NORGES
HANDELSHØYSKOLE

BERGEN, SPRING 2012

Master thesis in International Business

Trade externalities of anti-dumping duties in the salmon industry

Do changes in the U.S. average AD duty on fresh and chilled Atlantic salmon from Norway lead to trade diversion, product trade diversion and trade deflection within the period 1988 to 2011?

By Mari Didriksen and Silje Stadheim Stokke

Advisor: Ragnhild Balsvik

Acknowledgements

The thesis was written in the period January to June 2012. We would like to thank all the people who have contributed to our final product.

We would especially like to show our sincere gratitude to Ragnhild Balsvik. She has been a key person and a profound advisor throughout the process of writing the thesis. Due to the content and quality of the graduate course INB437 'Globalization and Integration' taught by Ragnhild Balsvik et al. at the Norwegian School of Economics, we decided to write a thesis within the topic of anti-dumping in the salmon industry. Considering our lack of experience within econometric techniques, Ragnhild Balsvik has been very helpful and indeed a source of inspiration. We would also like to thank Frank Asche for a valuable conversation about the economics of salmon aquaculture. In addition, we appreciate the service and the willingness of the Norwegian Seafood Council to supply us with Norwegian export data. We are also grateful to the Ministry of Fisheries and Coastal Affairs for forwarding information which has been essential for the work of the thesis.

Writing a master thesis has contributed to a good experience which we will benefit from in the professional working life. We have experienced a steep learning curve and challenged ourselves. Working in a small team has also shown to be rewarding as we have been able to discuss interesting topics and motivating each other as well as critically questioning the work we do.

Bergen, June 14 2012

Mari Didriksen

Silje Stadheim Stokke

Abstract

This thesis examines three trade externalities associated with the use of antidumping (AD) measures by the U.S. on fresh and chilled Atlantic salmon from Norway. This is performed by analyzing the relationship between the U.S. AD duties on fresh and chilled salmon from Norway and Norwegian exports of fresh salmon as well as the U.S. imports of salmon over within the period of 1988-2011.

We first investigate the trade diversion effect of the U.S. AD duties on U.S. imports of fresh and chilled salmon. We then analyze the product trade diversion on U.S. imports from Norway as a result of the U.S. AD measures. Finally, the trade deflection effect of the U.S. AD measures on Norwegian exports to third countries is examined.

We find trade diversion from Chile and Canada within the U.S. salmon market resulting from U.S. AD measures on Norwegian salmon. The model estimates about 300 tonnes on average of U.S. fresh and chilled salmon imports from Norway assumed to be destroyed appears to be replaced by Chile and Canada. We fail to find evidence for an increase in U.S. imports of *other* salmon products from Norway. However, we document that 7 % of Norwegian exports on average of fresh salmon assumed to be destructed have supposedly deflected to a non-U.S. export market.

The findings suggest that there are no trade externalities associated with the reviews and changes of the U.S. AD duties, meaning that the trade externalities result from the *initial* imposition of the AD measures. With regards to the effectiveness of the U.S. policy on Norwegian fresh and chilled salmon, the U.S. domestic production has not expanded in a large degree. Thus, we conclude that the U.S. AD measures associated with the salmon industry do not seem to be effective.

Table of Contents

List of Figures and Tables

1 Introduction

Up until 1995 the main users of anti-dumping (henceforth, AD) policies were Australia, Canada, the United States (U.S.) and the European Union (EU). By the end of 2003 the number of countries with AD laws was close to a hundred (Zanardi, 2009; Blonigen and Prusa, 2003). In the early studies of the implications of AD duties, a number of researchers assumed the economic welfare consequences of an AD duty were equal to an import tariff (Morkre and Kelley, 1994; Kelley and Morkre, 1998; Devault, 1996). More recent research concludes that there are considerably higher losses connected to AD duties than depicted by the simple trade model with an import tariff. When a tariff is imposed in this model, the volume of imports is reduced and domestic producers increase their production and therefore benefit, among other things. Several researchers have shown that restricting imports from one country does not only increase domestic production, but may also increase imports from third countries (Prusa, 1996; Avsar, 2011; Malhotra and Rus, 2009). This less desirable externality for the importing country is known as *trade diversion,* first introduced by Viner in 1950. In 2006, Bown and Crowley found evidence of another externality which they named *trade deflection.* The term refers to how the targeted exporter shifts trade flows away from the policy-imposing importer to other importing countries.

In a previous graduate course at the Norwegian School of Economics we wrote a term paper focusing on the use of AD duties on Norwegian salmon in the EU. The topic caught our interest, and resulted in continuing the work in a master thesis focusing on the U.S. market. The U.S. AD case on imports of fresh and chilled Atlantic salmon from Norway in 1991 is of particular interest given its long time frame of more than 20 years (Reuters, 2012). In March 2012, the AD duty was revoked by the U.S. International Trade Commission (USITC) (USITC, 2012b). By accessing public information from the USITC, the U.S. Department of Agriculture (USDA), and the Norwegian government, as well as receiving data on Norwegian salmon exports from the Norwegian Seafood Council[1], we have been able to follow the case in detail. The salmon industry is particularly interesting to study given Norway's exceptional position and experience in aquaculture. Norway has both been a pioneer and the world's largest exporter of salmon since the 1970s. Norwegian exports of salmon have grown tremendously even though the industry has been subject to AD duties in the U.S. as well as in the EU.

According to statistics of U.S. fresh and chilled Atlantic salmon imports from the USDA, Norway was the top import source in the U.S. in 1990 with 38% of total imports, and dropped to approximately

[1] The Norwegian Seafood Council is owned by the Norwegian Ministry of Fisheries and Coastal Affairs.

3% in 1991 (USDA, 2012a). Research by Prusa (2001) and Bown and Crowley (2006) have shown significant trade diversion as an effect of U.S. AD duties in general. In this thesis we will examine the causality between the U.S. AD duty implementation on fresh and chilled Norwegian salmon and a trade diversion effect. It is of particular interest to analyze the aquaculture sector as few studies have been conducted on specific sectors (Prusa, 1996; Blonigen, 2000). Two studies of the agriculture sector in the U.S. found that trade diversion is relatively unimportant (Malhotra et.al., 2006; Carter and Gunning-Trant 2010). Thus, it will be interesting to see whether we find corresponding results for salmon in the aquaculture sector.

The U.S. market was the third largest export destination for Norwegian exporters of fresh and chilled salmon in the two years prior to the U.S. preliminary anti-dumping and countervailing (CV) duties. In 1991, however, the U.S. was only ranked as number twelve. According to research by Bown and Crowley (2006; 2007), trade deflection is an effect of U.S. AD duties. Avsar (2010) found the same result when analyzing AD duties imposed by various countries. From this we can assume that there may have been trade deflection due to the U.S. AD duties on Norwegian fresh and chilled salmon.

In the literature review, we have also questioned how the AD duty on one product may lead to increased imports of value-added products. We have noticed that this externality may result from the importer and the exporter's side. The importer may demand other varieties of the policy-imposed product due to reasons such as a country-of-origin effect and superior quality association, while the exporter, now faced with import restrictions, may be forced to innovate and/or export other varieties in order to stay in the market. In contrast, it may be that AD orders on one product variety lead to uncertainty for policy-imposed producers and hence, decrease *total* imports of all product varieties from the country subject to the import restriction. This is a topic that needs further research, and is therefore also interesting to examine in our thesis. The U.S. import statistics from USDA show for example that Norway has remained the top import source of *frozen Atlantic* salmon since 1993, with the exception of a few years. Hence, we would like to examine whether there has been a significant increase in U.S. imports from Norway of *other* salmon products as an effect of the U.S. AD duties on fresh and chilled salmon. As mentioned, the term *trade diversion* is referring to increased imports from third countries. We define *product trade diversion* as increased imports of third *products.*[2] Throughout the thesis we will look at the salmon *farming* industry because the

[2] The hypothesis could also be defined as *product trade deflection.* Trade deflection is increased exports to *other* countries. Similarly, product trade deflection could be increased exports of *products* to the same country. However, we choose to focus on U.S. imports of other products from Norway. Also, we only have data on U.S. imports on a product-level.

majority of Atlantic salmon is farmed. The U.S. AD duty, however, does not specify 'farmed', but holds for both farmed and wild salmon (DOC, 1991).

The research question goes as follows:

'Do changes in the U.S. average AD duty on fresh and chilled Atlantic salmon from Norway lead to trade diversion, product trade diversion and trade deflection within the period 1988 to 2011?'

Key terms

Trade diversion:

- the U.S. diverting its imports of fresh and chilled Atlantic salmon from Norway to other source countries

Product trade diversion:

- the U.S diverting its imports of fresh and chilled Atlantic salmon from Norway to other Norwegian salmon product varieties

Trade deflection:

- Norway shifting its exports of fresh and chilled Atlantic salmon to other markets than the U.S.

The AD duty model in figure 1 displays the three externalities we will examine. First, Firm N (Norway) faces an anti-dumping duty from the U.S. and imports from Firm N of the policy-imposed good are reduced, namely *trade destruction*. The following possible externalities of the AD duty are:[3]

1. *Trade diversion:*
   The U.S. increases imports from e.g. Firm C (Canada) and Firm U (UK).
2. *Product trade diversion:*
   The U.S. increases imports from Firm N of product types exempt from AD duties.
3. *Trade deflection:*
   Firm N increases exports to e.g. Country A (Austria) and Country B (Belgium).

[3] The three externalities are not in chronological order.

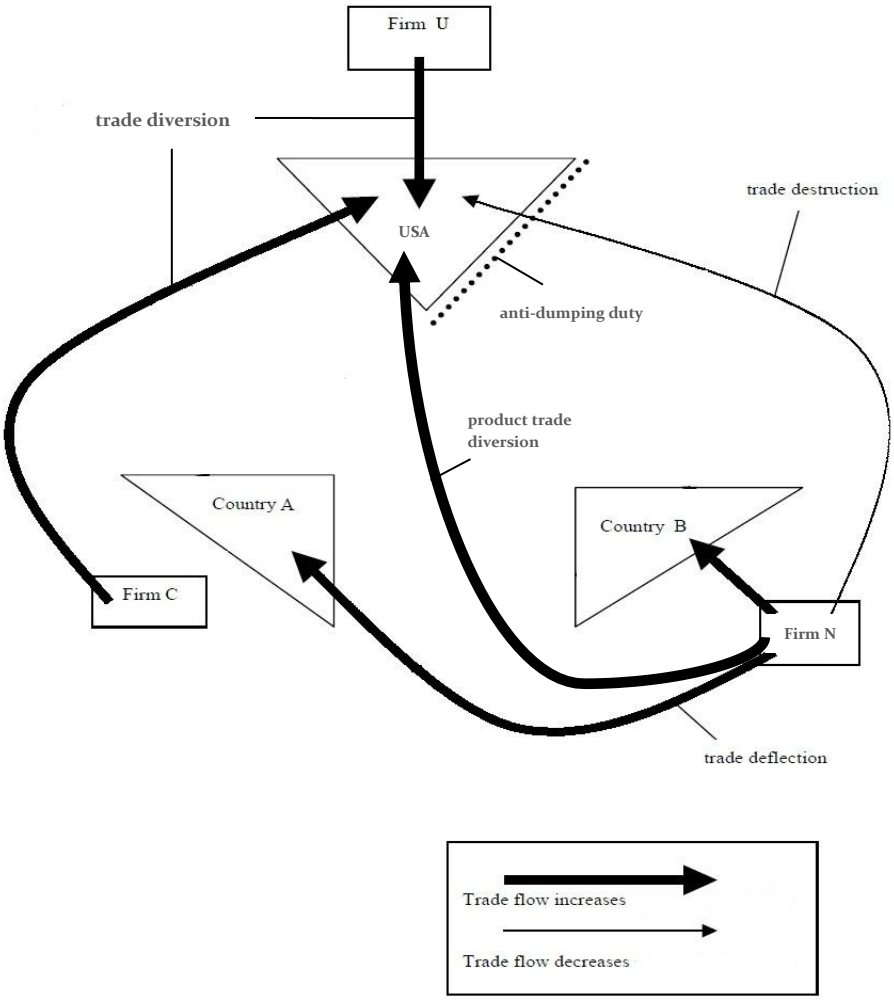


Figure 1. AD duty model displaying the AD duty externalities trade diversion, product trade diversion and trade deflection[4]

Investigating Norway and the U.S. for these external trade effects of an AD measure is especially interesting. First, Norwegian salmon is a frequently targeted product of import protection. Second, the U.S. is one of the most frequent AD users in the world. Third, Norway is the world's largest salmon exporter. Also, at the time of the imposition of the U.S. AD order on Norwegian fresh and chilled salmon in 1991, the U.S. was a moderately large salmon market in the world and a moderately large export market for Norway. For the reasons just mentioned, we assume that there is a possibility of external trade flow impacts due to the U.S. trade restriction on Norwegian fresh and chilled salmon.

[4] The AD duty model is based on Bown and Crowley (2007), Figure 2: Trade Flows Under an Anti-dumping Duty.

For the empirical analysis, we construct three data sets. First, we create a data set containing U.S. imports of fresh and chilled salmon from 55 countries between 1988 and 2011.This is done in order to assess whether the U.S. shifts its imports of fresh and chilled salmon towards other source countries after the U.S. AD duty on Norwegian salmon is imposed. This is our analysis of trade diversion. Second, a data set is constructed based on U.S. imports of 46 salmon products from Norway between 1988 and 2011. We create this data set to investigate product trade diversion, which focuses on whether the U.S. shifts its import of fresh and chilled salmon from Norway towards other Norwegian salmon products due to the U.S. AD duty. The final data set includes Norwegian exports of fresh salmon[5] to 100 countries between 1988 and 2011 to examine whether Norway shifts exports of fresh salmon to other countries than the U.S. following the U.S. AD order. This is our analysis of trade deflection. Finally, the trade destructing impact on Norwegian exports of fresh salmon to the U.S. and similarly U.S. imports from Norway of fresh and chilled salmon as a result of the U.S. AD measures is also investigated in all three data sets.

To our knowledge, this is the first paper analyzing trade diversion in the aquaculture sector, examining trade deflection within a specific sector as well as defining the hypothesis of product trade diversion.

We use a regression approach to analyze the effect of AD duties on trade diversion, product trade diversion and trade deflection. Our econometric analysis is faced with the challenge of identifying a causal impact of the AD duty on the trade flows investigated. By attempting to control for other factors that may affect Norwegian exports and U.S. imports, we hope to isolate the effect of the U.S. AD duty. We use various fixed effect approaches and control variables in our attempt to identify the causal effect, but acknowledge that there may be some problems regarding the approach. The unavailability of relevant data has forced us to find alternative methods to attempt controlling for factors such as the downward trend in production costs. A drawback with the available data is for example the trade statistics from the U.S. and Norway which do not separate between zero and missing values, which may have biased the coefficient for the average AD duty towards zero. In addition, the ability to import and export salmon varies substantially across countries as many countries included in the data sets have a very low share of imports/exports. A selection criterion of 1% share of U.S. imports and Norwegian exports has been applied in the analyses as a robustness check. Nonetheless, including too many or too few cross-sectional units may lead to a selection bias.

[5] Fresh salmon is the majority of exports. Chilled salmon has an insignificant share of Norwegian exports of fresh and chilled salmon, e.g. 0.42% in 2011.

In the time period 1988-2011, as an effect of the U.S. AD order on Norwegian fresh and chilled salmon, our findings show an increase of U.S. imports of the product from third country exporters (i.e., 'trade diversion'). Our results also show that the increase in U.S. imports of fresh and chilled Atlantic salmon from Chile and Canada seem to replace the decline in U.S. imports from Norway. As the AD duty increases with one percentage point, about 300 tonnes on average of U.S. imports assumed to be destructed seem to be diverted by the U.S. importing more from Chile and Canada. Thus, the U.S. AD policy does not seem to be effective in the U.S. salmon sector since the imported volume has not been reduced to help expand domestic production. Furthermore, there is an increase in Norwegian exports of fresh salmon to third country markets in the investigated period (i.e., 'trade deflection'). In addition, we find a decrease in the Norwegian exports of the policy-imposed product to the U.S (i.e. 'trade destruction'). As the average AD duty increases with one percentage point, 7% of Norwegian exports on average assumed to be destructed seem to be deflected to non-U.S. export markets. Finally, we fail to find evidence of an increase in U.S. imports of *other* salmon products from Norway (i.e., 'product trade diversion'). In relation to other economic studies on U.S. AD duties' consequences, our results on external trade effects complement the work of Bown and Crowley (2006; 2007) and Prusa (2001). Our findings of trade diversion in the salmon sector contradict the relative unimportance of trade diversion in the agriculture sector by Malhotra et al. (2006) and Carter and Gunning-Trant (2010). In addition, the findings of trade deflection to markets not previously exported to conflicts with the work by Avsar (2010).

The thesis is structured as follows. The second chapter presents relevant economic literature and the third chapter introduces background of the salmon industry. In the fourth chapter we present trade disputes and AD measures on salmon. The fifth chapter introduces the empirical model, our data and variables. In the sixth chapter we display our empirical results whereas the seventh and eight chapters discuss the empirical analysis and conclude with our main findings and questions for further research.

2 Literature

2.1 The World Trade Organization

In the agreements of the World Trade Organization (WTO) the principle of non-discrimination is embedded in all documents and rules and is a basic pillar of the organization (WTO, 2012a). The 'most favored nation' (MFN) principle is based upon the notion that countries cannot normally discriminate between WTO partners in trade. If deciding to lower or raise the duty on a product, it follows that the same action, and no less favorably, should be valid for all of the members in the WTO. During the Tokyo-rounds in the 1960s it was agreed that *fresh* salmon was incorporated in the GATT agreement with a 2 % MFN tariff (Utenriksdepartementet, 2012). In the U.S. the name MFN was changed to 'normal trade relations' (NTR) in 1998 (Pregej, 1999). Furthermore, the U.S. defines three types of NTR; permanent, conditional and denial of NTR (UNCTAD, 2000). Currently, Cambodia and Cuba are the only countries not covered by the NTR. According to the Harmonized Tariff Schedule Archive of the USITC, fresh or chilled salmon have had a 0% NTR duty since 1987 (USITC, 1989).

Even though the NTR and MFN duties on salmon are low or zero, there may be other measures restricting trade, such as non-tariff barriers and WTO's three exceptions of the MFN principle. Non-tariff barriers (NTB) that the salmon industry faces around the world include licenses, health and environment regulations, regulations on quality, veterinary restrictions, border controls and other technical rules (Asche and Bjørndal, 2011). The WTO has several agreements trying to regulate the use of barriers in a protectionist fashion, such as the agreement on import licenses and the agreement on inspection of shipment (WTO, 2012b). The WTO allows for an importing country to protect itself from 'unfair' trading conditions or exports causing 'injury' with three exceptions of the MFN principle (WTO, 2012c):

Safeguards

Safeguard actions are *temporary* import restrictions, tariffs or quotas, imposed to protect the domestic industry from a sudden increase in imports. The purpose of a safeguard is to allow the domestic industry to adjust when there is a threat of injury.

Subsidies and Countervailing Duties

When being subsidized, an industry can sell products at a low price and still gain profits. However, subsidies can lead to prices below market value and unfair competition. If this is proven, the subsidy must be withdrawn. Countervailing duties (CVD) may be imposed on subsidized products to obtain a fair market price.

Anti-dumping duties

The definition of dumping is when a company exports a product at a lower price than its normal value. The Anti-dumping Agreement under GATT includes articles that set forth substantive rules, the determination of dumping and specific provisions for the investigation and public notice, to mention some (WTO, 2012d). If dumping is proven to take place, the importing country can impose AD duties on the product to protect its domestic producers from unfair competition and 'material injury'.

One of the topics in the current Doha Development Round in the WTO is to negotiate AD and CVD regulations and tariff and trade barriers for non-agricultural products (Johnsen and Melchior, 2011). About two thirds of the world's tariff rates on fish are fixed, which means that the WTO puts an upper limit for the tariff that is implemented. The aquaculture industry is directly affected when it comes to negotiating tariffs, trade barriers, and regulations on anti-dumping duties and countervailing duties.

Another exception to the MFN principle is that countries are allowed to negotiate Free Trade Agreements (FTAs) that only hold for goods and services traded within the specific countries (WTO, 2012a). Even though this discriminates goods from outside, the WTO permits bilateral or multilateral trade agreements between countries. Some FTAs forbid the use of anti-dumping duties between member states (EFTA, 2011a). Also, Dukegun and Wonkyo (2011)show that countries within a FTA accuse each other less of dumping and file less anti-dumping petitions.

The U.S. has a FTA with two of its main import sources of salmon, namely Chile and Canada. This might eliminate the threat of accusations of dumping and also improve these countries' market access to the U.S. compared to Norway. In 2004, Chile and the U.S. entered into a FTA eliminating tariffs and opening markets (OUSTR, 2012a). The FTA with Chile was established ten years after the North American Free Trade Agreement (NAFTA) between the U.S., Canada and Mexico was signed (OUSTR, 2012b). The U.S. had entered a FTA with Canada already in 1989, namely CUSFTA and the NAFTA agreement was an extension of this (Foreign Affairs Canada, 2011).

Chile has focused on exporting salmon since the beginning of the mid 1980s, and quickly became the second largest exporter of salmon in the world after Norway (Asche and Bjørndal, 2011). Chile signed FTAs with South Korea in 2001, China in 2005, and Vietnam in 2011 (VSF, 2011). Furthermore, Chile created an Economic Partnership with the EU in 2005, Japan in 2007, and a partial trade agreement with India in 2007 (EENI, 2012). By creating trade agreements with importers of salmon, it is possible that Chile is able to capture a large salmon market share in these countries. This could again imply that Norwegian exports may have been reduced or not been able to reach these countries. Since the

EU is Norway's largest export market for salmon, we will take a closer look at the agreement between Chile and the EU. According to the European Commission, the agreement is a FTA covering all the areas of EU-Chile trade relations and eliminates barriers to trade (EC, 2010). In the EU-Chile agreement, reductions in tariffs for salmon was going to be transitional in a period of 10 years, where tariffs of 34.3% were removed for fresh and frozen Atlantic salmon in 2005 (Medin, 2003).

While Chile has successfully negotiated FTAs with several countries, Norway achieved no tariff reductions on salmon when entering the European Economic Area (EEA) agreement (Steinshamn et al., 2001).[6] Even though the agreement forbids anti-dumping duties between EEA states, there is an exception in the agreement for the fisheries and aquaculture sector (EFTA, 2011a). In 2005, the Norwegian government stated that the salmon industry was losing competitive advantage to Chile concerning market access (Ministry of fisheries and coastal affairs, 2005). The Norwegian government also mentioned large potential in markets such as India, Vietnam and Brazil with a high consumption of fish, but with very high duties restricting trade. After 2005, Norway has completed FTA negotiations with South-Korea, but is today still under duties from India, China, Vietnam, Brazil and Japan (Ministry of trade and industry, 2012).

2.2 The effects of an anti-dumping policy

In the case of implementing ad valorem or specific anti-dumping duties, the economic welfare consequences can partly be demonstrated by a simple partial equilibrium trade model (Blonigen and Prusa, 2003). The partial equilibrium analysis only depicts the effects of a policy action in the sector directly affected (Suranovic, 2010). The sector facing the tariff is assumed to be so small that there is little impact on other sectors or other sectors are simply ignored, which is in contrast to the general equilibrium model. In Norway, we can presume the salmon industry is a large sector creating ripple effects in the economy as it became one of the largest exporting sectors throughout the 1990s (Regjeringen, 2000). However, with regards to our thesis, the partial equilibrium analysis is more relevant than the general equilibrium analysis since we are exclusively focusing on the salmon industry.

The partial equilibrium model can be analyzed with a large or small country as the importing and policy-setting nation (Suranovic, 2010). A country can be defined as large, given that its imports or exports constitute a significant share of the international market of the commodity. When a large country removes a large trade flow, the world price of the product can be affected.

[6] The EEA consists of the three European Free Trade Association (EFTA) states Norway, Iceland and Liechtenstein, and the EU member states (EFTA, 2011b).

In the 1980s the European salmon market was negligible, whereas Japan and the U.S. were the main markets for salmon worldwide (Asche and Bjørndal, 2011). For the partial equilibrium model, we consider 1989 as the relevant year to evaluate whether the U.S. is a large or small country since preliminary AD duties were imposed in 1990. In 1989, Norway exported 85% of the world's total exports of fresh and chilled Atlantic and Danube salmon, see table 1 appendix 1. In lack of statistics on world exports on a country-level of fresh salmon, we use Norwegian export data retrieved from the Norwegian Seafood Council to determine U.S. import share of the international market due to Norway's large share. In 1989, five of 26 Norwegian exporting destinations had a share above 6%, where the largest market's share was France with 23%. The same year, the U.S. was the third largest destination for Norwegian exports with approximately 16%. We argue that both the U.S. and Norway can be considered as large countries in 1989 in relation to the partial equilibrium model. Therefore, we present the simple trade model with an import duty and a large importing country next.

The model assumes that there are two countries with perfectly competitive markets (Suranovic, 2010). It also assumes that the traded good is homogenous and perfectly substitutable across borders. There is no retaliation and initially the countries are trading freely.

The welfare consequences of imposing a tariff are illustrated in figure 1. The two diagrams A and B, respectively for the importing and exporting country, have each one demand (D) and supply (S) curve. Diagram C, shows the foreign export supply (XS) and the home import demand (MD) and the curves are combined in a XS-MD model. Looking first at the XS-MD model in diagram C, the free trade equilibrium price and quantity are Q^{FT} and P^{FT}. When the large country imposes a tariff, the tariff is shared between the importing country's consumers and the foreign exporters (Salvatore, 2004). The new price is P^{IM} for the importing country and P^{EX} for the exporting country and the total quantity traded declines to Q^{T}. The large importing country's increase in price will be less than the amount of the tariff and the nation benefits from an improvement in its terms-of-trade which may result in a net welfare gain.

In table 1 the welfare consequences on consumer surplus, producer surplus and tariff revenue are listed (Suranovic, 2010). The consumers gain and producers lose in the exporting country, while the opposite is true for the importing country along with a gain in government revenue. When looking at diagrams A and B for the importing and exporting country we can see the net welfare consequences for national welfare. The net welfare consequences for the exporting country consist of three areas, namely a negative consumption distortion (f), negative production distortion (h) and a negative

terms-of-trade effect (g). Similarly, for the importing country, a negative consumption distortion (D), negative production distortion (B) and a positive terms-of-trade effect (G).

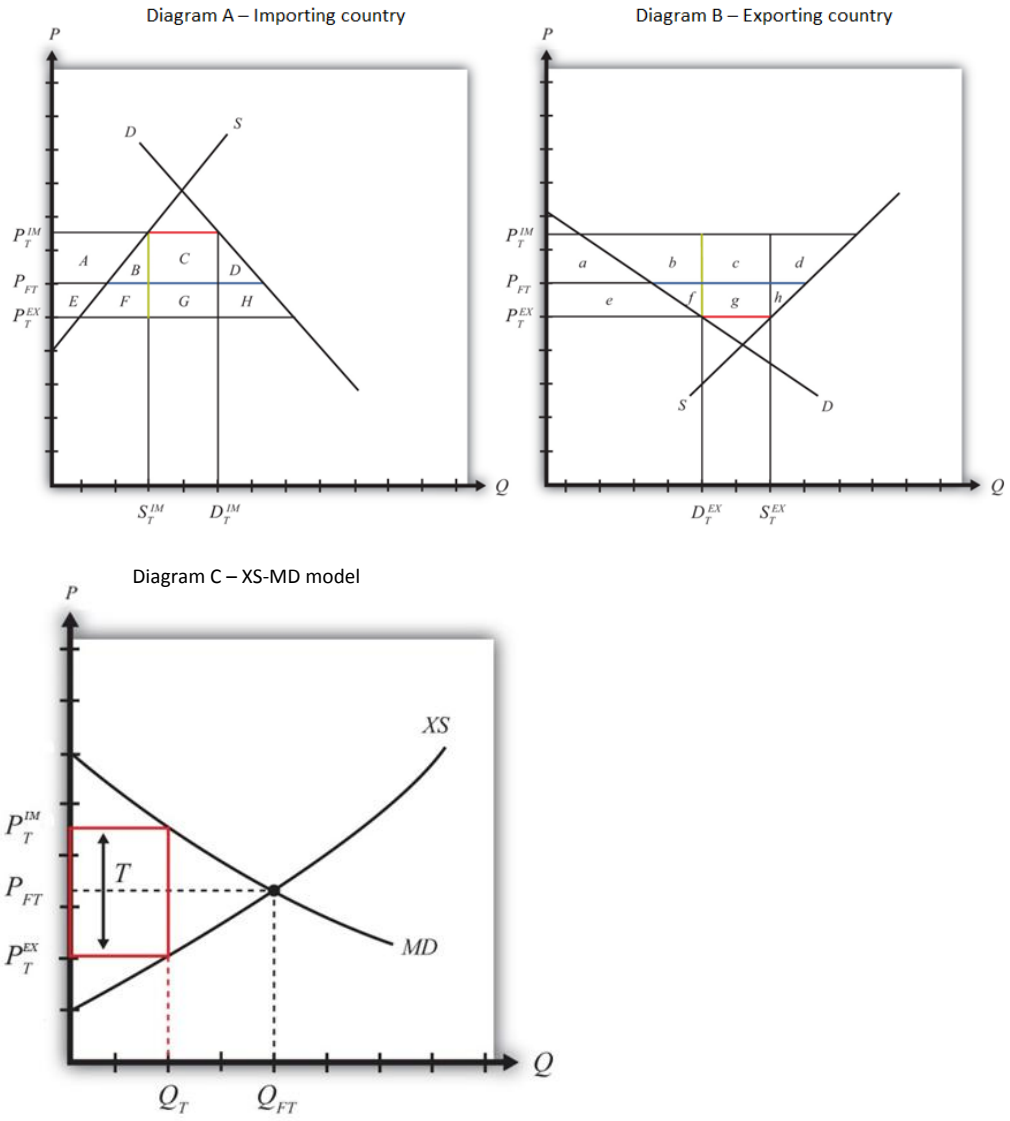


Figure 2. Welfare effects on a large country of an imposed tariff (Suranovic, 2010)

	Importing Country	Exporting Country
Consumer Surplus	− (A + B + C + D)	+ e
Producer Surplus	+ A	− (e + f + g + h)
Govt. Revenue	+ (C + G)	0
National Welfare	+ G − (B + D)	− (f + g + h)

Table 1. Welfare effects in the importing and exporting country (Suranovic, 2010)

The national welfare change is ambiguous for the importing nation and depends on the size of the area of the terms-of-trade gain and the deadweight loss triangles. The deadweight loss represents

consumers who stop buying the product and domestic producers expanding production instead of buying foreign goods more cheaply. The size of the loss is dependent on the elasticity of each of the demand and supply curves as well as the size of the tariff. The exporting country's national welfare change is nevertheless a loss.

The partial equilibrium model is not a complete overview of the effects of an anti-dumping duty as several aspects of AD law and administration of AD duties are not considered. Looking further into the assumptions of the partial equilibrium model, a perfectly competitive market is characterized by many small suppliers who are price takers, perfect information and homogenous products, equal access to resources and technology, no entry or exit barriers, and no externalities (Suranovic, 2010). Several of these assumptions do not hold in relation to the salmon industry. We will now proceed by discussing some of the shortcomings of the partial equilibrium model that we find especially relevant to our research question. As the AD duty characteristics and the assumptions of the perfectly competitive market do not hold, this may change the outcome relative to the model. In general, the potential additional consequences create a much larger welfare loss for the importing country.

