct for its various exemptions and calculation rules.

With respect to the first caveat mentioned above, Potter and Burney (2002) have researched on the arguments that the European Union has planned to use in subsequent trade negotiations in order to defend its rights in allocating domestic supports to farmers. These arguments are based on the so-called “European Model of Agriculture” brought about by the Commission of the European Communities (CEC, 1997, 1998, 2001). This model is built upon the key assumption that agriculture is multifunctional, which means that, not only does it produce food for human survival and contributes to labor productivity in all industries, it also serves as a means to *sustaining rural landscape, protecting biodiversity, generating employment and contributing to the viability of the rural areas*. As the argument goes, since this sector is so crucial for development, it cannot be opened to liberalization and therefore needs domestic support to foster its growth (Anderson 2000).

Nelson’s contention that the URAA was only an administrative construct seems to have found justification in the progress report of the developed countries in Doha. In their joint declaration, trade ministers of the developed world have acknowledged the failure of the URAA to achieve its target and reaffirmed their intention to make improvements in the three pillars mentioned above.⁵ Most importantly, they had also vowed to take into consideration the challenges posed by the environment and the development needs of developing and less-developed nations in terms of food security, and rural development.

There is a mixed feeling in the literature as to whether the URAA constituted a step in the right direction. For some, the Doha declaration came as no surprise since they expected it would have missed its target because the URAA was primarily non-binding (see Beard and Swinbank, 2001). Other authors have praised this agreement for bringing the liberalization of agricultural markets to the forum of negotiation. Some researches argue that the URAA has changed the way international negotiations among trading partners is conducted (Josling et al., 1996; Swinbank and Tanner, 1996). It has provided countries with a rule-based framework that commits them to market liberalization, the decoupling of domestic supports, and the elimination of export subsidies.

Export Subsidies

Trade-distorting export subsidies refer to special incentives provided by governments to exporters in order to encourage increased foreign sales. They can be either direct or indirect payments to exporters. A direct export subsidy is a cash payment to an exporter, the amount either reflecting the difference between cost of production and world price or simply a fixed sum per unit sold. van Beers and de Moor (2001) classify this

⁵ Market access, elimination of export subsidies, and cuts in domestic support

type of subsidy as *on-budget*. On the other hand, an indirect export subsidy is considered *off-budget* and includes tax concessions, insurance arrangements, loans below market rate, sale of surplus materials at below market price, and dumping (van Beers and de Moor 2001).

Other practices, not so obvious, that fall under the off-budget policies are the creation of organizations like the Export Development Bank in Canada and the Export-Import Bank (Eximbank) in the United States, both of which are state-owned. These institutions act as facilitators in the provision of indirect subsidies by reducing the cost of information to marketing products at the world level, identifying market niche for certain products, and organizing trade fairs. These banks also serve as financing organs to exporters and foreign buyers.

Prior to the URAA, export subsidies were an important policy instrument that governments used in agricultural trade, especially for grains and dairy products. This is in contrast to the international laws that govern manufactured goods, which ban subsidies and instead allow importing countries to impose countervailing duties if subsidized imports cause “material injury” to domestic producers. There is no doubt that some of the export subsidies have been beneficial to both domestic and foreign economies. For example, the assistance provided by the exporting country, say the U.S. or Canada, through such institutions as Eximbank and Export Development Bank, respectively, benefits both the domestic and the foreign economies in some instances. It has been found that by offering attractive credit terms to foreign buyers, domestic industries could access markets that would have otherwise not existed [Carbaugh (1997), OECD (2000)]. As such, domestic production could expand thereby increasing employment and income. From the importing country standpoint, amelioration in the productive capacity, and an increase in welfare that would not have otherwise observed, takes place. This trade policy has proven to be crucial in the growth of heavy industries in the U.S. and Canada and in the development of infrastructure and services in other trading countries.

Export subsidies have, however, resulted in more costs than benefits for partners as they encourage inefficient domestic producers to be in business, lead to forgone opportunities for more efficient allocation of national resources and lower demand for trade partners’ products. This has particularly been the case for the U.S. and the EU. The EU and U.S. are considered the two largest users of export subsidies. During 1995-98, the EU accounted for 89 per cent of expenditures while the U.S. accounted for just less than 1.5 per cent. Although the EU’s export subsidies have fallen from 25 per cent of value of farm exports in 1992 to 5.2 per cent in 2001 and budgetary expenditure on export refunds has fallen from 29.5 per cent of value of exports in 1991 to 7.5 per cent in 2001, the EU still accounts for the largest distortions in world prices, particularly for grain products (Burfisher 2001). These EU export subsidies have remained controversial and have sometimes

led to trade wars with other countries, especially the U.S. who also subsidize their farmers in the same products (especially wheat) as the EU. For example, in 1985 the U.S. introduced the Export Enhancement Program-an export subsidy program- as a direct response to the EU subsidies. Thus U.S. gains in some markets have ended up being offset by losses to the EU in other markets. Consequently, over the years U.S. market share has declined while that of the EU has increased tremendously. As a result, Canada and other competitors have been compelled to discount prices in the subsidized markets in order to remain competitive.

Due in part to these problems the WTO has, under the URAA, subjected a number of export subsidies to reduction. These include:

- direct export payments contingent on export performance;
- sales or gifts of government stocks at prices lower than acquisition prices;
- export payments financed through government action, including payments financed by levies on producers;
- the provision of subsidies to reduce export market costs, including handling and export-specific transportation; and
- subsidies on goods incorporated into export products.

Within the agricultural sector the URAA objective was to go beyond the usual tariff reduction (Tokyo Round) by considering the links between trade and all aspects of economic policies (Schott 1994; Meilke and Sarker 1997). It was recognized that over- subsidization of agriculture by the European Community imposes cost to farmers from the U.S. and Canada among others, and subsidies had to be reduced to a reasonable level consistent with trading partners' expectations. Specifically, countries export subsidies were to be disciplined under the URAA by placing a 21 per cent reduction in volume and 36 per cent reduction in value on subsidized exports. During the new agricultural negotiations that started in 2000, export subsidies will again be revisited. In fact, the U.S. and the Cairns Group are calling for a complete elimination of export subsidies. This means that countries will not be allowed to initiate new subsidies for commodities that are not in their export subsidy schedule. Furthermore the use of marketing practices that allows countries to circumvent export subsidy commitments will also be restricted, and other bona fide food aid and export market promotion and advisory services will not be allowed.

Despite the fact that export subsidies account for a relatively small share (13 per cent) of the total price distortions caused by agricultural tariffs and subsidies (export and domestic) they play an important role in the reform process (Burfisher 2001). First, the effects of export subsidies are largely attributable to a single region, the EU. Second, export subsidies strain trade relationships since they significantly affect trade in some

markets and create increased competition in these markets. Third, export subsidies are an integral part of related domestic price support programs.

Schmitz and Gray (2001) examine efforts that have been made by both the U.S. and Canada in their trade legislation over the years in order to arrive at an amiable solution to disputes in the grain and oilseed sectors. They analyzed direct government payments by each of the two countries to their farmers and found that the U.S. government has increased its subsidy to farmers by over \$20 billion. In contrast, the support provided by the Canadian government to the farm sector has drastically declined despite adverse shocks (e.g., drought, increase in the prices of inputs) that this sector has and continues to cope with. These facts led them to conclude that resolution of differences in agricultural trade policy between the two countries is far from materializing. In their view, this divergence exists because of the inability of Prairie farmers to lobby for support from the Canadian government, a situation that is different for U.S. farmers. As Schmitz and Gray further point out, the fate of Canadian farmers has a lot to do with the distribution of the population across the country. In Canada, farming is the principal activity for the western provinces, which, with the exception of Alberta, taken together have a population of about 2.5 million, a not too impressive figure for political pressures. Another important reason that the authors mention is the difference in the institutional structures that overlook the agricultural sector. In the U.S., agricultural policy falls directly under the jurisdiction of the federal government while in Canada it is primarily a shared responsibility between provincial and federal governments.

