How Effectively Does the Norwegian Seafood Council Promote Norwegian Seafood Exports?

Hvor Effektivt Fremmer Norges Sjømatråd Norsk Sjømateksport?

Research Report to the Norwegian Seafood Council
Forskningsrapport til Norges Sjømatråd

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Forecasting and Business Analytics, LLC

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NORWEGIAN SEAFOOD COUNCIL

FABA

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Report to the Norwegian Seafood Council (Norges Sjømatråd) by Forecasting and Business Analytics, LLC (FABA), June 2017

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Abstract:

The primary objective of this study is to answer two key questions regarding the Norwegian Seafood Council (NSC) seafood export promotion programs over time: (1) What have been the effects of NSC promotional activities on the Norwegian seafood export volume, price, and revenue in the aggregate? (2) Have Norwegian seafood producers, exporters, and other stakeholders benefitted from the export-levy-funded export promotion programs? The results of statistically analyzing the answer to the first question then are used to answer the second question in a benefit-cost analysis of the NSC export promotion program. The study concludes that the NSC export promotion program has been highly effective in boosting the volume, value, and price of Norwegian seafood exports and in enhancing the profitability of the Norwegian seafood industry (aquaculture and fisheries).

FABA is a Limited Liability Company formed in Texas in 2001. FABA is founded on the belief that to utilize information effectively in a decision-making process, it takes real world experience, sound econometric and statistical skills, and advanced analytical ability. FABA provides a mix of theoretical horsepower and real world experience to work with firms to provide these ingredients. FABA has resources with experience across many different private sector applications, with a common goal of utilizing econometric and statistical tools to create effective forecasting processes that enable better decisions. FABA provides complete forecasting and business analytic solutions. The commonality of past and current work centers on the development of econometric/statistical models to aid in decision-making in the business community in two ways: (1) to better interpret the business, economic, business and financial landscape and (2) to generate forecasts for future activities.

EXECUTIVE SUMMARY

The Norwegian Seafood Council (NSC) has long been seen as the "example of how to organize joint marketing efforts" (FAO 2001). The NSC works cooperatively with the Norwegian seafood industry (fisheries and aquaculture) to develop export markets for Norwegian seafood. NSC promotional activities are financed through fees levied on all exports of Norwegian seafood (captured and farmed). A major strategic concern for the industry is that the exporters who pay the levy that funds NSC advertising and promotion programs operate at the front end of the Norwegian seafood supply chain while consumers are far downstream at the opposite end, often in distant countries. Thus, to enhance exports of Norwegian seafood, the NSC must conduct its advertising and promotion campaigns at the retail end of the supply chain in many foreign markets under the assumption that sufficient benefits will migrate upstream to the various stakeholders to more than cover the cost of the advertising and promotion funded by the export levy.

The primary objective of this study is to answer two key questions regarding NSC seafood export promotion programs over time: (1) What have been the effects of NSC promotional activities on Norwegian seafood export volume, price, and revenue in the aggregate? (2) Have Norwegian seafood producers, exporters, and other stakeholders benefitted from the export-levy-funded export promotion programs? The results of statistically analyzing the answer to the first question then are used to answer the second question in a benefit-cost analysis of the NSC export promotion program. The answers to similar questions relating to the promotion of seafood products exported by Norway and specific countries to which Norway promotes seafood exports will be considered in future analyses.

The first step in measuring the relationship between Norwegian seafood exports and NSC seafood export promotion was to develop an econometric (structural) model of total (aggregate) Norwegian seafood exports using monthly data for January 2003 through December 2016. Econometric analysis allows the measurement of this relationship by controlling for other factors that may affect the volume of Norwegian seafood exports and, thus, isolating the specific effect of NSC promotion programs on the aggregate of captured and farmed seafood exports. Control or explanatory variables in the modeling process include income (GDP) measures for importing countries, exchange rates relative to the NOK for those countries, the price of exported seafood products, competing prices (inflation), and other variables as appropriate. The result of this process was a measure of the change in aggregate Norwegian seafood exports in response to NSC seafood export promotion expenditures at fixed prices, controlling for the effects of all other variables.

The next step in the process was to use the results of the econometric analysis research to simulate the price and export response to the NSC export promotion expenditures. The simulation results allowed us to determine the share of total Norwegian seafood export volume, price, and value that can be confidently attributed to the export promotion efforts of the NSC over the study period.

The main conclusions of this study are that the Norwegian Seafood Council export promotion program has been highly effective in boosting the volume, value, and price of aggregate Norwegian

seafood exports and in boosting the profitability of the Norwegian seafood industry (aquaculture and fisheries). Among the major findings of this study are the following:

- *The Norwegian Seafood Council seafood export promotion program has generated between NOK 61.6 billion and NOK 69.6 billion (9.3% to 10.5%) in* **additional aggregate seafood export revenue** *(captured and farmed) over 2003 to 2016, a monthly average of between NOK 374.0 million and NOK 435.2 million in additional seafood export revenue.* Thus, between 9.3% and 10.5% of the value of Norwegian seafood exports since 2003 is directly attributable to the NSC export promotion program. In other words, Norwegian seafood industry revenues from exports would have been 9.3% to 10.3% lower if there had not been an NSC export promotion program

- *The additional export revenue generated by the Norwegian Seafood Council resulted from a combination of:*
  - ➢ *an* **addition to the aggregate seafood export price** *(captured and farmed) of between 801 NOK/tonne and 2,496 NOK/tonne (3.5% to 12%) over 2003 to 2016 and*
  - ➢ *an* **addition to the aggregate seafood export volume** *(captured and farmed) of up to 1.76 million tonnes (6.5%), a monthly average of up to 10,981 tonnes of additional aggregate seafood exports, over the same period.*

  Thus, between 3.5% and 11.8% of the price and up to 6.5% of the volume of Norwegian seafood exports are directly attributable to the NSC export promotion program since 2003. In other words, both the export price and volume would have been substantially lower (3.5% to 11.8% and up to 6.5%, respectively) if there not been an NSC promotion program.

- *The Norwegian Seafood Council seafood export promotion program has generated a* **high rate of return** *to the Norwegian seafood industry of between 13.8 NOK and 15.7 NOK in additional export revenue per NOK of promotion expenditure and between 4.2 NOK and 15.7 NOK of additional industry profit per NOK of promotion expenditure.*

- *The state-of-the-art econometric model used in the analysis explains 98% of the variation in Norwegian aggregate seafood export demand over the period of analysis and identifies the key drivers of that demand, including the following:*
  - The price of seafood exports. Norwegian seafood export demand is fairly responsive to changes in price (adjusted for inflation). A 10% increase in price results in a 9.45% decrease in export demand.
  - Consumer purchasing power in importing countries. A 10% increase in consumer purchasing power in importing countries (inflation- and exchange-rate-adjusted GDP) leads to a 4% increase in seafood export demand.
  - The trend in preference towards healthier foods in importing countries. This trend has increased seafood export demand by 13.6% between 2013 and 2016 compared to 2008 to 2012.
  - Seasonality. Seasonal changes in seafood demand and other events cause seasonal variation in Norwegian seafood exports.
  - Various events related to the world seafood industry. Specific events had a statistically significant effect on Norwegian seafood export demand, including: (1) the algae bloom in Chile in 2016; (2) the EU trout tariff (2004 – 2008); (3) the world-wide economic recession

(2008 – 2009); (4) the salmon feed quota (and after-effects) (2003 – 2007); and (5) various other events in specific months in specific years.

- NSC export promotion expenditures. The effect is not felt all at once but instead is distributed over the current month of expenditure and the following five months. A 10% change in NSC export promotion expenditures (adjusted for inflation and changes in exchanges rates in importing countries) in a given month results in a 0.13% change in export demand in that month and a cumulative impact of 1.25% over five months.

These conclusions suggest a number of considerations for NSC promotion and program management purposes.

- The Norwegian seafood industry is still underinvesting in export promotion as indicated by the relatively high BCRs for the NSC promotion program.
- A failure to maintain and enhance the growth in funding for seafood export promotion in some time periods can have serious negative impacts on stakeholder profitability over many years.
- A high estimated BCR found for the NSC export promotion program is not indicative of the magnitude of the impact of the program on export volume, value and price. Smaller programs with much smaller impacts on exports can still have high returns on investment (BCR).
- The BCRs reported in this study provide measures of the *average* return to stakeholders from seafood export promotion and not necessarily the return to each individual stakeholder.
- Finally, past experience suggests that inevitably some stakeholders will ask: "If the returns are between 4.2 and 15.7 kroner for every krone invested in the seafood export promotion program, where are my 4.2 to 15.7 kroner for every krone that I have paid in levy fees?" What is often not clear is that the benefits to them are included in the revenue line on their balance sheets. Some part of that revenue has come from the larger volume of seafood exports that the NSC export promotion program has enabled them to produce and export at a higher price. This study concludes that 9%-10% of the industry revenue stream is the result of the export promotion program by increasing the export volume by up to 6% and the export price by 3% to 12% between 2003 and 2016.

The research reported in this study was envisioned as the first step in the examination of the effectiveness of the Norwegian Seafood Council seafood export promotion program. Despite the positive results for the NSC promotion program reported in this study, many questions remain such as "Do these results hold for specific seafood products and for specific countries?" and "Is the NSC seafood export promotion program promoting the right products at the right level of expenditure and in the right countries?" Consequently, the next steps in the evaluating the effectiveness of the NSC seafood export promotion program over the next two years include the statistical examination of NSC export market development programs by selected promoted seafood products and subsequently by major import markets. These evaluations would include various metrics of effectiveness and return on investment associated with NSC investments related to these seafood products and markets.

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Governments of most countries in the world cooperate in different ways with agricultural and seafood producer organizations and other private groups to promote exports of their respective commodities. In the United States, for example, the U.S. Department of Agriculture cooperates with nonprofit U.S. agricultural trade associations, farmer cooperatives, nonprofit state-regional trade groups, and small businesses to promote exports of a broad range of agricultural and food commodities, including seafood, primarily through the Foreign Market Development (FMD) program and the Market Access Program (MAP)[1]. Similar export promotion programs operate in many other agricultural, food, and seafood exporting countries, including, for example, Chile (ProChile), India (Marine Products Export Development Authority), and Ireland (Bord Iascaigh Mhara), Ireland's Seafood Development Agency), among others.