The arguments are structured as follows: 1-3 discusses AD characteristics in general, 4 highlights AD attributes in an imperfect competition setting, 5-7 presents the weaknesses of the assumptions of perfect competition specific to the salmon industry, 8-10 focuses on general research on externalities not covered in the partial equilibrium model.

1. The AD duties imposed are often very high, creating an even larger deadweight loss than a regular tariff in the partial equilibrium model (Pugel, 2009). To give an example, the U.S. Department of Commerce (DOC) imposed AD duties in 2012 on Chinese steel companies on magnitudes from 194% to 235 % (Xinhua, 2012).

2. The partial equilibrium model is a static model and assumes that the imposed duty is fixed. In a procedure called *the administrative review*, if requested by an interested party, the USITC recalculates anti-dumping duties as foreign dumping behavior changes (Blonigen and Prusa, 2003) Research by Gallaway et al. (1999) shows that exporting firms subsequently raise their prices after an AD duty is imposed because of the administrative review process. The exporting firms therefore successfully divert tariff revenue from the importing country to themselves. Hence, in this setting there is a much higher loss to the importing country than if the AD duties were fixed.

3. The simple trade model with an import tariff does not take into account indirect costs of AD duties. Parties involved in AD lawsuits spend time and resources on investigations and legal advice to prove or disprove dumping complaints. In 2003, the standard estimated legal fees in the U.S. for pursuing AD investigations were ranging from USD 250,000-1,000,000 (Blonigen and Prusa, 2003). However, this cost only covers the original investigation and therefore does not take into consideration the added fees incurred for additional administrative reviews.
   There is also the threat of the policy-imposed country retaliating with AD duties. For example U.S.' AD measures against Canada may lead to retaliatory AD actions against U.S exporters to Canada (Blonigen and Bown, 2003). This means that both countries are subject to a loss, as supposed to the situation in the partial equilibrium model where only one country imposed AD duties. Blonigen and Bown (2003) examined retaliation effects of AD processes in the U.S. between 1980 and 1998. Their findings suggest that the U.S. industries take into consideration the threat of reciprocal foreign AD duties when deciding which country to name in the original petition in AD lawsuits. They also find significant evidence that the U.S AD authority's decisions about AD measures are affected by the potential threat of retaliation under the WTO dispute mechanism. The utilized time and resources mentioned are only some of the indirect costs that occur before an AD duty is implemented, which are not considered in the partial equilibrium model.

   When an AD duty is imposed there is also a threat of AD accusations and protection related to upstream (primary or intermediate) and downstream (consuming) industries (Blonigen and Bown, 2003). Research by Feinberg and Kaplan (1993) concludes that U.S. AD import protection of metal and chemicals spread to downstream industries. Vandenbussche and Zanardi (2010) argue that AD duties may affect downstream products when using the protected product as an input factor. In their paper, they use two examples on how AD duties on one product may lead to an increase in imports of other products. The first example is a country using AD measures to protect an upstream intermediate input such as steel in cars. Vandenbussche and Zanardi argue that these AD measures may lead to a negative impact on the country's competitiveness of domestically assembled cars compared to foreign cars. Hence, the result may be increased downstream imports of foreign cars exceeding the decrease in imports of steel, and an increase in aggregate imports. The second example they use is the case of a country using AD measures to protect unrefined products, such as raw shrimps. This may result in foreign processing of the unrefined good to turn it into a value-added product not subject to an AD duty. Subsequently, this could result in the importing country increasing its imports of value added products. This is

an example of the hypothesis of product trade diversion if the increased imports of value-added products originate from the policy-imposed country. There is a possibility of increased aggregate imports if the value added product imports are larger than the decline in the unrefined product subject to the AD duty. Thus, if the increased imports originate from the policy-imposed country, the exporting country's welfare loss of an AD duty predicted by the simple trade model might be overestimated. In both above-mentioned examples, the surge in imports of downstream products as an effect of AD protection on a related product might injure the domestic downstream industries. This could again turn into an AD investigation on the downstream product. Although interesting, there is little research on the topic of AD effects on imports of intermediate or downstream products. The AD duty's impact on downstream industries or products is not covered by the partial equilibrium model.

There are also indirect costs related to lobbying of influential decision-makers in hope of a favorable outcome in AD lawsuits. Hansen and Prusa (1997) show there is a greater probability of AD duties when resources are spent by an import-competing domestic industry on influential congressmen. These rent-seeking costs are regarded to be inefficient because they could have been alternatively spent to make the domestic industry more productive. Miyagiwa and Ohno (1995) argue that domestic firms receiving trade protection are regarded to be less innovative than under a setting of free trade. The simple trade model with an import duty does not take into account the additional costs of lobbying.

4. Another point to stress is the relevance of dynamic game theory and strategic behavior that may appear in absence of a perfectly competitive market. Concerning this point, the administrative review process might help facilitate collusion (Khatibi, 2007). In contrast to the perfect competition setting, exporters are price setters with some market power. Anticipating the administrative review process, the exporters' strategic move may be to raise their prices to reduce the chance of a higher AD duty. As an administrative review process is initiated and exporters most likely have increased their prices, domestic producers might raise their prices correspondingly having predicted this is the strategy of the exporter. Domestic producers also have access to public information regarding the specific dumping margins and can possibly then estimate the price increase of the exporter. The consequences of a transparent AD system may thus be higher prices and domestic firms profit. The antitrust laws, however, try to prevent collusion because market power and higher prices cause a substantially higher consumer loss

than in a perfectly competitive market. This is a possible additional effect of an AD duty not taken into account with regards to the partial equilibrium model.

5. The assumptions of a perfectly competitive market contain among others the notion of no entry or exit barriers. In the salmon industry, there are national regulations for access to sites and licensing to produce. Norwegian producers such as Marine Harvest have been criticizing the industry to be rigidly regulated in Norway (Marine Harvest, 2010). Also, in the U.S. aquaculture industry there is a low potential for increasing the production of Atlantic farmed salmon due to environmental constraints, national regulations and unavailability of sites (Asche and Bjørndal, 2011). When AD measures are imposed, the partial equilibrium model predicts domestic production to increase. However, entry barriers in the salmon industry such as national regulations might limit the capacity of domestic producers or slow down the process of expanding production. Therefore, the welfare gain to the importing country coming from increased domestic production might not occur and the welfare losses will be higher than predicted by the partial equilibrium model.

6. Another attribute of perfect competition is the assumption of many small suppliers with no market power. The salmon industry at the firm level may correspond to the characteristic as there are many small firms (Asche and Bjørndal, 2011). However, there are few countries with suitable locations and natural endowments for large production of salmon. When looking at the country level, there are regionalized salmon suppliers that may have market power. Thus, it can be assumed that there is weak competition. Countries with more market power may attempt to gain more profits by limiting supply. Despite all this, production of salmon has increased tremendously, and therefore it is difficult to argue that quantity has been limited.

   Trade measures such as AD duties are usually directed at all or the majority of producers in one country (Asche and Bjørndal, 2011). In the salmon industry, there have been many AD duty disputes involving several countries. The worldwide AD cases on salmon are presented in further detail in chapter 4. The partial equilibrium model expects that the exporting country imposed to AD measures becomes uncompetitive and loses considerable market share. In two of the AD duty disputes in table 3 in chapter 4.2, the exporting country did not lose considerable market share in the importing country (Asche and Bjørndal, 2011). This occurred when the U.S. imposed AD duties on salmon from Chile in 1998 and similarly the case when the EU imposed AD duties on Norwegian salmon in 2006. Chilean and Norwegian exporters did not become uncompetitive

in these markets respectively. From this it can be assumed that Chile has some market power in the U.S. and likewise for Norway's position in the EU. Therefore, it seems that the assumption of the partial equilibrium model and perfect competition might not hold for the salmon industry. The predicted welfare effects of the partial equilibrium model may be underestimated for the exporting country and overestimated for the importing country with regards to the examples shown from the salmon industry.

7. The assumptions of perfect competition further presume homogenous products and perfect substitutes. According to Asche and Bjørndal (2011) salmon is *not* a homogenous product as there are substantial differences in quality such as fat content, color and size. If Norwegian salmon is perceived as higher quality, consumers around the world might demand Norwegian salmon in *all* product forms. This amplifies the probability of increased imports of *other* salmon product varieties from Norway as an additional effect of an AD duty imposed on another salmon variety. Also, several studies have shown that there is a high degree of substitutability between product forms of salmon (Asche et al., 2001; Asche et al., 1999). Thus, when a high AD duty is imposed on one salmon product from Norway, this may lead to increased imports of other product varieties such as frozen salmon. The perfect competition assumption concerning product characteristics does not hold for the salmon product. Therefore, there might be additional outcomes of an AD duty than what is predicted by the simple trade model with a tariff.

8. The partial equilibrium model predicts a reduction in volume of imports, also known as *trade destruction,* and for domestic producers to increase their production and benefit (Bown and Crowley, 2006). Furthermore, the model assumes that there are no externalities. Several researchers have shown that restricting imports by AD duties indeed lead to externalities such as increased imports from third countries (Prusa, 1996; Avsar, 2011; Bown and Crowley, 2006). This less desirable externality is known as *trade diversion,* first introduced by Viner in 1950. The externality is less desirable for the importing country because the domestic producers do not gain from increasing their production. Originally, Viner's model explains trade diversion due to a customs union, but researchers such as Bown and Crowley (2006; 2007) have used Viner's model to explain trade diversion from AD duties.

   Viner's model refers to *trade diversion* as an effect of two countries forming a customs union and leaving a third country outside the union subject to tariffs, see appendix 1 figure 1 (Dalimov, 2009). This takes place when the importing country (Home) switches to trade more with the country within the union and less with the third country subject to tariffs excluded from the

union (Baldwin and Wyplosz 2006; Salvatore, 2004). In the case of AD duties, almost the same occurs as Home imports more from a country or several countries without an AD duty and less from the country with an AD duty. Viner's model predicts that the country within the union now can charge a higher price without the tariff. The country still subject to the tariff gets an even lower price than before due to the preferential treatment of the other country. Home buys more from the exporter whose price has relatively increased and less from the exporter, whose price has fallen, thus reducing welfare. For the consumers in the Home country, the imports from either country cost the same and they are unaware that the commodities from the union-partner in fact cost *more* to Home than those from the exporter outside the union. Thus, trade diversion has negative impacts on the international distribution of resources and shifts production away from a comparative advantage. With trade diversion, there is a higher welfare loss than predicted by the partial equilibrium model because of increased imports from non-policy imposed countries instead of expansion in domestic production.

9. The partial equilibrium model focuses only on one good in one sector. In a discussion paper from 2010, Vandenbussche and Zanardi's results show that the use of AD measures has a significant depressing impact on total imports, known as *general trade depression*. The trade-depressing effects of AD policies are therefore also connected to goods and sectors *not* subject to the policy. Few studies have analyzed impacts on other sectors or products caused by an AD duty. Due to the threat of dumping accusations, spillovers may arise, and there might be a negative effect on aggregate exports to the policy-imposing country. Between 1980 and 1994, 700 AD cases were filed in the U.S., more than any other country (Prusa, 2001). In contrast to research on import diversion and AD duties, Vandenbussche and Zanardi (2010) advocate that other import sources than the policy-imposed country may be affected by a country's AD reputation or learning effects and thus *decrease* its exports to the country. The potential negative effects of an AD duty on aggregate imports are likely to create a larger welfare loss for the importing country compared to the partial equilibrium model.

10. There are also externalities from imposing a duty related to new trade patterns of the exporter that the partial equilibrium model does not include. AD duties may possibly force exporters to turn to new products, new markets or even new organizational structures (Lorentzen, 2006a). An effect of AD duties for exporters could be innovating new products, given they are established in the markets and already have a customers' base. Also, the exporters may want to keep their long-term contracts within logistics and distributional systems. We have been unable to locate

research regarding exports of new products due to AD duties, indicating shortcomings in the literature. When it comes to new markets. Bown and Crowley (2006) talk about two different aspects of trade diversion, namely import diversion and export diversion. Up until 2006, researchers have been focusing on import diversion as a result of AD duties. Bown and Crowley (2006) extended the literature on AD policy effects as they found evidence of export diversion, which they named *trade deflection.* Specifically, the term refers to how the targeted exporter shifts trade flows away from the policy-imposing importer to other importing countries. Concerning AD duties' effect on exporters' new organizational structures, Blonigen (2000) focuses on tariff-jumping FDI as an effect of AD duties. His findings show that the tariff-jumping is relatively modest. To sum up, the above-mentioned externalities of an AD duty may create a smaller welfare loss for the exporting country than predicted in the partial equilibrium model.

2.3 Implications for the Norwegian salmon case

Recent research has stressed that there are considerably higher costs related to AD policies than what is predicted by the partial equilibrium model with a tariff. We would like to examine some of the externalities related to AD duties, namely trade diversion and trade deflection. Applying Viner's model to the Norwegian salmon case, we argue that the U.S. AD duty causes increased U.S. imports of fresh and chilled salmon from other countries than Norway. This implies that the domestic salmon industry in the U.S. does not largely increase production, but instead shifts to import more from other sources. This contrasts to the predictions of the partial equilibrium model, which overestimates the gain for the importing country, here the U.S. On the contrary, relating Vandenbussche and Zanardi's (2010) argument to the salmon industry, it may follow that the U.S.' reputation for repetitive engagement in AD investigations may lead to a *decrease* in imports of salmon from other countries than Norway. We will examine whether *total* U.S. imports of fresh and chilled Atlantic salmon have decreased due to the U.S. AD duty on the Norwegian fresh and chilled salmon, or if the *net* effect on U.S. imports is low due to trade diversion replacing the decline in imports of Norwegian salmon.

Linking the effects of the simple trade model with an import tariff to the Norwegian salmon case, it implies that U.S. imports from Norway decrease. This is also known as trade destruction and creates a welfare loss for Norway. However, the externality theory of trade deflection by Bown and Crowley (2006) suggests otherwise. Norway might have deflected exports of fresh and chilled Atlantic salmon to other countries than the U.S due to the U.S. AD duty. Given that Norway has deflected exports, the welfare loss in the partial equilibrium model might be negligible.

Another potential externality is the imports of new product varieties other than the policy-imposed, namely product trade diversion. The importing country, here the U.S., may demand other varieties of the policy-imposed product fresh and chilled salmon from the same import source. Due to the AD duty on an unrefined product such as fresh and chilled salmon, we can possibly expect an increase in imports of value-added salmon products as illustrated by Vandenbussche and Zanardi (2010). The increased imports of related salmon products might also be due to a country-of-origin effect where the product is perceived as higher quality when made in Norway.

We will focus on increased U.S. imports of Norwegian salmon products. However, our literature review shows that new product varieties in a market can also stem from the exporters' side such as maintaining long-term commitments within distribution and logistics. The hypothesis product trade diversion needs further research, and is therefore of particular interest to examine in our thesis. Given that our findings support the hypothesis, this could imply an overestimated welfare loss for Norway in the partial equilibrium model.

3 Salmon: Producers and Markets

3.1 Salmon characteristics

The term 'aquaculture' refers to the farming of aquatic organisms, there among fish, on either land-based or open-ocean operations (Maine.gov, 2006). There are seven species referred to as *Pacific* salmon; chinook, chum, coho, pink, kokanee/sockeye, cutthroat and steelhead salmon while *Atlantic* salmon is the name for only one species (Turner, 2011). The term 'farmed salmon' refers to coho, salmon trout and Atlantic salmon (Asche et al., 2001).

The salmon life cycle starts as a supplier delivers eggs to the fish farmer (Marine Harvest, 2010). A smolt is the result of a fertilized egg after 6-12 months in tanks on land. The smolt is then released into fresh- or seawater. The Atlantic salmon production cycle takes approximately 2-3 years depending on water temperatures.

In the value chain for farmed salmon there is primary and secondary processing (Marine Harvest, 2010). After the salmon has reached an adult age, the fish is slaughtered and gutted in the first process. Next are the filleting, fillet trimming, portioning, smoking and other processes. The results from the secondary processing are called value-added products. Next, the distribution depends on whether the salmon is sold to retailers or Hotels, Restaurants and Catering (HORECA).

The salmon industry is characterized as volatile and cyclical (Asche et al., 2005). When the salmon price is high and predicted to remain high, the farmers release more smolt, which is ready for harvest after 2-3 years. If many producers follow suit the supply may be too large and the price hence drops. The industries of shipping, aluminum and forestry all share the cyclical features of the salmon industry. What separates the salmon industry from the industries mentioned is that there is substantial productivity growth and price reduction combined with the cycles, thereby making the underlying trend of the price decreasing. Despite this, the more successful producers will survive the shorter cycles. For less successful producers, the cycles can be an excuse for regulations that limits competition.

Producers must cover cost elements such as fish feed, smolt, labor, and processing (Marine Harvest, 2010). Fish feed costs has been the largest share with 34% of total costs in 1985 and today it accounts to more than 50%. There is also the cost component of salmon mortality and disease that the producers must take into account. There has been a general stabilization of mortality in Norway, Scotland and Canada and a similar trend is expected in Chile in the years to come (Asche and Bjørndal, 2011).

During the last decade, however, there has been a trend of consolidation and the rise of multinational companies such as in 2006 when Pan ASA, Fjord Seafood ASA and Marine Harvest merged to what is now called the Marine Harvest Group (Marine Harvest, 2008).This trend is also expected to continue in the future (Asche and Bjørndal, 2011). Globalization can be seen in the aquaculture sector through foreign direct investment (FDI) and outsourcing of production processes (Sissener and Asche, 2003). Other factors increasing the integration of seafood markets are better logistics, cheaper transport and reductions in trade barriers.

3.2 Producers of salmon

Salmon is produced in large quantities in only a few set of countries; Norway, Chile, UK and Canada (Asche, 2001; Asche and Bjørndal, 2011). Norway and Chile have contributed to more than two thirds of total salmon production worldwide since the early 1990s. In figure 3, the world production of Atlantic salmon is illustrated. From 1986 to 2006 world production of Atlantic salmon increased from about 60,000 tonnes to more than 1 million tonnes (NRK, 2012). Production of salmon has leveled off in the last decade in countries except for Norway and Chile (Asche, 2010).

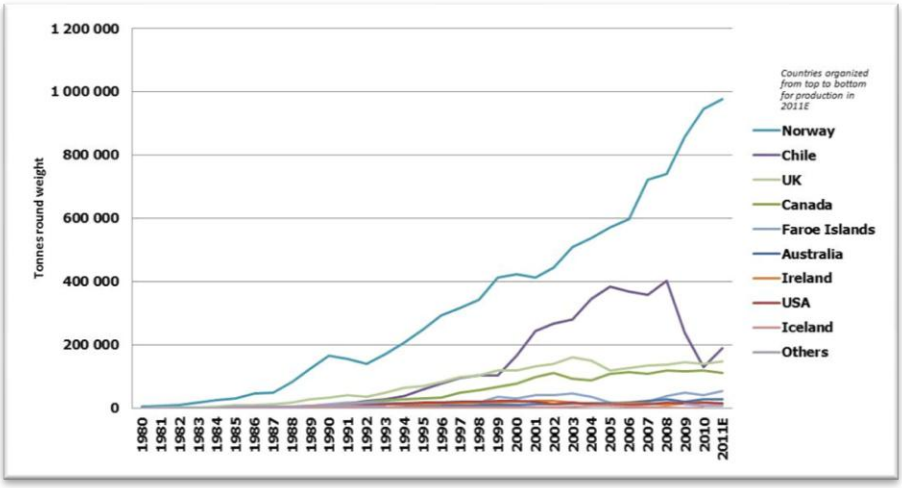


Figure 3. World production of Atlantic salmon (Kontali, BANR, DFO, FAO, Scottish Office, Directorate of Fisheries, SER)

3.2.1 Norway

The Norwegian aquaculture industry is a global leader with a high degree of knowledge and with a historically high R&D capacity (Asche et al., 2012). The farming of Atlantic salmon is the most important activity within the aquaculture industry in Norway, accounting for 80 % of production (FAO, 2012a). The clean and long Norwegian coast line stretches to more than 25,000 kilometers including fjords and bays, making Norway very suitable for salmon farming (SSB, 2011). The sea temperatures along the Norwegian coast vary throughout the year and the grow-out-rate of salmon is longer than in Chile, which may give Chile a comparative advantage (Marine Harvest, 2010).

The development in the Norwegian salmon farming industry can be categorized into three periods of i) infant industry (1970-1980), ii) expanding (1980-1990) and iii) reorganizing: 1990-1995 (Salvanes et al., 1995). Since 1995 the industry has grown enormously, and from 1990-2008 the production of salmon almost quadrupled (Asche and Bjørndal, 2011).

Periods of dips in production and exports of Norwegian salmon have been in 1986-1987 due to disease problems and in 1990-1992 and 2001-2002 because of profitability problems (Asche and Bjørndal, 2011). Especially relevant to our thesis is the period 1990-1992 because of the issuance of the U.S. AD order on fresh and chilled Atlantic salmon from Norway. Due to the fast growing production in the 1980s the salmon markets were oversupplied. By the end of 1990 the prices were very low forcing the Norwegian sales organization for fish, Fiskeoppdretternes Salgslag A/L (FOS) to initiate deep-freezing of salmon (NOU, 1992). Furthermore, many companies filed for bankruptcy in the beginning of the 1990s. The freezing program of the FOS failed and the organization was bankrupt in November 1991. This also created big losses for companies within the salmon farming industry. In addition, the trade barrier on the U.S.' fresh and chilled salmon imports from Norway in

1991 contributed to the difficult situation because the U.S. market nearly disappeared. This trade barrier will be presented in further detail in chapter 4.1

The Norwegian salmon industry has experienced declining production costs as a result of substantial productivity growth, see figure 4 (Ministry of foreign affairs, 2012). The growth is partly a result of longstanding investments by the Norwegian government. Throughout the decades since the start-up of the aquaculture sector, the government has been supporting innovation, research and educational institutions.

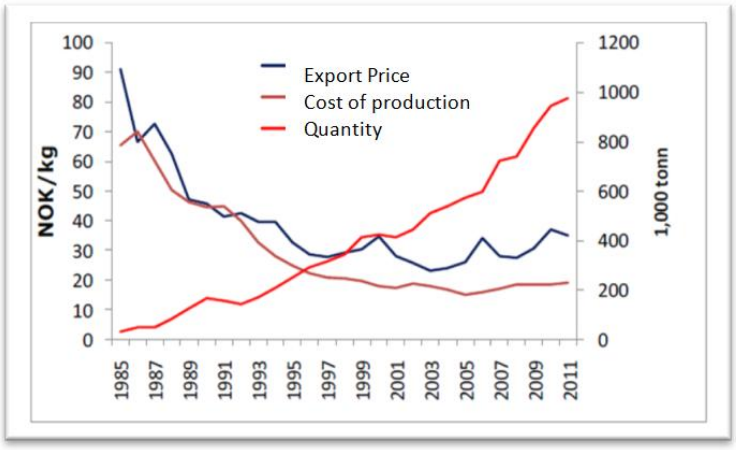


Figure 4. Norwegian salmon export price, production cost and production (Asche, 2011a)

Since the 1980s, the Norwegian export pattern of fish and fish products to the EU has changed as illustrated in figure 5. Today, two thirds of the total Norwegian salmon export value goes to the EU (EU-delegasjonen, 2011). During the 2000s, Europe has become a very important Norwegian export market due to factors such as proximity, cheap transportation costs, organized transportation system, as well as a steady increase in demand. Asche (2012) states that it takes up to 3 days to transport fresh salmon to countries in Europe by using trucks.

In recent years, the largest salmon export destinations for Norway has been France, followed by Russia, Poland, and Denmark (Asche and Bjørndal, 2011). The main salmon products are fresh, chilled and frozen whole salmon in addition to fillets. Tariffs are very high for processed salmon products such as smoked, marinated or ready-to-eat salmon. Tariffs and high labor costs in Norway have prevented the processing industry from developing, with the exception of filleting. According to numbers from 2008, salmon products except for whole fresh, chilled, frozen and fillets only account for 1% of total exports from Norway.

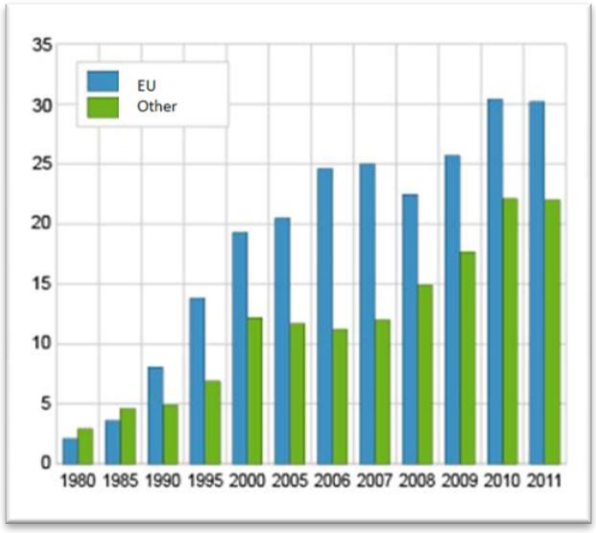


Figure 5. Export of fish and fish products to the EU and other countries. NOK billion (SSB, 2009)

The Norwegian salmon farming industry has grown to become a large and complex sector and there are almost endless possibilities when drawing a value-chain across countries (Iversen et al., 2011). Figure 6 displays the most important options with regards to export and processing. A large amount of salmon is exported unprocessed or only after the primary processing stage, such as whole fillets. This occurs for example from Norway to traders in Sweden, and furthermore to importers in France who then sell it to a restaurant. The next step in processing usually occurs closer to each individual market such as smoking the salmon in France. The exploitation of low costs has led some of the export and processing to Poland and some Baltic countries before selling the salmon to other countries.

KPMG Consulting performed a study which concluded that every 1000 tonnes of salmon exports from Norway created jobs for 30 people in the EU processing industry (NHO, 2000). When looking at the many hundreds of thousands of tons exported yearly to the EU, it signifies that the processing industry is much larger in the EU compared to Norway.

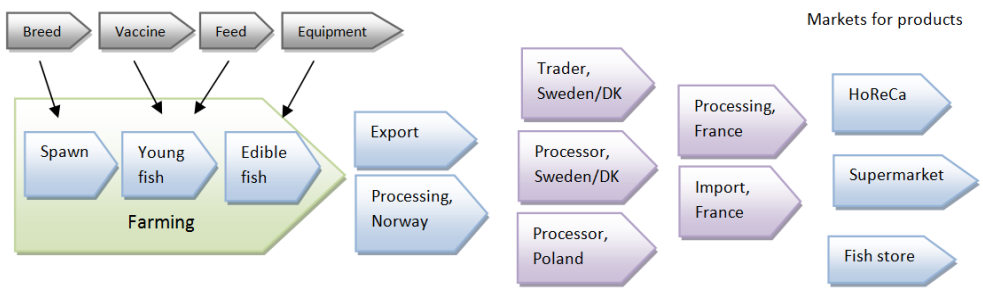


Figure 6. An example of several possibilities in the value-chain for salmon (Iversen et al., 2011)

The unprocessed *fresh salmon* is the main exported salmon product from Norway and faces entry barriers in several countries world-wide. Tariffs in Asian countries such as Vietnam, India, China and South-Korea have been ranging from 10% to 35% (WITS, 2012). Countries in Middle and South America such as Brazil, Mexico, Colombia and Venezuela also have tariffs ranging from 10% to 30% on salmon imports from Norway. In addition, the Norwegian salmon exports have been faced with NTBs in various countries (Asche and Bjørndal, 2011). From 1997-1998 there were border controls in the EU, which is claimed to have had an effect on fish and products of fish (Utenriksdepartementet, 2012). From 2006 the Russian veterinary service needed to authorize all companies wanting to export seafood (FHL, 2010). In addition, it is only possible to apply for allowance the last working day of each month, which may delay and make entry into Russia more difficult. As Kazakhstan, Belarus and Russia formed a customs union in 2010, the fish going to Kazakhstan has to be pre-approved by the Russian veterinaries since it is transported through Russia. Also, China started implementation of stricter inspections and quarantines for imported fresh and frozen salmon from all countries in 2011 (Norges Sjømatråd, 2011).

3.2.2 Other producers

Chile is the largest producer of salmon after Norway and also the world's second largest fish meal producer (Asche and Bjørndal, 2011). Chile is endowed with a long coastline and has low fish feed and labor costs as well as lenient regulation. For these reasons, Chile has been able to quickly develop a large salmon industry with a large processing activity. The Chilean salmon consumption is low and the main focus of the industry is exports. Chilean production and exports of salmon have been reduced in several periods since the late 1990s. In 2005-2008 there were disease as well as production problems. Due to the salmon production cycle, the repercussions of the disease infectious salmon anemia (ISA) were postponed 2 to 3 years, as can be seen in figure 3. The main export market for Chilean salmon is the U.S., despite the additional cost challenge of air freight. In South America, Chilean exports of fresh salmon are increasing to countries such as Brazil and Argentina.

Canada has its main market for salmon in the U.S followed by its domestic market (Asche and Bjørndal, 2011). The main export products for Canada are fresh and chilled whole salmon.

In the UK the production of salmon has been characterized by disease and production problems (Asche and Bjørndal, 2011). Among the world's suppliers of salmon, Scotland is the only major producer with its domestic market as the main market for salmon. Other small producers of Atlantic salmon are Australia, the Faroe Islands, Ireland, Iceland and the U.S.

The U.S. production of salmon has grown for two decades from 1979 as shown in figure 7 (Kocik and Sheehan, 2006). From 1990 to 1991 the production more than doubled and this also occurred from 1991 to 1992. The production reached a peak in 1999 with a production of 24,000 tonnes. According to the world leading consulting firm in the aquaculture and fishing industry, Kontali Analyse, the Norwegian production was 53 times larger than the U.S in 2010 (Reuters, 2012).

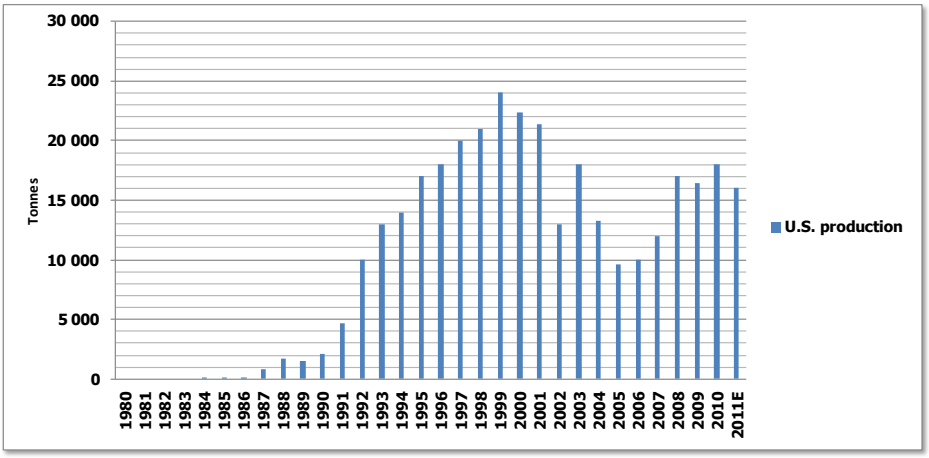


Figure 7. U.S. farmed salmon production in tonnes (Kontali, BANR, DFO, FAO, Scottish Office, Fiskeridirektoratet, SERNAP)

3.3 Export markets for salmon

Salmon is a global product where combined exports from Chile and Norway supply nearly 150 countries (Asche and Bjørndal, 2011). Consumption of salmon around the world differs greatly because of factors such as geographical location, transport and logistics systems, willingness and ability to pay as well as culinary traditions. The main markets for salmon are the EU, Japan and the U.S, but markets such as Brazil, Russia and South-East Asia have been emerging since the 2000s. Even though the salmon price has been declining, most consumers outside the three main markets do not have the ability to pay for salmon. The most important indicators where demand for salmon will increase may thus be GDP growth or income growth.