Alston and Gray (2000) have shown that the U.S, which uses export subsidies to support American wheat producers, offers more protection to American farmers than Canadian farmers receive through the Canadian Wheat Board (CWB), which uses price discrimination to offer Canadian farmers protection. Alston, Carter, Gray, and Sumner (1997) have also investigated the issue of trade liberalization and export subsidies between the U.S. and Canada. They use a model that includes freight subsidies by the CWB and export subsidies on durum wheat trade by the U.S. that fall under the Export Enhancement Program (EEP). This exercise allowed them to investigate the claim by the U.S. government that freight subsidies were in fact export subsidies and to compare the welfare impacts of the trade distortions initiated by each country. Their model results led them to conclude that although the U.S. lost from freer trade in durum, it actually gained from eliminating the EEP under the Canada-U.S. Free Trade Agreement (CUSTA).

This discussion suggests that in the agricultural sector export subsidies remain a major point of contention between nations. Although we have analyzed mostly the grain sector in the agricultural sector, the hog and cattle sectors are also subject to disagreements but not to the same extent as the grain sector. One exception, perhaps, is the dairy industry where the results of its examination lead to the support that its policy systems in

both countries are similar, and that the barriers erected have resisted changes from WTO and NAFTA (Romain and Sumner 2001).

We now turn to the analysis of export subsidies as they apply to the industry sector. Export subsidies to industries have been explained in terms of the **lack of traditional trade theory**, which asserts that on the basis of the principle comparative advantage that each nation will gain by taking part in free trade with other nations. This gain materializes as countries specialize in the product in which they are best at producing, i.e, the product in which they are the lowest-cost producer. However, the predictions of this theory do not hold when there are externalities and market structures that are either monopolistic or oligopolistic. As the argument goes, since GATT has ruled out the use of tariffs to protect domestic industry, governments recur to other forms of support to protect asset-specific industry such as telecommunications, transportation, technology, and other heavy industries

Zahariadis (2001) has attempted to shed light on why industrialized nations heavily subsidize their industries. He uses a multivariate regression analysis of 13 OECD countries that include only European countries for the period 1990-1993 in order to assess the impact of asset specificity on the disbursement of subsidies. Subsidies are treated as the dependent variable, while Research and Development (R&D), job immobility, and trade (defined as per cent value of exports over imports) enter as explanatory or independent variables. Part of the conclusions that Zahariadis arrived at was that asset specificity: (a) not only affects political behavior but it also affects political outcome; (b) determines the kind of subsidies industry will gain; and (c) is less important than R&D as to its impact on subsidies. The author, therefore, reasons that due to the globalization of international markets, one should expect political discontentment to manifest over industry subsidization.

Neary (1998) provides a theoretical insight to the discussion. He developed a two-period-two-country model to determine whether governments should support export oriented high-technology firms that compete in oligopolistic industries. His work suggests that the theory of strategic trade policy⁶ does not justify subsidies to these industries.

Neary's findings appear to have received some support from other researches. Several studies (Harris et. Al, 1993; Gretton and Fisher 1997; Bergstrom 2000; and Beison and Weinstein 1996] found that there is a negative correlation between industrial subsidies and growth and productivity. Lee (1996, 2002) has reported

⁶ The theory of strategic trade policy stipulates that *a nation can create comparative advantage (through temporary trade protection, subsidies, tax benefits, and cooperative government-industry programs) in asset specific fields such as semiconductors, computers, telecommunications, and other industries that are deemed crucial to future growth in the nation* [Salvatore (2001)]

a downward trend in the level of industrial support overtime in OECD countries. On this basis, it can be argued that subsidy to the industry sector is not as contentious as subsidy to the agricultural sector.

Economic, Social and Environmental Impacts of Trade-Distorting Subsidies

The literature shows that the provision of trade-distorting subsidies can and does lead to a number of considerable drawbacks and cost to society that outweighs the benefits. We have shown above that, in general, domestic subsidies create an oversupply of agricultural commodities, which lead to depressed world prices while export subsidies create increased competition for producers in other countries.

A number of specific studies show various economic impacts of government support (trade-distorting domestic and export subsidies). van Beers and de Moor (2001) point out that both providers and recipients become addicted to subsidies as they find themselves involved in a vicious circle where mutual favors (political and economic) keep the system alive. Mohammad and Whalley (1985) in an intersectoral study further show that subsidies tend to favour one sector over another and they eventually lead to a sub-optimal social welfare. Other studies indicate that subsidies tend to exacerbate the volatility of world prices since they are often applied when world prices are low. In particular, export subsidies have been found to account for 31 per cent of the total agricultural price impacts of the three policies-market access, export subsidies and domestic subsidies (Burfisher 2001:8). Other studies have found that since trade flows depend more on a subsidizing country's internal policies and less upon world market conditions, applying subsidies to stabilize domestic markets results in more unstable world markets (Bos 2003). Other studies suggest that subsidies lead to loss of important economic efficiency benefits that can be gained from allowing market signals to guide the allocation of resources, particularly in the agricultural sector (Bos 2003).

Government supports have also come under increasing attack for their unintended negative environmental and social impacts. Several studies (see for example, Shah and Larsen 1992; de Moor and Calamai 1997; OECD 1997; 1998) have concluded that subsidies fail to meet the sustainability expectation in every aspect. Shah and Larsen (1992) of the World Bank found that subsidies to the energy sector are largely responsible for environmental degradation and were found to be a cause of economic inefficiency. De Moor and Calamai (1997) demonstrated that subsidies to other sectors such as agriculture, water, and road transportation degrade the environment, distort trade and widen the gap between poor and rich, across and within countries. The OECD studies (1997; 1998) also stress that subsidies to key economic sectors such as agriculture, energy, and industry usually encourage pollution, waste generation, and excessive use of natural resources.

Current Measures for Detecting and Resolving Trade Disputes

Aggregate Measure of Support

To measure the trade-distorting effects of subsidies, the aggregate measure of support and producer subsidy equivalent has been used in the literature. During the implementation period (1995-2000) of the URAA, a 20 per cent decrease in aggregate levels of trade-distorting support was mandated (Bos 2003). Under this agreement an aggregate subsidy measure known as the Aggregate Measure of Support (AMS) was defined in order to provide “a means [for quantifying] and [comparing] countries’ annual levels of domestic support” (Bos 2003:3). The AMS is in fact an index that measures the monetary value of the extent of government support to a given sector. In particular, the AMS measures only the domestic support that is subject to URAA disciplines (i.e. amber box policies). This measure includes both budgetary outlays and revenue transfers from consumers to producers due to policies that distort market prices. It includes actual or calculated amounts of direct payments to producers (e.g. deficiency payments), input subsidies (e.g. on irrigation), the estimated value of revenue transferred from consumers to producers as a result of policies that distort market prices (market price supports), and interest subsidies on commodity loan programs. The AMS provides countries flexibility to seek competitive advantages in one area while reducing subsidies in another commodity program. However, this measure, according to ESR/USDA, may pose to be a problem for those countries that are faced with an increase in commodity-specific subsidies by another country.