The Norwegian Seafood Council (NSC), headquartered in Tromsø, Norway, has long been seen as the "example of how to organize joint marketing efforts" (FAO 2001). The NSC works cooperatively with the Norwegian seafood industry (fisheries and aquaculture) to develop export markets for Norwegian seafood[2]. The Norwegian seafood industry finances NSC activities through fees levied on all exports of Norwegian seafood. A major strategic concern for the Norwegian seafood industry is that the exporters who pay the levy that funds NSC advertising and promotion programs operate at the front end of the Norwegian seafood supply chain while consumers are far downstream at the opposite end, often in distant countries. Thus, to enhance exports of Norwegian seafood, the NSC must conduct its advertising and promotion campaigns at the retail end of the supply chain in many foreign markets under the assumption that sufficient benefits will migrate upstream to the various stakeholders to more than cover the cost of the advertising and promotion funded by the export levy. The vast majority of the large and growing body of literature demonstrates that, by and large, generic export promotion programs like those operated by the NSC have successfully expanded the export demand for their respective products across a broad range of commodities. What's more, the studies overwhelmingly conclude that stakeholders have earned substantial returns on their investments in those programs. A recent study concluded that the average return to exporters across a large number of producer-funded U.S. agricultural and food export promotion programs is $US 10.81 per dollar invested in export promotion with a range of $US 3.5 to $US 25.7 (Williams et al. 2016).

The primary objective of this study is to answer two key questions regarding NSC seafood export promotion programs over time: (1) What have been the effects of NSC promotional activities on aggregate Norwegian seafood export volume, price, and revenue (captured and farmed)? (2) Have

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[1] For more detail on USDA Foreign Market Development Programs, see Williams et al. (2016) and USDA (2017).
[2] In this study the term "seafood" includes both captured and farmed seafood. The term "seafood industry" includes both aquaculture and fisheries.

Norwegian seafood producers, exporters, and other stakeholders benefitted from the export-levy-funded export promotion programs? The results of statistically analyzing the answer to the first question then are used to answer the second question in a benefit-cost analysis of the NSC export promotion program. The analysis relies on monthly data from January 2003 through December 2016 and considers aggregate seafood exports. The answers to similar questions relating to the promotion of seafood products exported by Norway and specific countries to which Norway promotes seafood exports will be considered in future analyses.

This study first provides a summary of Norwegian seafood exports and the programmatic expenditures of the Norwegian Seafood Council. Then some notes on the relationship between generic export promotion and export sales are provided along with a review of pertinent literature and a comparison of the results of previous studies of Norwegian seafood export promotion. The methodology used in this study to measure the effectiveness of NSC export promotion is then outlined. A discussion of the analytical results follows. Finally, the major conclusions of the study and some considerations for NSC export promotion and program management are discussed.

NORWEGIAN SEAFOOD EXPORTS AND PROMOTION

Over the last two decades, seafood has become Norway's second largest export earner. In recent years, growth in seafood exports has been largely a response to strong demand bolstered by a weak NOK despite a lower harvest, problems with sea lice, a Russian ban on food imports from Norway, and concerns about access to Chinese markets. Farmed salmon and trout comprise about 67% of Norway's seafood exports. The fresh/chilled product share is nearly two-thirds of the total.

Norwegian Seafood Export Volume, Price, and Value

Although export volume has increased steadily over the years, the increased demand and rising seafood prices have increased seafood export revenues at a much faster pace. Between January 2003 and December 2016, the monthly volume of aggregate Norwegian seafood exports has averaged 175,867 tonnes and ranged from a low of 82,631 tonnes to a high of 327,510 tonnes. In 2016, the monthly volume of aggregate Norwegian exports averaged about 185,920 tonnes, slightly above the average over the entire period of analysis. The seasonal pattern of Norwegian seafood exports is evident in Figure 1. Aggregate export volume is highest in the months of October, November, February, and March and the lowest in the months of April, May, June, July, and August.

Since January 2003, Norway has exported seafood to nearly 190 different countries (NSC 2017). Over that period, the euro area was the largest importing region accounting for 27% of all Norwegian seafood exports. The other top ten importers over that period included (in order) Denmark (13.3%), Russia (11.3%), Poland (5.8%), Japan (5.2%), China (5.2%), Ukraine (5.0%), the UK (5.0%), Sweden (2.8%), and Nigeria (2.3%). These countries and the United States along with 10 other countries accounted for 90% of Norwegian seafood exports between 2003 and 2016 (Figure 2).

Figure 1: Monthly Volume of Norwegian Seafood Exports (tonnes), January 2003 to December 2016
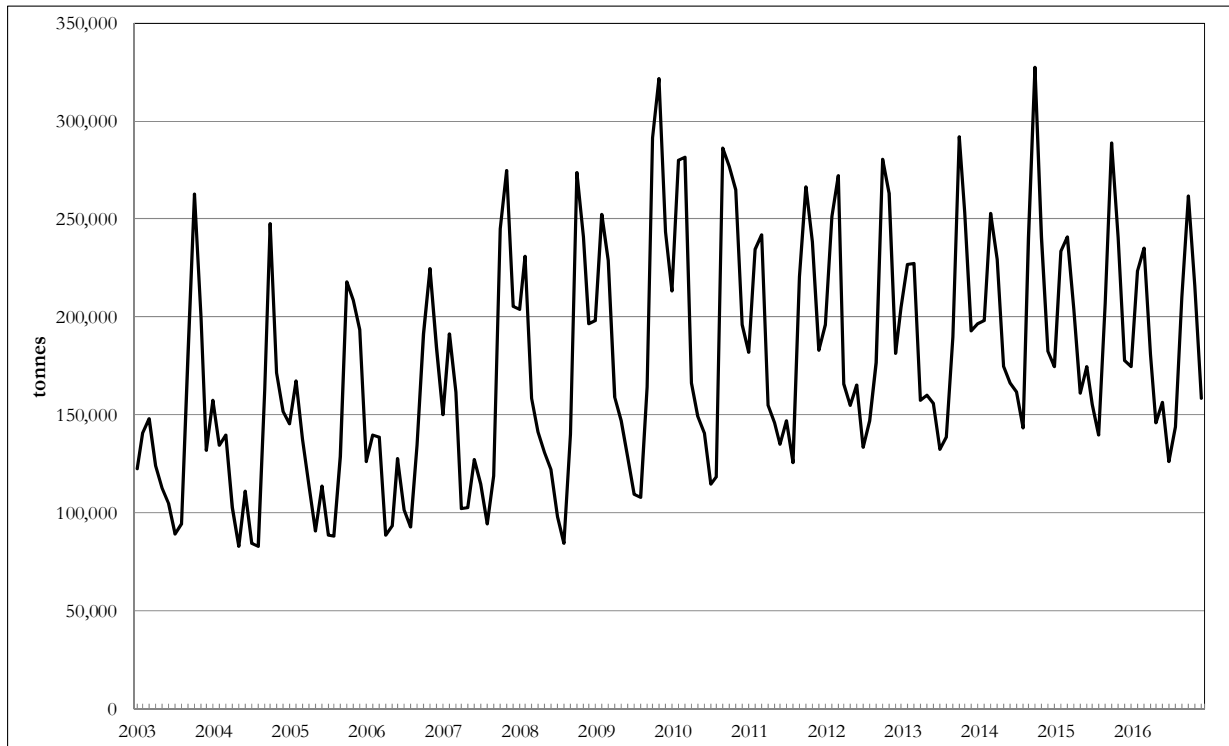
Source: Developed by authors from data provided by NSC (2017).

Figure 2: Countries Importing a Total of 90% of Norwegian Seafood Exports, January 2003 to December 2016
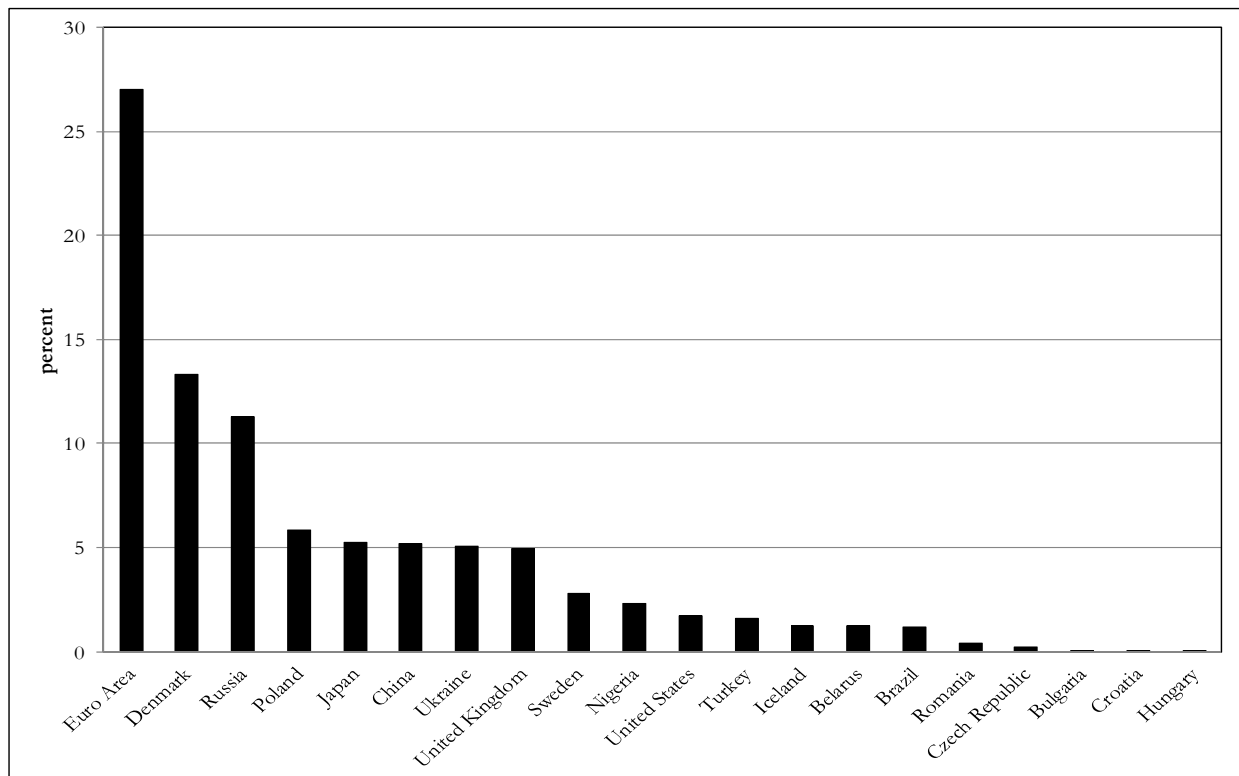
Source: Developed by authors from data provided by NSC (2017).