Atlantic salmon producers have developed a global market by capturing one market at a time (Asche and Bjørndal, 2011). The reasons for targeting one geographical area at a time are economies of scale in transport and logistics. These are also the reasons for why businesses may start by penetrating export markets with frozen salmon. As markets grow and become more profitable, salmon companies invest in the necessary logistics for fresh salmon. For instance, this is what occurred for exports of salmon going to Russia and Eastern Europe.

3.3.1 The U.S.

The U.S. market is dominated by imports of farmed Atlantic salmon from Chile and Canada (Asche and Bjørndal, 2011). U.S. imports of salmon have consisted on average of two thirds of fresh and chilled salmon. However, the frozen salmon share has been increasing over the years, and especially there has been growth within the share of value-added products such as fillets. The largest U.S. import sources vary with respect to each product of salmon, such as fresh and frozen whole fish and fillets.

Up until 1984, Norway was the largest salmon supplier and only supplier of fresh salmon to the U.S. market (WTO, 1994b). From then on, Canada, Chile, Scotland and Norway have been the primary exporting countries of fresh and chilled salmon to the United States and are all members of WTO with a 0% NTR duty on their products. In figure 8 we can see there is an upward trend in total U.S. imports of fresh and chilled salmon, even in the years after implementing the AD duty against Norwegian exporters in 1991. There is a drop in U.S. import of fresh and chilled salmon from Norway in 1991. From the mid 1990s Canadian exports of fresh and chilled salmon have dominated the majority of the U.S. market.

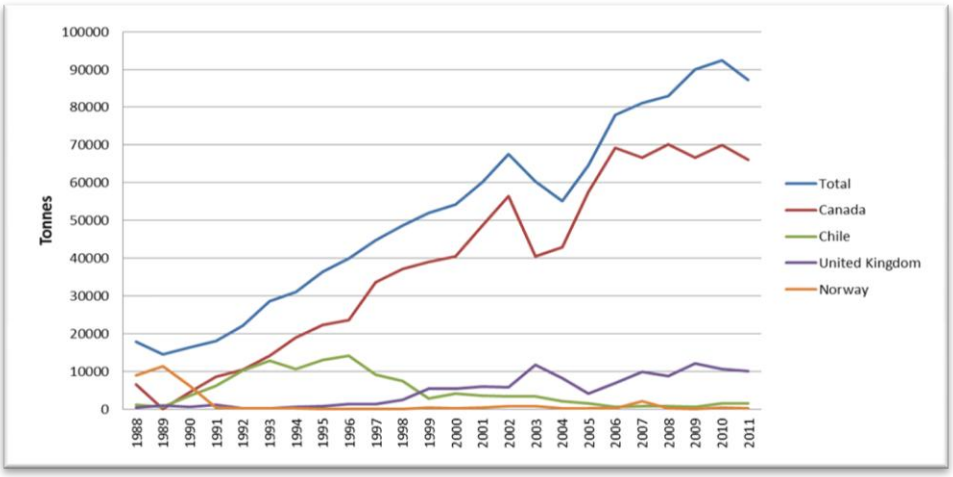


Figure 8. U.S. imports of fresh and chilled Atlantic salmon in tonnes (USDA GATS, 2012)

Figure 9 illustrates the development of U.S. imports of *frozen* Atlantic salmon from the main importing countries Norway, Chile, the Faroe Islands and Canada. Chile and Norway are the dominating countries with average market shares of 20% and 40% respectively from 1989-2010.

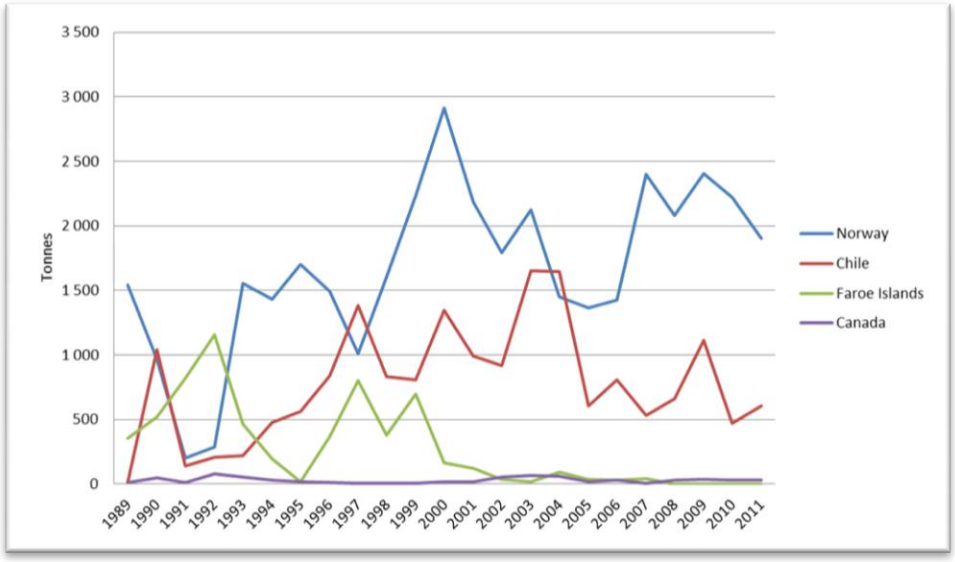


Figure 9. U.S. imports of frozen Atlantic salmon in tonnes (USDA, 2012A)

Figure 10 presents the U.S. import volume of fresh and frozen Atlantic fillets by major import countries. As the graph clearly depicts, Chile has been the main import source until 2008. Chile's dramatic drop due to the ISA virus opened up for Norwegian exporters since Norway was the main U.S. import source of these products in 2010. However, in 2011 Chile regained its position in the U.S. market, as can be seen in the figure 10.

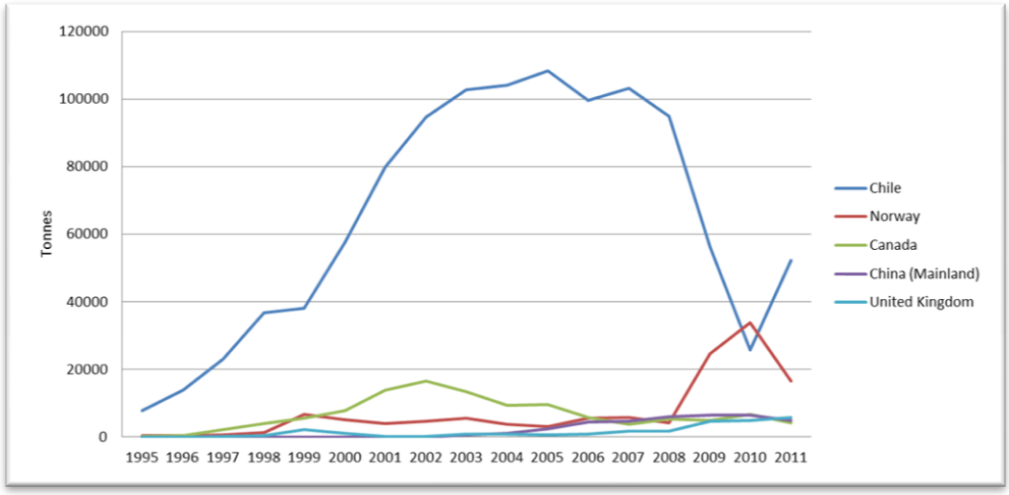


Figure 10. U.S. imports of fresh and frozen Atlantic salmon fillets in tonnes (USDA, 2012A)

3.3.2 Other export markets

Looking at the countries belonging to the EU separately, we will focus on France, Germany, Poland, and the UK. In France, the Scottish and Irish farmed salmon are priced higher and also perceived as

higher quality than the Norwegian salmon (Asche and Bjørndal, 2011). The main supplier of salmon in Germany is Norway, but a great deal of Norwegian exports is traded or processed in third countries such as Denmark or Poland. A large processing industry has evolved in Poland and the country therefore mainly imports whole fresh salmon from Norway. It is also important to note that the UK is one of the largest salmon markets in Europe, with Norway being the main source of import. Also, a large volume of Norway's exports go through Denmark, Sweden and Poland before entering the UK due to high tariffs on Norwegian exports of processed salmon products.

The Japanese salmon market is characterized by seasonal demand where local availability and change in the quality of salmon affects consumption (Asche and Bjørndal, 2011). Before the farmed salmon production was established, salmon was not consumed raw because of parasites in the wild salmon. Today, farmed salmon is often used in high-end markets at restaurants for sushi.

Of the emerging markets, Brazil and Russia are the most interesting. Brazil surpassed the U.S. in 2010, becoming the second largest importer of Chilean salmon in volume (MercoPress, 2010). The Norwegian salmon exports to Brazil are negligible. Russia receives a large amount of Norwegian salmon through the Baltic countries (Asche and Bjørndal, 2011). The largest importer share of salmon in Russia is captured by Norway with 90% in the last few years. The market is particularly experiencing changes in consumption due to new trends in the younger generations and higher income.

4 Trade disputes – AD measures on salmon

4.1 The U.S. AD measures on Norwegian salmon

The U.S. anti-dumping law originated with the Anti-dumping Act of 1921 (Irwin, 2004). Today, this law and WTO's agreements allow the U.S. government to impose duties on imported products that have been proven to be dumping and causing material injury for the domestic industry. The two bodies involved in the anti-dumping investigation are the USITC and the U.S DOC. The USITC investigates the existence of material injury from the alleged imported products, but is not a policymaking body or a court of law (USITC, 2012a; Moore, 2006). The role of the U.S DOC is to conclude whether foreign firms are dumping or not.

Unlike many other countries, the U.S. Tariff Act defines a retrospective assessment system (Federal Register, 2012). Each year during the anniversary months of the publication of an AD order, an interested party may request an *administrative review* of the AD order. For exporters that did not export to the U.S. during the original investigation period, but are currently exporting, there is a

special procedure called *new shipper review*. In addition, these exporters cannot be affiliated in any way with a producer that exported to the United States during the period of the original investigation. In 1994, the Uruguay Round Agreements Act created what is commonly known as *sunset reviews*. This refers to when the U.S. DOC, no later than once every five years, must determine the consequences of a revocation of an AD or CVD order. If the U.S. DOC decides that dumping or subsidies will continue or resume if the duties are removed, the order remains in place.

Table 2 shows the history of the U.S. AD order on Norwegian fresh and chilled Atlantic salmon. An AD petition was filed by the Coalition for Fair Atlantic Salmon Trade (FAST) in February 1990 claiming material injury resulting from imports of fresh and chilled Atlantic salmon from Norway (USITC, 2006). FAST represented the U.S. domestic industry consisting of 21 firms covering the majority of all production of fresh Atlantic salmon in the U.S. (WTO, 1994a). Within the major parties of interest representing Norway was: the Norwegian Seafood Council, the Norwegian Seafood Federation (NSF) and the Aquaculture Division of the Norwegian Seafood Association (ADNSA), to mention some.

A few months after the AD petition, the U.S. DOC published a notice to impose provisional CVD and subsequently AD duties some months later (USITC, 2006). In April 1991, the U.S. DOC issued AD and CVD orders on imports of fresh and chilled Atlantic salmon from Norway. The orders did not specify 'farmed salmon', but covered both farmed and wild salmon (DOC, 1991). Eight different companies were named and received a specific dumping margin between 15.65% - 31.81% and all others received a duty of 23.8%. The U.S. DOC estimated the CVD to be 2.27%. According to data from the Norwegian Seafood Council, fresh and chilled salmon to the U.S. were 15.8% in 1989 of total fresh and chilled salmon exports from Norway. In 1990 and 1991, however, the U.S. share of Norwegian exports of fresh and chilled salmon decreased to 9.5% and 0.6% respectively. In October 1991, the Norwegian government challenged the determinations made by the USITC before the GATT Panels, now WTO Panels. The Panel found that the orders made by the USITC had not been inconsistent with the rules in GATT.

The U.S. DOC has conducted five reviews of the AD order, when excluding sunset reviews, but no review on the CVD (USITC, 2006). The four administrative reviews and their amended results have all determined some change for several companies' dumping margins. It was only the last review, the new shipper review, which concluded that the company in question was not dumping.

When it comes to the five-year reviews, also known as sunset reviews, it was decided in 2000 that the termination of the AD and CVD orders on Norwegian fresh and chilled salmon would lead to continuation or recurrence of dumping and subsidies (USITC, 2000). The review reinstated the eight

dumping margins from the original AD order along with the dumping margin of 23.8% for all other companies and the CVD remained unchanged. In the second and third sunset reviews, the order from the original investigation was determined to continue to be valid (USITC, 2011).

Year	Type of review
1990	Preliminary investigation
1991	Original investigation
1993	1st Administrative review
1994	2nd Administrative review
1995	Amended final results of 1st Administrative review
1996	3rd Administrative review
Jan.1997	New shipper review
Aug.1997	Amended final results of 3rd Administrative review
1999	4th Administrative review
2000	1st Sunset review (5-year review)
2005	2nd Sunset review (5-year review)
2011	3rd Sunset review (5-year review)
2012	Notice

Table 2. The U.S. AD order; investigations, administrative reviews, new shipper reviews and sunset reviews (USITC, DOC)

In November 2011, NSF and ADNSA confronted the U.S. AD and CVD order with a Pre-hearing Brief [7] on behalf of the Norwegian salmon industry (NSF and ADNSA, 2011a). In March 2012, the USITC issued a notice saying the AD and CVD order was revoked (USITC, 2012b).

The USITC has not commented on the matter except for indicating that there are no expectations of a repeat of the material injury. Sveinung Sandvik, head of NSF, stated that the U.S. order has been pure protectionism (Reuters, 2012). The current director of marketing information in the Norwegian Seafood Council, Egil Ove Sundheim, stated that they do not expect a large increase in exports of fresh whole salmon to the U.S. after the repealed AD and CVD orders (Norges Sjømatråd, 2012). However, he also stated that Norwegian exporters will now be able to respond to U.S. consumers who are willing to pay a premium for whole fresh salmon from Norway.

4.2 Other AD measures on salmon

Although the main focus of our thesis is the U.S. AD duties on fresh and chilled Atlantic salmon from Norway, there have been other trade disputes on salmon world-wide.

[7] The Pre-hearing Brief is a document written on behalf of Norwegian exporters as a defense of the dumping accusations and was received by e-mail from the Ministry of Fisheries and Coastal Affairs.

Being two of the main export markets for salmon as well as having a small domestic production, the U.S. and the EU have been involved in several trade conflicts over the years. Thus, the U.S. is not the sole AD user on salmon imports. In addition, Norway is not the only exporting country targeted by temporary or permanent AD duties, see table 3. Nonetheless, Norwegian exporters are the only producers of salmon that have been met with *permanent* AD measures in *both* the U.S. and the EU. In table 3 we have listed trade disputes by the years, the accusing country and the actions regarding AD measures.

Over the last decades the MFN tariff rate in the EU of 2% on salmon has been supplemented by measures of trade protection against Norway in different forms.[8] Scottish salmon producers filed the first anti-dumping complaint against Norwegian salmon as early as in 1989 (Regjeringen, 2006). Throughout the 1990's an arrangement with a Minimum Import Price (MIP) was introduced and abolished in several rounds. 'Lakseavtalen' and provisional AD measures followed, until 2006 when the European Commission (EC) imposed a MIP of EUR 2.80 per kilogram (Ministry of foreign affairs, 2008). Norway claimed that the anti-dumping agreement was violated, and also had this confirmed in WTO's panel report in 2007 concluding 22 inconsistencies of the WTO regulations. The European Council repealed the duties in 2007 (Asche and Bjørndal, 2011).

The EU has also had a short trade dispute with salmon producers in other exporting nations at the same time as Norway. In the beginning of February 2005, two years after 'Lakseavtalen' was removed, the European Communities decided to enforce definitive safeguard measures on imports of farmed salmon from Chile, the Faroe Islands and Norway (Ministry of fisheries and coastal affairs, 2005). The measures were supposed to be valid until August 2008. However, Chile and Norway involved the WTO and stated that the measures were inconsistent with the WTO agreement (WTO, 2005). The safeguard measure against all the above countries was terminated at the end of April 2005.

The EU has had a long-standing trade dispute with Norway, its largest import source of salmon. Similarly, the U.S has had a trade dispute with Chile, one of its largest import sources. Going back to 1998, the U.S. imposed anti-dumping duties between 2-11% on three of the five largest Chilean exporters and approximately 5% on other smaller companies (Knapp et al., 2007). In the sunset review in 2003, these duties were abolished.

[8] The following paragraph is based on a term paper written together with Kristin Lorentzen in the graduate course INB427 'Globalization and Integration' at the Norwegian School of Economics the spring of 2011.

Year	Accusing country	Action
1989	EU	Formal dumping complaint against Norway
1991	EU	Introduction of ADD and later a Minimum Import Price (MIP) on EU imports from Norway
1997	U.S. & EU	Formal dumping complaint on U.S. imports from Chile EU adopts 'Lakseavtalen' with Norway
1998	U.S.	Final AD duties on Chilean exports
2002	EU	AD lawsuits opened against Chile and the Faeroe Islands, formal AD case filed against Norway and Faroe Islands
2003	U.S. & EU	Termination of AD measures on U.S. imports from Chile EU and Norway terminate 'Lakseavtalen'
2004	EU	AD lawsuit against Norway
2005	EU	Temporary AD duties/safeguards against Chile, the Faroe Islands and Norway are imposed – then removed
2006	EU	Permanent AD duties against Norway
2007	EU	All measures against Norway abolished

Table 3. Anti-dumping complaints, temporary and final measures on salmon (Asche and Bjørndal, 2011; DOC; USITC)

5 Methodology and Data

5.1 Previous empirical research

Several studies using U.S. anti-dumping cases have found evidence of trade diversion where the U.S. diverts its imports from a policy-imposed country to *third* countries. In addition, there are findings of trade deflection where the policy-imposed country shifts its exports away from the policy-imposing country to *third* countries. Prusa (1996) examines all AD petitions filed between 1980 and 1988 with data containing more than 50 countries. His findings show that there is substantial trade diversion due to AD duties. Imports from non-named countries grow between 15-40% and the diversion is larger when the duty is higher. For the years 1992 to 2001, Bown and Crowley (2006) analyze AD duties' effect on Japanese exports when it comes to trade diversion, destruction, and deflection. They find that there is trade diversion as the U.S. imports more from Japan and less from countries that are faced with an AD duty. In contrast, they do not find the same results when the policy-imposed country is within the EU. Bown and Crowley also confirm findings of trade destruction when the AD duty is imposed on Japanese exports. Nevertheless, on average, between a quarter and one third of the value of Japanese exports assumed to be destroyed is in fact deflected to the EU. The trade deflection effect resulting from U.S. AD duties on Japanese exports is also confirmed in a study by Bown and Crowley in 2007.

Other U.S. import sources not subject to U.S. AD duties should in theory have a higher price and not be a threat to domestic producers. However, it is argued that the U.S. imports from third countries

are majorly replacing U.S. imports from the policy-imposed country. In this way, demand is still covered by imports and U.S. domestic producers do not expand production. Thus, the effectiveness of U.S. AD duties in general is questioned. Contrastingly, Carter and Gunning-Trant (2010) conclude that AD measures are very effective forms of protection for the U.S. agriculture. They examine agricultural AD cases from 1980 to 2005 and show that trade diversion is relatively unimportant. These findings are also true for research done by Malhotra et al. (2006).

Similarly, research on AD cases in the EU finds that AD duties are effective forms of protection for EU producers. Vandenbussche et al. (1999) use data from all EU AD investigations from 1985 to 1990 concerning 48 countries. The conclusion is little or no trade diversion as an effect of anti-dumping actions in the EU. The AD legislation in the EU deviates from the U.S. in several aspects which Vandenbussche et al. argue is a reason for the differing results. Examples are the use of injury margins and price undertakings in the EU instead of calculating dumping margins .Vandenbussche et al. suggest low trade diversion findings in the EU is due to the fact that EU AD duties are lower than in the U.S. The same results of a low or non-existing trade diversion effect of EU AD duties are found in research by Brenton (2000).

Several studies examining the use of AD duties around the world show conflicting evidence of trade diversion and trade deflection. According to Avsar (2011), Turkey's use of AD duties from 1992 to 2008 leads to trade diversion. Looking at AD data from 1990 to 2000, Malhotra and Rus (2009) reveal that trade diversion is low in Canada. India filed 285 AD cases between 1992 and 2002, and has been the leading AD initiator in the world. A paper by Ganguli (2008) studies 285 AD cases in India in the period 1992-2002 and finds trade diversion. Niels (2003) studies trade diversion and AD policy in Mexico by looking at 70 AD investigations between 1992 and 1997and finds no evidence for trade diversion.

Avsar (2010) uses export data of Brazilian firms in the period 1994 to 2000. He examines trade deflection of Brazilian products resulting from AD duties imposed by various countries, such as the EU and the U.S. The results show that there is trade deflection to countries where the Brazilian company already was exporting the product or another product, but no significant trade deflection to countries not previously exported to. This could possibly be explained by fixed costs of entering a new export market, so-called export sunk costs, compared to continued exports to an established market. Bown and Crowley (2010) find that U.S. and EU trade restrictions on imports from China did not deflect Chinese exports to third countries from 1992 to 2001. They suggest one reason could be

that China was an emerging economy with a relatively recent entry into the global market. Also, they argue that China lacked established networks to deflect a large volume of exports.

In the studies mentioned above, findings on trade diversion and trade deflection are ambiguous. It seems that trade diversion is a topic in need of more research. Trade diversion appears to be dependent on the country imposing the AD duties and the policy-imposed sector. Trade deflection is a recent term established in the 2000s. The few studies performed are conflicting and seem to indicate that the likeliness of trade deflection as an effect of AD duties is dependent on the policy-imposed exporting country and existing export partners. It could be suggested that China was less likely to deflect exports due to a short exporting history with few existing export destinations.

Our analysis will be different from earlier studies given the long time series from 1988 to 2011. To our knowledge, the most recent study is by Carter and Gunning-Trant (2010) who use data from 2005. Their research is also one of the few studies not analyzing aggregate U.S. AD cases, but AD cases specific to the agriculture sector. In our thesis we will analyze a sector that, to our knowledge, has never been examined when it comes to external trade effects of AD duties, namely the salmon industry. In addition, we are examining the effects of an AD duty on one specific product, the fresh and chilled salmon from Norway. Asche (2001) examines the U.S. AD duty on Norwegian fresh and chilled salmon. In the study, he uses trade data on prices in order to see whether there were price effects in the U.S. market. He finds that the U.S. domestic price is not affected. Our thesis will have a different focus and uses data on trade volumes instead.

There has been little research on the AD effect on related products which are not subject to the AD duty. In this thesis we will examine effects of the AD duty on product forms which are similar to the policy-imposed product. Doing this, we will investigate what we have defined as ‘product trade diversion’.

5.2 The empirical investigation

The gravity model of trade could possibly be useful when examining the trade diversion effect resulting from U.S. AD duties. The model is usually applied to determine trends in global trade Bergstrand, 1985; Economywatch, 2010). To our knowledge, the gravity model has only been used to examine trade diversion effects due to FTAs. In addition, the model has mainly been applied on aggregate trade, and not on specific products. This means that the gravity model may not be the best model to examine our research question and we therefore choose to consider other models.

Next, we consider a difference-in-difference regression model. This approach examines *one* change in a policy, whereas there have been several changes in the U.S. AD duty on Norwegian fresh and chilled salmon that we would like to take into account. Thus, to apply this model may be difficult, given that there are several changes in the AD policy in the time period we will examine.

We choose to apply a regression model when examining our research question. We want to explore whether there is evidence that the U.S' use of AD measures has impacted the country's own imports of fresh and chilled salmon from *third countries* and imports of *third* salmon products from Norway. The former is known as trade diversion, and the latter we identified as product trade diversion. We will also investigate whether the U.S. AD duty on Norwegian fresh and chilled salmon has influenced Norwegian export of fresh salmon to *third* markets, namely trade deflection. Combining previous empirical research in addition to our literature review, we predict that the U.S. AD duty on Norwegian fresh and chilled salmon will affect:

(i) the U.S. fresh and chilled salmon imports from country *i* (trade diversion)
(ii) the U.S. imports of salmon product *j* from Norway (product trade diversion)
(iii) Norwegian fresh salmon exports to country *k* (trade deflection)

where country *i* denotes import sources except for Norway, product *j* denotes products except for fresh and chilled salmon from Norway, and country *k* denotes export destinations except for the U.S.

Our prediction is that the signs of the coefficients on (i)-(iii) are positive. We also expect trade destruction on U.S. imports of fresh and chilled salmon from Norway. Therefore, the effect of the U.S. AD duty is the opposite of the assumed effect for (i)-(iii) when it comes to Norway, the product fresh and chilled salmon, and the U.S. respectively. In addition, the partial equilibrium model predicts that the export price on Norwegian salmon will drop because of the U.S. AD duty. However, game theory and the characteristics of the reviews of AD duties suggest that Norwegian exporters raise their export price in order to lower the dumping margin. Asche (2001) finds that the U.S. domestic fresh salmon price was not affected by the AD duty, but the Norwegian export price is not examined. Thus, we do not have a clear prediction of the effect the U.S. AD duty has on Norway's export price of fresh and chilled salmon to the U.S.

A simple regression equation includes our main explanatory variable of interest, the U.S. AD duty, and the outcome variable which is a trade flow. There are many other factors that may explain trade flows between countries besides the U.S. AD duty on Norwegian fresh and chilled Atlantic salmon. Least squares will be biased when omitting essential variables that are determinants of the dependent variable (Adkins and Hill, 2011). Nonetheless, useful results may be retrieved even if a

relevant variable is omitted. A required condition for this is that the omitted variable cannot be correlated with the included independent variables. There will not be a consequence for the validity of tests and confidence intervals if omitting a relevant variable that is uncorrelated with the included variables. Unfortunately, the unavailability of data limits the number of variables we are able to include. However, we will introduce alternative approaches that may capture the effect of some of the variables we do not have data access to.

The counterfactual problem and causality

We raise the question whether the U.S. AD order on Norwegian fresh and chilled salmon affected trade flows, or whether there is no causality. The assumed causality may in fact be a counterfactual problem.

In the Pre-hearing Brief from 2011, it is shown that the U.S. market is not as profitable as other export markets for Norwegian exporters (NSF and ADNSA, 2011a). Asche claims that without the U.S. AD duty in 1991, Norway would still have withdrawn from the U.S. market (Asche, 2012). He also characterizes the U.S. domestic salmon farming industry as uncompetitive, mainly as a result of U.S. regulations. Permits must be issued for a producer to make changes in the salmon farming plants. This makes the process of upgrading and implementing modern technology long and difficult.

According to Asche, it seems that regardless of the AD duty, U.S. imports from Norway would have decreased and the U.S. would have needed to import salmon from other sources due to its low domestic capacity (Asche, 2012). Therefore, it can be questioned whether there is causality between the average AD duty on Norwegian salmon and the assumed trade diversion effect in the U.S. In contrast to Asche's statements, U.S. import data from USDA show that fresh and chilled salmon imports measured in tonnes from Norway peaked in 1989, the year prior to the initiation of the AD investigation (USDA GATS, 2012). This holds for the Norwegian export statistics as well, however, the U.S export share of total Norwegian exports decreased from 1988 to 1989. Since we only have Norwegian trade statistics from 1988, we cannot draw any conclusions about a downward trend in Norwegian exports to the U.S.

The same could be argued for the assumed causality between the U.S. AD duty and trade deflection. Again, from the Pre-hearing Brief and our literature review, evidence shows that the EU market was in the early 1990s growing to become an important salmon market (NSF and ADNSA, 2011a). Asche stresses that air transportation is needed for Norwegian fresh and chilled salmon to reach the U.S. market (Asche, 2012). While in the EU, fresh and chilled salmon is transported by trucks from Norway to European destinations. The Pre-hearing Brief refers to the EU market as more profitable than other

markets. Thus, it may be speculated that salmon exports from Norway would have deflected to the EU, regardless of the imposition of the AD duty, as the EU's demand for salmon increased.

Another econometric issue is the potential endogeneity of the AD duty. This is perhaps one of the greatest econometric concerns when estimating external trade effects of the AD duty. Our solution to the causality and endogeneity problems is to include several relevant control variables and dummies, as well as applying a fixed effects (FE) model. Examining the relationship between the AD duty and the trade flows in this way may bring us closer to causality. We will also try to examine different time periods. The period after the first year of implementation will be especially interesting to examine as there are some re-evaluations and changes in the U.S. AD duty. This might give us an indication of whether there are any external trade effects in the years after the AD duty is already introduced.

Trade diversion specification

We are interested in exploring the relationship between the predictor variable (AD duty) and the outcome variable (U.S. import volumes) *within* an entity, in this case within a country (Torres-Reyna, 2008). Each country has its own *unobservable* individual characteristics that may or may not influence the variables. For the specification of trade diversion, we can think of it as the country's unobserved ability. In a panel data regression model the disturbances are

$$u_{it} = \mu_i + v_{it}$$

where μ_i represents the unobservable individual-specific effect and the remainder disturbance v_{it} varies with individuals and time (Baltagi, 2009). The FE model lets us control for these individual effects by removing the time-invariant characteristics. In this way, we can assess the predictors' net effect on the dependent variable over time, namely the average AD duty and the U.S. imports respectively.

One important assumption of the FE model is that each country's error term and constant should not be correlated. If the opposite is true, the FE model is not suitable. We may introduce N new indicator variables in the regression model if the number of entities (N), here countries, is not too large (Adkins and Hill, 2011). This model is called the least squares dummy variables (LSDV). FE models often have many cross-sectional units of observations which in turn require many dummy variables and hence remove degrees of freedom (Yaffee, 2003). Another issue is that a model with many of these variables may be exposed to the problem of multicollinearity. This will increase the standard errors and the statistical power for testing parameters will be weak.

Specific to our thesis we will be estimating the variance of the following model:

$$Y_{ct} = \beta_{1c} + \beta_2 \, AD_{2Nt} + \boldsymbol{\beta X} + u_{ct} \qquad (1)$$

Where

- Y_{ct} is the U.S. imports from each country at time *t*
- β_{1c} is the coefficient for the constant term which is country specific
- β_2 is the coefficient for the AD variable
- AD_{2Nt} represents the AD variable on Norwegian fresh and chilled Atlantic salmon
- $\boldsymbol{\beta}$ is the coefficient for a vector representing independent variables
- $\boldsymbol{X}$ represents a vector of independent variables
- u_{ct} is the error term which varies with countries and time

The vector $\boldsymbol{X}$ contains several relevant control variables that will be discussed further below. The vector may contain different types of variables specific to the U.S. or the U.S. import source countries. To give an example, one type of variable will try to control for the U.S. demand for salmon, while others attempt capturing the import sources' production capacity.

The U.S. imported volume in tonnes of fresh and chilled salmon will vary in accordance with demand. It is a known problem that it is difficult to estimate demand and willingness to pay. In empirical research, the Gross Domestic Product (GDP) is a common proxy for the general increase in demand within a country. Thus, we include GDP level as a variable trying to capture country-specific changes in demand. Also, exchange rates are regarded to affect demand for imports if the price does not adjust immediately. For trade diversion, the importing and salmon-demanding country is the U.S. As the exchange rate increases, meaning here that the U.S. can buy more from the exporters for each dollar, U.S. imports may increase. Ignoring this variable might lead to a biased effect of the average U.S. AD duty if the U.S. imports of fresh and chilled salmon are particularly affected by a weak or strong USD.