Producer subsidy equivalent

The Producer Subsidy Equivalent (PSE) is a measure of agricultural support that was originally proposed by Josling (1973, 1975) as part of his assignment from the FAO. The OECD has used his work for different countries since 1987. The main objective was to understand to “what extent [agricultural policies] subsidize producers (Josling 1975:1)” without interfering in trade relations across countries that involves the comparison of prices. The OECD defines PSE as “the payment which would be required to compensate farmers for the loss of income resulting from the removal of a given policy measure. Expressed as a percentage, it represents that part of the value of output accounted for by assistance of various kinds” (OECD 1987:100). Unlike the AMS, the PSE is a broad measure of support provided to agriculture by governments. It combines into one total aggregate value, direct payments to producers financed by budgetary outlays (e.g. deficiency payments), budgetary outlays for certain other programs considered to provide benefits to agriculture (e.g. research and inspection and environmental programs), and the estimate of revenue transfers from consumers to producers as a result of policies that distort market prices. In other words, the PSE comprises two components: budgetary outlays and market price support. In its measure of market price support (calculated as the gap between the domestic producer price and current world reference price for each commodity) it includes the effects of trade policies (tariffs and export subsidies) and all

government budget expenditures on farm programs, including exempt (Green box programs), non-exempt (Amber box policies) and Blue box forms of domestic support.

The AMS differs from the PSE in the sense that it excludes estimated benefits (or costs) of certain non-commodity specific policies (such as research and environment programs) and uses special WTO-defined measures of deficiency payments and market price supports. Furthermore in the new negotiations the AMS calculations exclude deficiency payments under WTO special provisions.

The survey thus far suggests that the elimination of subsidies may be a good thing for some sectors but not for others. In other words, some subsidies may be trade-distorting but others are not. The interesting issue is the distinction between the two. It is clear from the above discussion on measures that neither the PSE nor the AMS is capable of detecting whether a subsidy is trade-distorting or not. This is because the AMS and PSE only provide information about the volume of support or the aggregate monetary value of subsidy disbursed by nations but do not have any means to infer whether these subsidies are justifiable or not.

What we infer from the literature is that prices as opposed to volumes or aggregate values of transfers (as in AMS, and PSE,) are a better instrument for detection and the resolution of unfair trade practices. In section V we will show that the terms-of-trade is a better indicator than the PSE and AMS and determine if it can offer an alternative to the PSE and AMS. Since our objective is to show how the terms-of-trade can be used in order to face challenges brought about by over-subsidization, we need to situate the debate by pinpointing the areas of conflicts. We believe taxonomy of trade related subsidies is the best way to proceed and it is to this discussion that we now turn.

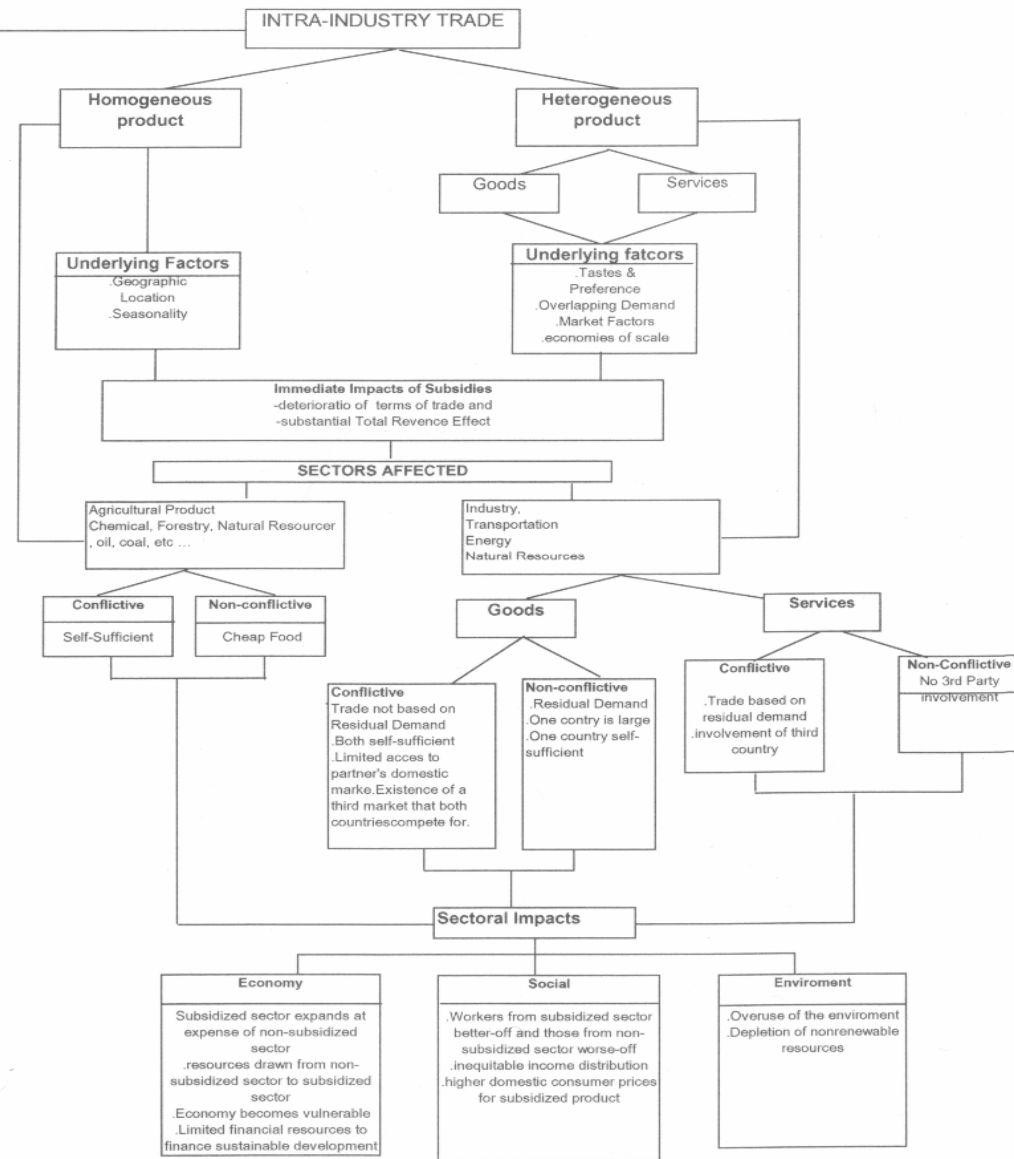
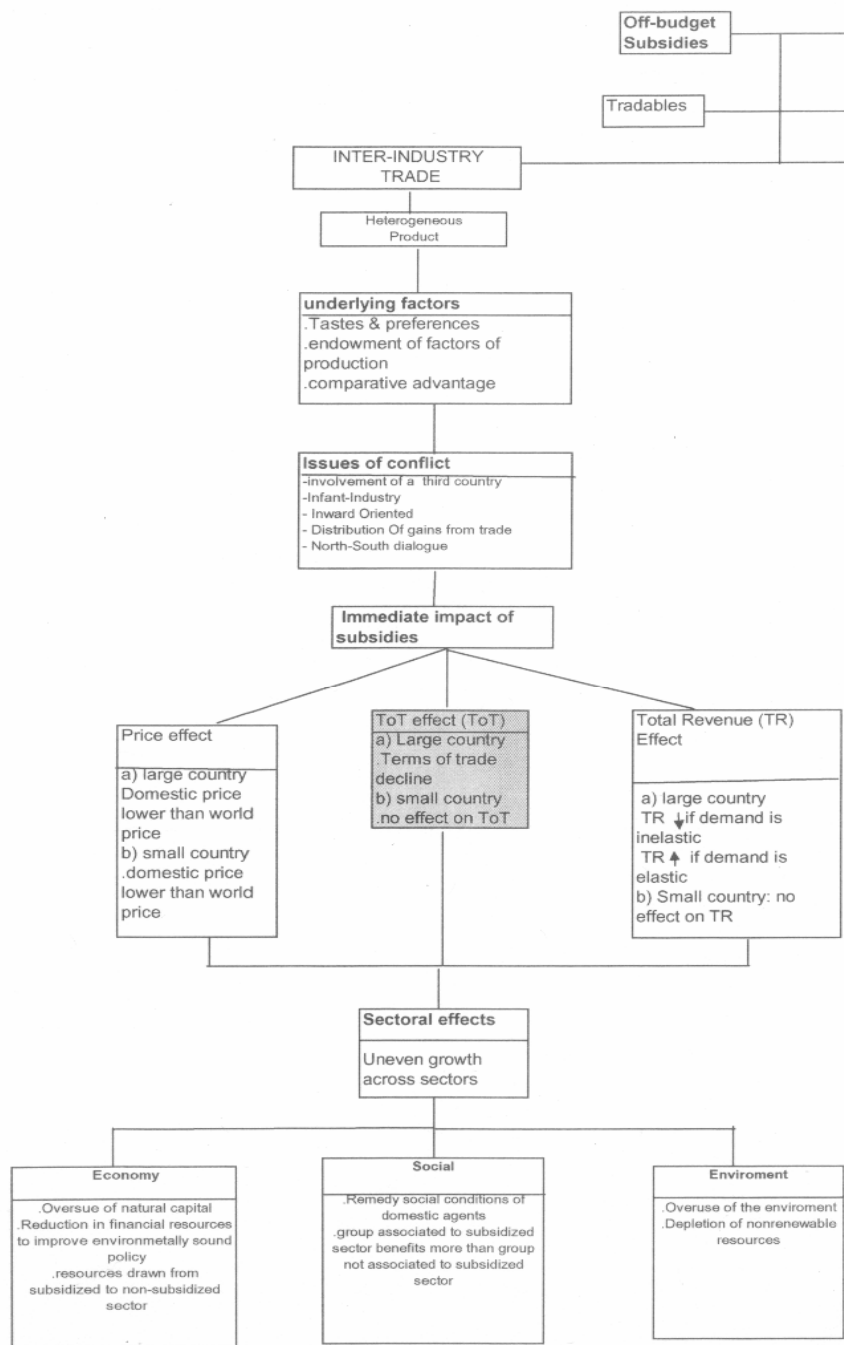
IV. Taxonomy of Trade-Related Subsidies