Over the same period of time, the monthly value of aggregate Norwegian seafood exports averaged NOK 4,027.3 million and ranged from NOK 1,530.2 million to NOK 9,063.7 million. The value of aggregate Norwegian seafood exports exhibits a persistent positive trend as well as seasonal variation (Figure 3). The nominal (unadjusted for inflation) value of aggregate Norwegian seafood exports grew almost six times from January 2003 to December 2016. In 2016, the monthly value of seafood exports averaged NOK 7,434.0 million, about 1.8 times the average over the entire period. Accounting for nearly 1% of the gross domestic product (GDP) of Norway, seafood exports are clearly a key component of the overall Norwegian economy.

The monthly aggregate price of those exports averaged 23.31 NOK/kg and varied widely from 12.62 NOK/kg to 52.42 NOK/kg over the period of January 2003 to December 2016. The price of aggregate Norwegian seafood exports also exhibits a noticeable positive trend as well as seasonal variation like the export value (Figure 4). The nominal (unadjusted for inflation) price of aggregate Norwegian exports grew more than four times from January 2003 to December 2016. In 2016, the nominal price of aggregate Norwegian seafood exports averaged 41.20 NOK/kg, almost twice the average price over the period of January 2003 to December 2016.

Norwegian Seafood Export Promotion

Norwegian seafood producers and exporters (stakeholders) jointly promote exports of their products through the Norwegian Seafood Council (NSC) whose stated mission is to "win the world for Norwegian seafood" (Martinussen 2012). In operational terms, that mission translates into a simple goal of increasing the value of Norwegian seafood resources. Headquartered in Tromsø, Norway, NSC has offices around the world serving key markets, including Stockholm, London, Hamburg, Paris, Madrid, Lisbon, Milan, Rio de Janeiro, Tokyo, Singapore, Shanghai, and Boston. The Norwegian Seafood Council was established in 1991 and operates under the authority of the Ministry of Trade, Industry and Fisheries. The Minister appoints seven members to the NSC board of directors for 2-year terms. Three additional members of the board are elected to serve by employees of the NSC itself. While the NSC has other responsibilities such as acting as the approval authority for Norwegian seafood exporters and advising the Ministry of Trade, Industry and Fisheries in affairs concerning seafood exports and trade, the primary responsibility of NSC is to represent Norwegian seafood producers and exporters in promoting sales of Norwegian seafood. To that end, the NSC carries out three categories of activities: (1) increasing the demand for Norwegian Seafood through activities intended to raise consumer awareness of and preference for Norwegian seafood; (2) providing exporters access to data, information, and analysis of market opportunities for strategic decision-making; and (3) protecting the reputation of Norwegian seafood through proactive market risk management. In carrying out these activities, the NSC works closely with the seafood industry to identify and develop markets for Norwegian seafood products.

The promotional activities of the NSC are financed by a levy of from 0.30% to 0.75% on the value of Norwegian seafood exports. The export levies are delineated by species, including salmon, trout, whitefish, cured whitefish, pelagics, and shellfish (Table 1). The levy for salmon and trout was reduced from 0.75% to 0.60% in 2016 and then to 0.30% in 2017. The levy for whitefish and

Figure 3: Monthly Value of Norwegian Seafood Exports (million NOK), January 2003 to December 2016
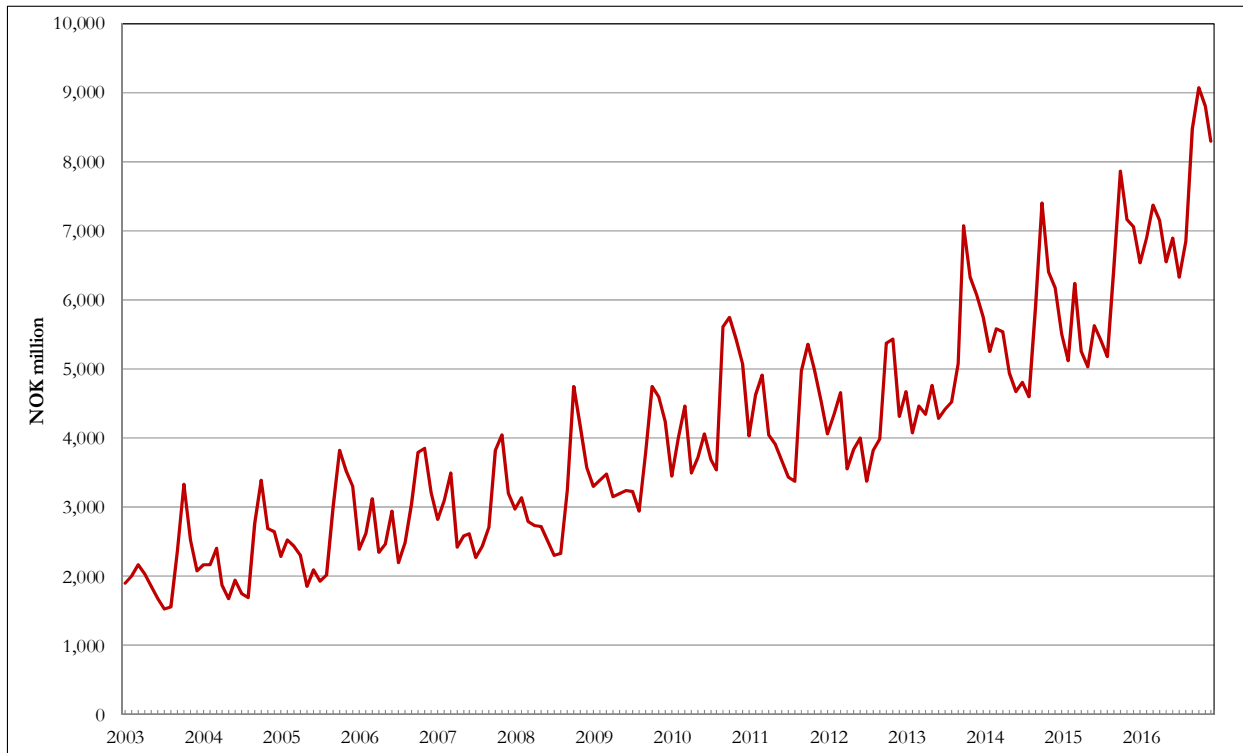
Source: Developed by authors from data provided by NSC (2017).

Figure 4: Monthly Price of Norwegian Seafood Exports (NOK/kg), January 2003 to December 2016
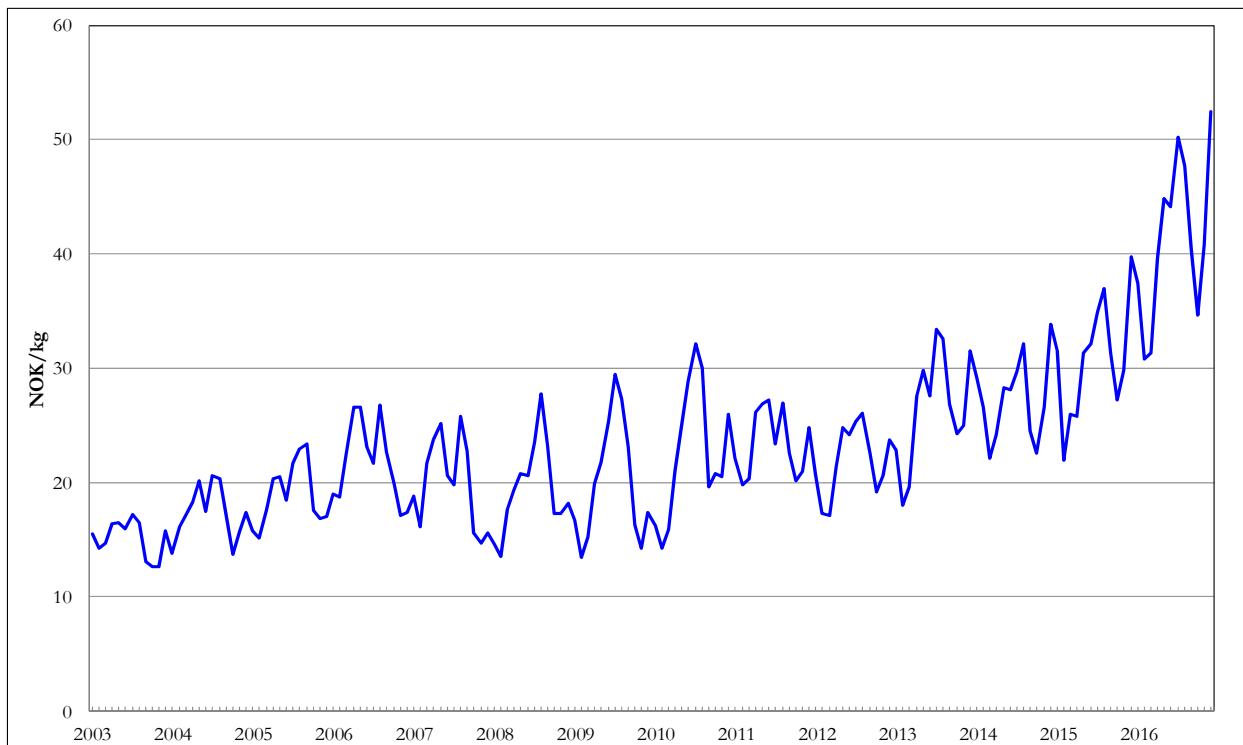
Source: Developed by authors from data provided by NSC (2017).

Table 1: Marketing Levies on Norwegian Seafood Exports, 2003-2017

	Fish Species					
				Cured		
Year	Salmon	Trout	Whitefish	Whitefish	Pelagic	Shellfish
	-- % --					
2003	0.75	0.75	0.30	0.75	0.30	0.30
2004	0.75	0.75	0.30	0.75	0.30	0.30
2005	0.75	0.75	0.30	0.75	0.30	0.30
2006	0.75	0.75	0.30	0.75	0.30	0.30
2007	0.75	0.75	0.30	0.75	0.30	0.30
2008	0.75	0.75	0.30	0.75	0.30	0.30
2009	0.75	0.75	0.30	0.75	0.30	0.30
2010	0.75	0.75	0.50	0.75	0.50	0.50
2011	0.75	0.75	0.75	0.75	0.75	0.75
2012	0.75	0.75	0.75	0.75	0.75	0.75
2013	0.75	0.75	0.75	0.75	0.75	0.75
2014	0.75	0.75	0.75	0.75	0.75	0.75
2015	0.75	0.75	0.75	0.75	0.75	0.75
2016	0.60	0.60	0.75	0.75	0.60	0.75
2017	0.30	0.30	0.75	0.75	0.30	0.75

Source: NSC (2017)

shellfish increased from 0.30% in 2003 to 2009 to 0.50% in 2010 and then to 0.75% since 2011. The levy for pelagics rose from 0.30% in 2003 to 2009 and to 0.50% in 2010 and to 0.75% a year later. In 2016, the levy on pelagic exports was reduced to 0.60% in 2016 and again to 0.30% in 2017. The levy for cured whitefish remained at 0.75% over the entire period 2003 to 2017.