In addition, it would be ideal to include variables measuring the exporting capacity of the U.S. import sources. The exported volume will vary with regards to cost and productivity factors and some countries will have a lower ability to export fresh salmon to the U.S. than others. Since we do not have data on this matter, it may create an imprecise estimate of the trade diversion effect of the AD duty. It is difficult, if not impossible, to obtain public information regarding cost structure and technology for each exporting country. When requiring these types of control variables in the analysis, we introduce an alternative method to control for this.

Asche underlines that transportation costs are of great importance when it comes to exporting fresh salmon (Asche, 2012). Statistics from the Norwegian Institute of International Affairs confirm that transportation costs vary greatly between countries and also between salmon products (see table 2 appendix 1). Over the years, shipping costs and other costs of transportation have been reduced. It is therefore ideal to include a variable for this since U.S. imports have most likely been affected by changes in transportation costs. If this is ignored it may lead to an imprecise estimation of the AD duty's effect. To gather information about the costs and usage of transportation for each U.S. import source over the years is time-consuming and perhaps not obtainable. In addition, the major difference in transportation costs may not lie between years, but between the panels of the data sets. Hence, the real difference is between countries, as can be seen in the appendix 1 table 2. We will be using country fixed effects as a proxy to control for transportation cost differences between panels. We also argue that country fixed effects may capture salmon specific factors that vary between countries as an alternative to the unavailable data on e.g the differences in use of vaccinations or medication on salmon between countries.

Moreover, year specific shocks affecting U.S. imports from all countries within the panel may be controlled for by using time fixed effects. When it comes to specific events affecting only U.S. imports from certain countries, we choose to create dummy variables. The dummy variables are included because ignoring them might result in the trade diversion estimates of the AD variable being imprecise. In the model for trade diversion it is necessary to include a dummy for the ISA virus outburst in Chile in 2007 and 2008. Due to the salmon production cycle of about two years, the full effect of the ISA virus on production appears in 2009-2010 and we therefore include these additional years. In these years, it can be seen in figure 3 from chapter 3.2 that Chile's production of farmed salmon is severely reduced. We also include another dummy for the U.S. AD duties on Chilean exports of fresh salmon. The U.S. import statistics from USDA show that the imported volumes from Chile in the years of trade restrictions are less than half of the volumes in the years prior to the AD duties. We also choose to take into account FTAs between the U.S. and its import source countries and include it in a dummy. Finally, a dummy variable is added for the crisis in the Norwegian fish farming industry in 1990-1992. This is relevant because there was a large decrease in fresh salmon supply from Norway as a freezing program was initiated.

Product trade diversion specification

In the analysis for product trade diversion there is one importing and one exporting country, the U.S. and Norway respectively. In this model, the panel consists of different products that are imported from Norway and the μ_i represent the *unobservable product*-specific effects. Product fixed effects

will remove the unobservable time-invariant product characteristics and time fixed effects will be included to control for time-varying factors that hold for the entire panel. The equation for product trade diversion is almost identical to (1), except for changes in the subscript where p is the various salmon products the U.S. imports from Norway. Y_{pt} is the U.S. imports of each product from Norway at time t.

$$Y_{pt} = \beta_{1p} + \beta_2 AD_{2Nt} + \boldsymbol{\beta X} + u_{pt} \qquad (2)$$

In this case, the vector $\boldsymbol{X}$ consists of several types of explanatory variables specific to the U.S. and Norway. As in the previous case of trade diversion, it is necessary to include GDP level in the U.S. and exchange rates between the trading countries, here the U.S. and Norway. We also include the dummy variable for the crisis in the Norwegian fish farming industry. There is a lack of salmon specific data that could be ideal to include for each product, e.g. quality differences between products. Product fixed effects will be a proxy to try capturing differences in salmon specific conditions such as the transportation costs differences displayed in table 2 in appendix 1. In addition, it can be speculated that Norway's ability to export salmon products varies over time for different products. For example, there might be more R&D invested in the development of equipment only related to certain products. Again, this data is unavailable for this thesis and in the analysis we will introduce an alternative method to proxy for trends in Norway's ability to export different salmon products.

Trade deflection specification

As with the specification of trade diversion, we will apply a regression model with country and time fixed effects when analyzing trade deflection. The FE model will capture *unobservable* differences between the importing countries. Using country fixed effects will also be a proxy to control for differences in the panel in salmon specific conditions due to lack of data. Ideally, we would for example want to control for which cultures and countries prefer meat over fish due to culinary traditions. We will be estimating the variance of the model similar to (1), where subscript c is the various countries that Norway exports to and Z_{ct} represents the Norwegian exports to each country in year t.

$$Z_{ct} = \beta_{1c} + \beta_2 AD_{2Nt} + \boldsymbol{\beta X} + u_{ct} \qquad (3)$$

This model also includes vector $\boldsymbol{X}$ which contains independent variables related to Norway, the importing countries or Norway's competitor Chile. Demand conditions in the importing country will

once again be proxied by GDP level. The importing countries are varied and therefore we must control for GDP in each individual importing nation. Similarly, exchange rates between Norway and each importing country are relevant to include. In addition, we include several dummy variables to control for specific incidents that could have affected export flows from Norway negatively. If we ignore the following dummy variables, it is possible that our trade deflection estimate of the AD variable is biased downwards. We include a dummy for Chile's trade agreements as Chilean exports may have increased to member countries of trade agreements. Given that Chile creates a trade agreement with a country where Norway does not export, it may be regarded as a first-mover advantage for Chile. In markets where Norway already exports, Chile's FTAs may possibly reduce Norwegian exports in favor of Chilean exports.

Norway's trade agreements are disregarded as they are not likely to have a large effect on the time period we are investigating. The EEC agreement covers countries receiving a majority of Norwegian exported volumes of salmon, but permits AD duties on fish products. The Norwegian FTA with South-Korea is irrelevant due to effective import duties on Norwegian salmon until 2010 (WITS, 2012).

The different forms of protectionist measures imposed by the EU on Norwegian salmon in our period of examination are included in a dummy variable for member countries of the EU. Similarly, other import restricting factors such as NTBs on salmon from Norway imposed by various countries are included in a dummy variable. In addition, we assume Norway would have deflected less or no exports to countries imposing high tariffs. We therefore add countries imposing tariffs over 10% in a dummy variable.

5.2.1 Variable construction and data

Trade variables

The trade statistics are collected from the Foreign Agriculture Service's Global Agricultural Trade System of the USDA and by a request to the Norwegian Seafood Council (USDA GATS, 2012). The Norwegian Seafood Council forwarded trade statistics on Norwegian exports of the product fresh Atlantic salmon in the time period 1988-2011 measured in tonnes, NOK per kilogram and total value.[9] In the Norwegian trade statistics 157 countries are represented. The U.S trade statistics are compiled and distributed by the U.S. DOC, Foreign Trade Statistics and the U.S. Census Bureau (USDA GATS, 2012). The statistics from the USDA are U.S import of salmon measured in tonnes divided into

[9] Chilled salmon has an insignificant share of Norwegian exports of fresh and chilled salmon, e.g. 0.42% in 2011. Due to the marginal difference we continue compiling the data set for trade deflection with the data available from the Norwegian Seafood Council, only covering exports of fresh salmon.

countries and product types in 10-digit Harmonized System (HS) codes and 7-digit Tariff Schedule of the USA (TSUSA) codes from 1986 to 2011. A total of 95 countries are represented.

In the data set for trade diversion and product trade diversion we use the U.S. trade statistics from USDA to construct the dependent variables U.S. imported volume of fresh and chilled Atlantic salmon in tonnes from any country at time *t* and U.S. imported volume in tonnes of any salmon product at time *t* from Norway respectively. Using the Norwegian trade statistics we create the dependent variable for trade deflection, namely Norwegian fresh Atlantic salmon export volume in tonnes to any country at time *t.* We measure trade diversion, product trade diversion and trade deflection as an increase in the demanded quantity due to the average AD duty on Norwegian fresh and chilled salmon. The AD duty increases the total amount paid for the Norwegian fresh and chilled salmon in the U.S. which again affects the demanded quantity (tonnes).

Using tonnes compared to the *value* of the imports/exports enables us to focus on the change in tonnes demanded without being concerned about price changes. To give an example, the value of Norwegian exports might be less than in the previous year, even though we have had an increase in quantity sold. If we use the value of Norwegian exports as the dependent variable, we might get a negative relationship between an increase in the average AD duty and exported value. This could occur even though the total demanded quantity has increased, due to a lower price per kilogram. It is also time-consuming to adjust for inflation and we might have needed to convert to a common exchange rate, which we do not need when using volumes instead of value.

A drawback with using two different data sources is that the data collection varies. Comparing the reported U.S. imports from Norway to the reported Norwegian exports to the U.S., we find that the data does not entirely correspond. This is not unexpected, as the data from USDA reports fresh and chilled salmon, whereas the Norwegian Seafood Council only includes fresh salmon in the statistics. However, the Norwegian export statistics report in general higher volumes.

A drawback with the data from the Norwegian Seafood Council and USDA is that it represents aggregate export flows. This is a problem since not all companies are subject to the AD duty.[10] Also, there are differences between companies in the calculated dumping margin. The effect of the AD duty for each company may therefore vary. The U.S. might import less from policy-imposed companies and more from *third* companies in Norway. Thus, there is possibly a *company* trade

[10]A few companies were able to prove in the U.S. court that they did not dump and was exempted from the AD order (Asche and Bjørndal, 2011). Fjord and Stolt are two companies not subject to the AD order (Intrafish, 2003).

diversion effect due to the AD duty. This effect will be lost because of the lack of data on a company-level. However, it would be interesting to examine this if data is available.

U.S. anti-dumping variable

The data on the U.S. AD duty is gathered from the U.S Government Printing Office's Federal Digital System (FDsys) (US govmt., 1994). We use this data to create the main predictor variable, average AD duty in year *t.* We first find the dumping margin for each Norwegian company in each year and furthermore assess the appropriate way to calculate the average AD duty.

One of the drawbacks with the Federal Register's publications is that there are inconsistencies with regards to the number and names of exporters included in a review. The U.S. DOC stated that the total number of exporters involved in the original investigation was more than 70 and that they chose to name the eight largest exporters (WTO, 1994b). The exporters that were named accounted for more than 60% of the total Norwegian exports to the U.S. at the time. It is highly likely that some companies listed in the original investigation have merged, had a name change or a compulsory liquidation.[11]Another drawback which makes it difficult to calculate the average AD duty, is that the FDsys only contains documents starting from 1994. Thus, we have made several assumptions and decisions regarding the data to calculate an average AD duty per year. See appendix 2 for a detailed explanation.

The most correct way to calculate an average anti-dumping duty is to create a weighted-average of the Norwegian companies' dumping margin and their sales from exports. Since we can only access the financial reports of one or two companies, we were forced to calculate it differently. We take the sum of all the companies' dumping margin and divide it by the number of companies and add the countervailing duty. The Norwegian government among others refers to a duty of 26.07% in 1991 (Ashe, 1997; Lerøy, 2010; Ministry of fisheries and coastal affairs, 2005). When we use our simple calculation on the data from the original investigation in 1991, we also get a percentage of 26.07%. Asche confirmed that this way of calculating is common due to the lack of data (Asche, 2012). It is interesting to know if the largest exporters have dumping margins close to our average calculation. When calculating the average AD duty from the eight largest exporters from the original investigation in 1991, we get an average AD duty of 26.06%. This is 0.01% less than the above-mentioned

[11] The U.S. journals have stated the company name change for Skaarfish AS. We do not know whether this is the only time a company has been renamed or if it is the only time USITC has informed about the name change. Intrafish states that the Norwegian companies Fjord and Stolt were not subject to the AD duty (Intrafish, 2003). We choose to ignore this information as the mentioned names are not identical to any exporter referred to by the USITC.

calculation where we have almost 90 exporters. Hence, it is reasonable to believe that our calculation is fairly correct.

In the 20 years of trade restriction in the U.S., our calculation shows that the average AD duty has changed seven times and has varied from 5.7% to 30.538%, see appendix 2 table 1. We have chosen to include six of these changes and an overview is displayed in table 4. Bown and Crowley (2007) state that targeted exporters in AD cases start adjusting already to the provisional AD duties imposed right after the investigation is announced. Therefore, we choose to include the provisional AD duty in 1990. From this year forward the countervailing duty is added to the AD duty. Even though we do not focus on the effects of a countervailing duty, it is merely a percentage added on top of the antidumping duty, restricting imports even more. We will also disregard the change in December 1996, since there is a new change one month later. We decided that including only 1989 as the year where the AD duty was 0% would possibly create imprecise estimates as this was the year Norwegian export volumes to the U.S. peaked. Since the Norwegian export data is from 1988 and the U.S. import data is from 1986, we choose to use 1988 as a common starting point.

Due to no access to data on a monthly basis, we decided to report the average AD duty as if it was effective in January the same year.[12] There may be a bias when doing this, but it would also be incorrect to calculate an average monthly export volume as there are variations throughout the year (Asche, 2012). Moreover, the AD duty was officially changed five out of six times within the first four months of the year. This is another reason why we choose to include the AD duty in the beginning of the year.

Year	AD duty	Year	AD duty
1988	0.00 %	2000	26.07 %
1989	0.00 %	2001	26.07 %
1990	5.70 %	2002	26.07 %
1991	26.07 %	2003	26.07 %
1992	26.07 %	2004	26.07 %
1993	25.92 %	2005	26.07 %
1994	30.54 %	2006	26.07 %
1995	30.54 %	2007	26.07 %
1996	30.54 %	2008	26.07 %
1997	30.47 %	2009	26.07 %
1998	30.47 %	2010	26.07 %
1999	30.56 %	2011	26.07 %

Table 4. Average anti-dumping duty calculated per year (for more details see appendix 2)

[12]Data on monthly basis was unobtainable from the Norwegian Seafood Council due to the large number of countries.

Macroeconomic variables

The data on GDP levels was collected from the International Monetary Fund (IMF) and is in constant prices in national currencies (IMF, 2011). For some countries, there are some years where no data is available, such as the countries that were a part of the Soviet Union.[13] In addition, GDP levels for some countries do not exist in the IMF database.[14] The missing levels are not gathered from other sources because they are not considered to be important for the analysis as they only contribute to marginal, close to non-existing, shares of Norwegian exports/U.S. imports.

When it comes to the exchange rate variable for the data set for trade diversion, it is the currency of the importing nation, the U.S., against all the exporters' currencies. We only need the exchange rate between Norway and the U.S. for the data set created for product trade diversion. In the analysis of trade deflection, the only exporter is Norway and we have several importing nations. Thus, we need exchange rates for Norway against all the importing countries. The real bilateral currency exchange rates USD to the exporters' currency were gathered from USDA Economic Research Service (USDA, 2012b). By using the same data, we constructed real bilateral NOK to the importers' currency exchange rates. There were some countries where the currency was not obtainable or we had to make some assumptions.[15] For countries where both exchange rates and GDP levels are unobtainable and where import/export levels are marginal, we choose to exclude these from the data sets.[16]

Other variables

We discussed whether to include a lagged dependent variable in the regression models. The salmon production cycle of 2 to 3 years might create a postponement of some independent variables' effect on the U.S. imported tonnes or Norwegian exported tonnes. However, when analyzing product trade diversion, some products have the possibility to be stored over a longer period, such as products of frozen salmon. With increased demand of these products, the lagged effect of the production cycle

[13] Lithuania, Belarus, Ukraine, Latvia, Estonia, Czech Republic, Slovakia, Slovenia, Georgia, Serbia, Kazakhstan, Kyrgyzstan, Uzbekistan, Trinidad & Tobago, Namibia, Azerbaijan, Liberia, Libya, Zimbabwe, Malta, Bosnia-Herzegovina, Dominica, Costa Rica and Russia.

[14] Guam, the Virgin Islands, Reunion, St. Helena, Macao, Monaco, East-Germany (DDR), the Faroe Islands, Liechtenstein, Soviet Union, the Antilles, Zimbabwe and Puerto Rico.

[15] There are a few missing values for Somalia and two of the Former Yugoslav countries, namely Serbia and Bosnia-Herzegovina. The Faroese króna is a version of the Danish Kroner. Therefore, to not exclude one of the moderately large producers of salmon, we use the Danish kroner as an approximation to the Faroe Islands. The Cook Islands have a currency pegged at par to the New Zealand currency. For our research question the importance is whether the currency depreciates or appreciates, therefore we use the New Zealand currency. The Cayman Island's dollar has been pegged to the USD.

[16] East Timor, Yugoslavia, the Netherlands Antilles and Qatar.

may not be so important given that the products are already produced. For the trade deflection analysis, shifting exports to the EU that would otherwise have been exported to the U.S., do not require increased production. In conclusion, due to time constraints and the fact that we only may need a lagged dependent variable with regards to some cross-sectional units, we have decided not to include this. Nevertheless, with more time and research, including a lagged dependent variable would most likely be more correct due to the salmon production cycle. Hence, including a lagged dependent variable could be interesting for future research.

Trade diversion

In order to control for the effect of the ISA virus on farmed salmon in Chile, we generated a disease dummy from 2007 to 2010. Similarly, another dummy for Chile is created for the years when the U.S. imposed AD duties on Chilean fresh salmon exports. The AD duties were implemented in 1998, and the order was effectively revoked in 2003. A dummy variable for Norway is created for the crisis in the Norwegian fish farming industry in 1990-1992. Finally, a dummy variable for FTAs between the U.S. and its import source countries was also generated.[17]

Trade deflection

We created a dummy to control for Chile's trade agreements with several salmon importing nations.[18] Moreover, Norwegian exports of fresh salmon to the EU have been exposed to a MIP in the period 1991-1996, as well as 'Lakseavtalen' in 1997-2003, and AD duties 2005-2007.[19] Thus, we create a dummy for countries within the EU for these years. Another dummy variable is generated to control for non-tariff barriers (NTBs) in different countries that may have restricted Norwegian exports of fresh salmon.[20]

Moreover, we created a dummy variable for high tariffs imposed on Norwegian exports of salmon. The source of our tariff data is the TRAINS data base of the World Bank (WITS, 2012). We gathered information about tariffs from 10% on HS 03212[21] exported from Norway in the period 1988 to 2012. The TRAINS data base reports when and if countries' tariffs change or become zero. Therefore, we assume that the last reported tariff for each country is the one that holds today. For those countries

[17] In the dummy variable for FTA, the countries with value of 1 are Chile (from 2004), Canada (from 1989), as well as Mexico (from 1994) under NAFTA.

[18] Chile's relevant agreements include the following countries and years: South-Korea (2001-), USA (2004-), EU (2005-), China (2005-), India (2007-), Japan (2007-) and Vietnam (2011-).

[19] Therefore, EU member countries receive the value '1' for the years 1991-1996, 1997-2003, and 2005-2007 while all other years and countries get the value '0'.

[20] The dummy variable has the value '1' for China in 2011, Russia and Kazakhstan from 2006, and member countries of the EU from 1997 to 1998.

[21] Fresh and chilled- Pacific, Atlantic and Danube salmon.

with a high tariff in the years before becoming a member of EU, we assume EU's MFN tariff of 2% is adopted after the membership.

5.3 Data preparation

One issue with the Norwegian trade statistics is that it does not distinguish between zero and missing. Therefore, we do not know the difference between when the data is missing and when the export to a specific country is zero. There are several observations where Norwegian exports are almost certainly zero e.g. in 1997 the reported Norwegian salmon exports to Romania were 2 tonnes whereas in 1998 the exports are reported as missing. We decided to include all the observations by transforming missing values to zero even though this might create a bias for some countries.

In contrast to the Norwegian trade statistics, there are no missing values as observations are reported as zero in the U.S. trade statistics. It is difficult or maybe impossible to know whether a product did not exist or if there were no imports in certain years. We choose to include all observations as we did previously in the trade deflection data set.

In 2009, the scope of the AD order was changed to include whole salmon steaks as well (USITC, 2010). However, the U.S. import statistics show no import of the product with the HS description 'salmon steaks' after 1989. This product is most likely reported within another HS code. Thus, we choose to ignore the change in the scope of the order.

There were some challenges with regards to different HS codes on the product fresh and chilled salmon from Norway. Prior to 1989, U.S. imports are reported in TSUSA codes. From 1990 and onwards, U.S imports are reported in HS codes where fresh and chilled Atlantic salmon is within three different codes.[22] For 1988, we use the observations reported in the TSUSA code description 'Salmon fresh or chilled'.[23] The TSUSA codes are not separated into different types of salmon, meaning that it contains both Pacific and Atlantic salmon. The statistics for 1988 may therefore be biased for countries exporting a small amount of Atlantic salmon and more of Pacific salmon. Moreover, it seems as if 1989 was a transition year, because there are no tonnes reported for the three HS codes used in 1990 and onwards. Since the U.S. imports from Norway are about 11,000 tonnes in another HS code, we believe this is the transitional HS code for Atlantic salmon and use this for all countries in 1989. [24]

[22] HS 030212002, HS 030212003, and HS 030212004

[23] 1102045: 'Salmon, fresh or chilled, whole or behead etc, not scaled'

[24] HS 032120065:'Salmon fresh or chilled nesoi' where nesoi means 'not either specified or included'.

For the analysis of product trade diversion, we included all the reported salmon products from the USDA's statistics on imports from Norway. Since no products are reported as missing, there may be some incorrectness in the data set. More than half of the 46 products have only two observations that are not zero throughout the whole time period. We also presume that there are several of these products that are in fact the same product, only with different HS classifications. With the risk of tampering too much with the data, we do not want to compile HS codes and create new product categories. To find any significant results in the analysis, we will most likely need to exclude outliers in this data set.

We have created all three data sets by compiling data material from the World Bank, IMF, the Norwegian Seafood Council, and USDA among other sources. We take into account that there may be some typing errors within our data sets due to editing within large spreadsheets.

6 Analysis and results

In this chapter we test equations (1)-(3) from chapter 5.2 on a panel of U.S. imports of fresh and chilled salmon from 1988-2011, U.S. imports of salmon products from Norway from 1988-2011, and Norwegian fresh salmon exports from 1988-2011. The analysis is conducted by using the statistical program Stata version 9.0.

When estimating regression equations for (1)-(3) we find presence of autocorrelation and heteroskedasticity. Heteroskedasticity means that the regression disturbances do not have the same variance across time and entities (Baltagi, 2009). The variances, standard errors, confidence intervals and t-statistics are directly affected by heteroskedasticity. Autocorrelation may cause imprecise estimates of coefficients in the regression and also bias standard errors (Adkins and Hill, 2011). Autocorrelation occurs when the errors of the regression model are correlated with one another. We therefore use a first-order autoregressive (AR (1)) autocorrelation structure and robust standard errors to correct for heteroskedasticity in the regressions. Thus, we perform regressions using the command 'xtgls' in Stata when testing equations (1)-(3).[25] When using a GLS regression, the R-squared statistics is less useful and is not reported since it does not represent the percentage of total variation in the dependent variable (StataCorp, 2003). Also, the estimated R-squared does not need to be affected by the various independent variables that are included or excluded.[26]

6.1 Trade diversion

In this thesis, trade diversion has been identified as an AD duty causing the policy-imposing country to increase imports from *third* countries. In addition, trade destruction is the AD duty's negative effect on the policy-imposed country. Applying this, we expect to find evidence for a reduction in U.S. imports of fresh and chilled salmon from Norway and similarly an increase in imports from country *i* due to the average AD duty.

Figure 11 displays the average AD duty and the U.S. imports of fresh and chilled salmon from Norway in tonnes. The average AD duty experiences little variation with no rates between 10-20%. In most years, the rate is between 25 % and 30%, with an upper limit of 30.6% in 1999. We can also see that

[25]When using the command 'xtreg' in Stata, 'AD' is omitted from the model due to collinearity. We found that 'AD' is most likely collinear with some of the time dummies.

[26] The findings of our preferred regression for trade diversion, product trade diversion and trade deflection using 'reg' in Stata is found in appendix 1, table 3. Our preferred regressions are listed in column 4 table 7, column 4 table 10, and column 3 table 13.The 'reg' command reports R-squared and Adjusted R-squared, but does not control for autocorrelation. The adjusted R-squared for each preferred equation ranges from 0.48-0.98, meaning the variables included explain a relatively large amount of the variation in the dependent variable.

the majority of the U.S. imported volumes in tonnes per year from Norway is below 1,000 tonnes, with outlier years reaching almost 12,000 tonnes in the year prior to the preliminary duty. What is more, the average AD duty is about 30% in the period of 1994-1999, and the U.S. import from Norway is at its lowest point from 1995 to 1998. When the average AD duty later levels out in 2000 to the same rate as in 1991, there is a small increase in U.S. imports from Norway in the following years. In 2001, the U.S. imported tonnes from Norway are about the same level as in 1991.

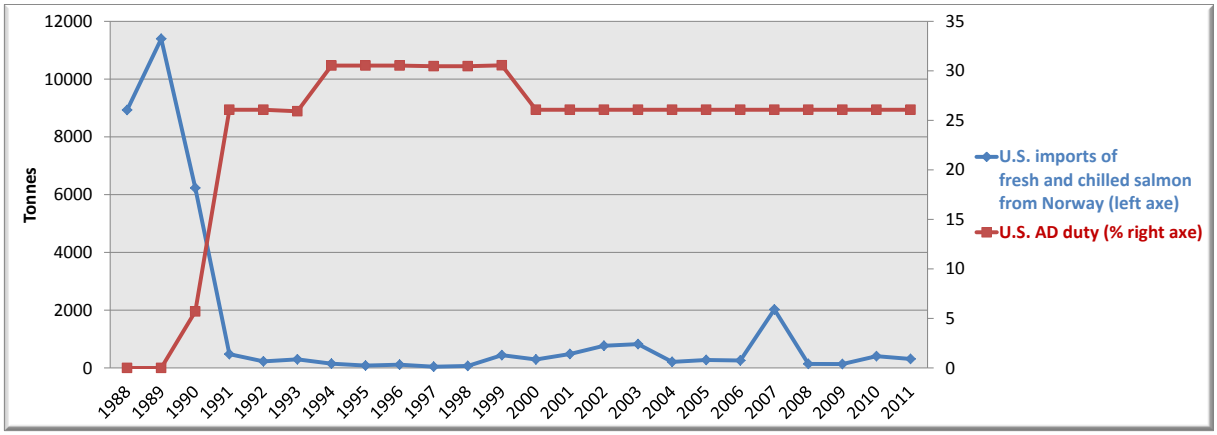


Figure 11. AD duty on fresh and chilled salmon from Norway and U.S. imports of Norwegian fresh and chilled salmon

Figure 12 depicts the U.S. fresh and chilled salmon imports from countries except Norway, country *i,* and the U.S AD duty on Norwegian salmon. The U.S. imports from country *i* more than doubled in 1990 and almost doubled from 1990 to 1991. The only years in which U.S. imports from country *i* have decreased is between 2002 and 2004. In these two years, the AD duty was unchanged.

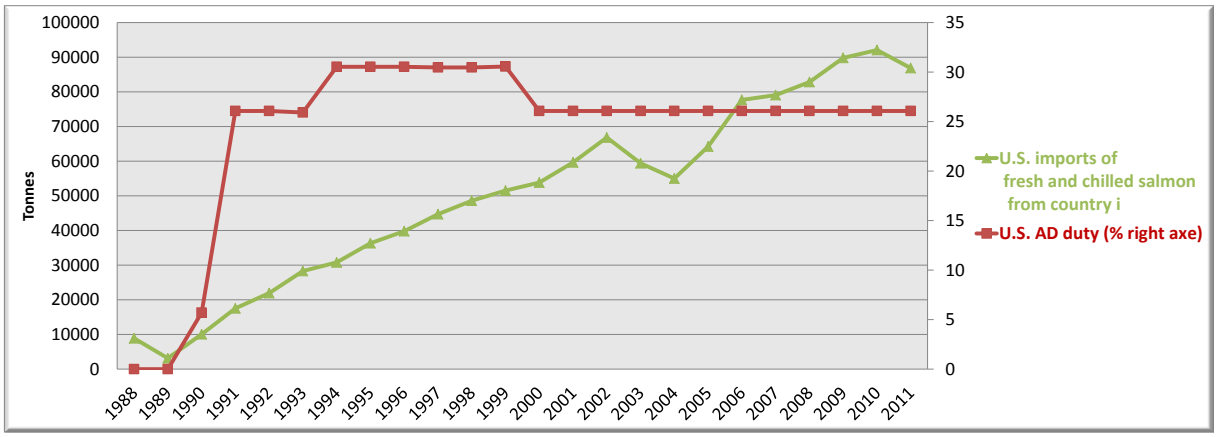


Figure 12. AD duty on fresh and chilled salmon from Norway and U.S. imports of fresh and chilled salmon from country *i*

We have summarized descriptive statistics from the trade diversion data set and explanations of variables in table 5.

Descriptive statistics - Trade diversion							
panel variable: country (strongly balanced)							
time variable: year, 1988 to 2011							
Variables	**Description**	**Predicted sign**	**Mean**	**Std. Dev.**	**Min**	**Max**	**Observations**
Dependent							
tonnes	U.S. imported volume from country *i* (tonnes)		942.16	6098.07	0	70116.90	1320
Independent							
AD	Average U.S. AD duty on Norwegian fresh and chilled salmon	+	24.15	8.68	0	30.56	1320
AD*Norway	Interaction term average AD duty and Norway dummy	-	0.44	3.43	0	30.56	1320
AD*CanadaChile	Interaction term average AD duty and Canada and Chile dummy	+	0.88	4.82	0	30.56	1320
gdp	GDP level in the U.S. (billions)	+	10658.06	1975.95	7607.40	13287.89	1320
exrate	National currency of country *i* relative to USD	+	903.42	3963.05	0.26	38749.42	1320
Dummies							
disease	Dummy for the ISA virus in Chile	-	0.003	0.05	0	1	1320
addum	Dummy for U.S. AD duties on Chilean salmon	-	0.004	0.06	0	1	1320
norwaycrisis	Dummy for the crisis in the Norwegian fish farming industry	-	0.004	0.06	0	1	1320
FTA	Dummy for FTAs between the U.S. and country *i*	+	0.02	0.15	0	1	1320

Table 5. Descriptive statistics of all variables in equation (1)

In order to get an overview of the relationship between the dependent and the independent variables (except dummy variables) in equation (1) from chapter 5.2, we create table 6 showing the results of a Pearson's correlation. The independent variables in year *t;* exchange rate (country|USD) called 'exrate', GDP in the U.S. 'gdp', and the average U.S. AD duty on fresh and chilled salmon from Norway 'AD', are not highly correlated with the dependent variable U.S. import volume in tonnes 'tonnes'. Also, the variable 'AD' is correlated with 'gdp' at a 0.1% significance level.

Pearson's correlation				
	tonnes	*AD*	*gdp*	*exrate*
tonnes	1			
AD	0.0333	1		
gdp	0.0716**	0.4392***	1	
exrate	-0.0333	-0.0053	-0.0046	1

NOTES: *p < 0.05,. ** p < 0.01, and. *** p < 0.001

Table 6. Pearson's correlation of variables in equation (1)

By examining the two independent variables 'AD' and 'gdp' more closely, we attempt to detect the presence of collinearity. We estimate two auxiliary regressions where each of the predictors is regressed on the other. The R-squared is not above the 0.8 threshold indicating strong collinearity and we do not display these regressions. As we do not find a strong correlation between the predictor variable 'AD' and the dependent variable 'tonnes', it will most likely be difficult to find statistically significant parameters in a regression analysis. Nevertheless, we may find results by including various control variables.

We start estimating equation (1) from chapter 5.2 by only including the main predictor average anti-dumping duty 'AD' and the outcome variable 'tonnes'. We find no significant results for 'AD', the coefficient is negative and close to zero, see column 1, table 7.

The coefficient for 'AD' in column 1 represents the average impact of the U.S. average AD duty on imports from any country. The effect the variable 'AD' has on U.S. imports from any country is most likely different from country to country. To capture this, we created an interaction term consisting of the 'AD' variable multiplied by the country dummy for Norway. The estimated parameter for the interaction term will tell us the difference in the average AD duty's effect between Norway and the average of the other U.S. import sources, country *i*.