International trade theory has shown quite explicitly that the size of the country in terms of its exports and imports is critical in analyzing trade patterns and the impact of domestic and foreign policies. In our taxonomy we make a distinction between small and large countries. Small countries as defined in the literature are those whose domestic and /or export policies have no influence on the world price, because the quantities they supply or purchase are minimal in comparison to the rest of the world. Large countries, by contrast, have this power. For example, although Brazil is the world's largest supplier of coffee, a deliberate action by the U.S. to cut its imports, be it because of shifts in tastes or preferences, will create an excess supply and thereby drive the world price of coffee down. By the same token, Brazil may decide to limit its supply in order to keep the price high. Suffice to say, this distinction between small and large countries is important when the objective is to understand the trade implications of domestic support.

There are a number of taxonomies in the literature, each one very similar to another. These taxonomies are only confined to listing the different types of subsidies and classifying them in categories such as on- and off-budget (see for example De Moor 1997; van Beers and de Moor 2001). Such subsidy taxonomies may not be very useful for identifying the areas of conflicts. If there is one strong message in this literature review, it is that subsidies may not be totally harmful. Most importantly, subsidy by a small country independently of how large it is cannot create frictions in the world markets. We believe these facts, among others, need to be taken into consideration. We present below a more comprehensive taxonomy that would help capture some of these issues (see Figure below).

The start off point for this taxonomy is de Moor's (1997) and van Beers and de Moor's (2001) classification of subsidies into on-budget and off-budget. We then distinguish between tradable and non-tradable goods. Although subsidies may well have an impact on the economy, society, and /or the environment through the non-tradeable goods, attention is paid to tradeable goods since the main focus of this paper is on trade-distorting subsidies.

We further distinguish between agriculture, industry, transportation, energy, and natural resources, and within each sector, goods and services are separated when necessary. This classification enables us to capture the effect of subsidies on a larger scale than previous classifications. Within the tradeable category, some exceptions can still be made with respect to their trade-distorting potential. For example, sectors like energy and transport services appear to be less controversial. As a matter of fact, public support to transportation in one country does not necessarily affect the supply of transportation in another country. However, there may be an exception when two companies from different countries are competing against each other for a



contract in a third country or at home, whereby the subsidized company may be at an advantage in bidding against the other company because of a subsidy received. The supply of hydro-electricity within the energy sector is another example.⁷ Due to its peculiar characteristic, the international trade in energy is limited to only countries that share the same borders. In this case, there is little or no competition between providers (domestic and foreign) and therefore no conflict over subsidies because the export of hydro energy simply aims at satisfying the residual demand in the importing country. In other words, the portion of demand those domestic firms in the importing country cannot meet because of underproduction. In the agricultural sector, export subsidies may not be totally harmful (at least in the very short-run) since its curtailment may have adverse effects on net food importing countries. The point is, those countries in need are less likely to sustain a convincing argument against the subsidized firms from the developed countries even when they risk not to become self sufficient.

In this taxonomy we make a differentiation between inter-industry and intra-industry trade. The former refers to the exchange of goods with different factor requirements from different industries across nations (e.g. cars and computers for sugar cane and coffee) while the latter refers to trade in a similar commodity (e.g. Japanese cars for American cars). Unlike intra-industry trade, inter-industry trade in tradeable commodities is expected to have no significant trade distortions. Inter-industry trade falls within the realm of the Heckscher-Ohlin model of comparative advantage, which predicts that, under the assumptions of the same demand conditions and technology, countries tend to specialize and export the commodity that requires their abundant factor inputs. Since economic agents are rational by assumption, a subsidy in the context of inter-industry trade does not really make great sense unless there is a third competitor involved in the market,⁸ for it entails that the governments are willing to accept losses for nothing in return. Based on this line of thought, one would not expect disputes between countries on inter-industry trade-related subsidies to reach the table of WTO. This paper leaves aside all these peculiarities of subsidies and concentrates on those aspects that are most relevant for arbitration.⁹

⁷ Please note that coal, gas, oil, solar, wind, hydro, and biomass are all sources of energy, in other words, they are inputs used in the production of a final product. Trades that take place in these resources and that are hampered by subsidies fall under the spectrum of our theory.

⁸ The point here is that it does not make sense for the United States government to subsidize the export of oranges to Canada if there is no other competitor, say Mexico, that threatens to displace the U.S. in the Canadian market. In that case, the dispute would oppose Mexico and the U.S. not the U.S. (subsidy provider) and Canada (buyer) simply because Canada has nothing to lose.

⁹ Our view does not by any means undermine the environmental, and economic problems associated to the **generation** of energy as carefully emphasized by de Moor (1997) concerning global warming, damages to property, forest, and biodiversity, health, safety, sanitation etc... But our focus is on the distortions that the trade of the final product might carry because of subsidy. As we explain above, there is no major issue to deal with.

The problem of subsidies mostly arises within the context of intra-industry trade. For example, lumber producers from the United States have claimed that they have lost business against their Canadian counterparts because the Government of Canada has been subsidizing the lumber industry. The result was that the U.S. government retaliated by imposing a heavy duty on Canadian lumber. A similar situation occurs in the wheat industry. In the 1980s, Japan was forced to voluntarily cut its automobile exports to North America and Europe in fear of retaliation. These are only a few of the many cases that the WTO has to deal with as intra-industry trade expands across nations.