On an annual basis, NSC promotional expenditures[3] on seafood exports declined by 38% from NOK 241.9 million to NOK 146.8 million between 2003 and 2004 and then began a steady increase to NOK 428.7 million in 2013, a nearly 200% increase over 10 years (Figure 5). Annual expenditures have shown little trend since then, ranging between about NOK 430 million to NOK 445 million through 2016 (Figure 5). Monthly expenditures on seafood export promotion have been as variable over time as export revenue (Figure 6). Averaging NOK 24.8 million over the period of January 2003 through December 2016, monthly seafood export promotion expenditures have varied widely from a low of NOK 3.5 million in April 2003 to a high of NOK 74.0 million in December of 2015. The strong growth in promotion expenditures is evident in the monthly data (Figure 6). The average monthly expenditures in 2016 was NOK 37.0 million, about 1.5 times the average over the 14-year

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[3] In the analysis, we consider all operational expenses made by the NSC over the period 2003 to 2016. When the expenses of administrative offices abroad are subtracted from the total, the difference between the two series is almost negligible. In fact, the correlation of all operational expenses and that total minus the cost of administrative offices abroad is 0.9968. Hence, references in this report to NSC promotional expenditures refer to all operational expenses.

Figure 5: Annual Promotion Expenditures of the Norwegian Seafood Council, 2003-2016
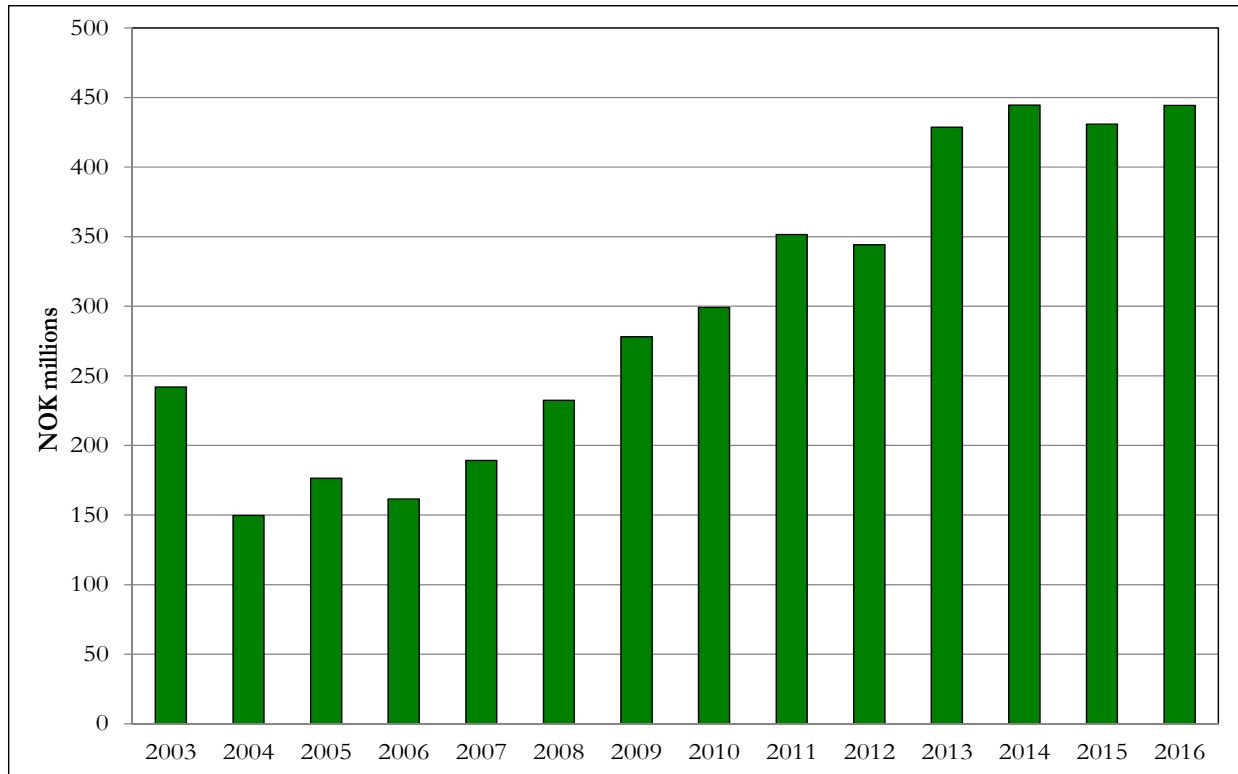
Source: Developed by authors from data provided by NSC (2017).

Figure 6: Monthly Promotion Expenditures of the Norwegian Seafood Council, January 2003 to December 2016
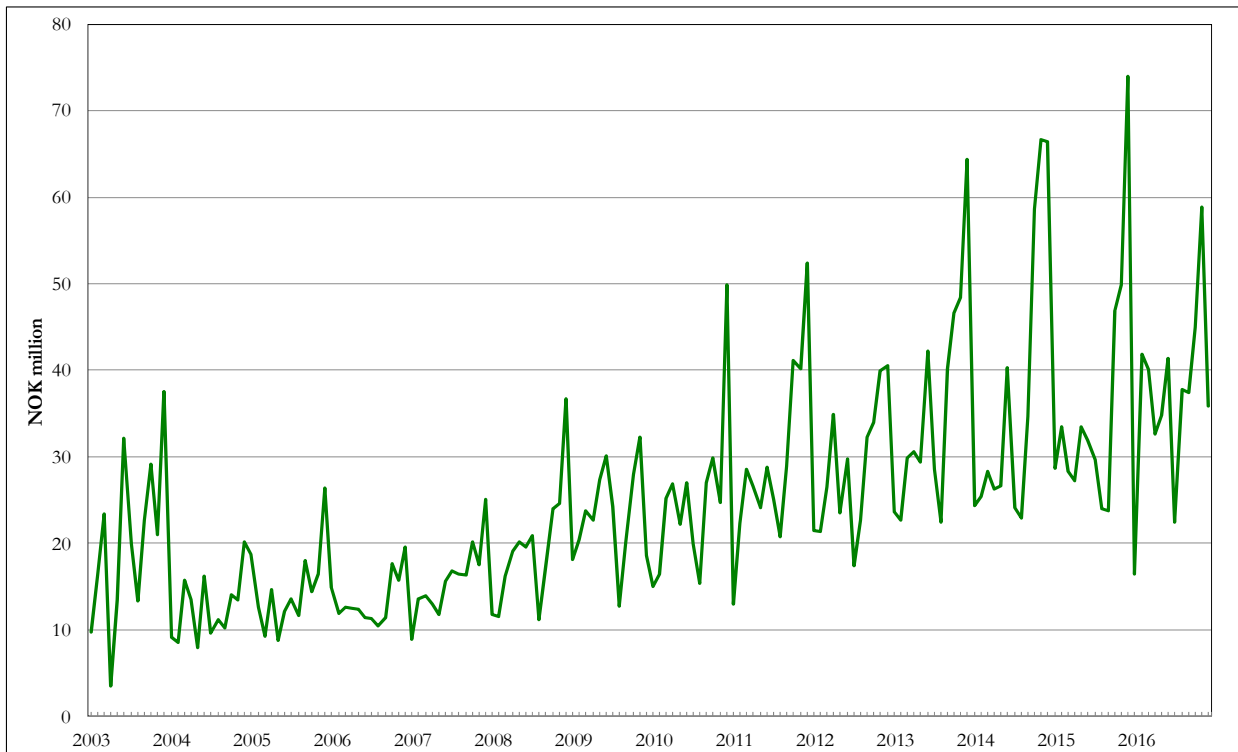
Source: Developed by authors from data provided by NSC (2017).

period from 2003 to 2016. Overall, from January 2003 to December 2016, the NOK 4.17 billion has been invested in the promotion of Norwegian seafood exports.

NOK export promotion expenditures exhibit a strong seasonal pattern (Figure 6). Expenditures have been the highest in the months of December, October, and November and lowest in the months of January, February, and April. Importantly, this seasonal pattern in promotional expenditures does not match the seasonal pattern in the volume of aggregate Norwegian seafood exports. As evident in Figure 6, the variability of monthly expenditures has increased markedly in recent years perhaps in efforts to better target seasonal demand.

Despite the strong upward trend in the nominal NOK value of NSC promotion expenditures since 2003, price inflation in major foreign markets for Norwegian seafood and a general depreciation in the value of the NOK against the currencies in those countries, particularly since 2012, have eroded the real purchasing power of those expenditures in the markets where NSC conducts promotional activities. While annual nominal expenditures have nearly tripled since the low point of 2004 as indicated earlier, the real purchasing power of those expenditures[4] has only doubled (Figure 7). In other words, each NOK was able to purchase increasingly less in terms of promotional activities in foreign countries in every year since 2003 because of inflation in foreign countries and weakness of the NOK against foreign currencies. In essence, foreign currency changes and inflation in foreign markets have substantially eroded the NSC promotion budget by about by NOK 63.4 million (20.1%) on average between 2003 and 2016 (Figure 7). In 2015 and 2016, the erosion in the purchasing power of the NSC promotional budget reached about NOK 152 million (35%) as a result of inflation and a continuing weakness in the NOK.

When the real expenditure series is also seasonally adjusted, the extent of the wide swings in monthly promotion expenditures is diminished (Figure 8). Adjusting for seasonality is the conventional practice in econometric analysis of export demand to account for seasonality to better isolate the effects of programmatic impacts of the expenditures on exports. Even so, the movement of the nominal and real NSC promotion expenditures series is very similar (correlation of 0.96).