In equation (1) from chapter 5.2 we identified several factors that may impact U.S. imported volumes of salmon in addition to the average AD duty. Therefore, the coefficient in column 1 might be biased. We proceed by including all these independent variables in a regression and perform an F-test. The new variable 'AD*Norway', and 'norwaycrisis' which controls for the crisis in the Norwegian fish farming industry are the only significant variables. The F-test also rejects the null when testing the variables that are insignificant together. Therefore, we exclude the regressors 'exrate', 'gdp', the dummy variable for the ISA virus in Chile 'disease', 'addum' controlling for U.S. AD duties on salmon imports from Chile, and 'FTA' that controls for FTAs between the U.S. and its import sources. The results are reported in column 2 in table 7. The sign of the coefficients for 'AD' and 'AD*Norway' are what we expect. Nevertheless, the coefficient for 'AD' is still statistically insignificant and close to zero. The interaction term captures the negative effect of the average anti-dumping duty on the dependent variable, and including this may have caused the change in the sign for 'AD'. The U.S. imported tonnes from Norway is different from the average U.S. imported tonnes from other countries by -281. When adding the coefficients for 'AD' and 'AD*Norway', we get the partial effect of the average AD duty on U.S. imported tonnes of fresh and chilled salmon from Norway. As the average AD duty increases with one percentage point, the U.S. imports of fresh and chilled salmon from Norway decrease 281 tonnes on average. The results signify that there is trade destruction.

	Dependent variable								
Independent variables	(1) tonnes	(2) tonnes	(3) tonnes	(4) tonnes	(5) log(tonnes) LOG of tonnes	(6) tonnes 1% filter	(7) tonnes (1988-2002)	(8) tonnes (1992-2011)	(9) tonnes (1989-1993)
AD	-0.02	0.04	-0.10	-0.12	0.00	-12.16	-0.02	-0.59	-0.01
	(0.18)	(0.16)	(0.03)	(0.04)	(0.9)	(0.27)	(0.01)	(0.08)	(0.03)
AD*Norway		-281.41	-294.15	-298.38	-0.15	-284.96	-302.96	-38.49	-217.82
		(5.96)**	(9.70)**	(11.01)**	(7.92)**	(6.59)**	(11.89)**	(0.53)	(5.38)**
norwaycrisis		-1,412.12	-1,494.41	-1,408.42	-0.10	-1,308.53	-1,476.75	-85.50	-2,182.16
		(2.12)*	(2.47)*	(2.48)*	(0.31)	(1.51)	(2.70)**	(0.18)	(5.00)**
AD*CanadaChile				291.71	0.108	304.204	148.668	137.238	2.319
				(4.06)**	(7.99)**	(3.98)**	(1.67)	(0.52)	(0.09)
constant term	1.69	2.44	-1,185.99	-6,025.20	5.74	-6,491.19	-7,343.57	-6,029.94	-6,037.19
	(0.05)	(0.04)	(0.32)	(1.73)	(7.83)**	(2.10)*	(3.08)**	(0.66)	(7.52)**
Time fixed effects	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country specific time trend	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number in panel	55	55	55	55	55	6	55	55	55
Observations	1320	1320	1320	1320	1320	144	825	1100	275

NOTES: * p<0.05; ** p<0.01, t-statistics in parenthesis (AR(1) autocorrelation structure)

Table 7. Regressions estimating the trade diversion effect of the average AD duty[27]

The estimated parameters in column 2 might be biased due to omitted variables which could influence the U.S. imported volumes of salmon. The U.S. imports from all countries may be affected by events such as a global crisis, international agreements, and economic shocks. We attempt to control for this by introducing time fixed effects.[28] There may be fixed differences in levels in U.S. imports from different countries because of characteristics such as geographical distance, wage level, cost level of input factors such as fish feed, natural resources, national regulations that affect production and capacity, the level of R&D, and transportation costs. Country fixed effects will control for such differences. Furthermore, it is likely that cost structure and technology within the salmon industry change differently over time for different countries. Having a variable for production costs would capture each country's ability to export salmon over time. Unfortunately, this type of data is unavailable. The increase in U.S. imports may to a large degree arise from an effect of the downward trend in exporters' transportation and production costs. We do not have enough degrees of freedom to multiply time dummies by country dummies. In order to control for country specific trends alternatively, we create interaction terms for the 55 country dummies multiplied by a time trend variable. To sum up, in column 3 in table 7 we add country and time fixed effects as well as the

[27] All regressions are performed using the command 'xtgls' in Stata controlling for heteroskedasticity and autocorrelation.

[28] In all the tables, the estimated coefficients of country dummies, time dummies and dummies controlling for and product specific time trends are not reported because of space limitations.

country specific time trends. The partial effect on U.S. imported tonnes of fresh and chilled salmon from Norway is similar to the trade destruction effect in column 2.

Given our non-existing findings of trade diversion in column 1-3, we will continue examining the trade diversion effect of the average AD duty on a selection of countries. The trade statistics from USDA show that Canada dominates and Chile holds the second largest share of U.S. fresh and chilled salmon imports in the period we are testing. As it is most likely that the U.S. has diverted its imports from Norway to these countries, we create the interaction term 'AD*CanadaChile' from multiplying the average AD duty by a Canada and Chile dummy. This means that the 'AD' variable now represents the average AD duty's effect on average U.S. imports from countries besides Norway, Canada and Chile.

In column 4 in table 7 we show the results of a regression similar to column 3 adding the new interaction term 'AD*CanadaChile'. The direction of the result for the interaction term 'AD*Norway' is the same as in column 3 with a coefficient of -298. There is still no statistically significant relationship between the average AD duty and the U.S. import volumes in tonnes with regards to countries besides Norway, Chile and Canada. The interaction term 'AD*CanadaChile' is statistically significant at the 1 % level and has a coefficient of 292. For the partial effect of the average anti-dumping duty on U.S. imports from Chile and Canada, we find suggestive evidence for trade diversion. The U.S. imports from these countries increase by 292 tonnes on average when the average AD duty increases by one percentage point. The absolute size of the partial AD duty's effect on U.S. imports from Canada and Chile together and on U.S. imports from Norway is almost identical. This could infer that the decrease in U.S. imports from Norway has simply been replaced by imports from Canada and Chile.

Analysis of robustness

Our preferred regression in table 7 is column 4 with the variables 'AD', 'AD*Norway', 'norwaycrisis', 'AD*CanadaChile', in addition to time and country fixed effects as well as the country specific time trends. The results might still be biased since the USDA trade statistics do not separate between zero and missing values. The inclusion of observations that should have been missing will bias the coefficient towards zero. This might be the reason for an insignificant 'AD' variable, and possibly the case of a type II error where we fail to reject a false null hypothesis (Johannessen et al., 2004).

In column 5-9 we check the robustness of our preferred regression from column 4, all in table 7. In column 5, we apply a log-level model in order to mitigate outlier dominance. This is done by using the logarithm of U.S. imports as our dependent variable and transforming the data using the

logarithm of 1 where imports in tonnes are reported as zero. The direction of the results implies the same evidence for a trade destruction effect for Norway and only a trade diversion effect for Canada and Chile as in column 4. U.S. imports from Norway decrease on average with 15% and imports from Canada and Chile increase on average by 10% due to a one unit increase in the average anti-dumping duty.

The data set includes many countries that have a very low share of the U.S. imports of fresh and chilled salmon. A majority of the 55 countries does not have the ability to respond to a demand shock, for instance due to a low production capacity. There might be a selection bias causing a lower effect of the coefficient of 'AD'. Thus, we decide to exclude countries that have less than 1% share of total U.S. imports of fresh and chilled salmon in the examined period. Starting with 55 countries, the selection criterion leaves us with six countries. These six countries total 99.4% of total U.S. imported volume in tonnes of fresh salmon in 1988-2011, and Norway is represented within these six. Using a small sample of the panel may also lead to a selection bias. Nonetheless, we choose to test these six countries in a regression similar to column 4 as they are the countries that most likely have the ability to export salmon. The regression output is reported in column 6 in table 7. The direction of the results for Canada, Chile and Norway is the same as column 4 even though the coefficients are slightly changed. As in column 4, the trade destruction effect on U.S. imports from Norway is almost identical in absolute terms to the trade diversion effect on U.S. imports from Canada and Chile. We find no trade diversion effect for the remaining U.S. import sources, Iceland, the UK and the Faroe Islands due to an increase in the average AD duty on Norwegian salmon.

As we want to examine the effect of a change in the average AD duty, including the full time period may create imprecise estimates since the AD measures are unchanged in the last 11 years. Hence, we choose to exclude 2003-2011 from our data set and run a regression similar to column 4. The new limited period 1988-2002 will thus include a few years after the final change of the average AD duty. The findings are reported in column 7 in table 7. As in column 4, the coefficients for 'AD' and 'AD*Norway' have signs and sizes that imply trade destruction of U.S. imports from Norway due to the average AD duty. Nevertheless, the coefficient for 'AD*CanadaChile' is now statistically insignificant and half the size of the coefficient in column 4. Multicollinearity may cause unexpected changes in size and signs of coefficients. To find evidence for multicollinearity we run a test that uses the Variance Inflation Factor (VIF) measure (Wooldridge, 2009; UCLA, 2012). The rule of thumb says that when finding a VIF value of about 10 for a variable, there is collinearity associated with the variable. The mean VIF value is 12, and the presence of multicollinearity is confirmed.

Since the variation in the variable 'AD' is small, we suspect that the implementation of the anti-dumping duties in 1991 may be the main cause of our findings in column 4-6. Hence, we test an additional period of 1992-2011 and the results are reported in column 8, table 7. We find no significant variables. This suggests that the initial AD duties on Norwegian salmon are the main reason for our findings. The changes in the average anti-dumping duty that occurred during subsequent reviews do not seem to affect the changes in U.S. imported volume in tonnes.

Given the findings in column 8, we test the period of 1989-1993 and display our findings in column 9 in table 7. We include 1993 because the U.S. salmon industry requires about two years adjusting production after the U.S. AD order in 1991. The outcome of the regression shows that the coefficient for 'AD*Norway' is slightly reduced in absolute terms and statistically significant as in column 4. The effect of the average AD duty on U.S. imports from Canada and Chile is very low compared to column 4 and not statistically significant. The mean VIF value of this regression is 16, which could signify that multicollinearity have influenced the unexpected low coefficient of 'AD*CanadaChile'.

Summing up, none of the regressions show that the variable for the average anti-dumping duty is statistically significant. This means that there is no trade diversion effect of the average AD duty on U.S. imports from country *i*. However, several regression outputs confirm a trade destruction effect of the average U.S. AD duty on U.S. imports from Norway. Also, the findings seem to support trade diversion from Chile and Canada due to the average AD duty on Norwegian salmon. From our robustness check, we found similar results for Canada and Chile using a filtered data set with 1% share of U.S. imports as well as using a log-level model. The absolute sizes of the trade diversion effect for Canada and Chile and the trade destruction effect for Norway suggests that imports from Canada and Chile have nearly replaced U.S. imports from Norway. Furthermore, using several limited time periods did not confirm our previous findings of trade diversion from Canada and Chile. The results of trade destruction for Norway are fairly robust, except for the sample testing 1992-2011. Thus, the changes in the average AD duty after 1991 may appear not to have an effect on U.S. imports of fresh and chilled salmon from any country.

6.2 Product trade diversion

In the literature chapter, we defined product trade diversion as the policy-imposing country increasing imports of third *products* from the country subject to the AD policy. We expect seeing evidence for product trade diversion where the U.S. is diverting its imports of fresh and chilled Atlantic salmon from Norway to other salmon products (product *j*) from Norway.

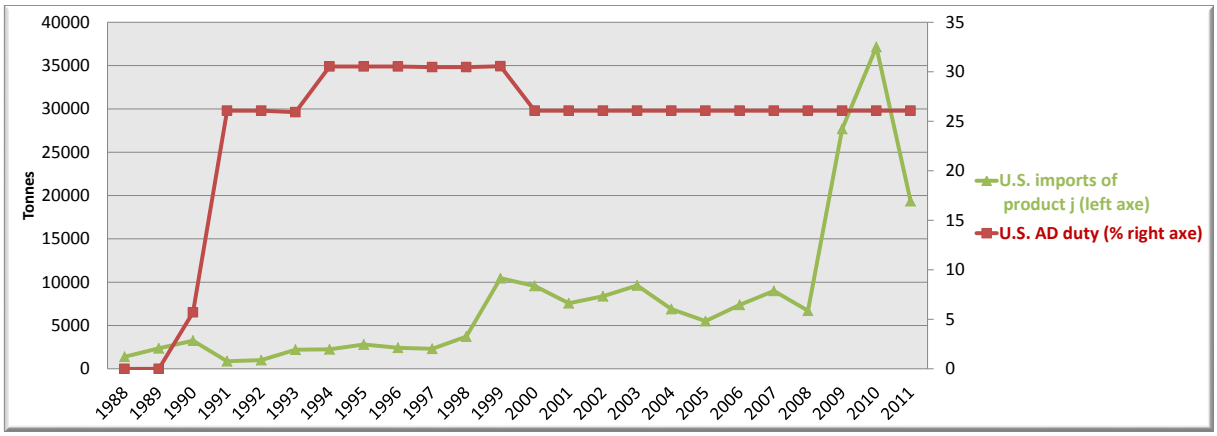


Figure 13. U.S. average AD duty on fresh and chilled Atlantic salmon from Norway and the U.S. imports of product *j*

When the preliminary anti-dumping duty is implemented in 1990 there is a small increase in U.S. imports of other salmon products than fresh and chilled salmon from Norway (product *j*), see figure 13. However, it looks as if the AD duty had a negative effect on U.S. imports of *all* products from Norway in 1991. The average AD duty is at its highest level between 1998-1999 and at the same time the U.S. imports doubles for product *j* from Norway. From then on, there are some variations in the U.S. imports of product *j* from Norway, which do not seem to vary in relation to the changes in the average AD duty. The main trend in U.S. imports of product *j* from Norway, however, is positive. Also, most of the imported volume in tonnes per year of product *j* from Norway is below 10,000 tonnes, with some outlier years around 20-40,000 between 2009 and 2011. All in all, the U.S. imports of salmon from Norway in quantities are low.

Table 8 presents descriptive statistics from the product trade diversion data set and explanations of variables.

Descriptive statistics - Product trade diversion							
panel variable: product (strongly balanced)							
time variable: year, 1988 to 2011							
Variable	**Description**	**Predicted sign**	**Mean**	**Std. Dev.**	**Min**	**Max**	**Observations**
Dependent							
tonnes	U.S. imported volume in tonnes of product *j* (tonnes)		203.32	1199.15	0	22570.50	1104
Independent							
AD	Average U.S. AD duty on Norwegian fresh and chilled salmon	+	24.15	8.68	0	30.56	1104
AD*Fresh	Interaction term average AD duty and dummy for fresh and chilled salmon	-	0.53	3.75	0	30.56	
AD*Frozen&Fillets	Interaction term average AD duty and dummy for frozen salmon and fresh fillets	+	1.05	5.25	0	30.56	1104
AD*Fillets	Interaction term average AD duty and dummy for frozen and fresh fillets	+	8.05	12.48	0	30.56	144
gdp	GDP level in the U.S. (billions)	+	10658.06	1975.95	7607.40	13287.89	1104
nokus	NOK relative to USD	+	6.57	0.80	5.51	8.63	1104
Dummy							
norwaycrisis	Dummy for the crisis in the Norwegian fish farming industry	-	0.13	0.33	0	1	1104

Table 8. Descriptive statistics of all variables in equation (2)

As in the trade diversion analysis, we perform a Pearson's correlation with the results in table 9. The independent variables in year *t* are the average anti-dumping duty on fresh and chilled salmon from Norway 'AD', GDP in the U.S. 'gdp' and the exchange rate NOK|USD 'nokus'. The variables are not

highly correlated with the dependent variable U.S. imported volumes in tonnes of product *j* from Norway 'tonnes'. The variable 'AD' is correlated with the independent variables 'gdp', and 'nokus' at a 0.1% significance level. In addition, the variables 'gdp' and 'nokus' are correlated with the same significance level.

Pearson's correlation				
	tonnes	*AD*	*gdp*	*nokus*
tonnes	1			
AD	-0.0244	1		
gdp	0.075*	0.4393***	1	
nokus	-0.0213	0.2827***	0.1101***	1

NOTES: *p < 0.05,. ** p < 0.01, and. *** p < 0.001

Table 9. Pearson's correlation of variables in equation (2)

The correlation between the main predictor 'AD' and 'tonnes' is negative and close to zero, which may make it difficult to find a statistically significant parameter supporting product trade diversion. Nonetheless, we will add several control variables which may give us different results. In this analysis, we also estimate three auxiliary regressions with the three predictors in order to detect the presence of collinearity. The R-squared in the regressions are all below the 0.8 threshold.

Similar to the previous analysis, we start by estimating equation (2) from chapter 5.2 with only the dependent variable 'tonnes' and the main predictor variable 'AD' see column 1 of table 10. We find no significant results and the coefficient might be biased due to omitted variables. In this analysis, we also suspect that the effect the 'AD' variable has on U.S. imports varies between subgroups. We expect that U.S. imports of fresh and chilled salmon from Norway decrease, while U.S. imports of *other* salmon product varieties from Norway increase due to an increase in the average anti-dumping duty. To be able to see the separate effect of the variable 'AD' on the product fresh and chilled salmon, we have created an interaction term. It is called 'AD*Fresh' and multiplies the average AD duty by the product dummy for fresh and chilled salmon. The estimated parameter for the interaction term tells us the difference in the effect of the average AD duty between the fresh and chilled salmon product and the other salmon products, product *j*. Next, we estimate a regression adding the interaction term and the remaining independent variables as well as the dummy variable 'norwaycrisis' controlling for the crisis in the Norwegian fish farming industry. When running an F-test on the regression, all variables are to be excluded from the model, except 'AD*Fresh'. In this analysis, we also include the regressor 'AD' to interpret the interaction term. The results are reported in column 2 table 10, where the U.S. imports of fresh and chilled salmon from Norway are reduced by 181 tonnes on average as the average AD duty increases by one unit. This implies trade destruction, also corresponding to the findings in the trade diversion analysis in chapter 6.1.

	Dependent variable									
Independent variables	(1) tonnes	(2) tonnes	(3) tonnes	(4) tonnes	(5) log(tonnes) *LOG*	(6) tonnes *1%-filter*	(7) tonnes *(1988-2002)*	(8) tonnes *(1992-2011)*	(9) tonnes *(1989-1993)*	(10) tonnes *HS-filter*
AD	-0.26	-0.22	-34.21	-34.11	0.01	-36.18	-3.95	25.29	-20.20	-13.80
	(0.66)	(0.54)	(0.92)	(0.94)	(0.51)	(0.57)	(0.08)	(0.56)	(0.23)	(0.24)
AD*Fresh		-180.95	-304.98	-305.29	-0.14	-300.20	-314.11	-32.60	-362.98	-310.48
		(3.28)**	(10.24)**	(10.45)**	(6.59)**	(6.75)**	(9.17)**	(0.45)	(5.22)**	(6.92)**
AD*Frozen&Fillets				10.612	0.083	-4.108	0.33	-7.52	-13.73	
				(0.49)	(2.17)*	(0.12)	(0.2)	(0.11)	(1.06)	
AD*Fillets										-74.32
										(2.17)*
constant term	15.782	15.866	-14.982	-14.77	0.68	327.38	18.062	-594.424	-167.991	310.736
	(1.07)	(1.06)	(0.17)	(0.17)	(1.5)	(0.39)	(0.19)	(0.57)	(0.15)	(0.42)
Time fixed effects	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Product fixed effects	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Product specific time trend	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number in panel	46	46	46	46	46	8	46	46	46	6
Observations	1104	1104	1104	1104	1104	192	690	920	230	144

NOTES: * p<0.05; ** p<0.01, t-statistics in parenthesis (AR(1) autocorrelation structure)

Table 10. Regressions estimating the product trade diversion effect of the average AD duty[29]

The findings in column 2 may also be imprecise due to an omitted variable bias. Because of restrictive access on a number of data, we proceed to control for factors that vary over years for all products by using time fixed effects. In addition, product fixed effects controls for fixed differences in levels in U.S. imports of different products due to e.g. distribution systems, natural resources, transportation costs, and processing level. As in the trade diversion analysis, we will also here control for specific time trends within the panel. It is likely that Norwegian exporters' ability to produce and export different products varies over time due to trends in costs and improvements in technology. Due to unavailability of data, we create interaction terms by multiplying the 46 product dummies by a time trend variable. Summing up, in column 3 table 10 we now test a regression with product and time fixed effects as well as including the product specific time trends. What is different from column 2 is the larger coefficients on both 'AD' and 'AD*Fresh'. There is now a larger trade destruction effect on the product fresh and chilled salmon due to the average AD duty. As the average AD duty increases by one percentage point, the U.S. imports of fresh and chilled salmon from Norway decrease with approximately 340 tonnes on average. This is almost a doubled trade destruction effect compared to column 2, meaning that omitting the additional control variables from the model might have led to biased coefficients.

[29] All regressions are performed using the command 'xtgls' in Stata controlling for heteroskedasticity and autocorrelation.

Hitherto, we have no results indicating product trade diversion. The two Norwegian products with the largest U.S. import share over the examined period are frozen Atlantic salmon and, fresh and chilled Atlantic salmon fillets. If there is any chance of confirming the hypothesis of product trade diversion, it will most likely occur from a diversion of U.S. imports from fresh and chilled Atlantic salmon to these two salmon products. Therefore, we generate a variable that captures the difference in the effect of the average anti-dumping duty between the two largest imported products and the average of the remaining products. Column 4 in table 10 displays the findings for a regression similar to column 3, adding the new interaction term 'AD*Frozen&Fillets'. The direction of the results for the variable 'AD' and 'AD*Fresh' are almost identical to column 3, and the new interaction term 'AD*Frozen&Fillets' is not statistically significant.

Analysis of robustness

From table 10, our preferred regression is column 4 including the variables 'AD', 'AD*Fresh', 'AD*Frozen&Fillets', in addition to time and product fixed effects as well as the product specific time trends.

We use the same data as in trade diversion which means we again encounter the issue with the USDA trade statistics not separating between zero and missing values. At least 14 of the 46 Norwegian salmon products are *Pacific* salmon, which makes it highly likely that many observations in the data set should not have been included. As our argument in the trade diversion analysis, this could be a reason for not finding a product trade diversion effect of the AD duty. The inclusion of products where there are no reasons to expect any increased trade flows due to e.g. production constrains may bias the estimated average AD duty coefficient.

In column 5-10 in table 10 we check the robustness of our preferred regression from column 4. In column 5, we compute a regression with the logarithm of the dependent variable 'tonnes'. The results show the first evidence implying a product trade diversion effect of the average anti-dumping duty on U.S. imports of frozen Atlantic salmon and fresh and chilled Atlantic salmon fillets from Norway. When the average AD duty increases with one percentage point, U.S. imports of the products Atlantic *frozen* salmon and fresh and chilled *fillets* from Norway increase by approximately 10% on average. Moreover, a one percentage point increase in the average AD duty leads to the U.S. imports of fresh and chilled salmon from Norway decreasing with 13% on average.

The data set includes many products which have a very low share of U.S. imports from Norway. On the one hand, this may cause imprecise estimates of parameters as there might be a selection bias. As in the analysis of trade diversion, we also use a selection criterion of 1% share, in this case of total

U.S. imports of any salmon product from Norway. This filtering excludes 38 products from the data set. The remaining eight products total 94.9% of U.S. imports of salmon from Norway and the fresh and chilled salmon product is one of the eight. It is reasonable to presume that Norway's ability to export products such as Pacific salmon products is low.[30] On the other hand, including such a low number of products in the panel may also create a selection bias. Nevertheless, it is unrealistic to argue that there could be a product trade diversion effect of *Pacific* salmon products since the majority of Norwegian exports is based on aquaculture and not fisheries. The regression output of including only eight products in a regression similar to column 4 is displayed in column 6 table 10. Excluding the majority of the panel seem to affect only the coefficient of the variable 'AD*Frozen&Fillets' which is now negative. The results in column 4 seem to be fairly robust regardless of limiting the number of products in the panel.

As in the previous analysis, we run a regression similar to our preferred regression, here column 4 with the period 1988 to 2002 and report the findings in column 7, table 10. The outcome is similar to column 4, supporting the trade destruction effect of the average AD duty on the product fresh and chilled salmon from Norway. Compared to column 4, the coefficients for 'AD' and 'AD*Frozen&Fillets' are closer to zero.

Next, we limit the time period including only 1992 to 2011 as in the previous analysis. The regressions outcome is reported in column 8, table 10. As in the analysis of trade diversion, we find no significant results. This again supports that the changes in the average AD duty after 1991 do not have an effect on U.S. imported volumes in tonnes of salmon from Norway.

Moreover, the results from the limited period 1989 to 1993 is found in column 9, table 10. The outcome of the regression is similar to column 4, but the trade destruction effect is larger in absolute size. The results show a negative coefficient for the interaction term 'AD*Frozen&Fillets' compared to column 4.

Examining the statistics of the eight products reported in column 6, we believe that four of the products may in reality be two products given the similar HS code descriptions. [31] In addition, U.S. import data were missing from two of the products before 2006, and in the other products after 2006. This means that updates and changes to the U.S. Harmonized Tariff Schedule may have caused

[30] E.g the Norwegian Pacific salmon products: fresh and chilled chinook totals 0.4 tonnes and fresh and chilled pink totals 1.3 tonnes of U.S. imports in the period 1988-2011 (USDA, 2012).

[31] For example: HS 0304104093: *Farmed Atlantic salmon (*Salmo salar*), fillets or other meat, fresh or chilled.
HS 0304190064: Atlantic salmon (Salmo salar), fillets etc, farmed, fresh or chilled.

imprecise estimates of our parameters. If treating the four products as two, this leaves us with a data set containing six products. The products with the highest U.S. import share of Norwegian salmon products are now changed to frozen and fresh fillets of Atlantic salmon. Therefore, we create a new interaction term 'AD*Fillets'. The findings from a regression similar to column 4 using the HS-filtered data set with the new interaction term are reported in column 10 in table 10. The trade destruction effect is similar to column 4. The coefficient of 'AD*Fillets' is negative and statistically significant on a 0.05 level. U.S. imports of fillets from Norway decrease with 88 tonnes on average as the average AD duty increases by one percentage point. The outcome does not support the hypothesis of product trade diversion.

In conclusion, our findings do not support the hypothesis of product trade diversion in general, except for two salmon products when applying a log-level model. There is evidence suggesting trade destruction which is seemingly robust when using a log-level model and in two of the limited periods of years. In the period 1992 to 2011, all variables are statistically insignificant. Hence, the reviews' changes in the anti-dumping measures do not seem to affect the U.S. imported volumes of different salmon products from Norway. Also, when transforming the data set to six products, we find statistically significant evidence of a *negative* effect of the average AD duty on U.S. imports of salmon fillets from Norway.

6.3 Trade deflection

Trade deflection has been identified as an AD duty causing the policy-imposed country to increase exports to *third* countries. We expect to see Norway shifting exports of fresh salmon[32] to *other* countries than the U.S. (country *k*) as the average AD duty increases.

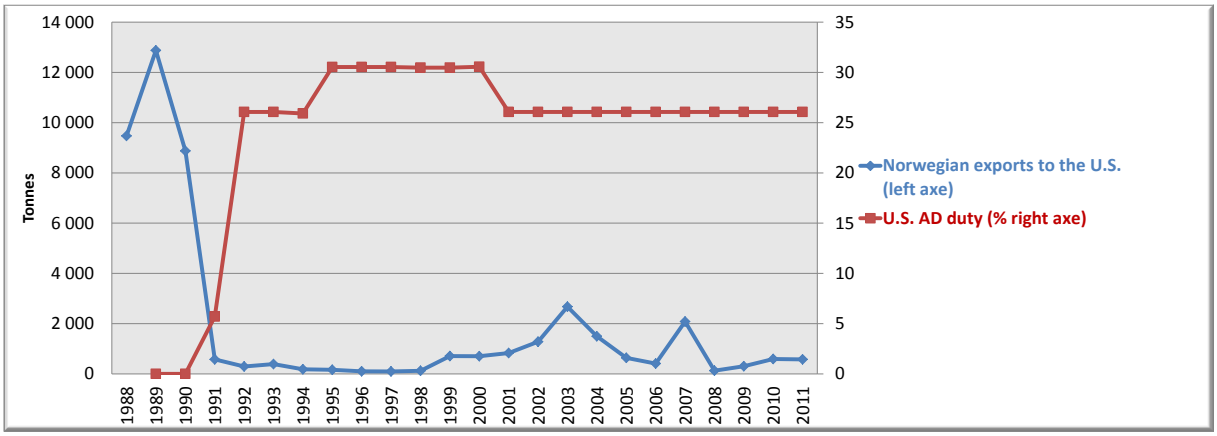


Figure 14. U.S. average AD duty on fresh and chilled salmon from Norway and Norwegian fresh salmon exports to the U.S

Figure 14 should be identical to figure 11 in the analysis of trade diversion. However, the statistics from the two different data sources differ slightly. This must be due to different data collection methods, as the U.S. imports do not include chilled salmon and the Norwegian export statistics report generally higher volumes.

Figure 15 depicts Norwegian exports to other countries than the U.S., country *k,* and the average anti-dumping duty. During the past 20 years, the exported volumes of fresh salmon from Norway have had a tremendous growth in size from about 55,000 tonnes to nearly 700,000 in 2011. The average U.S. AD duty and the Norwegian exports to country *k* do not move in the same direction.

[32]The analysis for trade deflection covers exports of fresh salmon. *Chilled* salmon has an insignificant share of Norwegian exports of fresh and chilled salmon together, e.g. 0.42% in 2011.

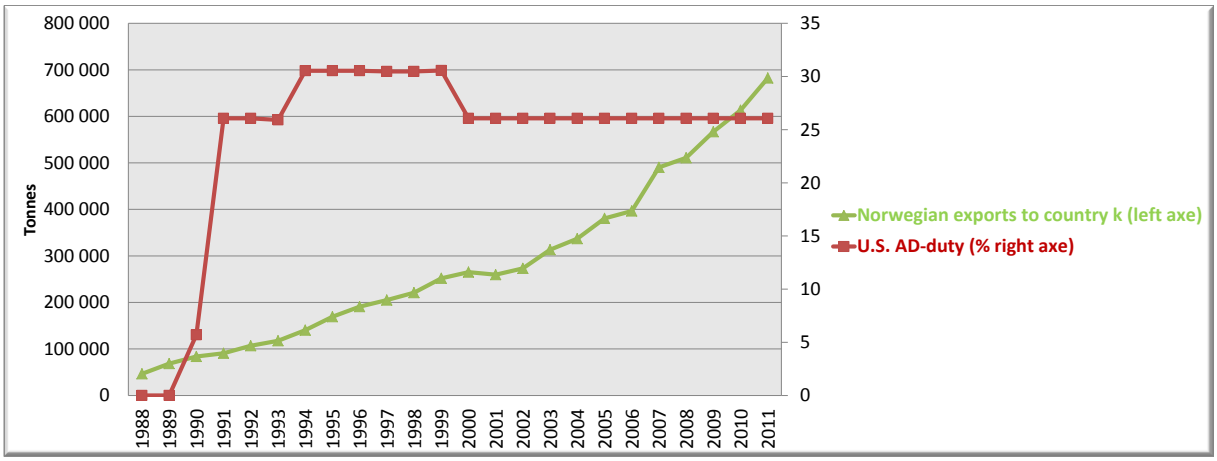


Figure 15. Average U.S. AD duty on fresh and chilled salmon from Norway and Norwegian fresh salmon exports to country *k*

The pie charts in figure 16 show the major Norwegian export destinations of fresh salmon in 1988 and 1993. The two years are selected to illustrate the export pattern before and after the implementation of the U.S. AD order. In 1988, France, Denmark and the U.S. are the largest export destinations. In 1993, the exported volumes to France and Denmark more than double. Norwegian exports to the U.S. are reduced from 9,470 tonnes in 1988, to 388 tonnes in 1993.