What are the motives for intra-industry trade? Why do countries import and export the *same* product? There are many reasons, according to international trade theorists (e.g., Bagwati 1987; Krugman and Obstfeld 1997), why industrialized nations are involved in this type of trade. In the case of homogeneous goods, transportation costs and seasonality seem to be the main underlying factors. For example, it is cheaper for a buyer in New York to import goods from Quebec than from California; by the same token, it is also cheaper for a firm in British Columbia to import the same goods from Washington. Since different parts of the world experience different seasons at the same time, agricultural products that are exported during a peak season may be imported during seasons of less abundance. The same holds for electricity. As Carbaugh (1995) explains, the bulk of intra-industry trade however takes place in *differentiated* products. Overlapping demand,¹⁰ tastes, marketing factors, and economies of scale are the main justifications. Having established these facts, it is not surprising to realize that, in terms of intra-industry trade, the context of terms-of-trade definition changes slightly because it now involves the same product.

¹⁰ A theory developed by Staffan Linder, which stipulates that wealthy nations are likely to trade with each other because they have the same level of income per capita, tastes and preferences, and therefore consume the same goods. This theory does not exclude trade between poor and wealthy nations because in each poor country there is a rich segment that constitutes the market niche targeted by industrialized nations.

V. Terms-of-Trade: Proposed Indicator for Detecting and Resolving Trade-Related Disputes

We have seen from sections III and IV that the main issues in trade dispute seem to center around export subsidies, which are considered as unfair practices by the WTO. Therefore, the interesting question is why then do nations prefer to spend valuable domestic resources in improving the welfare of foreign buyers? The theory of international trade provides some clues. Since nations compete against each other in the world market, they use subsidies as a means to displace or eliminate their competitors. The price reduction that foreign buyers enjoy is only temporary because prices are raised once the competitor has established a dominant position in the export market. In his analysis of non-tariff trade barriers, Carbaugh (1995) stipulates that there are two direct effects associated to granting an export subsidy for the home economy—a *terms-of-trade effect* and an *export revenue effect*.

The terms-of-trade is an index defined as the ratio of the export price index to the import price index¹¹—a subsidy reduces the export prices and thereby leads to its deterioration- i.e., the terms of trade effect. However, lower prices tend to increase the volume of exports of the exporting economy resulting in a rise in total revenue, which is the export revenue effect.¹² These two issues (i.e. the terms-of-trade and total revenue effects) deserve further consideration if the goal is to develop an indicator that will guide the WTO in settling disputes. The next section is therefore devoted to this task.

In section III we indicated that it is difficult to infer from the PSE and AMS whether export subsidies are justifiable or not because they only provide information about the volume of support or the aggregate monetary value of subsidy disbursed by nations. The terms-of-trade by contrast has this power. Since it is an index that takes the value of 100 when the price of export equals the price of import of the same commodity, any deviation from this value clearly indicates that some unfair practices have taken place. A question that arises is how to account for subsidies that aim at ensuring a minimum welfare to households or firms for their survival. Once the terms-of-trade is deteriorated (below 100) it is a sign that the subsidy had gone beyond the goal for which it was implemented, and therefore needs to be reduced.

Review of terms-of-trade

The review of the literature on terms-of-trade suggests two strands of thoughts. The first strand emphasizes the underlying woes to economic development (Singer 1950; Prebisch 1950; and Kindleberger 1958). The

¹¹ Simply put, Terms of Trade = (Export Price Index / Import Price Index) * 100

¹² Total exports revenue is a product of two terms (export price * export volume). If the percentage decrease in prices is outweighed by the percentage increase in volume, then total revenue will increase for sure.

second strand explores the effects of the terms-of-trade changes on social welfare (Svensson and Razin 1983; Hamada and Iwata 1984; Diewert and Morrison 1986) and intersectoral dynamics (see Sah and Stiglitz 1987; and Mohammad and Whalley 1985).

Terms-of-trade has long been used in international trade research as an argument to support the import-substitution strategy. This argument was put forward in the well-known thesis of Singer (1950) and Prebisch (1950) and raises the awareness of the disadvantages that developing and less developed nations (the South) face in trading with the developed or industrialized world (the North). Singer and Prebisch argue that the South produces primary products whose prices at the international market are very low and are more susceptible to price deterioration vis-à-vis manufactured goods produced by the North.

The main problem is that underdeveloped economies are not able to generate sufficient profit to buy capital goods that will enable them to achieve a sustained level of economic growth. These countries, according to Singer and Prebisch, are then condemned to remain poor. Their solution to this problem is that the South must employ its resources in producing domestically manufactured goods in order to reduce the existing gap between the two blocks.

Following the Singer-Prebisch contribution, there have been many attempts to measure the impacts of terms-of-trade changes on social welfare. Svensson and Razin (1983) used an intertemporal utility maximization model to examine the effects of terms-of-trade changes on the trade balance of a small open economy that takes as given world prices and interest rates. Their exercise demonstrated that a temporary terms-of-trade deterioration gives rise to a temporary deterioration of the trade balance whereas the effect of a permanent terms-of-trade deterioration is ambiguous.

However, Diewert and Morrison (1986) have argued that this approach is problematic when it comes to aggregation over consumers¹³. In order to remedy the aggregation problem, the focus on the terms-of-trade has been geared towards measuring its impacts on national welfare by solely considering the point of view of the producer. In this respect, Diewert and Morrison (1986) have used a translog approach to productivity indexes in order to account for the effects of changes in terms-of-trade on domestic real output. Based on the assumption that exports and imports flow through the production sector, they could demonstrate that an

¹³ Welfare for a nation is the sum of individual welfare enjoyed by its citizens. The achievement of the maximum utility or satisfaction is considered as the maximum welfare for the individual. What Diewert and Morrison argue is that once you have those utilities per head, it is very difficult to put them together in order to get the welfare of the population. For the utility function needs to be of a special functional form (GORMAN-POLAR FORM).

improvement in the terms-of-trade has an effect that is directly associated with an increase in total factor productivity.

Thus far, the literature has outlined matters related to the terms-of-trade at the international level that in part oppose developing and developed economies. It is also the case that certain strategies of development may give rise to deterioration in the terms-of-trade of the traditional sectors. Hence, the debate on intersectoral terms-of-trade has also become relevant in the analysis of social welfare since governments in some cases attempt to implement policy measures such as taxes and subsidies in order to redistribute income across sectors. In their assessment of the industrialization strategy proposed by the Soviet State as to how to raise funds to finance rapid capital accumulation for economic development, Sah and Stiglitz (1987) developed a model to understand the structure of both socialist and non-socialist economies when there are at least two sectors such as agriculture and industry. The question to which they have sought answers is to what extent the state can shift the terms-of-trade¹⁴ against the peasants or the industrial proletariat in order to increase capital accumulation that is fundamental in the initial phases of development? Their analysis shows that there is an optimal terms-of-trade between the two sectors that limits the amounts of surplus that the government can extract from the agricultural sector.

Contrary to the Sah and Stiglitz model where the central planner alters the terms-of-trade by setting the prices of agricultural products at a lower level, Mohammad and Whalley (1985) carried out a study of the Indian intersectoral terms-of-trade where the government allows the agricultural sector to be perfectly competitive and the industry sector to be subjected to price controls. In their view, since such practice leads to a black market, the only means of enforcement the government has at its disposal is to implement fines. The end results are that both sectors may experience deterioration in their terms-of-trade because those from the agricultural sector incur search costs when they transact in the controlled market, and those from the industry sector have to pay fines if caught in the black market.