Even though the Norwegian seafood industry invested nearly NOK 4.2 billion in promoting exports of their seafood products between January 2003 and December 2016, those expenditures have actually been quite meager when compared to actual value of Norwegian seafood exports. Over that period, the promotion intensity (defined as the ratio of the total investment in Norwegian seafood export promotion divided by the value of seafood exports) amounted to between 0.25% and 1.81% with an average of only 0.61% (Figure 9). This low promotion intensity is actually common across export promotion programs (Kinnucan and Cai 2011). However, the low promotion intensity means

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[4] To calculate the real purchasing power of NSC expenditures, we divided nominal expenditures by a trade-weighted Consumer Price Index (base 2003) for the top ten countries that have imported Norwegian seafood over 2003-2016 to account for inflation. The deflated expenditures series was then adjusted for changes in the value of the NOK over the same period using a trade-weighted exchange rate index (base 2003) also created by the FABA team for the same top ten countries that have imported seafood from Norway between 2003 and 2010. See the methodology section for more information on how a deflated and exchange-rate-adjusted expenditure variable was used in the econometric analysis.

Figure 7: Annual Nominal vs. Real, Exchange-Rate-Adjusted NSC Export Promotion Expenditures and the Implied Reduction in the NSC Promotion Budget, 2003-2016
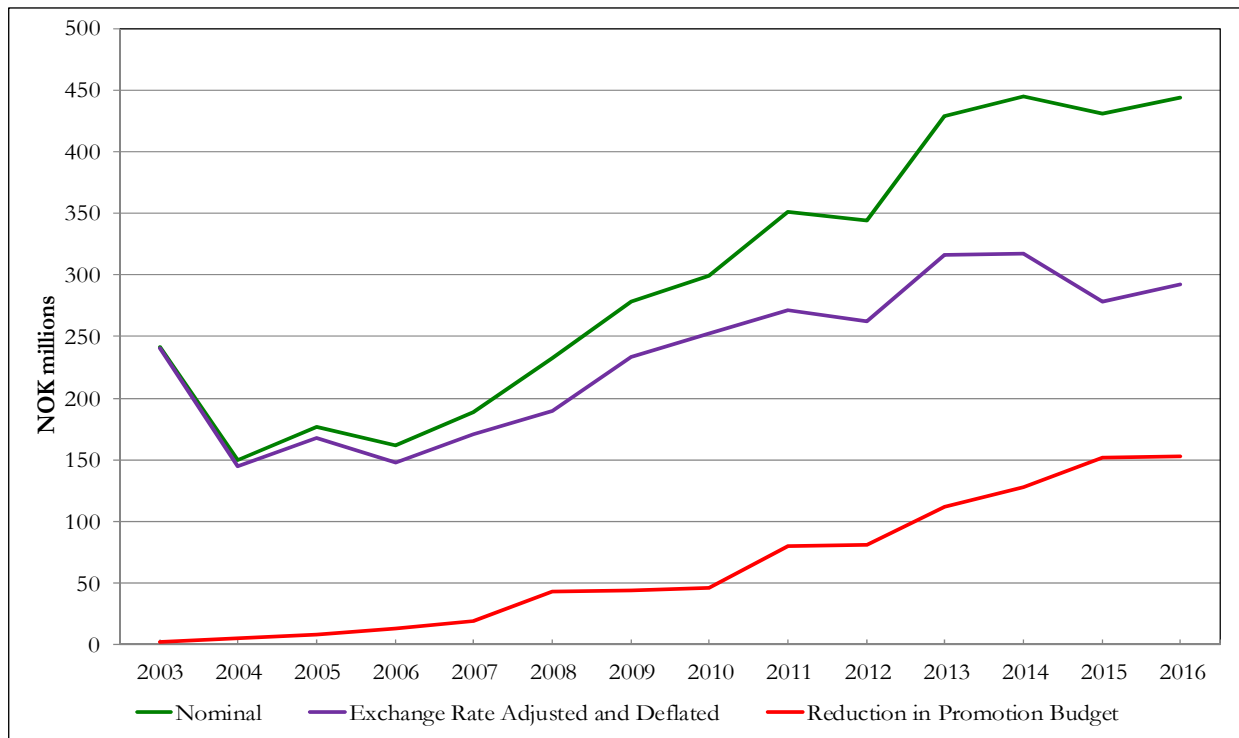
Source: Developed by authors from data provided by NSC (2017) and data from IMF (2017).

Figure 8: Monthly Nominal vs Seasonally-Adjusted Real, Exchange-Rate-Adjusted NSC Promotion Expenditures, January 2003 to December 2016
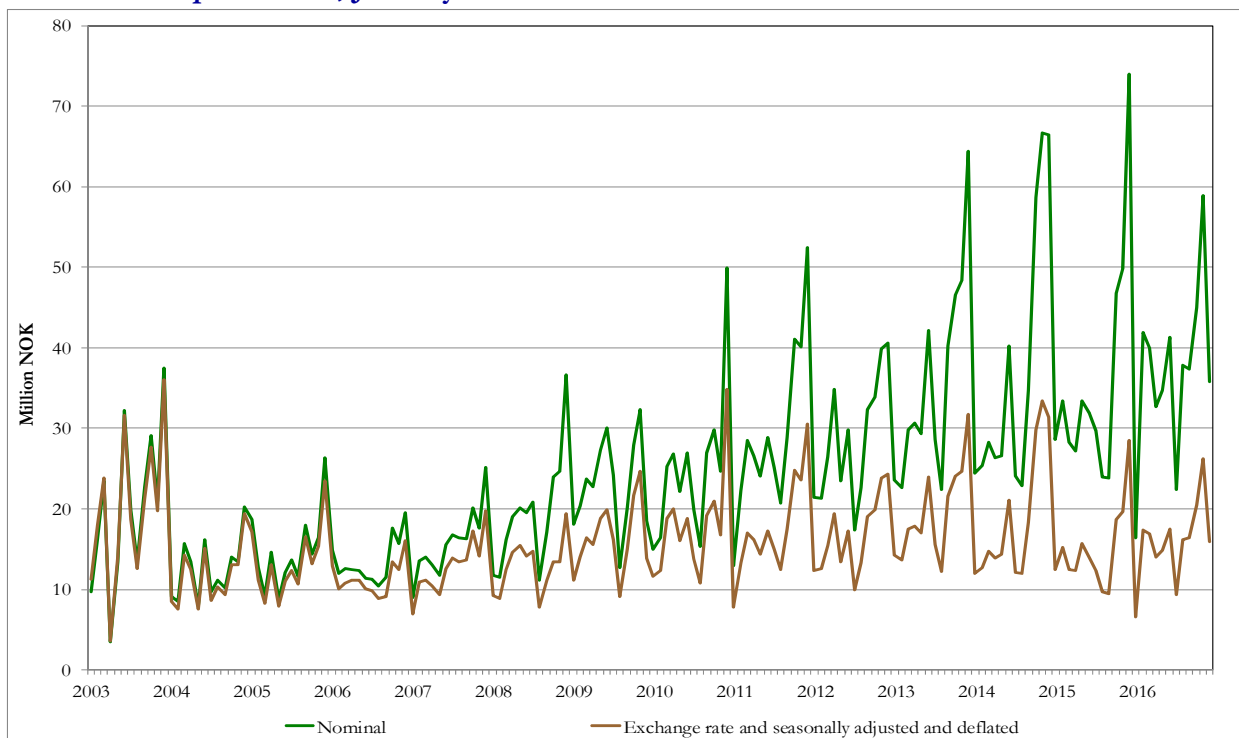
Source: Developed by authors from data provided by NSC (2017).

Figure 9: Promotion Intensity of NSC Expenditures, January 2003 to December 2016
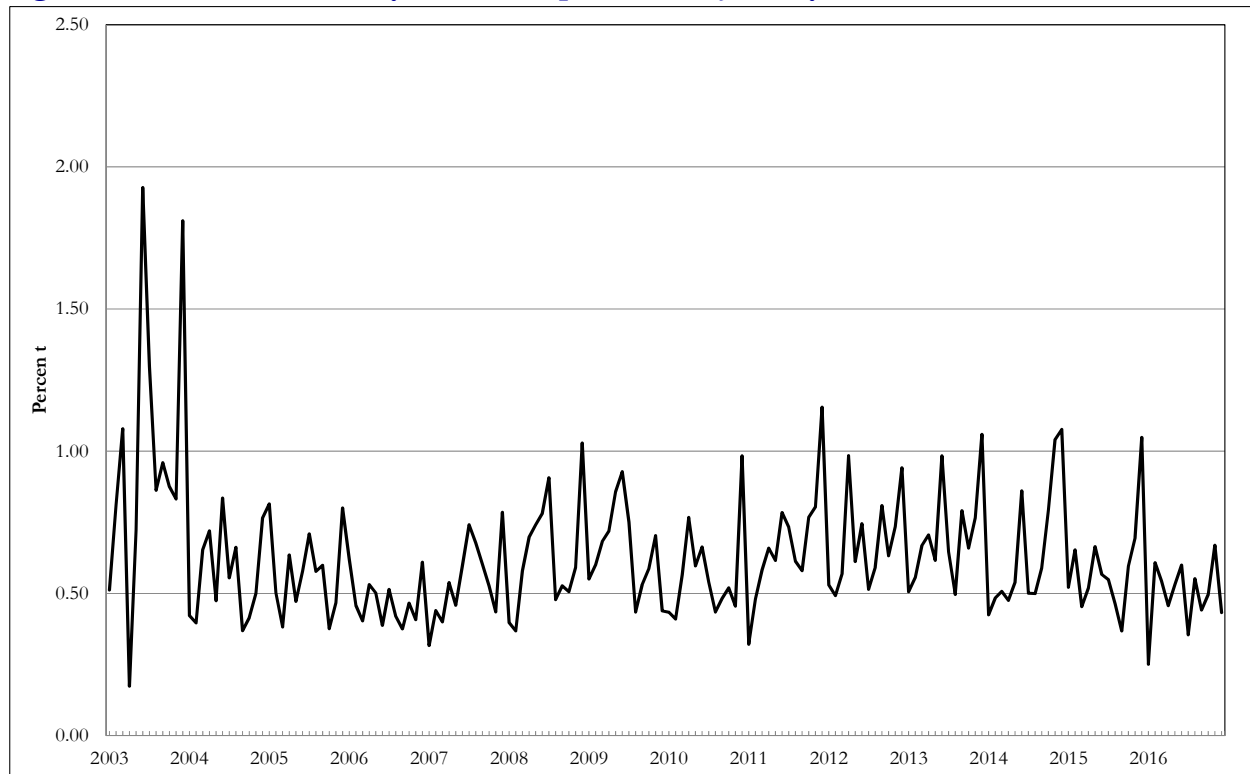
Source: Developed by authors from data provided by NSC (2017).

that the NSC seafood export promotion program could hardly be expected to have a *large* absolute impact on Norwegian seafood exports, price, and value even if the impact could be said to be statistically significant.