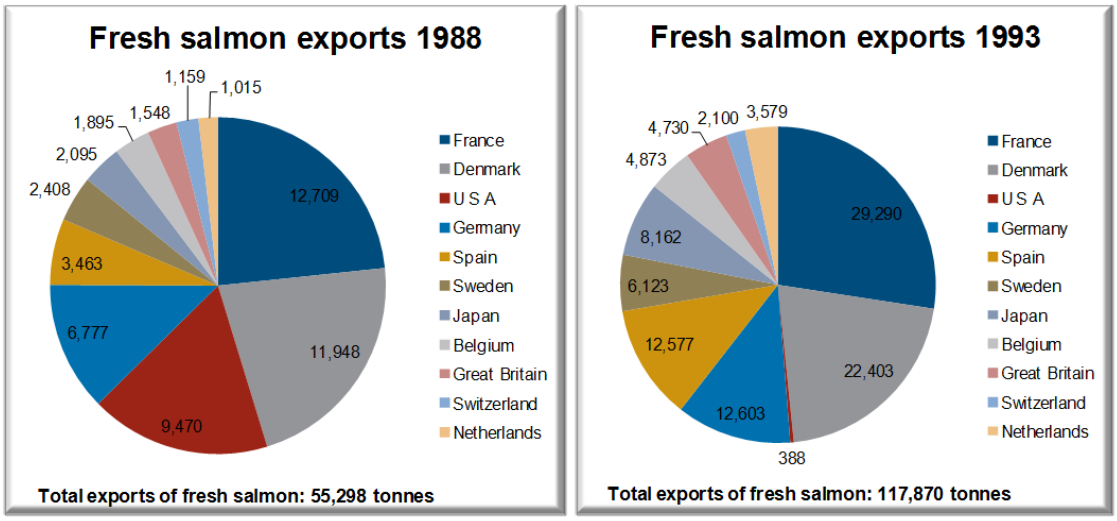


Figure 16. Norwegian exports of whole fresh salmon in 1988 and 1993 (the Norwegian Seafood Council, 2011)

As in the previous analyses, we display descriptive statistics of the data set and variables, see table 11. The main predictor variable is the average U.S. anti-dumping duty on fresh and chilled Norwegian salmon in year *t,* 'AD', and the dependent variable is Norwegian fresh salmon export volumes in tonnes to any country in year *t,* 'tonnes'. The other independent variables identified in equation (3) from chapter 5.2 are in year *t*; the exchange rate between Norway and a importing country 'exrate', and GDP in a importing country 'gdp'. We also have identified dummy variables controlling for Chile's trade agreements 'chag', the crisis in the Norwegian fish farming industry 'norwaycrisis', AD

duties imposed by the EU on Norwegian salmon 'addum', NTBs on Norwegian salmon exports 'ntbdum', and tariffs from 10% on Norwegian salmon exports 'tar10'.[33]

Descriptive statistics - Trade deflection							
panel variable: country (strongly balanced)							
time variable: year, 1988 to 2011							
Variable	**Description**	**Predicted sign**	**Mean**	**Std. Dev.**	**Min**	**Max**	**Observations**
Dependent							
tonnes	Norwegian exported volume to country *k* (tonnes)		2843.54	9954.44	0	103611	2400
Independent							
AD	Average U.S. AD duty on Norwegian fresh and chilled salmon	+	24.16	8.67	0	30.56	2400
AD*US	Interaction term average AD duty and dummy for the U.S.	-	0.24	2.56	0	30.56	2400
AD*FranceDenmark	Interaction term average AD duty and dummy for the France and Denmark	+	0.48	3.60	0	30.56	2400
gdp	GDP level in country *k* (billions)	+	34744.84	185502.40	0.284	2458574	2263
exrate	National currency of country *k* relative to NOK	+	3.64	4.96	0.0004	29.6699	2389
Dummies							
chag	Dummy for Chile's trade agreements	-	0.10	0.30	0	1	2400
tar10	Dummy for tariffs from 10% on fresh Norwegian salmon	-	0.16	0.37	0	1	2400
ntbdum	Dummy for NTBs on Norwegian salmon exports	-	0.03	0.17	0	1	2400
addum	Dummy for EU AD duties on Norwegian salmon	-	0.11	0.31	0	1	2400
norwaycrisis	Dummy for the crisis in the Norwegian fish farming industry	-	0.13	0.33	0	1	2400

Table 11. Descriptive statistics of all variables in equation (3)

We have also computed a Pearson's correlation depicted in table 12. The independent variable 'AD' is significantly correlated with the independent variable 'tonnes' at a 1% level. However, the correlation coefficient is very low. Again, as with our previous analyses, adding several control variables may possibly contribute to significant findings.

Pearson's correlation				
	tonnes	*AD*	*gdp*	*exrate*
tonnes	1			
AD	0.062**	1		
gdp	0.0022	0.016	1	
exrate	0.076***	0.0149	-0.1386***	1

NOTES: *p < 0.05,. ** p < 0.01, and. *** p < 0.001

Table 12. Pearson's correlation of variables in equation (3)

The regressor 'gdp' is correlated with 'exrate' at a 0.1% significance level. Regressions with the variables 'gdp' and 'exrate' find that the R-squared is below the threshold suggesting collinearity.

As in the previous analyses, column 1 only includes the main predictor 'AD' and the estimated coefficient might be biased due to omitted variables. In column 2 we further add the remaining predictor variables, see table 13. It can be assumed that the Norwegian exports to the U.S. decrease while exports to country *k* increase due to an increase in the average AD duty. In order to capture this interaction effect we create the variable 'AD*US'. This is constructed by multiplying the variable 'AD' by a country dummy for the U.S. This interaction term will tell us the difference in the effect of the average AD duty between the U.S. and the average of country *k*. The F-test finds that 'AD*US' is

[33] fresh Pacific salmon, Atlantic salmon and Danube salmon.

the only variable to be included in the model. As previous, we continue adding 'AD' to interpret the interaction term. The results are reported in column 2 table 13, where 'AD*US' is statistically significant at a 1% level. When adding 'AD' to 'AD*US' we get the partial effect of the average AD duty on Norwegian exported tonnes of fresh salmon to the U.S. When the average AD duty increases by one percentage point the Norwegian exports of fresh salmon to the U.S. decline by approximately 400 tonnes on average. Thus, the findings imply evidence of trade destruction of Norwegian exports to the U.S, which is similar to the previous analyses.

	Dependent variable							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Independent variables	tonnes	tonnes	tonnes	log(tonnes)	tonnes	tonnes	tonnes	tonnes
				LOG	1% filter	(1988-2002)	(1992-2011)	(1989-1993)
AD	-0.93	-0.87	-0.76	0.07	937.01	8.35	25.83	3.476
	(0.72)	(0.66)	(0.02)	(19.99)**	(10.25)**	(3.12)**	(1.1)	(4.12)**
AD*US		-399.029	-395.868	-0.141		-387.751	-22.167	-448.848
		(7.18)**	(7.59)**	(4.10)**		(7.87)**	(0.19)	(14.03)**
constant term	-1 686.83	-1 772.66	(omitted)	-1.07	44548.46	-94.63	-1 075.36	-40.55
	(3.29)**	(3.29)**		(4.31)**	(3.71)**	(0.23)	(0.21)	(0.36)
Time fixed effects	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Number in panel	100	100	100	100	14	100	100	100
Observations	2400	2400	2400	2400	336	1500	2000	500

NOTES: * p<0.05; ** p<0.01, t-statistics in parenthesis (AR(1) autocorrelation structure)

Table 13. Regressions estimating trade deflection effects of the average AD duty[34]

Other factors than the ones included so far may have influenced Norwegian exports of fresh salmon. This suggests that the estimated coefficients in column 2 may be biased. Fixed differences in levels in Norwegian exports to different countries can be captured by including country fixed effects. Examples of individual country attributes are distribution system, geographical distance, natural resources and domestic production of salmon and transportation costs. Time fixed effects capture factors that vary over time and impact Norwegian exports to all countries, e.g. international reduction in tariffs and changes in world GDP. In the previous analyses, the volume of U.S. imports was expected to be affected by each country's ability to export and Norway's ability to export different salmon products over time. In this analysis, however, we are only examining one product from one exporter, namely fresh salmon from Norway. Thus, we do not need to include the product/country specific trends. Continuing, in column 3 in table 13 we run a regression similar to column 2, this time adding time and country fixed effects. The direction of the results for the interaction term is almost identical to column 2.

[34] All regressions are performed using the command 'xtgls' in Stata controlling for heteroskedasticity and autocorrelation.

Hitherto, the trade deflection effect of the average AD duty has not been supported in the findings. To investigate whether there is a trade deflection effect of the average AD duty on a particular set of countries, we multiply the average AD duty by a France and Denmark dummy. It is most likely that Norwegian exports have deflected to these two countries given that they hold the largest shares of Norwegian fresh salmon exports for the analyzed time period. According to the F-test, the interaction term is not to be included in the model and we do not display the outcome of the regression. Hence, there is no statistically significant trade deflection effect due to the U.S. average AD duty to France and Denmark.

Examining the export price from Norway is an alternative method for estimating the effect of the average AD duty on Norwegian exports of fresh salmon to the U.S.[35] We attempt to control for the exchange rate 'nokus' and time fixed effects, but find no statistically significant variables. Therefore, we compute a simple OLS regression with the explanatory variable 'AD' and outcome variable 'price', see column 1, table 14. A one percentage point increase in the U.S. average AD duty leads to an average decrease of NOK 0.41 in the export price of Norwegian fresh salmon to the U.S. The adjusted R-squared is 0.22, which means that the average AD duty explains a moderate amount of the variation in the export price to the U.S. The results coincide with the partial equilibrium model from the literature chapter where the terms-of-trade is improved for the importing nation, here the U.S. Nonetheless, omitting relevant variables such as the downward trend in production costs of salmon may have biased the results. Due to lack of relevant data to include, we therefore will not rely heavily on these results.

[35] The average Norwegian export price in NOK per year to the U.S. for fresh Atlantic salmon was listed in the data received from the Norwegian Seafood Council. The average AD duty is not included in the export price, since the dumping margin is collected from the importers (Federal Register, 2012).

	Dependent variable
Independent variables	(1) Price
AD	-0.4119
	(-2.74)*
constant term	44.12
	(11.44)***
Time dummies	No
Product dummies	No
*Product*time trend*	No
R-squared	0.254
Adj. R-squared	0.221
Observations	24

NOTES: * p<0.05; ** p<0.01,*** p<0.001,
t-statistics in parenthesis

Table 14. Regression estimating the average AD effect on Norwegian export price to the U.S.

Analysis of robustness

Column 3 in table 13 represents our preferred regression including the variables 'AD', 'AD*US', in addition to time and country fixed effects. As in the previous analyses, the analyzed data set does not have any missing observations. This means that observations reported as zero should in some cases have been reported as missing. As a result of this, the coefficient of 'AD' might be biased towards zero.

In column 4-8 of table 13 we test the robustness of our preferred equation from column 3. In column 4, the dependent variable is defined differently as we take the logarithm of 'tonnes'. Compared to column 3 the variable 'AD' is statistically significant at a 1% level. When the average anti-dumping duty increases by one percentage point, there is an increase in Norwegian exports of fresh salmon to country *k* by an average of 7%. This is the first findings that seem to coincide with the trade deflection theory. Also, the partial effect of Norwegian exports to the U.S. is an average decline in 7% as the average AD duty increase by one percentage point, indicating trade destruction. It is interesting that the percentage decline in exports to the U.S. is equal to the percentage increase of exports to other countries, implying that exports are deflected.

The data set includes many countries that have a very low share of the Norwegian exports. The ability to import fresh salmon varies greatly between the countries in the data set which may have led to a selection bias in the former regressions. Even though the Norwegian export supply of salmon increases as the U.S market disappears, not all countries have the ability or willingness to pay for fresh salmon. This may cause biased estimates of the coefficient for 'AD'. Thus, we exclude countries that have less than 1% share of total Norwegian exports of fresh salmon in the period examined. The remaining 14 countries total 91% of Norwegian exports in tonnes of fresh salmon from 1988 to 2011.

Excluding 86 countries may also create a selection bias. Nevertheless, it seems as if the countries that are excluded in the sample are less likely to import salmon from Norway. The U.S. is not included in the selection criterion of 1% which makes the interaction term 'AD*US' non-existent. The results of a regression similar to column 3 with a smaller panel are reported in column 5, table 13. The variable 'AD' has a positive sign and is significant at a 1% level, which is a change from column 3. As expected, the size of the coefficient for the average anti-dumping duty is much larger when using the selection criterion. We find that Norwegian exports to the 14 remaining countries in the data set increase by an average of 937 tonnes as the average AD duty increases by one percentage point. Hence, when only including the countries perceived as having an ability to import fresh salmon, there is a trade deflection effect of the average U.S. AD duty.

As in the previous analyses, we also test the robustness of column 3 by limiting the period to 1988 to 2002. The regression output is reported in column 6, table 13. The direction of the findings of the interaction term 'AD*US' correspond to the results in column 3. What is different from column 3, is that 'AD' is statistically significant and the coefficient is positive. This may indicate that there is a trade deflection effect of the average AD duty before 2003. Next, the period of 1992 to 2011 is also examined. The results of a regression similar to column 3 are reported in column 7, table 13. None of the variables are statistically significant. These results therefore seem to be consistent for all analyses, suggesting that the average AD duty changes after 1991 do not affect Norwegian exported volumes nor U.S. imported volumes of salmon. We also limit the total time period to 1989-1993. The results are found in column 8, table 13. Compared to column 3, the variable 'AD' is statistically significant and the trade destruction effect of the average AD duty is larger. Thus, the initial AD duties prior to 1992 seem to be creating the trade deflection and trade destruction effect of Norwegian exports.

Summing up, from the analysis we find no significant proof of trade deflection in the time period 1988 to 2011 in our preferred regression. There is evidence of trade deflection when using a log-level model and when including the countries suggested having the ability to import. Moreover, the findings for the periods 1988-2002 and 1989-1993 indicate a trade deflection effect of the average AD duty. The trade destruction effect on Norwegian exports of fresh salmon to the U.S. is seemingly robust in most of the regressions. As we have no significant findings of trade deflection and trade destruction in the period 1992-2011, this signifies that the initial AD duties may have caused the external trade effects. We also have results that may imply a negative effect on the Norwegian export price to the U.S due to the average AD duty. Nonetheless, the reliability of these findings is questioned.

7 Discussion of findings

At the time of the U.S. AD order issuance in the early 1990s, Norway was the world's largest salmon exporter and the U.S. was a moderately large salmon market in the world with a small domestic production. Therefore, the probability is large for trade flows being deflected and diverted as AD duties were imposed on Norwegian fresh and chilled salmon.

Trade diversion

With trade protection of the U.S. domestic salmon industry, the U.S. production should increase in order to cover the decline in imports from the policy-imposed country Norway. Our findings show statistically significant evidence implying trade destruction of U.S. imports from Norway due to the average AD duty on Norwegian fresh and chilled salmon. The size and the significance level of the trade destruction effect are fairly robust throughout the analysis. Referring to figure 7 in chapter 3.2.2., the U.S. production increased between 1990 and 1992, but in 1993 the growth starts to level off and is negative in most years after 1999. The restrained development of the U.S. salmon farming production has been explained by U.S. regulations and bureaucracy, among other factors. Hence, a major drop in U.S. imports from Norway followed by a low domestic supply increased the possibility of U.S. imports of fresh and chilled salmon from *other* countries. As U.S. imports of fresh and chilled salmon originated from 17 countries besides Norway in 1990, the shortage in U.S. supply could easily be covered by third countries established in the market not subject to AD duties.

Throughout the analysis we fail to find a statistically significant coefficient for the average anti-dumping duty suggesting trade diversion of U.S. imports of fresh and chilled salmon from country *i*. This contrasts previous studies on U.S. anti-dumping measures by Prusa (1996; 2001) and Bown and Crowley (2006). Since the USDA statistics do not have any missing values, it is possible that the inclusion of these observations have biased the estimated coefficient for the average anti-dumping duty towards zero. However, we find statistically significant evidence implying a trade diversion effect of U.S. imports from Canada and Chile due to the average AD duty on Norwegian salmon. In the analysis of robustness we examine three different time periods and fail to find evidence of trade diversion from *any* country due to the average AD duty. This may suggest that there are other factors than the U.S. AD order explaining the increased U.S. imports.

Carter and Gunning-Trant (2010) find a relatively small amount of trade diversion in the agriculture sector whereas our findings in the salmon industry show trade diversion from few countries. Some of Carter and Gunning-Trant's explanations may be applicable to the salmon industry e.g. the geographical specificity of production. National regulations, natural endowments, the perishability of

fresh salmon as well as the production cycle limit how quickly third countries can adjust output. It also limits the production capacity or the ability for a country to produce salmon. The findings for Chile and Canada are robust when testing a log-level model as well as filtering the data set including only countries most likely to export. On the one hand, the selection criterion may eliminate countries with a low ability to export salmon and give more realistic results. On the other hand, the criterion may also cause a selection bias which can lead to significant findings that are wrong and thus a type I error where we reject a null hypothesis that is correct. With the selection criterion of 1 % share of U.S. imports of fresh salmon, the trade diversion effect of the average AD duty only holds for Chile and Canada. It could be argued this is due to profitability and disease problems of other salmon producing countries. In addition, the Canadian and Chilean fresh salmon may be more competitive in the U.S. due to advantages in transportation costs relative to other salmon producing countries in Europe. Canada's proximity to the U.S. is particularly advantageous when it comes to transportation costs.

Our findings implying trade diversion from Chile and Canada in addition to the very small increase in U.S. production could infer that the welfare gain to the U.S. might be smaller than predicted by the simple trade model in figure 2 from chapter 2.2. This also questions the AD policy effectiveness in protecting the U.S. salmon industry as imports from Norway appear to simply have been replaced by Canada and Chile. The size of the trade diversion effect for Chile and Canada is almost identical to the trade destruction effect for Norway in the preferred regression (see table 7 column 4). According to the simple trade model from chapter 2.2., total U.S. imports should decrease as a consequence of a tariff. The total U.S. imports of fresh and chilled salmon have been growing largely since the preliminary AD duty was imposed in 1990. Thus, U.S. consumers may not have been subject to a large welfare loss. However, without examining price effects it is not possible to draw any conclusions of welfare effects for consumers. Our explanations support the work of Asche (2001) which conclude that the AD measures on Norwegian imports of fresh and chilled salmon was not beneficial for U.S. producers and U.S. consumers did not lose as there was a reallocation in the trade pattern.

Another frequently discussed topic within AD studies is the additional costs of the administration and changes of AD duties in the U.S. When limiting the time period to 1992 to 2011, we investigated the effects of the changes in the average AD duty after the original imposition in 1991. Our findings show that the U.S. reviews of dumping margins after 1991 appear not to be affecting U.S. imports of fresh and chilled salmon.

Product trade diversion

The statistically significant trade destruction effect of the average AD duty on the product fresh and chilled salmon is almost equivalent to the findings in the analysis of trade diversion. The results are interesting since the data set and the control variables are different from the analysis of trade diversion. The trade destruction effect and welfare loss of the average AD duty of the exporting country seem to coincide with the predictions of the simple trade model from chapter 2.2. and are seemingly robust. This may be interpreted as the U.S. importers not perceiving the Norwegian fresh and chilled salmon as superior as they are not willing to pay the premium of the AD duty. In 1989, the year prior to the preliminary duties, the U.S. was importing 15 different salmon products from Norway alone. As fresh salmon from Norway almost disappeared from the U.S. market, U.S. importers demanding particularly Norwegian salmon had 14 other product forms to choose from. Findings implying product trade diversion may mitigate the welfare loss in Norway caused by the U.S. AD order on fresh and chilled salmon.

Nevertheless, the hypothesis of product trade diversion is not supported as we were unsuccessful in finding statistically significant results. One reason might be a change in consumer preferences. Over time new processed product forms have become especially important and Norwegian exporters do not supply a wide selection of value-added salmon products. Also, the very few processed products exported from Norway are not competitive in the U.S. due to the higher production and transportation costs compared to salmon producers in Chile and Canada. In addition, Vandenbussche and Zanardi (2010) argue that AD duties on unrefined products might lead to a surge in imports of processed goods. However, the U.S. processing industry has been characterized by low capacity which implies that the U.S. market does not depend heavily on domestically processed salmon (Winther et al., 2011). This means that the imposition of the AD duty on fresh Norwegian salmon most likely does not make the U.S. consumers shift from demanding domestically processed salmon to imported value-added salmon. Even if this was the case, we already identified that the Norwegian processing industry is uncompetitive. Again, if the Norwegian processing sector was more competitive we may have been able to capture product trade diversion as an effect of the average AD duty on fresh and chilled salmon.

With regards to more technical issues, there are problems with changes in HS codes in the data set. Tampering too much with the data may increase the probability of a type I error. This means that if the data manipulation leads to significant findings that are wrong, we reject a null that is correct. We attempted solving one of the issues by merging four products into two. Nevertheless, the results did not confirm the hypothesis of product trade diversion. Furthermore, no observations of any products

are declared as missing by the USDA. It is likely that most observations of Pacific salmon products should be missing instead of zero. These data issues may possibly be one reason for why we are unable to confirm product trade diversion.

We find statistically significant evidence indicating that the average AD duty caused product trade diversion of the products Atlantic frozen salmon and fresh fillets from Norway. Arguments supporting this could stem from low transportations costs in shipping frozen salmon and a possible country-of-origin effect. Nevertheless, the findings are only statistically significant when using a log-level model and therefore cannot be regarded as robust. Asche argues that frozen salmon is an inferior good with a much lower quality compared to fresh salmon (Asche, 2012). Therefore, we cannot expect that U.S. importers previously demanding fresh salmon from Norway due to a perceived higher quality will shift to frozen salmon products. When it comes to fresh fillets, transportation costs are most likely preventing U.S. importers shifting from fresh salmon to fresh fillet from Norway as there is access to presumably cheaper Chilean fillets.

As we use a selection criterion of 1% share of U.S. imports from Norway as well as transforming the data due to HS-code problems, the findings suggest a negative effect on U.S. imports on both fresh and frozen fillets due to the average AD duty. The findings coincide with Vandenbussche and Zanardi (2010) arguing there might be a trade depressing effect on products not directly affected by the AD measures. Although we have no statistically significant coefficient for the average anti-dumping duty in our findings, the majority of the estimated parameters have negative signs. If there was a decrease in other products due to the average AD duty, this might be caused by a loss of contracts in distribution and logistics related to the exit of the policy-imposed fresh and chilled salmon. It is also possible that the non-existing shift in U.S. imports from fresh and chilled Norwegian salmon to fillets is due to quality differences and again, higher costs. Fresh salmon has also been the main salmon product exported from Norway, and other product varieties may therefore be more difficult to buy if there are fewer suppliers.

To sum up, there are conflicting findings, whereby one suggesting product trade diversion and the other suggesting trade depression of selective products due to the average AD duty. We are cautious in drawing conclusions from the findings. The first results confirm the hypothesis, but are not robust. Similarly, the results implying trade depression have an increased probability of type I error and a selection bias as the panel is reduced from 46 to 6 products and the findings are also not robust.

The total welfare effect for Norway is difficult to estimate regardless of having evidence for a product trade diversion effect of the average AD duty. The reduction in U.S. volumes of fresh and chilled

salmon from Norway cannot be directly compared to an increase in tonnes of other product types due to price differences.

Deflection

According to the simple trade model with an import tariff from chapter 2.2., the implications of a tariff for the exporting country is a negative terms-of-trade effect, a loss of considerable market share and a welfare loss. We find statistically significant evidence indicating trade destruction of Norwegian exports of fresh Atlantic salmon to the U.S. as the average anti-dumping duty increases. The size of the trade destruction effect is larger in this analysis, which is not surprising as the Norwegian trade statistics report higher export flows compared to the U.S. imports statistics. The findings of trade destruction are robust for nearly all regressions, with the exception of the period 1992-2011. AD measures are not always effective in restricting the policy-imposed country's imports, however, the U.S. AD duties appear to have been successful in excluding Norwegian exports of fresh and chilled salmon from the U.S. market. From a simple OLS we also found statistically significant findings for an increase in the average AD duty affecting the Norwegian export price to the U.S. negatively. Nevertheless, we suspect that there may be several other factors than the U.S. anti-dumping order explaining this, such as the apparent downward trend in costs over the years.

Norway's *total* exports of fresh salmon did not decrease in the years following the imposition of the U.S. AD order in 1991, which is a contradiction to the predictions of the simple trade model. Before the preliminary AD duty was imposed in 1990, Norway was exporting fresh salmon to more than 30 countries in the world. As the U.S. market disappeared in 1990 and 1991, there was a large probability of trade deflection of Norwegian exports to third countries. When analyzing the entire panel, there were no statistically significant findings for the trade deflection effect of the average AD duty. The reason for this may be due to a selection bias of including too many countries in the data set that do not have the possibility to import a large volume of salmon. An explanation could be that fresh salmon is regarded as a luxury product in many countries, partly due to high transportation costs.

When testing the robustness of the analysis, the findings suggest statistically significant trade deflection of Norwegian exports to country *k* due to the average AD duty. This occurs when using a log-level model, a selection criterion of 1% share of Norwegian exports in addition to testing two limited time periods. In the log-level model the absolute size of the trade destruction and trade deflection effect is equal. Therefore, the predicted welfare loss in Norway according to the partial equilibrium model most likely did not happen as Norwegian exporters simply deflected trade. When testing a smaller time span between 1992 and 2011, there is no statistically significant trade

deflection or trade destruction effect of the average AD duty. In contrast, the opposite is true when running the same regression for 1989 to 1993. Thus, the AD measures' changes after 1991 in the administrative reviews, new shipper reviews and sunset reviews do not seem to have an impact.

Our findings supporting deflection of Norwegian fresh salmon exports contradict research by Bown and Crowley (2010) concluding that there was no trade deflection of Chinese exports. A reason for this could be Norway's position in the global salmon industry as an established player with a solid network compared to China's recent entry to the global market. We find a particularly large trade deflection effect when applying the 1% selection criterion. From the 14 countries included in the panel, 12 were within the EU. Norway has a comparative advantage in transportation costs of fresh and chilled salmon to the EU, whereas in Asia and America, Norway is in competition with Chile. According to the statistics, two of the 14 countries had zero exported tonnes of fresh salmon in the early 1990s. Nevertheless, from the early 1990s until 2011 these countries grew to become top export destinations for Norwegian fresh salmon. The findings of trade deflection to markets not previously exported to conflict with the work by Avsar (2010). However, it seems as if the Norwegian salmon exporters majorly focused on markets where transportation costs were lower and logistics were already in place, which could be due to export and market specific sunk costs. Past export experience and knowledge of culture and culinary traditions are other possible market specific sunk costs. Another factor which could have contributed to the increased Norwegian exports to the EU is the general increase in income as well as increase in demand world-wide for convenience products and processed salmon products. As the processing sector does not exist in Norway, there may also have been an indirect increase in the demand of fresh salmon from countries in the EU producing value-added salmon products.

We take into account that our findings might be biased due to a number of factors. First, data is unavailable or difficult to measure for many relevant variables. It could for instance be interesting to include variables for consumer preferences, transportation costs and distribution systems. Second, there may also have been a selection bias when defining the panel differently. Third, in the trade statistics all observations that were missing have been transformed to zero, which most likely biased our estimated coefficient for the average AD duty downwards. Despite these issues, our findings signify that the implications of imposing an AD duty do not necessarily create a welfare loss for the exporting country due to the external trade effect of the partial equilibrium model, namely trade deflection.

8 Conclusion

The purpose of the thesis has been to examine three external trade effects of the U.S. AD measures on fresh and chilled Atlantic salmon from Norway. First, we examine whether the changes in the average AD duty have caused diversion of U.S. imports of fresh and chilled salmon from Norway to *third* countries. Second, we test whether there has been a diversion of U.S. imports to *third* salmon product varieties from Norway due to a change in the average AD duty. Finally, we look at whether changes in the average AD duty have caused deflection of Norwegian exports to *third* export markets. To investigate this, we match data on the calculated average dumping margins for Norwegian salmon exporters to U.S. salmon import data on a product-level as well as Norwegian export data on fresh salmon.

There is no evidence supporting the average AD duty's trade diversion effect on U.S. imports of fresh and chilled salmon from third countries, except for Canada and Chile. When applying a log-level model we find a product trade diversion effect on U.S. imports of Atlantic frozen salmon and fresh fillets, but the robustness of these findings is questioned. We find evidence indicating that U.S. AD measures are both destructing and deflecting Norwegian exports of fresh salmon.

The absolute size of the average AD duty's trade diversion effect on U.S. imports of fresh and chilled salmon from Chile and Canada nearly matches the trade destruction effect on U.S. imports from Norway of about 300 tonnes. Similarly, the absolute sizes of the trade deflection and trade destruction effect on Norwegian exports due to the average AD duty are identical, namely 7%. The findings on trade destruction also seem robust throughout all three analyses. The results on the diversion of U.S. imports and deflection of Norwegian exports vary substantially across countries and time periods. The estimated impact appears larger for countries with geographical proximity and lower transportation costs.

There are some limitations to our results and approach. First, due to many factors discussed throughout the thesis, the ability to export and import salmon varies substantially across countries. Therefore, a selection criterion of 1% has been applied for all analyses in the robustness check of our preferred regressions. Including too many as well as including too few countries and products may both lead to a selection bias and it may be difficult to argue what is the most appropriate sample. Second, the trade statistics from the U.S. and Norway do not separate between missing and values of zero. This has most likely biased our estimated coefficient for the average anti-dumping duty towards zero. Third, throughout the analyses we have had several problems with the data. The presence of autocorrelation, heteroskedasticity and multicollinearity has been troublesome. Also, there has been

little variation over time in the most important explanatory variable, the average anti-dumping duty. Fourth, the unavailability and inconsistency of data from the USITC has forced us to make several assumptions with regards to the calculation of the average AD duty. Fifth, we have focused on the external effects of U.S. AD duties on a single product which limits the possibility to generalize our findings. Finally, we have included several control variables and used several approaches in an attempt to capture the causality between the average AD duty and the external trade effects. However, there is still a possibility that the trade externalities would have occurred regardless of the U.S. AD order on Norwegian salmon. This could be due to the importance of transportation costs, a growing demand in markets closer to Norway and competition in the U.S. from more proximate salmon producers.

Nonetheless, our findings have implications for empirical literature on the effects of U.S. AD measures on a sector not previously examined. We hope that the work of our thesis can contribute to emphasizing the need for U.S. AD policymakers to review the effectiveness of their AD policy in the salmon industry. In addition, the evidence we provide also takes into account the subsequent reviews of exporters' dumping margins. Our findings seem to indicate that the retrospective AD system of the U.S. does not have an impact on the external trade effects examined in the thesis. Even though the subsequent reviews do not seem to have trade flow externalities, it is confirmed that there are external trade effects associated with the imposition of the initial AD duty other than predicted by the partial equilibrium model. This leads possibly to an overestimated welfare effect for the U.S. and an underestimated welfare effect for Norway in the partial equilibrium model with a tariff.