These contributions inform that the terms-of-trade has been used in the past to either address problems related to redistribution, social welfare, or international development. In the next section we show, through a simple model, how the terms-of-trade can be used to detect and resolve trade distorting subsidies, particularly exports.

¹⁴ Alternatively referred to as *price scissors*, at the sectoral level, the terms-of-trade is the prices of agricultural products relative to the prices of industrial goods within the same country.

Simple Model

In this section, we develop a two-country model with a representative firm in each nation that uses the same technology and takes the prices of factors of production as given in the inputs markets in order to illustrate our proposed terms-of-trade indicator. Thus, the cost of production is assumed to be constant. The commodity being produced is similar but differentiated and consumer preferences vary across countries. This feature of the economy enables us to concentrate solely in intra-industry trade as opposed to inter-industry trade. Each government is assumed to provide subsidies to its domestic firm in order to compete with the foreign firm in the international market. The effect of the subsidy as documented in international trade theory is to reduce the domestic price in order to make domestic goods attractive to foreign buyers. We further assume for convenience that consumers from the domestic economy do not have access to the international market to purchase the domestic goods at the lower price because of transaction and transportation costs and other barriers that may be imposed by the government of that country.

The objective of each firm is to maximize profits, which in this case implies maximizing total revenue (see Appendix for the details). After some manipulation, we arrive at the equation (1) below (Eq. (9) in the Appendix).

$$\log tt = \left[\log\left(\frac{dy}{ds}\right) - \log\left(\frac{dy^*}{ds^*}\right) \right] + \left[\log\left(\frac{\partial\pi}{\partial y}\right) - \log\left(\frac{\partial\pi^*}{\partial y^*}\right) \right] + \left[\log\left(\frac{\partial\pi^*}{\partial p^*}\right) - \log\left(\frac{\partial\pi}{\partial p}\right) \right] \quad (1)$$

This equation tells us that disturbances in the terms-of-trade are the sum of three terms:

- 1) differential direct impacts of subsidies on output;
- 2) differential indirect impacts of subsidies on profits through output, and
- 3) differential indirect impacts of subsidies on profits through prices.

This model shows that the terms-of-trade for countries that are involved in intra-industry trade contains all the relevant information needed in order to determine whether players in the international market have been playing a fair game or not. What is most appealing however, is that if information in any of the terms is not available, one can easily set that term equal to zero and proceed with the variables at hand. The main objective is to determine whether the terms-of-trade of a country has deteriorated because it has implemented subsidies in order to gain its rival's market share.

This model is useful within the boundary we have set. Even when both firms are highly subsidized, the relative decline in their terms-of-trade may still be established by relying on the tools of Eq. (8) (see Appendix). Critiques may well point to the fact that there exists other factors unrelated to subsidies that may

lead to an increase in output and profits and, therefore, the terms-of-trade may be misleading. Such factors in our view could be a) technological progress; b) discovery of new and/or cheaper sources of inputs; and c) simply good luck. None of these cases can undermine the usefulness of the terms-of-trade as a means of detection for over-subsidization. This is because if any of these events have occurred, it will have become common knowledge to any stakeholder in the international market and therefore a relative price decrease would not have triggered a conflict between trade partners.

At the empirical level, this model can either be calibrated or estimated and the terms-of-trade may even be forecasted so as to determine a benchmark for comparison with future values that are to be computed on real data. Since this was not our mandate we did not attempt to do an empirical study. The terms-of-trade may also be proven useful in the revisions of past decisions that had relied on other methods. WTO may in fact standardize the indicator in terms of another index that may render decision-making faster.¹⁵ For these to be possible, data on every single commodity that is involved in *two-way* trades must be collected (if not already available).¹⁶ Upon ruling that the terms-of-trade of a country has deteriorated because of oversubsidization, the WTO may instantly compute the amount of penalty to be paid using a simple arithmetic rule (percentage decrease in terms-of-trade times the total value of trade in that commodity).

Comparison of the Current Measures with Proposed Terms-of-Trade Indicator

The interesting question at this point is to determine how best this new indicator works compared to the existing PSE and AMS measures and determine whether it can serve the purpose for the WTO. The PSE as we have already elaborated is a gross measure of agricultural policy whose initial main objective was to understand the extent to which agricultural policies subsidize producers without interfering in trade relations across countries that involves the comparison of prices. Moreover, as [Dunlop, Perry, and Nixon (1995)] have pointed out, although the currently existing GATT agreement requires that all tax subsidies be taken into consideration in subsidy measures, most tax subsidies are not included in PSE calculations. Insufficient data remain the main barriers. Dunlop et al (1995) implemented a Monte-Carlo simulation model to calculate a Tax-Social Program Subsidy Equivalents (TSSE), which is then compared with the PSE for each country. Their study embraces dairy trade between Canada, New Zealand, Germany, and United States and shows that in Canada, the pre-tax TSSE was approximately one-third of the value of agricultural dairy subsidy reported by the PSE, while in United States it was one-tenth.

As shown in our taxonomy (Figure 1 above) the features of the terms-of-trade that may contrast with the PSE are clearly delineated. It takes into consideration (1) the relative size of the countries (small vs. large); (2)

¹⁵ There may be an index for certain types of cars, computers, wheat, coffee, etc. . .

¹⁶ Data availability in this case must not be a concern. For a country that is accusing another of excessive subsidization must be able to show proof, which in most cases consists of data on prices, profits, and/or output among others.

the relative importance of government supports; (3) intersectoral as well as international contentions; (4) transactions on both goods and services; and (5) that relative prices are central in understanding conflicts in the world markets. The basis of the terms-of-trade as an alternative or a complement (depending on one's views) for the PSE in settling disputes is due to the fact it raises a very simple question. That is, given administrative, transportation, and transaction costs, is it justifiable for a firm to sell its products in the international market at a price greater than its domestic price, other things held constant? The answer is a straight no unless unfair trade practices are permissible.

VI. Concluding Remarks

The early 1960s have witnessed several changes in government policies as public awareness was building around the quality of life, conditions under which goods and services are being produced, and negative externalities associated with the production of goods. Special emphasis was then put on actions governments could undertake in order to guarantee a safer environment in all aspects. These have led to the implementation of various regulations, which somehow enter in conflict with the pursuit of certain economic goals. Chief among them is the use of subsidies (domestic and export) to enable domestic firms to mature in order to compete at the world level. However, it has been argued that this strategy fails in many ways in that it creates a vicious circle of interdependence between elected officials and recipients. Most importantly, it leads to unfair competition in the world markets and misuse of resources that deteriorate the environment. There have been several proposals to deal with this issue. Some have considered a complete ban and others have advocated a negotiated win-win solution. Yet, the main problem remains, it is difficult to even lay charges for over-subsidization because the WTO have no means of detecting which country is at fault.

This paper has unveiled features of the terms-of-trade that profile it as an attractive indicator that WTO may wish to use when it is called upon to settle disputes among nations that are involved in over-subsidization practices in order to gain market shares from their rivals in the world markets. We have shown, through a simple two-country model that the terms-of-trade contains sufficient relevant information on differential revenue, prices, and subsidies, which makes it possible to detect unfair trade practices. Our analysis further expands towards other issues of interests such as the uneven distribution of income, unbalanced sectoral growth, and negative environmental effects as indirect consequences of subsidies, which could be inferred from the terms-of-trade.