THE EXPECTED EFFECTS OF EXPORT PROMOTION ON EXPORT DEMAND

The primary objective of any generic promotion program (domestic or export) is to enhance the demand for the associated commodity and, therefore, foster the growth and profitability of the associated commodity industry. Ultimately, however, the individual producers, exporters, or others (referred to in this study as stakeholders) contributing to the program expect that the funds will be spent in such a way that they are individually better off than they would have been without the promotion program. What can reasonably be expected of an export promotion program in terms of the market effects and the returns to stakeholders?

The Expected Effects of Export Demand Promotion

The objective of export demand promotion is to shift out the foreign demand for exported goods, in this case Norwegian seafood, and, thereby, increase the export price on a higher volume of export sales over time. Indeed, export promotion programs that successfully move out the foreign demand curve also raise price. In raising the price, however, they also stimulate a greater level of production over time than otherwise would have occurred which in turn moderates the extent of the price increase.

Figure 10: Export Demand Promotion: Market and Producer Welfare Effects
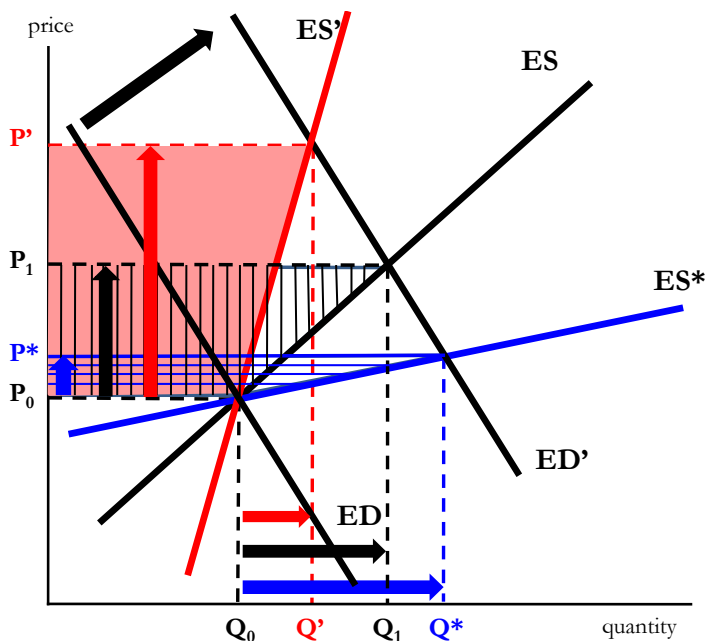
The importance of supply response to any price increase generated by promotion was first discussed in a now classic article by Nerlove and Waugh (1961). Subsequent researchers have concluded that when there are no supply controls, the supply response to promotion can effectively prevent a long-term rise in producer price or even completely offset the effects of promotion programs (for example, Carman and Green 1993; Kinnucan, Nelson, and Xiao 1995; Williams, Capps, and Lee 2014). On the other hand, supply controls can help insure that a supply increase will not erode any price increase, and therefore, profit, resulting from a commodity promotion program.

The supply response issue is illustrated in Figure 10. Assume, for example, that the promotion of Norwegian seafood exports shifts out the demand for those exports in a given year from ED to ED' as depicted in Figure 10. Given the export supply of Norwegian seafood ES*, the demand shift would tend to raise the export price for Norwegian seafood from P_0 to P*. In this case, the export supply is so responsive to price changes (i.e., price elastic) that most of the adjustment to a successful promotion program is manifest as an increase in export volume (Q_0 to Q*) rather than an increase in export price. Even though the export price increase from the promotion-induced export demand shift is moderated by the vigorous export supply response in this case, export sales revenue increases by a greater percentage than the export price increases over time because the export quantity sold at the somewhat higher export price also increases.

Although the total cost of exporting also increases with the higher exports, the increase in export revenue given a demand shift is greater than the export cost increase so that the net effect on producer profits is positive, represented by the small blue-lined area in Figure 10. Thus, while it could appear to individual stakeholders that the export promotion program was not highly successful because the export price did not increase much or as much as expected over time, in fact the program is quite successful in boosting stakeholder revenues and even profits.

A much less price-responsive export supply (such as ES' in Figure 10), however, would result in a higher export price increase (P_0 to P') relative to the increase in export sales (Q_0 to Q') as a result of the same export demand increase (ED to ED') and, thus, a larger positive effect on the profit from seafood exports (represented by the light red area in Figure 10). Thus, the extent of the increase in the profitability of a promotion-induced increase in export demand depends on the responsiveness

of export supply to changes in the export price over time (i.e., the long-run price elasticity of Norwegian seafood export supply).

The stronger the competition from competing foreign suppliers of seafood, the more likely the long-run export supply curve will look like ES* (price elastic) rather than ES' (price inelastic) in Figure 10. The more controlled or restricted exports are, however, the more the export supply curve will look like ES'. In the case of Norwegian seafood exports, the history of controls on exports of salmon and other seafood products makes it likely that the export supply curve (even in the long run) may resemble the inelastic export supply curve ES' in Figure 10.

Thus, the returns to stakeholders from the NSC export promotion program depends on several critical factors: (1) the price responsiveness of consumers in countries where promotion occurs, (2) the price responsiveness of Norwegian seafood producers, and (3) the magnitude of the rightward shift in export for Norwegian seafood attributable to the programmatic activities of the NSC. In other words, the key issue in the analysis of the returns to stakeholders from the NSC export promotion program is whether or not and by how much the demand for and price of Norwegian seafood exports have increased over time as result of the export-levy-financed promotion activities.

The Response of Export Demand to Promotion

In addition to the complications of supply response in measuring the export effects of promotion, the linkage between stakeholder investment in export demand promotion and the anticipated export effects is further complicated by a number of well-documented characteristics of the response of sales to advertising and promotion programs, including: (1) the magnitude of the sales response to promotion, (2) the minimum promotion threshold, (3) the delay effects of promotion, (4) the lagged or carryover effects of promotion, (5) the decay of promotion effects, and (6) advertising and promotion wearout.

Research has shown that the *response of sales to advertising* is normally positive and statistically significant but fairly small in magnitude or elasticity (Ward 2006). Also, research has demonstrated that some *minimum level of promotion expenditures* and messages are normally required for the expenditures to begin having any effect (Adachi and Liu 2010). Below that level, promotion expenditures may be simply unable to generate sufficient recall or awareness to motivate consumers.

Even if investments in promotion activities well above the minimum threshold level are made, there may be a *delay effect of promotion*. That is, there is likely a delay between the time that the promotion investment is made and the resulting impact on sales occurs.

Promotion expenditures also tend to have *lagged or carryover effects*. Expenditures in a given period often do not have their full impact within that period but continue to impact sales over an extended period of time. Generic promotion activities, like those of the Norwegian Seafood Council, are generally directed toward longer-term responses and, therefore, have often been found to generate sometimes lengthy lagged or carryover effects (Forker and Ward 1993).

Promotion activities also often display *decay effects* over time. That is, despite persisting over time to some extent, the effects of a promotion activity will not last forever and eventually begin to fade at some point.

Figure 11 illustrates a typical pattern of promotion effects on sales. Following the initial treatment (expenditure) at point A, there is usually some delay before the expenditures begin having an effect on sales at point B, assuming that the promotion expenditures are above some threshold level. The maximum impact of the initial treatment in Figure 11 is eventually reached after which there is some decay in the sales effects. The decay from the initial treatment can be avoided and aggregate sales boosted if additional expenditures are made before the decay begins (point B).

Continued promotion treatments (expenditures) (points C and D) can maintain the aggregate level of sales achieved with the first two treatments (dark black line in Figure 11). Higher and higher expenditures, however, can push sales to higher levels while a drop off in the level of promotion expenditures results in a decay of the sales effects. If promotion activities are ended altogether, the level of sales will taper off toward the pre-promotion program level over time. Research suggests, however, that because promotion programs may achieve some permanent change in user behavior, sales will not drop all the way back to pre-program levels after a promotion campaign. Forker and Ward (1993) note that without the decay phenomenon, there would be no reason for continued expenditures on promotion activities after the initial effort.

Moreover *advertising wearout* is also possible. Even though the continual exposure of an advertising or promotion message to consumers can help stem the decay effects of promotion expenditures, after long periods of exposure to a particular message, additional promotion expenditures on that message normally have decreasing impacts on sales. This phenomenon is consistent with the law of diminishing marginal returns in economics. For example, the effectiveness of the promotion of a specific fish species in a country unfamiliar with that species and the associated preparation and recipe requirements will likely erode over time as that species becomes adopted into standard diets in the country of promotion.

Previous Studies on Export Demand Promotion

U.S. producer-financed agricultural commodity promotion programs, known as checkoff programs, have been the focus of much of the previous research on the effectiveness of export demand promotion. With cost-sharing through the U.S. Department of Agriculture's (USDA) Foreign Market Development Program (FMD) and Market Access Program (MAP), many U.S. agricultural producer groups allocate a least some portion of the funds assessed on sales of their commodities (the so-called checkoff assessment) to promote the foreign demand for their respective commodities. Over 70% of the funding for export market promotion through the USDA FMD and MAP programs (known collectively as the USDA Export Market Development Programs) comes from producer assessments with the remainder funded by USDA.