We also coined the term *product trade diversion*, a new hypothetical external effect of AD duties. We speculate that the new hypothesis can provide an additional explanation for the proliferation of repeated use of AD measures within a country. The imposition of an AD duty can lead to a surge in imports of *third* products in which the policy-imposing country's response is to impose additional AD duties on the third products. This could possibly be the case of the scope of the U.S. AD order on Norwegian fresh and chilled salmon which was changed to including salmon steaks in 2009. Nevertheless, the U.S. does not report imports of salmon steaks in a separate HS code which prevents us from examining this.[36]

[36] This product is most likely included in a HS code with a general description as we fail to find a description with salmon steaks.

An alternative approach to our analysis is counterfactual simulations of the partial equilibrium model. With this approach we can examine the average AD duty's effect on U.S. salmon producers, U.S. consumers and Norwegian salmon producers. However, the approach is less useful for our research question since external trade effects and changes in the AD duty are not taken into account in the partial equilibrium model. Another potential approach is a difference-in-difference model of the first AD duty in 1991 since the reviews of the AD duties do not seem to have external trade effects.

In our analysis we were forced to make many choices and assumptions, and it is not unlikely that the outcome of the thesis could be changed if we decided differently. One example is the selection of panel in the sample. On the one hand it can be argued that the most correct way to measure the external effects is to include all the individuals in the panel. On the other hand, there will most certainly be no external trade effects for the individuals that lack the ability to import/export. An alternative approach to our selection criterion of 1% share could be a weighted regression to try to capture the different reactions within the panel.

For future research we propose a detailed analysis on a company level. There is possibly a 'company trade diversion' effect for Norwegian companies exporting to the U.S. There might be less U.S. imports from policy-imposed companies and more from *third* companies from Norway. Third companies in this case represent companies exempt from the duty as well as companies subject to a lower AD duty. In addition, it would be interesting to examine trade deflection in detail regarding different export markets for Norway. In this way, it could be possible to separate the trade deflection effect to markets where the product already exist, where similar products exist or non-existing export destinations.

During the work of our thesis, the U.S. AD duty on Norwegian fresh and chilled salmon was removed. It will be interesting to see whether the lifting of the AD duty will lead to any changes in the U.S. market with regards to Norwegian export flows of salmon.

List of references

Adkins, L.C., and Hill, R.C. (2011). *Using Stata for Principles of econometrics.* 4th Edt. John Wiley & Sons Inc., p. 177, 196, 202-203, 233, 257,277, 472-473,.

Asche et al. (2012). FoU, innovasjon og produktivitetsvekst i havbruk. *Magma, nr.1* , 23-31.

Asche et al. (2001). *Market interactions for aquaculture products.* Centre for Fisheries Economics, Discussion paper No. 10/2001, Norwegian School of Economics, Bergen.

Asche et al. (1999, August). Product aggregation, market integration, and relationships between prices: An application to world salmon markets. *American Journal of Agricultural Economics, Vol. 81, issue 3.* , pp. 568-581.

Asche et al. (2005). *Reguleringer av markedsadgang for norsk laks til EU.* SNF report 25/2005, Bergen.

Asche, F. (2012, April 2, Innsikt inn i lakseindustrien). (M. Didriksen, & S. Stokke, Interviewers)

Asche, F. (2011b, April 5). *Bærekraft- Vellykkede kystsamfunn i et rent miljø?* Retrieved February 7, 2012, from Presentation at Hardanger Akvasenter: http://www.akvasenter.no/havbruk_i_norge/presentasjoner_havbruk_i_norge/Baerekraft%20Vellykkede%20kystsamfunn%20i%20et%20rent%20milj%C3%B8%20-%20Frank%20Asche.pdf

Asche, F. (2011a, November 22). *Hva påvirker lakseprisen? Havbrukskonferansen 2011*. Retrieved May 21, 2012, from The Aquaculture conference 2011: http://www.slideshare.net/NSEC/frank-asche-professor-vehva-pvirker-lakseprisen

Asche, F. (2010). Rammevilkår. *Norsk Fiskeoppdrett, nr.6* , pp. 10-13.

Asche, F. (2001). Testing the effect of an anti-dumping duty: The US salmon market. *Empirical Economics, Vol. 26, issue 2* , 343-355.

Asche, F., and Bjørndal T. (2011). *The Economics of Salmon Aquaculture.* Wiley-Blackwell, p. 17-31, 35, 48, 61, 83-108, 113-116, 122-123, 125-134,136-141.

Ashe, F. (1997). Trade Disputes and Productivity Gains; The Curse of Farmed Salmon Production? *Marine Resources Economics* , Vol. 12, p. 67-73.

Avsar, V. (2010). *The anatomy of trade deflection.* Florida International University, Working paper No.1004, Miami.

Avsar, V. (2011). *The Impact of Turkey's Antidumping.* mimeo; Antalya International University, Antalya.

Baldwin, R.E., and Wyplosz C. (2006). *The Economics of European Integration, ch.5.* 2nd edt., McGraw-Hill Education, Berkshire.

Baltagi, B. (2009). *Econometric Analysis of Panel Data.* Wichester: John Wiley and sons Ltd., p. 9-12.

Bergstrand, J. H. (1985, August). The Gravity Equation in International Trade: Some microeconomic foundations and empirical evidence. *The Reivew of Economics and Statistics, Vol.67, issue 3.* , pp. 474 - 481.

Bettancourt, J.L., and Anderson S. (1993). A conjoint approach to model product preference: the New England Market for fresh and frozen salmon. *Marine Resource Economics, Volume 8* , 31-49.

Bjørndal, T., and Tveterås R. (1998). *Production, competition and markets: The evolution of the salmon aquaculture industry.* Centre for Fisheries, Working paper 33/1998, Norwegian School of Economics, Bergen.

Blonigen, B. A. (2000). *Tariff-jumping antidumping duties.* NBER Working Paper series, Working paper No.7776, Cambridge.

Blonigen, B.A., and Bown C.P. (2003, August). Antidumping and Retaliation Threats. *Journal of International Economics, vol.60, issue 2* , pp. 249-273.

Blonigen, B.A., and Prusa T.J. (2003, December). The Cost of Antidumping: the Devil is in the details. *Journal of Policy Reform, Vol.6, issue 4* , pp. 233-245.

Bloningen, B.A., and Prusa, T.J. (2001). *Antidumping.* NBER working paper series, NBER Working paper No. 8398.

Bown, C.P., and Crowley, M.A. (2010). China's export growth and the China Safeguard THreats to the World Trading System. *Canadian Journal of Economics, Vol. 43, issue 4* , pp. 1353-1388.

Bown, C.P., and Crowley, M.A. (2006, July). Policy Externalities: How US Antidumping affects Japanese Exports to the EU. *European Journal of Political Economy, Vol. 22, issue 3* , pp. 696-714.

Bown, C.P., and Crowley, M.A. (2007). Trade deflection and Trade depression. *Journal of International Economics, Vol.72, issue 1* , pp. 176-201.

Bown, C.P., and McCulloch, R. (2007). U.S. Trade Policy toward China: Discrimination and its implications. I P. Petri, & S. La Croix, *Challenges to the Global Trading System: Adjustment to Globalization in the Asia-Pacific* (ss. 58-82). Brandeis University, Washington DC.

Brenton, P. (2001). Anti-dumping policies in the EU and trade diversion. *European Journal of Political Economy, Vol.17* , pp. 593-607.

Carter, C.A., and Gunning-Trant, C. (2010, February). U.S. trade remedy law and agriculture: trade diversion and investigation effects. *Canadian Journal of Economics* , ss. Vol.43, No.1, p. 97 - 126.

Dalimov, R.T. (2009, November 10). The Dynamics of Trade Creation and Trade Diversion Effects under International Economic Integration. *Current Research Journal of Economic Theory, vol.1, issue 1* , pp. 1-4.

DeRosa, D. A. (2007). *Gravity Model Analysis.* Retrieved February 13, 2012, from Peter G. Peterson institute for international economics: http://www.piie.com/publications/chapters_preview/4266/06iie4266.pdf

DeVault, J. M. (1996). The Welfare Effects of US Antidumping Duties. *Open Economies Review vol.7, issue 1* , 19-33.

DOC. (1991, February 25). *Final Determination of Sales at Less Than Fair Value: Fresh and Chilled Atlantic Salmon from Norway.* Retrieved February 14, 2012, from Federal register; 56 FR 7661: http://ia.ita.doc.gov/esel/norway/91-225.htm

DOC. (1996, December 13). *Fresh and Chilled Atlantic Salmon From Norway, Final Results of Antidumping Duty Administrative Review.* Retrieved February 14, 2012, from Federal Register, 61 FR 65522: https://www.federalregister.gov/articles/1996/12/13/96-31590/fresh-and-chilled-atlantic-salmon-from-norway-final-results-of-antidumping-duty-administrative

DOC. (1995, March 1). *Fresh and Chilled Atlantic Salmon From Norway; Amended Final Results of Antidumping Duty Administrative Review.* Retrieved February 14, 2012, from Federal Register, 60 FR 11070: https://www.federalregister.gov/articles/1995/03/01/95-5053/fresh-and-chilled-atlantic-salmon-from-norway-amended-final-results-of-antidumping-duty

DOC. (1994, March 16). *Fresh and Chilled Atlantic Salmon From Norway; Final Results of Antidumping Duty Review.* Retrieved February 14, 2012, from Federal Register,: http://www.gpo.gov/fdsys/pkg/FR-1994-03-16/html/94-6003.htm

DOC. (1997, January 10). *Fresh and Chilled Atlantic Salmon From Norway; Final Results of New Shipper Antidumping Duty Administrative Review.* Retrieved February 14, 2012, from Federal Register, 62 FR 1430: https://www.federalregister.gov/articles/1997/01/10/97-634/fresh-and-chilled-atlantic-salmon-from-norway-final-results-of-new-shipper-antidumping-duty

Dukgeun, A., and Wonkyu, S. (2011). Analysis of Anti-Dumping Use in Free Trade Agreements. *Journal of World Trade, vol.45, issue 2* , 431-456.

EC. (2010, September 10). *European Commission*. Retrieved February 9, 2012, from Trade;Chile: http://ec.europa.eu/trade/creating-opportunities/bilateral-relations/countries/chile/index_en.htm

Economywatch. (2010, June 30). *Economywatch*. Retrieved February 13, 2012, from http://www.economywatch.com/international-trade/gravity-model.html

EENI. (2012). *Chile Free Trade Agreements*. Retrieved February 9, 2012, from EENI International Business: http://en.reingex.com/Chile-FTA-Agreements.shtml

EFTA. (2011b). *About the EFTA authority*. Retrieved January 25, 2012, from EFTA Surveillance Authority: http://www.eftasurv.int/about-the-authority/the-authority-at-a-glance-/

EFTA. (2011a, November 15). *EEA Agreement.* Retrieved January 16, 2012, from EFTA: http://www.efta.int/~/media/Documents/legal-texts/eea/the-eea-agreement/Main%20Text%20of%20the%20Agreement/EEAagreement.pdf

Elliott, L. (2011, August 7). *Global Financial Crisis: five key stages 2007 - 2011*. Retrieved February 17, 2012, from The Guardian: http://www.guardian.co.uk/business/2011/aug/07/global-financial-crisis-key-stages

EU-delegasjonen. (2011, October 3). *Fiskeripolitikk*. Retrieved June 2, 2012, from Den norske EU-delegasjonen: http://www.eu-norge.org/Norges_forhold_til_EU/Politikkomrader/fiskeri1/

FAO. (2012a). *Fisheries and Aquaculture*. Retrieved from http://www.fao.org/fishery/countrysector/naso_norway/en

FAO. (2012b). *Food and Agriculture Organization of the United Nations*. Retrieved March 20, 2012, from Fishery Statistical Collections; Global Production and Trade: http://www.fao.org/fishery/statistics/global-commodities-production/en

Fattah, M. (2012). *Introduction to Empirical Methods; Multicollinearity.* Retrieved April 27, 2012, from CHSBS: http://www.chsbs.cmich.edu/fattah/courses/empirical/multicollinearity.html

Federal Register. (2012, February 6). *Electronic code of Federal Regulations, Title 19: Customs Duties*. Retrieved February 8, 2012, from National Archives and Records Administration: http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?type=simple;c=ecfr;cc=ecfr;idno=19;region=DIV1;q1=351;rgn=div5;sid=b56cef405ddb49033128096b08eb123c;view=text;node=19%3A3.0.2.4.1#19:3.0.2.4.1.2.2.21

Feenstra, R. C. (2004). *Advanced international trade; Theory and Evidence.* Princeton University Press, Princeton.

Feinberg, R.M., and Kaplan, S. (1993, February). Fishing Downstream: The Political Economy of Effective Administered Protection. *The Canadian Journal of Economics, Vol. 26, issue 1* , pp. 150-158.

FHL. (2011, January 6). *Nøkkeltall for havbruk*. Retrieved April 27, 2012, from FHL: http://www.fhl.no/sjoematfakta/noekkeltall-for-havbruk-article174-43.html

FHL. (2010, March 9th). *Årsmelding 2010.* Retrieved February 7, 2012, from Fiskeri-og havbruksnæringsens landsforening: http://www.fhl.no/getfile.php/DOKUMENTER/FHLrapport2010_endelig_web.pdf

Field, A. (2009). *Discovering Statistics Using SPSS.* 3rd edt. SAGE Publications Ltd., London.

Fiskeri- og kystedepartementet. (2000). *Om gjennomføring av råfiskloven og eksportloven i 1997 og 1998, St.meld. nr. 23 (1999-2000)*. Retrieved Februar 06, 2012, from Regjeringen.no: http://www.regjeringen.no/mobil/nb/dep/fkd/dok/regpubl/stmeld/19992000/stmeld-nr-23-1999-2000-/4/3.html?id=321977

Foreign Affairs Canada. (2011, April 11). *Canada-United States Free Trade Agreement (FTA)*. Retrieved May 02, 2012, from Foreign Affairs and International Trade Canada: http://www.international.gc.ca/trade-agreements-accords-commerciaux/agr-acc/us-eu.aspx?lang=eng&view=d

Gaasland, I. (2008). *Vekst i havbruk; En samfunsøkonomisk analyse av gevinstpotensialet.* SNF report nr. 10/08, Bergen.

Gallaway et al. (1999). Welfare Costs of US Antidumping and Countervailing Duty Laws. *Journal of International Economics, Vol. 49.* , pp. 211-244.

Gascoine, D. (2000). *Managing Globalisation for Prosperity.* Melbourne: Victorian Department of State and Regional Development.

Guillotreau, P. (1998, July). *Foreign Trade and Seafood Prices; Implications for the Common Fisheries Policy.* Retrieved April 01, 2012, from FAIR: http://www.sc-eco.univ-nantes.fr/~corrail/a_telecharger/report.pdf

Hansen, W.L., and Prusa, T.J. (1996). Cumulation and ITC Decision Making: The Sum of the Parts is Greater than the Whole. *Economic Inquiry, Vol.34* , pp. 746-69.

Hansen, W.L., and Prusa, T.J. (1997, May). The Economics and Politics of Trade Policy: An Empirical Analysis of ITC Decision Making. *Review of International Economics, Vol.5, issue 2* , pp. 230-45.

Hulbert et al. (1990 (updated), November). *Department of environmental conservation*. Retrieved February 6, 2012, from New York State: http://www.dec.ny.gov/animals/7028.html

Hwang, W. (2000, Spring). *Lecture in Methodology; Regression by Wjonae Hwang.* Retrieved April 20, 2012, from University of Tennessee, Knoxville: http://web.utk.edu/~whwang/Regression.pdf

IMF. (2011, September). *World Economic Outlook Database*. Retrieved April 19, 2012, from International Moneary Fund: http://www.imf.org/external/pubs/ft/weo/2011/02/weodata/weoselgr.aspx

Intrafish. (2003, February 6). *Ikke Straffetoll i USA for Fjord og Stolt.* Retrieved April 1, 2012, from Intrafish: http://www.intrafish.no/sok/?q=ikke+d%C3%B8mt+for+dumping+usa

Irwin, D. (2004). *The rise of U.S. antidumping actions in historical perspective.* NBER working paper series, Working paper no. 10582, Cambridge.

ITA. (2012). *Import Administration*. Retrieved Februar 06, 2012, from International Trade Administration: http://www.trade.gov/ia/

ITC. (2009). *Business Guide to Trade Remedies in Brasil - Antidumping, Countervailing, Safeguard Legislation, Practices and Procedures.* Retrieved March 14, 2012, from International trade centre (WTO and UN): http://www.google.no/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CFEQFjAA&url=http%3A%2F%2Fwww.intracen.org%2FWorkArea%2FDownloadAsset.aspx%3Fid%3D37612&ei=hnbLT72xEorP4QTakyA&usg=AFQjCNHdDgFpZjIFghyuRjZaLEkKtkO-zg&sig2=ZRPTywtSK4XOg6jevT5Y2A

Iversen et al. (2011). *Markeds-og verdikjedeanalyse nordisk marin sektor.* Nordic Marine Innovation.

Johannessen et al. (2004). *Forskningsmetode for økonomisk-administrative fag.* Oslo: Abstrakt forlag, 2.edt.

Johnsen, Å., and Melchior, A. (2011). *Forhandlingsrunden i WTO; Tollreduksjoner for norsk sjømateksport.* Norwegian Institute of International Affairs, NUPI report, Oslo.

Kelly, K.H., and Morkre, M.E. (1998). Do Unfairly Traded Imports Injure Domestic Industries. *Review of International Economics, Vol. 6, issue 2* , 321-32.

Khatibi, A. (2007). *Effects of antidumping policy on trade diversion: A theoretical approach.* mimeo; Universite Cathlique de Louvian, Brussel.

Khatibi, A. (2009). *The trade effects of european antidumping policy.* ECIPE working paper no. 07/2009.

Kinnucan et al. (2008). The effects of exchange rates on export prices of farmed salmon. *Marine Resource Economics, Vol. 23, issue 4* , pp. 439-457.

Kinnucan, H.W., and Myrland, Ø. (2006, September). The Effectiveness of Antidumping Measures: Some Evidence for Farmed Atlantic Salmon. *Journal of Agricultural Economics, Volume 57, issue 3* , pp. 459-477.

Knapp et al. (2007). *The Great Salmon Run; Competition between wild and farmed salmon, Ch.6, Ch.15.* TRAFFIC North America, Washington D.C; World Wildlife Fund.

Kocik, J.F., and Sheehan, T.F. (2006, December). *Status of Fishery Resources off the Northeastern US; Atlantic salmon*. Retrieved February 20, 2012, from NOAA: http://www.nefsc.noaa.gov/sos/spsyn/af/salmon/

Kohler, U., and Kreuter, F. (2005). *Data Analysis Using Stata.* Stata Press, p. 213-214, 218-219, Texas.

Krugman et al. (2011). *International Economics; Theory and Policy.* 9th edt., Addison-Wesley, Boston.

Larsen, I.K. (2003). *Verdiskaping ved fisketransporter.* Transportøkonomisk Institutt, TØI rapport 651/2003, Oslo.

Lerøy. (2010, October 22). *Markeder og muligheter i Europa*. Retrieved Febrary 14, 20120, from Lerøy: http://www.google.no/url?q=http://helenorge.nho.no/getfile.php/filer%2520og%2520vedlegg/Leroey(1).pptx&ei=cDvLT_uxD-qJ4gTOmIku&sa=X&oi=unauthorizedredirect&ct=targetlink&ust=1338720888254635&usg=AFQjCNEdeh_yuj1ujHIh-HfeOokTl3ZzsA

Lorentzen, T. (1997). *Effekter av EU's straffetoll på norsk oppdrettslaks.* Stiftelsen for SNF, working paper 13/1997, Bergen.

Lorentzen, T. (2006b). *Lakseavtalen mellom Norge og EU 1997-2002 - En samfunnsøkonomisk analyse.* SNF report 14/2006, Bergen.

Lorentzen, T. (2006a). *Norsk fiskerinæring - Handelsbarrierer og strategisk handelspolitikk.* SNF report 05/2006, Bergen.

Maine.gov. (2006). *Department of Marine Resources*. Retrieved February 10, 2012, from http://www.maine.gov/dmr/aquaculture/what_is_aquaculture.htm

Malhotra et.al. (2006). *Antidumping Duties in the Agriculture Sector: Trade Restricting or Trade Deflecting?* mimeo; British Columbia and Canadian Agricultural Trade Policy Research Network, Vancouver.

Malhotra, N., and Rus, H. (2009, August 27). The Effectiveness of the Canadian Antidumping Regime. *Canadian Public Policy, Vol. 35, issue 2* , pp. 187-202.

Marine Harvest. (2008, February 29). *About Marine Harvest*. Retrieved May 17, 2012, from Marine Harvest: http://www.marineharvest.com/en/about-marine-harvest/History/

Marine Harvest. (2010, Juli 16). *Salmon Farming Industry Handbook 2010.* Retrieved Februar 3, 2012, from Marine Harvest: http://www.marineharvest.com/en/investor1/Industry-Handbook-/

Medin, H. (2003). *Regionale og bilaterale handelsavtaler i Latin-Amerika; Konsekvenser for norsk eksport.* Norwegian Institute of International Affairs, NUPI Notat 652, Oslo.

MercoPress. (2010, November 5th). *Brazil surpasses US as second-largest consumer of Chilean salmon*. Retrieved March 23, 2012, from http://en.mercopress.com/2010/11/05/brazil-surpasses-us-as-second-largest-consumer-of-chilean-salmon

Ministry of fisheries and coastal affairs. (2005). *St.meld. nr.19; Marin Næringsutvikling, Markedsadgang og handelshindre.* Retrieved February 9, 2012, from regjeringen.no: http://www.regjeringen.no/nb/dep/fkd/dok/regpubl/stmeld/20042005/stmeld-nr-19-2004-2005-/8.html?id=406733

Ministry of foreign affairs. (2008, July 17). *EU repeals anti-dumping measures against Norwegian salmon.* Retrieved January 31, 2012, from Regjeringen: http://www.regjeringen.no/en/dep/ud/press/news/2008/salmon.html?id=522167

Ministry of Foreign Affairs. (2009, Mai). *Handel i finanskrisens tid*. Retrieved February 17, 2012, from Regjeringen.no: http://www.regjeringen.no/nb/dep/ud/tema/handelspolitikk/nyhetsbrev_tidligere/handel-i-finanskrisens-tid.html?id=561005

Ministry of foreign affairs. (2012). *Utenfor og innenfor, Fisk, (NOU 2012: 2)*. Retrieved February 07, 2012, from Regjeringen: http://www.regjeringen.no/nb/dep/ud/dok/nou-er/2012/nou-2012-2/22/4.html?id=669755

Ministry of trade and industry. (2012, January 25). *Partnerland*. Retrieved February 9, 2012, from http://www.regjeringen.no/nb/dep/nhd/tema/frihandelsavtaler/partner-land.html?id=438843

Miyagiwa, K., and Ohno, Y. (1995). Closing the technology gap under protection. *American Economic Review, vol. 85* , pp. 755-770.

Moore, M. O. (2006). U.S. "facts available" antidumping decisions: An empirical analysis. *European Journal of Political Economy, Vol. 22, issue 3* , pp. 639-652.

Morkre, M.E., and Kelly, K.H. (1994). *Effects of Unfair Imports on Domestic Industries: US Antidumping and Countervailing Duty Cases.* Federal Trade Commission Bureau of Economics Staff Report.

Muendler, M. (2011, October 11th). *Trade Agreements lecture notes.* UCSD, San Diego, California, USA.

NA24. (2009, January 26). *Eksplosjon i konkurser*. Retrieved February 17, 2012, from NA24: http://www.na24.no/article2516331.ece

Navaretti, G., and Venables, A.J. (2004). *Multinational firms in the world economy.* 1st edt. Princeton University Press, Princeton.

NHO. (2000, NR.4). *Faktaark Europa.* Retrieved February 09, 2012, from http://nho.nsp01cp.nhosp.no/files/6116fisk.pdf

Niels, G. (2003). *Trade Diversion and Destruction Effects of Antidumping Policy: Empirical Evidence from Mexico.* mimeo; Oxera and Erasmus University Rotterdam, Rotterdam.

Norges Sjømatråd. (2011, February 1). *Kina har iverksatt strengere inspeksjon og karantene for importert laks til Kina.* Retrieved February 9, 2012, from Norges sjømatråd: http://www.seafood.no/Markedsinformasjon/Markedsadgang/Myndighetskrav-per-land/Kina/Laks

Norges Sjømatråd. (2012, January 27). *USA fjerner straffetollen på norsk laks.* Retrieved March 14, 2012, from Seafood.no: http://seafood.no/Nyheter-og-media/Presse/Pressemeldinger/USA-fjerner-straffetollen-paa-norsk-laks

NOU. (1992). *Krisa i lakseoppdrettsnæringa.* NoU report 36/1992, Fiskeridepartementet, Oslo.

NRK. (2012, Januar 4). *Kraftig fall i lakseeksporten*. Retrieved Februar 6, 2012, from NRK: http://pda.nrk.no/m/distrikt/artikkel.jsp?art_id=17939899

NSF and ADNSA. (2011b, November 18). Exhibits of the Pre-hearing Brief of Respondents before the USITC. *Public Version* . Washington, USA: (received by e-mail from Ministry of Fisheries and Coastal Affairs).

NSF and ADNSA. (2011a, November 18). Pre-hearing Brief of Respondents before the USITC. *Public Version* . (received by e-mail from Ministry of Fisheries and Coastal Affairs), Washington.

NY Times. (2011, October 3). *The New York Times*. Retrieved February 17, 2012, from Economic crisis and market upheavals: http://topics.nytimes.com/top/reference/timestopics/subjects/c/credit_crisis/index.html

OUSTR. (2012b). *Chile Free Trade Agreement*. Retrieved February 9, 2012, from Office of the United States Trade Representative: http://www.ustr.gov/trade-agreements/free-trade-agreements/chile-fta

OUSTR. (2012a). *North American FTA*. Retrieved February 9, 2012, from Office of the United States Trade Representative: http://www.ustr.gov/trade-agreements/free-trade-agreements/north-american-free-trade-agreement-nafta

Pregej, V. N. (1999, September 17). *MFN (NTR) Policy of the U.S.* Retrieved March 6, 2012, from Institute of Agriculture and Trade Policy: http://www.iatp.org/files/Most-Favored-Nation_Normal-Trade-Relations_Pol.htm

Prusa, T. J. (2001). On the spread and impact of anti-dumping. *Canadian Journal of Economics Vol. 34, No. 3* , pp. 591-611.

Prusa, T. J. (1996). *The trade effects of U.S. antidumping actions.* NBER working paper series, Working paper no. 5440, Cambridge.

Pugel, T. (2009). *International Economics.* 14th edt. The McGraw-Hill Companies, New York.

Regjeringen. (2006). *European Communities - Anti-dumping measure on farmed salmon from Norway.* First written submission before the WTO, WT/DS337.

Regjeringen. (2000, April 2000). *Om lov om endring i lov 14. juni 1985 nr. 68 om oppdrett av fisk, skalldyr m.v.* Retrieved March 16, 2012, from Ministry of fisheries and coastal affairs: http://www.regjeringen.no/nb/dep/fkd/dok/regpubl/otprp/19992000/otprp-nr-35-1999-2000-/2.html?id=160467

Regjeringen. (2012, January 31). *US government removes penalty tariffs on Norwegian salmon.* Retrieved March 14, 2012, from Ministry of Fisheries and Coastal Affairs: http://www.regjeringen.no/en/dep/fkd/Press-Centre/Press-releases/2012/us-government-removes-penalty-tariffs-on.html?id=670619

Reuters. (2012, January 27). *Norway's salmon producers eye U.S. as tariff falls*. Retrieved February 07, 2012, from Reuters: http://www.reuters.com/article/2012/01/27/norway-salmon-idUSL5E8CR1WL20120127

Rooney, B. (2012, February 1). *Europe's debt crisis: Where things stand*. Retrieved February 17, 2012, from CNN Money: http://money.cnn.com/2012/02/01/markets/europe_debt_crisis/index.htm

Salvanes et al. (1995). *Er mere regulering svaret på utfordringene i norsk oppdrettsnæring? .* Norwegian School of Economics, SNF-report 44/95. Bergen: Norges Handelshøyskole.

Salvatore, D. (2004). *International Economics 8th ed.* John Wiley & Sons Inc, ch. 8.

Sissener, E.H., and Asche F. (2003). Sjømatmarkedet i fremtiden. In T. Bjørndal, *Økonomiske perspektiv på sjømatnæringa - SNF årbok 2003* (pp. 105-120). Fagbokforlaget, Bergen.

SSB. (2009). *Fishing and fish farming*. Retrieved Februar 06, 2012, from http://www.ssb.no/english/subjects/10/05/fiskeri_havbruk_en/

SSB. (2011). *Oversikt over geografiske forhold*. Retrieved Februar 03, 2012, from Statistisk årbok 2011: http://www.ssb.no/aarbok/kart/i.html

StataCorp. (2003, April). *Why does xtgls not report an R-squared statistic?* Retrieved April 29, 2012, from Data Analysis and Statistical Software: http://www.stata.com/support/faqs/stat/xtgls2.html

Steigum, E. (2004). *Moderne Makroøkonomi.* 1. edt., Gyldendal Norsk Forlag AS, Oslo.

Steinshamn et al. (2001). *En prinsipiell drøfting av effekter for norsk sjømateksport av reduserte handelsbarrierer.* SNF nr. 20/01, Bergen.

Store Norske Leksikon. (2012, Februar). *fiskersamvirket*. Retrieved Feburar 07, 2012, from Store Norske Leksikon: http://snl.no/fiskersamvirket

Suranovic, S. (2010, May). *International trade: theory and policy.* Retrieved January 30, 2012, from Flatworld Knowledge: http://catalog.flatworldknowledge.com/bookhub/reader/27?e=fwk-61960-ch07

Toll. (2009, September 23). *Kommende frihandelsavtaler*. Retrieved February 9, 2012, from Tolldirektoratet: http://www.toll.no/templates_TAD/Article.aspx?id=176923&epslanguage=no&parentid=75522

Tollvesenet. (2011). Nye markeder - nye muligheter. *På grensen, nr.1* .

Torres-Reyna, O. (2008). *Lecture notes; Panel Data Analysis, Fixed and Random effects (Using Stata 10.x).* Retrieved April 22, 2012, from Princeton University: http://dss.princeton.edu/training/Panel101.pdf

Turner, K. (2011, september 14). *Pacific Salmon Species*. Retrieved February 6, 2012, from Think salmon: http://www.thinksalmon.com/learn/item/pacific_salmon_species/

Tveterås, R. (2003). Konsekvenser av nye kundekrav og teknologiar for næringsstrukturen i sjømatnæringa. In T. B. (red.), *Økonomiske perspektiv på sjømatnæringa - SNF årbok 2003* (pp. 49-73). Fagbokforlaget, Bergen.

Tveterås, R., and Asche, F. (2011). *En kunnskapsbasert sjømatnæring.* mimeo; Handelshøyskolen BI, 8/2011. Oslo.