It should be born in mind that the proposed model is simplistic and has limitations. What are the limitations of the model? First of all, it is very simple and based on some restrictive assumptions such as given cost function. We do know that the factor markets may be distorted because governments may subsidize wages and other inputs thereby reducing the cost of production for the firm that may eventually dump its product in the international market. This could also be analyzed by extending the current model, but we doubt that there is much insight to gain from this exercise. Another point of contention is the modeling device adopted for total revenue. We assume that total revenue depends only on the prices of domestic output, which are related to subsidies, and the domestic level of output. But it is a fact that if there are two firms competing in a market the revenue of one firm must also depend on the sales of the other firm because the commodities are close substitutes. This also is possible and further research is welcome to close those gaps. But our objective was to

use a model that is simple to understand by a general audience where some are math wise and others feel more comfortable with intuitive analysis.

References

- Alston, J., and R. Gray (2000).** “State Trading versus Export Subsidies: The Case of Canadian Wheat.” *Journal of Agricultural and Resource Economics*, 25(1), pp. 51-67.
- Alston, J., C. A. Carter, R. Gray, and D. A. Sumner (1997).** “Third-Country Effects and Second-Best Grain Trade Policies: Export Subsidies and Bilateral Liberalization.” *American Journal of Agricultural Economics*, 79(4), November, pp. 1300-1310.
- Anderson, K. (2000).** “Agriculture’s Multifunctionality and the WTO.” *The Australian Journal of Agricultural and Resources Economics* 44 (3), 475-494.
- Bagwati, Jagdish (1987).** *International Trade: Selected Readings*, 2nd Edition, MIT Press, Cambridge.
- Barg, S. (1996).** “Eliminating Perverse Subsidies: What’s the Problem? In Subsidies and Environment: Exploring the Linkages. OECD.
- Beard, N., and Swinbank, A. (2001).** “Decoupled Payments to Facilitate CAP Reform.” *Food Policy* 26, 121-145.
- Beason, R. and D. Weinstein (1996).** “Growth, Economies of Scale, and Targeting in on Japan (1955-1990).” *Review of Economics and Statistics* 78, 286-295.
- Beierle, Thomas C., (2002).** “Agricultural Trade Liberalization – Uruguay, Doha, and Beyond.” *Journal of World Trade* 36(6): 1089-1110.
- Bergstrom, F. (2000).** “Capital Subsidies and the Performance of Firms.” *Small Business Economics* 14, 183-193.
- Burfisher, Mary E. (2001).** “The Road Ahead: Agricultural Policy Reform in the WTO-Summary Report.” Market and Trade Economics Division, Economic Research Service, U.S. Department of Agriculture. *Agricultural Economic Report No. 797*
- Burfisher, Mary E., Xinshen Diao and Agapi Somwaru (2001).** “WTO Negotiations: Potential Gains from Ag Policy Reform.” *Agricultural Outlook*, January-February. Economic Research Service /USDA. pp. 11-13.
- Cahill, C. and W. Legg (1989-90).** “Estimation of Agricultural Assistance Using Producer and Consumer Subsidy Equivalents: Theory and Practice.” *OECD Economic Studies* 13 (Winter): 13-43.
- Carbaugh, Robert J. (1995).** *International Economics*. South-Western College Publishing
- Commission of the European Communities (CEC) (1997).** Rural Developments. Working Document from Directorate General of Agriculture, Brussels.
- Commission of the European Communities (CEC) (1998).** Agenda 2000: Commission Proposals. COM, Vol. 98. Final, Brussels, p.158.
- Commission of the European Communities (CEC) (2001).** The Agricultural Situation in the Community 2000 Report. Office for Official Publications of the European Communities.

De Moor, A. P. G. (1997). Perverse Incentives. Economic Incentives For Sustainable Development. Institute for Research on Public Expenditure. Earth Council.

De Moor, A. P. G., and P. Calamai (1997). "Subsidizing Unsustainable Development: Undermining the Earth with Public Funds." The Hague/Costa Rica: Institute for Research on Public Expenditure/Earth Council Report.

Diao, X., A. Somwaru and Terry Roe (2001). "A Global Analysis of Agricultural Reform in WTO Member Countries." *Background for Agricultural Policy Reform in the WTO: The Road Ahead.* USDA, Economic Research Service, ERS-E01-001

Diewert, W. E., and C. J. Morrison (1986). "Adjusting Output and Productivity Indexes for Changes in the Terms of Trade." *The Economic Journal*, 96, September, 659-679.

Grossman, G. M. (1990). "Promoting New Industrial Activities: A Survey of Recent Arguments and Evidence." *OECD Economic Studies* 14, 87-125

Hamada, K., and K. Iwata (1984). "National Income Terms of Trade and Economic Welfare." *The Economic Journal*, 94, December, 752-771.

Harberger, A. C. (1950). "Currency Depreciation, Income, and the Balance of Trade." *Journal of Political Economy*, 58, no. 1, February, 47-60.

Harris, A. H., G. A. Wood and T. Armstrong (1993). "The Role of Government Assistance in Structural Change in Manufacturing: Australian Experience." *Australian Economic Review* 103, pp. 45-55.

Jackson, John (2000). "World Trade Rules and Environmental Policies: Congruence or Conflict?" In John Jackson, *The Jurisprudence of GATT and the WTO.* Cambridge: Cambridge University Press, p. 433.

Kindleberger, C. P. (1958). "The Terms of Trade and Economic Development." *The Review of Economics and Statistics*, 40, Issue 1, Part 2. Problems in International Economics. February, 72-85.

Krugman, Paul R. and Maurice Obstfeld (1997). *International Economics: Trade and Policy*, Addison-Wesley, Reading, MA.

Lachica, E. (1992). "Anti-dumping Pleas Are Almost Useless." *The Wall Street Journal*, June 18, pp. A-1, A-11.

Laursen, S., and Metzler, L. A. (1950). "Flexible Exchange Rates and the Theory of Employment." *Review of Economics and Statistics*, 32, November, 281-99.

Lee, Frank (2002). "OECD Work On Defining and Measuring Subsidies In Industry." OECD Workshop On Environmentally Harmful Subsidies. SG/SD/RD(2002).

Lee, J-W. (1996). "Government Interventions and Productivity Growth." *Journal of Economic Growth* 1, 391-414.

Legg, Wilfred (1996). *Agricultural Subsidies and the Environment.* In OECD Documents: *Subsidies and Environment: Exploring the Linkages.*

List, F. (1942). *Sistema Nacional de Economia Politica.* Translation by Manuel Sanchez Sarto. Fondo de Cultura Economica.

Meilke, K. D. (2003). Agricultural Policies, Trade Agreements, and Dispute Settlement. Discussion Paper.

Meilke, K. D., and R. Sarker 1997. “National Administered Protection Agencies: Their Role in the Post-Uruguay Round World.” In *Understanding Technical Barriers to Agricultural Trade*. D. Orden and D. Roberts, eds. Proceeding of a Conference of the International Trade Research Consortium, Department of Applied Economics, University of Minnesota, St. Paul, MN.

Mohammad, S., and J. Whalley (1985). “Controls and the Intersectoral Terms of Trade: The Indian Case.” *The Economic Journal*, 95, Issue 379, September, 759-766.

Neary, J. P. (1998). “Pitfalls in the Theory of International Trade Policy: Concertina Reforms of Tariffs, and Subsidies to High-Technology Industries.” *Scandinavian Journal of Economics* 100(1), 187-206.

Nelson, Frederick J. (1997). *How the Producer Subsidy Equivalent Was Used to Implement Uruguay Round of GATT*. Economic Research Service, US Department of Agriculture, November, Washington D.C..

OAS – Trade Unit (1998). Subsidy Discipline in Multilateral and Sub-Regional Agreements. May. http://www.sice.oas.org/Tunit/SUBSID/subsi1_e.asp.