Figure 11: Delay, Carryover, and Decay Effects of Export Demand Promotion
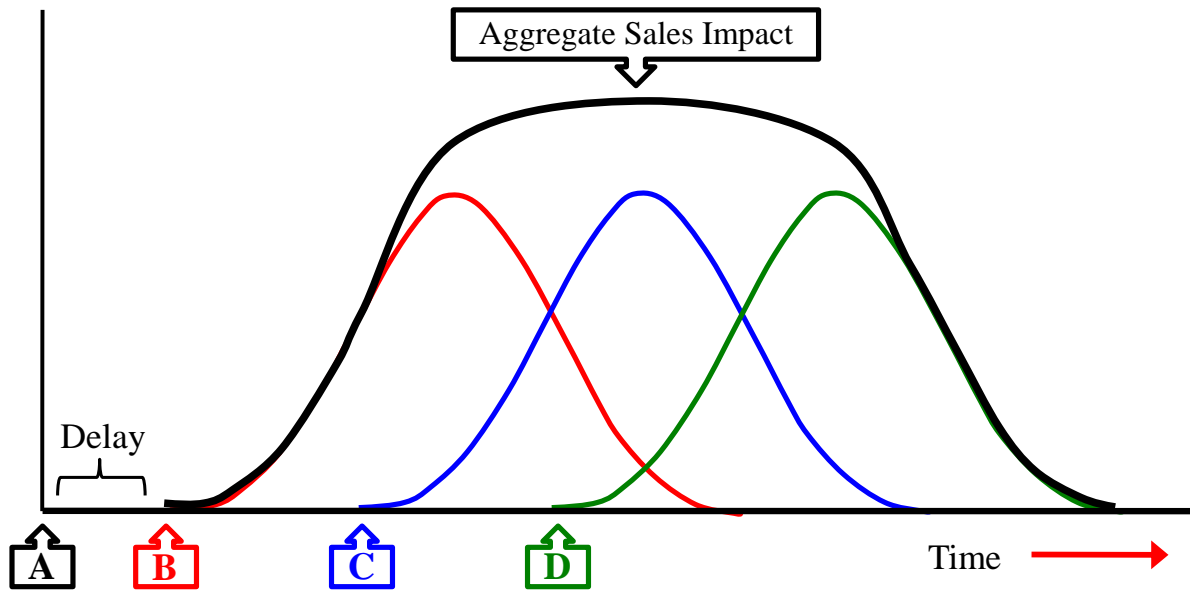
A = Initial treatment   B = First effects begin   C = Second treatment   D = Third treatment

Williams et al. 2016 summarized the conclusions of analyses of the major U.S. agricultural export demand promotion programs, most of which cooperate in the USDA Export Market Development Programs. They found that export promotion expenditures are a statistically significant driver of export demand and that the benefits of export demand promotion are large relative to their promotion expenditures across all studies reviewed. Table 2 summarizes their findings (as updated by the authors). The mean elasticity (responsiveness) of export demand to promotion expenditures across all U.S. export promotion programs studies reviewed by Williams et al. (2016) ranged from -0.085 (not statistically significant) to 0.625 with a mean of 0.25. In other words, a 10% increase in export promotion expenditures leads to an export impact of between a negative 0.8% and a positive 6.25% with the average impact at about 2.5%. Williams eta al. (2016) report that the average return per dollar spent on promotion, that is, the benefit cost ratio (BCR), across all export promotion programs report in studies they reviewed was 10.81 (updated to 10.1 in Table 2), meaning that an average of $US 10.81 is returned to U.S. agricultural producer groups for every dollar they have invested in export demand promotion. Not a single study reviewed by Williams et al. (2016) computed a BCR of less than 1. The lowest BCR among the studies reviewed was 3.5 and the highest 60.0 (see Figure 12). Thus, the overwhelming bulk of empirical evidence indicates that export promotion has had a positive and statistically significant impact on the demand for U.S. exports.

Williams et al. (2016) also conducted a comprehensive analysis of the effectiveness of the aggregate USDA Export Market Development Programs (including export promotion funding from both USDA and cooperating producer organizations) on U.S. exports of agricultural and food products (including seafood). The study concludes that for every dollar of export promotion expenditure over

Table 2: Reported Promotion Elasticities and Benefit-Cost Ratios for Major U.S. Export Promotion Programs

Product	Study	Promotion Elasticities		Benefit-Cost Ratios	
		Marginal	Average	Marginal	Average
Almonds	Halliburton and Henneberry (1995)	--	0.564	4.86	--
Apples	Rosson, Hammig, and Jones (1986)	0.51	--	60.0	--
Apples	Richards, Ispelen, and Kagan (1997)	--	0.036	--	--
Beef	Kaiser (2014)	0.167	--	14.2	
Cotton	Solomon and Kinnucan (1993)	--	0.092	--	--
Dairy	Song and Kaiser (2016)	0.273	--	7.45	15.78
Frozen Potatoes	Lanclos, Devodoss, and Guenther (1997)	0.477	--	9.81	--
Grapefruit	Fuller, Bello, and Capps (1992)	--	0.165	10.53	--
Orange Juice	Armah and Epperson (1997)	--	0.0776	21.94	--
Orange Juice	Lee and Brown (1986)	--	--	5.51	--
Peanuts	Boonsaeng and Fletcher (2010)	-0.085	--	--	--
Pecans	Onunkwo and Epperson (2000)	--	0.53	6.6	--
Pork	Kaiser (2012)	0.302	--	19.1	--
Potatoes	Richards and Kaiser (2012)	0.063	--	4.93	--
Poultry	Shahid and Gempesaw (2002)	0.625	--	--	--
Raisins	Kaiser (2010a)	0.204	--	--	3.49
Red Meat	Le, Kaiser and Tomek (1998)	--	0.165	15.62	--
Red Meat	Comeau, Mittlehammer, and Wahl (1997)	0.11-0.128	--	16.84	--
Rice	Rusmevichientong and Kaiser (2011)	0.205	--	--	4.88
Sorghum	Rusmevichientong and Kaiser (2011)	0.269	--	--	5.1
Soybeans	Williams, Capps, and Lee (2014)	--	0.033	--	10.1
Table Grapes	Alston et al. (1997)	0.21	--	4.15	6.75
Walnuts	Weiss, Green, and Havenner (1996)	--	--	5.85	--
Wheat	Kaiser (2010b)	0.295	--	10.52	12.29
Wheat	Rusmevichientong and Kaiser (2011)	0.616	--	--	25.71
All US Food Exports	Williams et al. (2016)	--	0.148 - 0.17	--	14.6
Median		0.271	0.157	10.17	10.10
Simple Average		0.283	0.199	13.62	10.62
Median over Marginal and Average		0.205		10.10	
Simple Average over Marginal and Average		0.250		12.54	

Source: Adapted and updated from Williams et al. (2016)

the period of 2002 to 2014, the return in terms of additional U.S. agricultural and food export revenue was $24.0 (that is, a BCR of 24) and $14.6 in terms of additional profit to producers (last study listed in Table 2).

One of the most studied non-U.S. export demand promotion programs has been that of the Norwegian Seafood Council, particularly for salmon exports. Numerous studies have analyzed various aspects of Norwegian salmon export promotion programs, most of which have been authored by Kinnucan, Mryland, and Xie (including, for example, Myrland and Kinnucan 2000; Kinnucan and Myrland 2000, 2001, 2002, 2003, 2006; Xie, Kinnucan and Myrland 2009; and Xie 2008 and 2015). A

Figure 12: Benefit-Cost Ratios (Marginal and Average) Reported for Major U.S. Export Promotion Programs
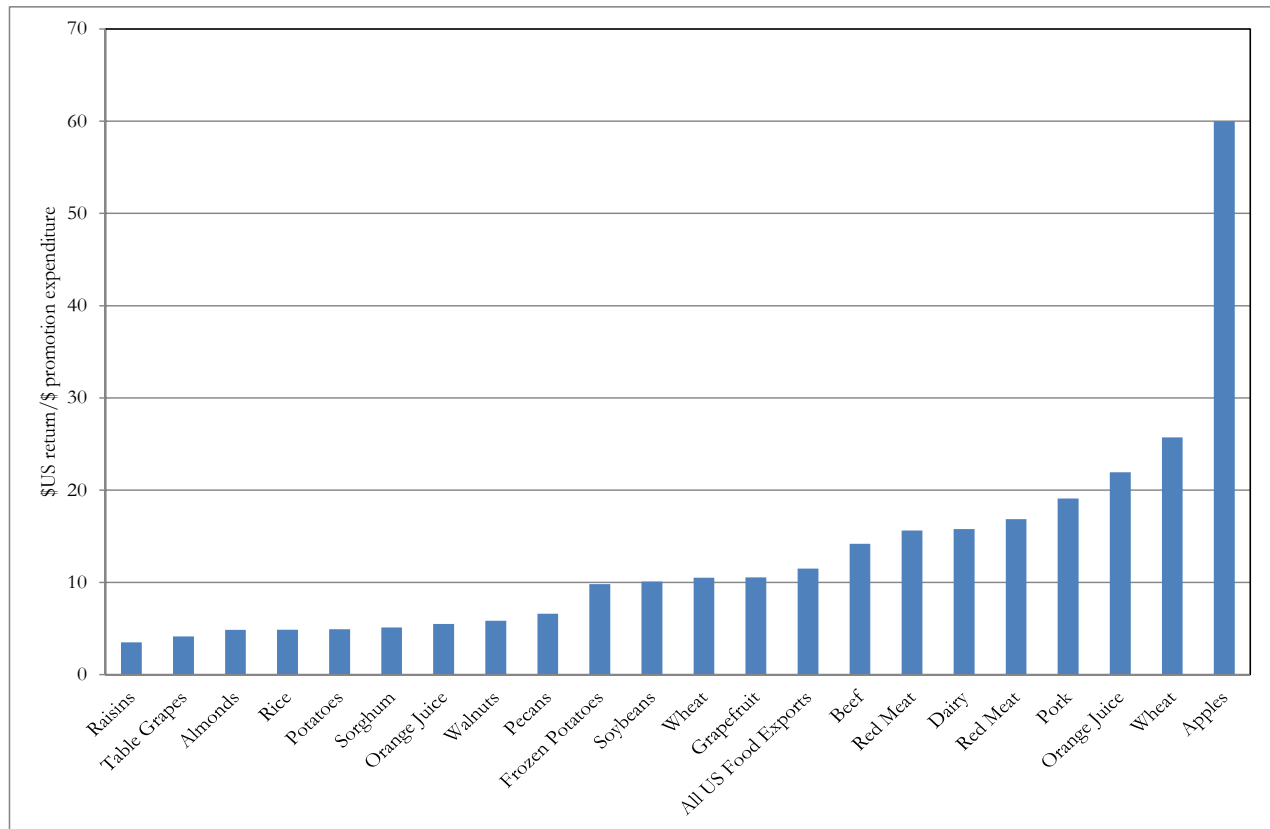
Source: Based on data in Williams et al. (2016).

recent study on the NSC promotion program for salmon was authored by Kaiser (2015). Another recent study by CAPIA AS (2016) attempted an analysis of NSC promotion of skrei and fresh cod. To the knowledge of the authors, however, no study has examined the effectiveness of NSC promotion of other seafood product exports or of seafood exports in the aggregate as was done by Williams et al. (2016) for the aggregate of all U.S. agricultural and food exports.