U.S. GPO. (2012). *About Federal Register*. Retrieved February 14, 2012, from GPO's Federal Digital System: http://www.gpo.gov/help/index.html#what_s_available.htm

UCLA. (2012). *STATA web books, Regressions with Stata.* Retrieved April 20, 2012, from UCLA Academic Technology Services: http://www.ats.ucla.edu/stat/stata/webbooks/reg/chapter2/statareg2.htm

UNCTAD. (2000, June). *Handbook on the scheme of The United States of America.* Retrieved March 06, 2012, from http://apps.americanbar.org/intlaw/committees/business_regulation/trade/itcdtsbmisc58_en.pdf

US govmt. (1994). *Government Printing Office*. Retrieved February 14, 2012, from GPO Federal Digital System: http://www.gpo.gov/fdsys/search/home.action

USDA. (2012a). *Economic Research Service.* Retrieved February 20, 2012, from Aquaculture data: http://www.ers.usda.gov/data/aquaculture/

USDA GATS. (2012). *USDA Foreign Agriculture Service's Global Agricultural Trade System*. Retrieved April 11, 2012, from United States Department of Agriculture: http://www.fas.usda.gov/gats/default.aspx

USDA. (2012b). *International Macroeconomic Data Set*. Retrieved April 18, 2012, from United States Department of Agriculture: http://www.ers.usda.gov/data/macroeconomics/

USITC. (2012a). *About United States International Trade Commission*. Retrieved Februar 6, 2012, from USITC: http://www.usitc.gov/press_room/gen_info.htm

USITC. (2000, February 4). *Final Results of Expedited Sunset Review: Fresh and Chilled Atlantic Salmon From Norway*. Retrieved February 14, 2012, from Federal Register, 65 FR 5584: https://www.federalregister.gov/articles/2000/02/04/00-2591/final-results-of-expedited-sunset-review-fresh-and-chilled-atlantic-salmon-from-norway#h-13

USITC. (1997, August 20). *Fresh and Chilled Atlantic Salmon From Norway, Amended Final Results of Antidumping Duty Administrative Review*. Retrieved February 14, 2012, from Federal Register, 62 FR 44255: https://www.federalregister.gov/articles/1997/08/20/97-22083/fresh-and-chilled-atlantic-salmon-from-norway-amended-final-results-of-antidumping-duty

USITC. (2011, November 14). *Fresh and Chilled Atlantic Salmon From Norway: Final Results of Full Third Sunset Review of Countervailing Duty Order*. Retrieved February 15, 2012, from Federal Register, 76 FR 70411: https://www.federalregister.gov/articles/2011/11/14/2011-29335/fresh-and-chilled-atlantic-salmon-from-norway-final-results-of-full-third-sunset-review-of

USITC. (2005, December 30). *Fresh and Chilled Atlantic Salmon From Norway: Final Results of the Full Sunset Review of Antidumping Duty Order*. Retrieved February 15, 2012, from Federal Register, 70 FR 77378: https://www.federalregister.gov/articles/2005/12/30/E5-8136/fresh-and-chilled-atlantic-salmon-from-norway-final-results-of-the-full-sunset-review-of-antidumping

USITC. (1999, April 12). *Fresh and Chilled Atlantic Salmon from Norway; Final Results of Antidumping Duty Administrative Review.* Retrieved February 14, 2012, from Federal Register; 64 FR 17616: https://www.federalregister.gov/articles/1999/04/12/99-9049/fresh-and-chilled-atlantic-salmon-from-norway-final-results-of-antidumping-duty-administrative

USITC. (2012b, March 2). *Fresh and chilled Atlantic Salmon from Norway; Revocation of Antidumping and Countervailing Duty Orders,.* Retrieved March 14, 2012, from Federal Register, 77 FR 12800: https://www.federalregister.gov/articles/2012/03/02/2012-5024/fresh-and-chilled-atlantic-salmon-from-norway-revocation-of-antidumping-and-countervailing-duty

USITC. (2006). *Fresh and Chilled Salmon from Norway; second review.* Washington D.C.: USITC.

USITC. (1989). *HTSA Archive*. Retrieved March 06, 2012, from http://www.usitc.gov/tata/hts/archive/index.htm

USITC. (2010, March 24). *Notice of Scope Rulings.* Retrieved March 28, 2012, from Federal Register, 75 FR 14138: https://www.federalregister.gov/articles/2010/03/24/2010-6525/notice-of-scope-rulings#p-9

Utenriksdepartementet. (2012). *Utenfor og innenfor; Norges avtaler med EU.* NOU 2012: 2, Utenriksdepartementet, Oslo.

Vandenbussche et al. (1999). *Import Diversion under European Policy.* NBER working paper series, Working paper no. 7340, Cambridge.

Vandenbussche, H., and Zanardi, M. (2010, January 10). The Chilling Trade Effects of Antidumping Proliferation. *European Economic Review, vol.54, issue 6* , pp. 760-777.

Viner, J. (1950). *The Customs Union Issue.* Carnegie Endowment for International Peace, New York.

VSF. (2011, June 27). *Chile: Successful negotiations on a trade agreement with Vietnam* . Retrieved February 9, 2012, from Vietnam seafood trade: http://www.vietfish.org/20110623024234694p49c90/chile-successful-negotiations-on-a-trade-agreement-with-viet-nam.htm

Winther et al. (2011). *Potensial for økt verdiskaping i lakse-og ørretoppdrettsnæringen.* SINTEF, prosjektnr. 860203, Trondheim.

WITS. (2012). *World Integrated Trade Solution; TRAINS database*. Retrieved April 20, 2012, from World Bank: http://wits.worldbank.org/WITS/

Wooldridge, J. M. (2009). *Introductory Econometrics: A modern approach.* 4th ed. South-Western, p.99, 481-500. Mason, Ohio.

WTO. (2005, May 12). *European Communities - Definitive Safeguards on Salmon*. Retrieved March 26, 2012, from Dispute Settlement: Dispute DS326: http://www.wto.org/english/tratop_e/dispu_e/cases_e/ds326_e.htm

WTO. (2011, December 16). *Ministerial Conference approves Russia's WTO membership*. Retrieved February 9, 2012, from WTO: http://www.wto.org/english/news_e/news11_e/acc_rus_16dec11_e.htm

WTO. (2012a). *Understanding the WTO; Basics; Principles of the trading system.* Retrieved February 01, 2012, from World Trade Organization: http://www.wto.org/english/thewto_e/whatis_e/tif_e/fact2_e.htm

WTO. (2012d). *Understanding the WTO; Members and Observers*. Retrieved March 20, 2012, from WTO: http://www.wto.org/english/thewto_e/whatis_e/tif_e/org6_e.htm

WTO. (2012c). *Understanding the WTO; The agreements; Anti-dumping, subsidies, safeguards: contingencies, etc.* Retrieved February 1, 2012, from World Trade Organization: http://www.wto.org/english/thewto_e/whatis_e/tif_e/agrm8_e.htm

WTO. (2012b). *Understanding the WTO; The agreements; Overview.* Retrieved February 1, 2012, from World Trade Organization: http://www.wto.org/english/thewto_e/whatis_e/tif_e/agrm1_e.htm

WTO. (1994b, April 27). *United States - Imposition of anti-dumping duties on imports of fresh and chilled atlantic salmon from Norway.* Retrieved February 15, 2012, from Report of the WTO Panel: http://www.wto.org/english/tratop_e/dispu_e/91saladp.pdf

WTO. (1994a, April 28). *United States - Imposition of countervailing duties on imports of fresh and chilled Atlantic salmon from Norway.* Retrieved February 14, 2012, from Report of the Panel: http://www.wto.org/english/tratop_e/dispu_e/91salcvd.pdf

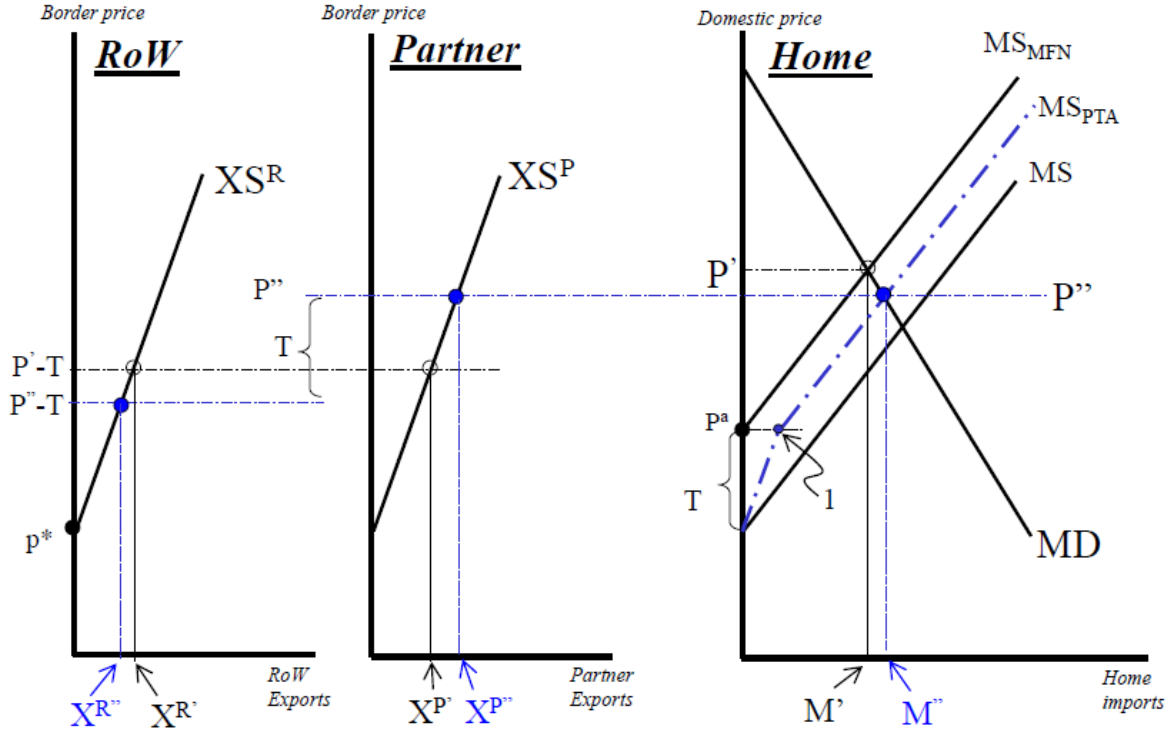
Xinhua. (2012, April 24). *US will not levy punitive duties on steel wire from China, Mexico*. Retrieved April 30, 2012, from ChinaTimes: http://www.wantchinatimes.com/news-subclass-cnt.aspx?cid=1102&MainCatID=&id=20120424000127

Yaffee, R. (2003). *A primer for Panel Data Analysis.* Retrieved April 25, 2012, from Information Technology at NYU: http://www.nyu.edu/its/pubs/connect/fall03/pdfs/yaffee_primer.pdf

Zanardi, M. (2009, April 9-10). Global Antidumping Use and Implications for Developing Countries. *Conferance* . Washington, District of Columbia, USA: http://www.gwu.edu/~iiep/assets/docs/zanardi_gwu_ad_conference.pdf.

Ørebech, P. (2011). *EØS, fisken, tollen og alternativene til EØS.* Tromsø: mimeo; Universitetet i Tromsø.

Appendix 1: figures and tables



Effects of PTA	RoW	Partner	Home
Price	↓	↑	↓
Quantity	↓	↑	↑
Welfare	↓	↑	~

Figure 1: Price and quantity effects of discriminatory tariff liberalization (The PTA diagram) (Baldwin and Wyplosz, 2006)

Table 1. World export of Atlantic and Danube salmons, fresh or chilled (FAO, 2012b)

Land Area	Trade flow	Commodity	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Americas	Export	Atlantic and Danube salmons, fresh or chilled	57	73	83	103	177	197	134	152	53	46	143	868	62	1 626	8 082	11 148	602	16 028	19 720	26 195	27 996	38 698	43 136	45 422	49 582	59 676	62 021	61 532
Asia	Export	Atlantic and Danube salmons, fresh or chilled	0 .	0 .	0 .	0 .	0 .	0 .	0 .	0 .	0 .	0 .	0 .	0 .	0 .	0 .	0 .	0 .	0 .	0 .	0 .	0 .	20 F	0 -	0 -	0 -	0 -	0 -	0 -	0 -	0 -
Europe																														
Norway	Export	Atlantic and Danube salmons, fresh or chilled	979 .	1 288 .	2 545 .	3 587 .	3 003 .	5 595 .	7 981 .	13 189 .	17 465 .	21 566 .	34 506 .	39 304 .	56 098 .	81 159 .	92 861 .	91 309 .	108 052 .	118 348 .	140 747 .	169 445 .	191 122 .	205 235 .	221 143 .	251 728 .	265 744 .	260 617 .	274 453 .	316 495 .
Europe	Export	Atlantic and Danube salmons, fresh or chilled	1 527	1 813	3 036	4 398	3 773	6 595	9 172	14 722	19 447	23 708	38 234	46 576	64 452	94 036	114 833	112 473	122 927	133 933	153 613	176 535	203 225	219 664	233 548	276 601	286 628	292 087	303 697	350 924
Grand total			1 584	1 886	3 119	4 501	3 950	6 792	9 306	14 874	19 500	23 754	38 377	47 444	64 514	95 662	122 915	123 621	123 529	149 961	173 333	202 750	231 221	258 362	276 684	322 023	336 210	351 763	365 718	412 456

2004	2005	2006	2007	2008	2009
68 084	84 268	93 753	92 913	114 573	101 782
0 0	0 -	0 -	0 -	0 -	0 -
338 544 .	379 273 .	397 922 .	492 496 .	514 773 .	568 066 .
364 866	392 524	406 579	503 282	537 328	596 460
432 950	476 792	500 332	596 195	651 901	698 242

	Price (NOK/kg)	Denmark	Italy	USA	Japan
Fresh salmon fillet	54.57	1.40 %	2.90 %	16.50 %	25.50 %
Frozen salmon fillet	64.16	1 %	2 %	2 %	2 %

Table 2. Transportation costs in percentage of export price (Larsen, I.K., 2003)

	Dependent variables		
Independent variables	(1) trade diversion	(2) product trade diversion	(3) trade deflection
AD	-8.96	-33.86	244.92
	(1.11)	(1.65)	(4.61)**
AD*Norway	-307.003		
	(11.21)**		
AD*CanadaChile	214.539		
	(2.49)*		
norwaycrisis	-1255.426		
	(3.65)**		
AD*Fresh		-309.034	
		(9.46)**	
AD*FrozenFillets		-64.334	
		(1.55)	
AD*US			-446.771
			(10.49)**
constant term	-6148.281	1.886	-2392.337
	(2.01)*	(0.02)	(3.20)**
Time fixed effects	Yes	Yes	Yes
Fixed effects	Country	Product	Country
Cost controlling trend variables	Yes	Yes	No
R-squared	0.98	0.53	0.70
Adjusted R-squared	0.98	0.48	0.69
Number in panel	55	46	100
Observations	1320	1104	2400

NOTES: * p<0.05; ** p<0.01, t-statistics in parenthesis, regressions not adjusted for autocorrelation

Table 3. Using the command 'reg' (not corrected for autocorrelation)

Appendix 2: average AD duty calculation

The majority of companies in the Norwegian salmon industry are not stock market companies which limit the data on annual reports, name changes, and mergers and acquisitions. It is important to have a consistent number of companies in our calculation as the exporters who are reviewed must have been affiliated or included in the original investigation. There are inconsistencies with regards to which companies are mentioned by name and which fall under a general category of 'all others'.

Prior to 1990

There is a NTR of 0% on fresh and chilled salmon from Norway.

0% average AD duty from 01.01.1988- 31.12.1989

Provisional duties ; 29.06.1990 and 03.10.1990

Data was available from the WTO (WTO, 1994a). Preliminary CVD of 2.45% (NOK 0.77) imposed on all companies in June and preliminary AD duty of 1.6% to 4.9% imposed on most firms in October. Due to the lack of information of number of companies in October we take the average of the two preliminary AD duties. We add the CVD to the calculated average preliminary AD duty.

5.7% average AD duty from 03.10.1990 – 24.02.1991

Original investigation; 25.02.1991

Data was not available on FDsys, number 56 FR 14920. We used data available from the DOC (DOC, 1991). Eight companies received an individual dumping margin and one dumping margin was for 'all others'. There were more than 70 companies in the investigation. By including all names in every subsequent review we have a consistent number of 89 (90 after the new shipper review). The CVD of 2.27% for all producers or exporters is added to the calculation of the average AD duty on all subsequent calculations since it is never changed.

26.069% average AD duty from 25.02.1991 – 13.07.1993

First administrative review; 14.07.1993

Data was not available on FDsys, number 58 FR 37912. We used data available from the DOC in 1995 which is amended final results (DOC, 1995). The company Skaarfish has a changed dumping margin.

25.917% average AD duty from 14.07.1993 – 15.03.1994

Second administrative review; 16.03.1994

Data was not available on FDsys, number 59 FR 12242. We used data available from the DOC (DOC, 1994). The document displays the names of 83 companies and their specific dumping margin. This presumably means that these 83 companies were under review earlier, hence we add the new

names to the previous calculations with the 'all other' dumping margin. We estimate the average of the dumping margins for the 83 companies as well as the previous companies.

30.538% average AD duty from 16.03.1994 – 12.12.1996

Third administrative review; 13.12.1996

Data is collected from the FDsys, number 61 FR 65522 (DOC, 1996).

Change in the dumping margins for Arctic Group, Fresh Marine, Greig Norwegian Salmon, Norwegian Taste Co, Victoria Seafood A/S, Norwegian Salmon, and Skaarfish. Four of these seven companies are previously not mentioned. We assume that the four companies were included in the "all others" at rate of 23.8% in previous years. Therefore we add these new names to previous calculations. We calculate the dumping margin by using the companies from earlier as well as adding the changed margins from this review.

30.841% average AD duty from 13.12.1996 – 09.01.1997

Shipper review; 10.01.1997 and amended final results 20.08.1997

Data is collected from FDsys, number 62 FR 1430 and 62 FR 44255 (DOC, 1997; USITC, 1997).The new shipper review for Nordic A/L concludes no dumping (0% duty). The companies Skaarfish and Norwegian salmon are amended in the final results of the third administrative review. We calculate the average by using all the dumping margins from previous reviews in addition to the new company and amended results.

30.471% average AD duty from 10.01.1997– 11.04.1999

Fourth administrative review; 12.04.1999

Data is collected from FDsys, number 64 FR 17616 (USITC, 1999). The company 'Nornir Group' receives the highest dumping margin of 31.81%. The company was included in the original investigation and requested a review. Therefore, the company is added to the previous calculations with the 'all others' dumping margin. To calculate the average, we assume all previous companies' dumping margins have not changed and add the change in Nornir Group.

30.56% average AD duty from 12.04.1999– 03.02.2000

First sunset review; 04.02.2000

Data is collected from FDsys, number 65 FR 5584 (USITC, 2000). The review reinstates the margins from the original investigation for the eight companies named and all other companies get 23.8%. We take the average of all these companies.

26.069% average AD duty from 04.02.2000– 29.12.2005

Second sunset review; 30.12.2005

Data is collected from FDsys, number 70 FR 77378 (USITC, 2005). The dumping margins from the original investigation are continued. This means no changes in the average AD duty.

26.069% average AD duty from 30.12.2005– 13.11.2011

Third sunset review; 14.11.2011

Data is collected from FDsys, number 76 FR 70411 (USITC, 2011). The dumping margins from the original investigation are continued. This means no changes in the average AD duty.

26.069% average AD duty from 14.11.2011– 01.03.2012

Revocation of the antidumping and countervailing duty order; 02.03.2012

Data collected from FDsys, number 77 FR 12800 (USITC, 2012b). The anti-dumping and countervailing duty orders are revoked with effective date February 13th 2011.

Based on our consideration we have created a list over the various companies and their dumping margins from the above reviews.

All companies dumping margin	*1991*	*1993*	*1994*	*1996*	*01.1997*	*08.1997*	*1999*	*2000*	*2005*	*2011*
Chr. Bjelland Seafoods A/S	19,96 %	19,96 %	31,81 %	31,81 %	31,81 %	31,81 %	31,81 %	19,96 %	19,96 %	19,96 %
Hallvard Leroy A/S	31,81 %	31,81 %	31,81 %	31,81 %	31,81 %	31,81 %	31,81 %	31,81 %	31,81 %	31,81 %
Domstein and Co.	31,81 %	31,81 %	31,81 %	31,81 %	31,81 %	31,81 %	31,81 %	31,81 %	31,81 %	31,81 %
Fremstad Group A/S	21,51 %	21,51 %	31,81 %	31,81 %	31,81 %	31,81 %	31,81 %	21,51 %	21,51 %	21,51 %
Saga A/S	26,55 %	26,55 %	26,55 %	26,55 %	26,55 %	26,55 %	26,55 %	26,55 %	26,55 %	26,55 %
Salmonor A/S	18,39 %	18,39 %	31,81 %	31,81 %	31,81 %	31,81 %	31,81 %	18,39 %	18,39 %	18,39 %
Sea Star International A/S	24,61 %	24,61 %	31,81 %	31,81 %	31,81 %	31,81 %	31,81 %	24,61 %	24,61 %	24,61 %
Skaarfish Mowi A/S	15,65 %	2,15 %	2,15 %	2,28 %	2,30 %	2,30 %	2,30 %	15,65 %	15,65 %	15,65 %
Nornir Group A/S	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	31,81 %	23,80 %	23,80 %	23,80 %
Nordic Group Inc	23,80 %	23,80 %	31,81 %	31,81 %	31,81 %	31,81 %	31,81 %	23,80 %	23,80 %	23,80 %
Nordic Group A/L					0%	0 %	0 %	23,80 %	23,80 %	23,80 %
Arctic Group	23,80 %	23,80 %	23,80 %	31,81 %	31,81 %	31,81 %	31,81 %	23,80 %	23,80 %	23,80 %
Brodrene Sirevag A/S	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %
Fresh Marine Co. Ltd	23,80 %	23,80 %	23,80 %	31,81 %	31,81 %	31,81 %	31,81 %	23,80 %	23,80 %	23,80 %
Greig Norwegian Salmon	23,80 %	23,80 %	23,80 %	31,81 %	31,81 %	31,81 %	31,81 %	23,80 %	23,80 %	23,80 %

More Seafood A/S	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %
Norwegian Taste Company A/S	23,80 %	23,80 %	23,80 %	31,81 %	31,81 %	31,81 %	31,81 %	23,80 %	23,80 %	23,80 %
Victoria Seafood A/S	23,80 %	23,80 %	23,80 %	31,81 %	31,81 %	31,81 %	31,81 %	23,80 %	23,80 %	23,80 %
West Fish Ltd. A/S	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %
Adeco A/S	23,80 %	23,80 %	31,81 %	31,81 %	31,81 %	31,81 %	31,81 %	23,80 %	23,80 %	23,80 %
Arne Lund & Sonner A/S	23,80 %	23,80 %	31,81 %	31,81 %	31,81 %	31,81 %	31,81 %	23,80 %	23,80 %	23,80 %
Aalesundfisk A/S	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %
Aqua Star A/S	23,80 %	23,80 %	31,81 %	31,81 %	31,81 %	31,81 %	31,81 %	23,80 %	23,80 %	23,80 %
Austevoll Fiskeindusti A/S	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %
Atlantic Salmon A/S	23,80 %	23,80 %	31,81 %	31,81 %	31,81 %	31,81 %	31,81 %	23,80 %	23,80 %	23,80 %
Brodrene Reme	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %
Edal Laks A/S	23,80 %	23,80 %	31,81 %	31,81 %	31,81 %	31,81 %	31,81 %	23,80 %	23,80 %	23,80 %
Edda Seafood A/S	23,80 %	23,80 %	31,81 %	31,81 %	31,81 %	31,81 %	31,81 %	23,80 %	23,80 %	23,80 %
Fjord Aqua Group A/S	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %
Flatanger Laks A.S. K.S	23,80 %	23,80 %	31,81 %	31,81 %	31,81 %	31,81 %	31,81 %	23,80 %	23,80 %	23,80 %
Fonn Rogaland A/S	23,80 %	23,80 %	31,81 %	31,81 %	31,81 %	31,81 %	31,81 %	23,80 %	23,80 %	23,80 %
Fossen Senter--Valestrand A/S	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %
Fremco Fresh Marine A/S	23,80 %	23,80 %	31,81 %	31,81 %	31,81 %	31,81 %	31,81 %	23,80 %	23,80 %	23,80 %
Frionor Norsk Frossenfisk A/S	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %
Halco Norway A/S	23,80 %	23,80 %	31,81 %	31,81 %	31,81 %	31,81 %	31,81 %	23,80 %	23,80 %	23,80 %
Handels-Huset Nord A/S	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %
Heroyfisk A/S	23,80 %	23,80 %	31,81 %	31,81 %	31,81 %	31,81 %	31,81 %	23,80 %	23,80 %	23,80 %
Iglo Aqua Group A/S	23,80 %	23,80 %	31,81 %	31,81 %	31,81 %	31,81 %	31,81 %	23,80 %	23,80 %	23,80 %
Janas A/S	23,80 %	23,80 %	31,81 %	31,81 %	31,81 %	31,81 %	31,81 %	23,80 %	23,80 %	23,80 %
Janas Rokeri A/S	23,80 %	23,80 %	31,81 %	31,81 %	31,81 %	31,81 %	31,81 %	23,80 %	23,80 %	23,80 %
J.H. Fremstad A/S	23,80 %	23,80 %	31,81 %	31,81 %	31,81 %	31,81 %	31,81 %	23,80 %	23,80 %	23,80 %
Johan J. Helland A/S	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %
Kaldfjord Handel & Fiskeforr	23,80 %	23,80 %	31,81 %	31,81 %	31,81 %	31,81 %	31,81 %	23,80 %	23,80 %	23,80 %
Karl Abrahamsens Rokeeri A/S	23,80 %	23,80 %	31,81 %	31,81 %	31,81 %	31,81 %	31,81 %	23,80 %	23,80 %	23,80 %
Karsten J. Ellingsen A/S	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %
King of Norway A/S	23,80 %	23,80 %	31,81 %	31,81 %	31,81 %	31,81 %	31,81 %	23,80 %	23,80 %	23,80 %
Konrad Sekkingstand A/S	23,80 %	23,80 %	31,81 %	31,81 %	31,81 %	31,81 %	31,81 %	23,80 %	23,80 %	23,80 %

Knut Nero Exp	23,80 %	23,80 %	31,81 %	31,81 %	31,81 %	31,81 %	31,81 %	23,80 %	23,80 %	23,80 %
Kr. Kleiven & Co. A/S	23,80 %	23,80 %	31,81 %	31,81 %	31,81 %	31,81 %	31,81 %	23,80 %	23,80 %	23,80 %
Kvalos Trading A/S	23,80 %	23,80 %	31,81 %	31,81 %	31,81 %	31,81 %	31,81 %	23,80 %	23,80 %	23,80 %
Leica Fiskeprodukter	23,80 %	23,80 %	31,81 %	31,81 %	31,81 %	31,81 %	31,81 %	23,80 %	23,80 %	23,80 %
Manger Seafood A/S	23,80 %	23,80 %	31,81 %	31,81 %	31,81 %	31,81 %	31,81 %	23,80 %	23,80 %	23,80 %
Marinor Edelfisk A/S	23,80 %	23,80 %	31,81 %	31,81 %	31,81 %	31,81 %	31,81 %	23,80 %	23,80 %	23,80 %
Marinus A/S	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %
Misundfisk A/S	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %
M. Loining & Sonner A/S	23,80 %	23,80 %	31,81 %	31,81 %	31,81 %	31,81 %	31,81 %	23,80 %	23,80 %	23,80 %
Noa Gourmet Seafood A/S	23,80 %	23,80 %	31,81 %	31,81 %	31,81 %	31,81 %	31,81 %	23,80 %	23,80 %	23,80 %
Norfood Group A/S	23,80 %	23,80 %	31,81 %	31,81 %	31,81 %	31,81 %	31,81 %	23,80 %	23,80 %	23,80 %
Norfra A/S	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %
Norsk Akvakultur A/S	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %
Nor-Star Seafood A/S	23,80 %	23,80 %	31,81 %	31,81 %	31,81 %	31,81 %	31,81 %	23,80 %	23,80 %	23,80 %
Northern Seafood A/S	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %
Norwegian Seadeli A/S	23,80 %	23,80 %	31,81 %	31,81 %	31,81 %	31,81 %	31,81 %	23,80 %	23,80 %	23,80 %
Norwegian Salmon A/S	23,80 %	23,80 %	31,81 %	18,65 %	13,88 %	13,88 %	13,88 %	23,80 %	23,80 %	23,80 %
Norwegian Seafood A/S	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %
Nova Sea A/S	23,80 %	23,80 %	31,81 %	31,81 %	31,81 %	31,81 %	31,81 %	23,80 %	23,80 %	23,80 %
Oddvin Bjorge A/S	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %
Prima Seafood	23,80 %	23,80 %	31,81 %	31,81 %	31,81 %	31,81 %	31,81 %	23,80 %	23,80 %	23,80 %
R. Domstein & Co	23,80 %	23,80 %	31,81 %	31,81 %	31,81 %	31,81 %	31,81 %	23,80 %	23,80 %	23,80 %
Reinhertsen & Co	23,80 %	23,80 %	31,81 %	31,81 %	31,81 %	31,81 %	31,81 %	23,80 %	23,80 %	23,80 %
Salmar A/S	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %
Salmonex A/S	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %
Seanor A/S	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %
Scandinavian Seafood Ltd	23,80 %	23,80 %	31,81 %	31,81 %	31,81 %	31,81 %	31,81 %	23,80 %	23,80 %	23,80 %
Scandinavian Superior Seafood	23,80 %	23,80 %	31,81 %	31,81 %	31,81 %	31,81 %	31,81 %	23,80 %	23,80 %	23,80 %
Scanfarm A/S	23,80 %	23,80 %	31,81 %	31,81 %	31,81 %	31,81 %	31,81 %	23,80 %	23,80 %	23,80 %
Sea Eagle Group A/S	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %
Smefa A/S	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %
Sotra Smoked Fish A/S	23,80 %	23,80 %	31,81 %	31,81 %	31,81 %	31,81 %	31,81 %	23,80 %	23,80 %	23,80 %

Stabburet A/S	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %
Stabburet Marine Produkter A/S	23,80 %	23,80 %	31,81 %	31,81 %	31,81 %	31,81 %	31,81 %	23,80 %	23,80 %	23,80 %
Stavanger Rokeri & Fisk A/S	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %
Sunnmorsfisk A/S	23,80 %	23,80 %	31,81 %	31,81 %	31,81 %	31,81 %	31,81 %	23,80 %	23,80 %	23,80 %
Terra Seafood A/S	23,80 %	23,80 %	31,81 %	31,81 %	31,81 %	31,81 %	31,81 %	23,80 %	23,80 %	23,80 %
Troll Salmon A/S	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %
Tromsfisk A/S	23,80 %	23,80 %	31,81 %	31,81 %	31,81 %	31,81 %	31,81 %	23,80 %	23,80 %	23,80 %
Uniprawns A/S	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %
Vikenco A/S	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %	23,80 %
Vikin A/S	23,80 %	23,80 %	31,81 %	31,81 %	31,81 %	31,81 %	31,81 %	23,80 %	23,80 %	23,80 %
Westfood A/S	23,80 %	23,80 %	31,81 %	31,81 %	31,81 %	31,81 %	31,81 %	23,80 %	23,80 %	23,80 %
TOTAL number of firms	89	89	89	89	90	90	90	90	90	90

By adding all margins for each company and dividing by the total number of firms for each review, in addition to adding the countervailing duty we get the average AD duty which is displayed in the table below.

Date of Notice	Type of investigation	Average total duties
29.06.1990	Preliminary CVD	2.45 %
03.10.1990	Preliminary CVD and ADD	5.70 %
25.02.1991	Orginal investigation	26.069 %
14.07.1993	1st Administrative review	25.917 %
16.03.1994	2nd Administrative review	30.538 %
13.12.1996	3rd Administrative review	30.841 %
10.01.1997	Shipper review	30.471 %
20.08.1997	Amended final results 3rd Adm. review	30.471 %
12.04.1999	4th Administrative review	30.560 %
04.02.2000	1st sunset review	26.069 %
30.12.2005	2nd sunset review	26.069 %
14.11.2011	3rd sunset review	26.069 %

Table 1. Administration and changes in the average AD duty