OECD (1987). *National Policies and Agricultural Trade*. Paris

OECD (1996). *Subsidies and Environment: Exploring the Linkages*. Documents. OECD.

OECD (1998, 1999). Improving the Environment Through Reducing Subsidies. Parts I, II, and III.

OECD, (2001). *The Uruguay Round Agreement on Agriculture: An Evaluation of Its Implementation in OECD Countries in OECD Countries*. Paris: OECD.

OECD (2003). Agricultural Policies in OECD Countries: Monitoring and Evaluation 2003. Highlights.

Potter, C., and J. Burney (2002). Agricultural Multifunctionality in the WTO – Legitimate Non-Trade Concern or Disguised Protectionism? *Journal of Rural Studies* 18, 35-47.

Prebisch, R. (1950). *The Economics of Latin America and its Principal Problems*. Economic Commission for Latin America.

Romain, R., and Daniel A. Sumner (2001). “Dairy Economic and Policy Issues Between Canada and the United States.” *Canadian Journal of Agricultural Economics*, 49(4), December, pp. 479 – 492.

Sah, R. K., and Joseph E. Stiglitz (1987). “Price Scissors and the Structure of the Economy.” *The Quarterly Journal of Economics*, 22, Issue 1, February, 109-134.

Schmitz, A., and R. Gray (2001). “The Divergence in Canada-U.S. Grain and Oilseed Policies.” *Canadian Journal of Agricultural Economics*, 49 (4), December, pp. 459-478.

Schott, J. J. (1994). *The Uruguay Round: An Assessment*. Institute for International Economics, Washington D. C.

Shah, A., and B. Larsen (1992). “World Energy Subsidies and Global Carbon Emissions.” Background Paper to the World Development Report, World Bank.

Singer, H. W. (1950). “The Distribution of Gains Between Investing and Borrowing Countries.” *American Economic Review*, May, 473-485.

Suranovic, Stephen (2003). International Economics. Online Internet. Available at: <http://internationalecon.com/>

Svensson, L. E. O., and A. Razin (1983). “The Terms of Trade and the Current Account: The Harberger-Laursen-Metzler Effect.” *The Journal of Political Economy*, 91, Issue 1, 97-125.

United States International Trade Commission (1995). *The Economic Effects of Antidumping and Countervailing Duty Orders and Suspension Agreements*. Publication 2900. June.

van Beers, C., and Andre de Moor (2001). *Public Subsidies and Policy Failures*. Edward Elgar.

von Moltke, Konrad (2003): “High Level Round Trade and Environment” Background paper: Subsidies and Sustainable Development. IISD.

World Trade Organization (1994): *Agreement on Subsidies and Countervailing measures*. The Uruguay Round Agreement Final Act Annex 1A

Zahariadis, N. (2001). “Asset Specificity and State Subsidies in Industrialized Countries.” *International Studies Quarterly*, 45, pp. 603-616.

Appendix

The objective of the representative firm is to maximize profit:

$$\Pi = \pi (y, p(s)) - \tau \quad (1)$$

Where $\pi ()$ is the total revenue, y is the level of output, p is the price level of exports, s is the subsidy and τ is the total cost. The price level is a decreasing function of the subsidy rate.

Differentiating totally Eq. (1), we obtain

$$d\pi = \frac{\partial \pi(.)}{\partial y} dy + \frac{\partial \pi(.)}{\partial p} \frac{\partial p}{\partial s} ds \quad (2)$$

As we move along the profit curve, $d\pi = 0$ because positive effects of increase in output and negative effect of subsidies on price are cancelled out. Setting $d\pi = 0$ in (2) and rearranging gives us

$$\frac{dy}{ds} = - \frac{\frac{\partial \pi}{\partial p} \frac{\partial p}{\partial s}}{\frac{\partial \pi}{\partial y}} > 0 \quad (3)$$

Where $(\partial \pi / \partial p) > 0$, $(\partial p / \partial s) < 0$, and $\partial \pi / \partial y > 0$. Equation 3 confirms that subsidies have a positive effect on output. Since our point of interest is the terms-of-trade, by solving equation 3 to extract the effect of subsidies on prices, we obtain

$$\frac{\partial p}{\partial s} = - \frac{\frac{dy}{ds} \frac{\partial \pi}{\partial y}}{\frac{\partial \pi}{\partial p}} < 0 \quad (4)$$

A similar equation holds for the foreign country for which we use an asterisk (*) for differentiation.

$$\frac{\partial p^*}{\partial s^*} = - \frac{\frac{dy^*}{ds^*} \frac{\partial \pi^*}{\partial y^*}}{\frac{\partial \pi^*}{\partial p^*}} < 0 \quad (5)$$

Without any distortion in the international market, it can be establish that $p = p^* = p^w$, and the terms-of-trade (tt) is:

$$tt = \frac{p}{p^*} 100 \quad (6)$$

It is obvious that $tt = 100$ when $p = p^*$ and government subsidies to both firms are of the same size in each country. In this case, there are no anomalies and no matter to settle before the WTO. However, problems arise when one of the firms is over subsidized and the other firm receives little or no subsidy at all. That is, when

$$P = (p^w - s) < (p^w - s^*) \text{ or } p = (p^w - s) < (p^* = p^w) \text{ }^{17}$$

The perturbation in the terms-of-trade (tt^s) can be looked at from two different angles: (i) as a ratio of the innovations in prices of the commodity across countries

$$[tt^s = (\partial p / \partial s) / (\partial p^* / \partial s^*)] \quad (7)$$

Or (ii) as a ratio of the disturbances in prices of each firm relative to the established international price for the commodity

$$[tt^s = (\partial p / \partial s) / p^w \text{ vs. } tt^s = (\partial p^* / \partial s^*) / p^w] \quad (8)$$

Eq. (8) is most appropriate for a before-and-after approach to subsidy analysis while Eq. (7) is most suitable for our purposes. By log-linearizing this equation, it follows that

$$\begin{aligned} \log tt &= \log(\partial p / \partial s) - \log(\partial p^* / \partial s^*) = \log \left[\frac{\frac{dy}{ds} \frac{\partial \pi}{\partial y}}{\frac{\partial \pi}{\partial p}} \right] - \log \left[\frac{\frac{dy^*}{ds^*} \frac{\partial \pi^*}{\partial y^*}}{\frac{\partial \pi^*}{\partial p^*}} \right] \\ &= \left[\log \left(\frac{dy}{ds} \right) + \log \left(\frac{\partial \pi}{\partial y} \right) - \log \left(\frac{\partial \pi}{\partial p} \right) \right] - \left[\log \left(\frac{dy^*}{ds^*} \right) + \log \left(\frac{\partial \pi^*}{\partial y^*} \right) - \log \left(\frac{\partial \pi^*}{\partial p^*} \right) \right] \end{aligned}$$

After rearranging the terms

$$\log tt = \left[\log \left(\frac{dy}{ds} \right) - \log \left(\frac{dy^*}{ds^*} \right) \right] + \left[\log \left(\frac{\partial \pi}{\partial y} \right) - \log \left(\frac{\partial \pi^*}{\partial y^*} \right) \right] + \left[\log \left(\frac{\partial \pi^*}{\partial p^*} \right) - \log \left(\frac{\partial \pi}{\partial p} \right) \right] \quad (9)$$

Further manipulation could easily demonstrate that disturbances in the terms-of-trade are a function of differential output, subsidy rate, profit, and price level across the two countries.

¹⁷ The implicit assumption is that the domestic firm is the one that benefits from the over subsidization. There is no loss of information if one takes the opposite stance.