Many studies related to Norwegian salmon export promotion have simply used the statistical results of other studies in their analyses, including all of the Kinnucan and Mryland studies listed in Table 3. Myrland and Kinnucan (2000) conducted an econometric analysis of data from Pan-European surveys and concluded that NSC salmon export promotion increased at-home salmon consumption in the French and German markets by 9.0% and 8.7% percent, respectively, in 1998/99. Based on that work, Kinnucan and Myrland (2001) calculated a range of estimates for NSC salmon promotion elasticities for France and Germany of 0.039 to 0.059 and 0.032 to 0.054, respectively. Using those estimated salmon promotion elasticities, they then calculate a range of (marginal) BCRs for Norwegian salmon promotion in France and Germany of 0.59 to 1.37 and -0.08 to 0.26, respectively (Table 3). In most of their subsequent work, Kinnucan and Myrland base their analyses of salmon export promotion on *assumed* promotion elasticities in the range of those first published in their

Table 3: Selected Promotion Elasticities and Benefit-Cost Ratios Reported for Norwegian Seafood Export Promotion

Seafood Product	Study	Estimation Time Period	Promotion Elasticity	Benefit-Cost Ratio (BCR)	
				Marginal	Average
Salmon	Myrland and Kinnucan (2000)	1998/99	0.039-0.059 (France) 0.032-0.054 (Germany)	0.59 - 1.37 (France) -0.08 - 0.26 (Germany)	--
Salmon	Kinnucan and Myrland (2000)	Assumed	0.01 - 0.10	--	--
Salmon	Kinnucan and Myrland (2001)	Assumed	Uses Mryland and Kinnucan (2000) results	--	--
Salmon	Kinnucan and Myrland (2002)	Assumed	0.04	--	2.56 - 3.03
Salmon	Kinnucan and Myrland (2003)	Assumed	0.04	--	--
Salmon	Kinnucan and Myrland (2006)	Assumed	0.038	--	--
Salmon	Xie (2008)	1998-2007	0.054	5.93 - 6.19	--
Salmon	Xie, Kinnucan, Myrland (2009)	1998-2007	0.0133	2.34	--
Salmon	Xie (2015)	1998-2007	0.054	--	7.95
Salmon	Kaiser (2015)	2004-2014	0.036	--	4.95 - 9.53
Skrei	CAPIA AS (2016)	2003-2015	--	10.3 (2003-2013) 13.7 (2014-2015)	1.02
Fresh Cod	CAPIA AS (2016)	2003-2015	--	14.5	4.56

Source: Authors

2001 study (about 0.04) as indicated in Table 3. In their 2002 study, Kinnucan and Myrland estimate a BCR for salmon promotion of between 2.56 to 3.03, substantially different from the estimates for France and Germany in their 2001 study.

Xie, a student and now colleague of Kinnucan and Mryland at The Arctic University (Tromso, Norway), conducted an econometric analysis of the NSC salmon export promotion program in 2008 using monthly data for January 1998 through July 2007. She reported a salmon export promotion elasticity of 0.046 and a marginal BCR in the range of 5.93 to 6.19 for the NSC salmon export promotion program. A subsequent econometric analysis by Xie, Kinnucan, and Myrland (2009) reported a salmon promotion elasticity and BCR of 0.013 and 2.34, substantially lower than the results in the preceding study. In 2015, Xie updated her econometric results using monthly data over the same January 1998 - July 2007 period. She reported results for both the salmon export promotion elasticity and a BCR that were more in line with her original analysis in 2008 of 0.054 and 7.95, respectively.

Kaiser (2015) considered nine countries in his analysis of Norwegian salmon export promotion program (Finland, France, Italy, Germany, Poland, Portugal, Spain, Sweden, and the Czech

Republic) over the period of 2004-2014. Annual NSC expenditures for salmon export promotion over that period for those nine countries averaged NOK 54.7 million. Kaiser used an econometric modeling approach and quarterly panel data. He concluded that the key drivers of the demand for exports of Norwegian salmon by the nine countries he studied were the export price of salmon, the gross domestic product (GDP) of those countries, and the NSC export promotion expenditures. He reported an own-price elasticity (price responsiveness) of the demand for Norwegian salmon by those countries of -0.491 (not highly price responsive), a GDP elasticity of 0.108 (low responsiveness to changes in incomes in those countries), and an export promotion expenditure elasticity of 0.036. The reported promotion expenditure elasticity indicates that a 10% increase in NSC salmon export promotion increases the demand for Norwegian salmon by 0.36%, almost exactly the same as used by Kinnucan, Myrland, and Xie in many of their studies. Using the results of his econometric analysis, Kaiser conducted a simulation analysis and found that salmon export promotion expenditures annually contributed 58,300 tonnes (15.1%) to the volume of Norwegian salmon exports over the study period. He also concluded that NSC salmon export promotion supported the profitability of the Norwegian salmon industry by adding between NOK 4.95 and NOK 9.53, on average, for each NOK invested in salmon export promotion to the nine countries studied over the study period. That is, Kaiser estimated the NSC salmon export promotion BCR to range between 4.95 and 9.3 depending on the export supply elasticity assumed.

The study by CAPIA AS (2016) of NSC promotion of skrie and fresh cod takes an econometric approach based on the methodology of Kaiser (2015) for salmon. Using quarterly data for 2003-2015, they reported an average BCR for NSC skrie and fresh cod promotion over that period of 1.02 and 4.56, respectively. However, they found the marginal export promotion BCR for skrie to be higher at 10.3 over the 2003-2013 period and 13.7 over the 2014-2015 period. Likewise for fresh cod, they found a higher marginal BCR of 14.5 over the full 2003 to 2015 period. The implication is that for both skrie and fresh cod, small increases in funding for export promotion would yield impressive returns.

Although many studies have focused on Norwegian seafood export promotion, nearly all have focused on salmon and few have actually undertaken a rigorous statistical analysis of the impact of NSC export promotion on Norwegian seafood exports. The existing literature is clearly sparse concerning the impacts of promotional spending across all Norwegian seafood exports. Consequently, the analysis in this report focuses on the effectiveness of NSC export promotion of all seafood, not just salmon, and to all countries that import from Norway, not just the EU, as most studies have done. Future planned analyses will look at NSC promotion of exports by major seafood products to major export markets.

METHODOLOGY

The first step in measuring the relationship of Norwegian seafood exports and NSC seafood export promotion expenditures was the development of an econometric (structural) model. Econometric analysis allows the measurement of this relationship through controlling for other factors that may affect the volume of Norwegian seafood exports and, thus, isolating the specific effect of NSC

promotion programs on those exports. The analysis covers the time period from January 2003 to December 2016, a total of 168 monthly observations. The modeling process considers total (aggregate) Norwegian seafood exports to various international markets. Control or explanatory variables in the modeling process include income (GDP) measures for importing countries, exchange rates relative to the NOK for those countries, the price of exported seafood products, competing prices, and other variables as appropriate. The result of this process was a measure of the change in aggregate Norwegian seafood exports in response to NSC seafood export promotion expenditures at fixed prices, controlling for the effects of all other variables.

The next step in the process was to use the results of the econometric analysis to simulate the price and export response to the NSC export promotion expenditures. The simulation results allowed us to calculate the contribution of the NSC programs to the levels of and changes in the volume, price, and value of Norwegian seafood exports over time. The results provide estimates of the share of total Norwegian seafood export volume, price, and value that can be confidently attributed to the export promotion efforts of the NSC over the study period.

The final step in this process was the use of the results from the first two steps to calculate the return to stakeholders associated with the investment in the NSC seafood export promotion programs. Even if the NSC export promotion programs have successfully increased the levels of Norwegian seafood export revenues, the important question for stakeholders is whether or not the cost to them of those programs over time has outweighed any share of the additional export seafood revenues that may have accrued to them. Put another way, stakeholders want to know what the return has been to the money they have contributed to promoting Norwegian seafood exports and, therefore, whether those funds might have been more profitably invested elsewhere. Addressing these questions requires a benefit-cost analysis of the returns to the stakeholders from the additional export revenues generated by the NSC export market development program. To this end, pertinent benefit-cost ratios (BCR) for NSC programs are calculated and represent economic measures of return on investment (ROI) to the NSC export programs.

Econometric Model Development

To assess the effectiveness of the various export promotion activities for Norwegian seafood, an econometric demand function representing total (aggregate) Norwegian seafood export demand was developed and estimated. This approach allows for an accounting of the impact of a variety of factors that most likely influence export demand for Norwegian seafood in an effort to isolate the specific effects of the NSC export promotion programs. Economic theory and previous research suggest that the major factors affecting Norwegian seafood export demand likely include: (1) the export price of Norwegian seafood; (2) prices in foreign markets; (3) income or the gross domestic product (GDPs) of importing countries; (4) exchange rates of the importing countries relative to the NOK; (5) inflation in importing countries; (6) expenditures by the NSC to promote seafood exports; (7) inertia (rigidities or habit persistence); and (8) qualitative and other factors, essentially non-economic events, that affect the level of Norwegian seafood export demand.

The econometric, single-equation model of Norwegian seafood export demand that we developed follows the work of Williams et al. (2016) related to aggregate U.S. agricultural export demand and that of many of the studies referenced in both Tables 2 and 3. From this quantitative analysis, the primary result will be a measure of the contribution of NSC export promotion programs to Norwegian seafood export demand. The dependent variable in the econometric analysis is the monthly volume of aggregate Norwegian seafood exports measured in tonnes over the period of 2003 through 2016.

In the model, the variable representing the export price of Norwegian seafood is calculated as the ratio of the value to the volume of Norwegian seafood products. The resulting weighted average price of Norwegian seafood product exports is expressed in NOK per kilogram (kg). To be consistent with economic theory, Norwegian seafood export demand should be inversely related to the export price. To account for changes in the prices of competing food products and other consumer items in importing countries, we divided the export price of Norwegian seafood products by an aggregate trade-weighted Consumer Price Index (CPI, base period 2010) representing the top ten importing countries. The trade weights used represent the shares of Norwegian seafood exports accounted for by the top ten importing countries and were calculated for each month in each year because the top ten countries were not uniform from year to year[5]. As well, the effects of changes in the currency values of the top 10 importing countries against the NOK in each month in each year over the study period were accounted for by multiplying the deflated Norwegian seafood export price by a monthly trade-weighted exchange rate index (base period 2010) across the top ten importing countries in each month of each year.[6]

As indicated earlier, economic theory also suggests that Norwegian seafood export demand should be directly related to the incomes of seafood consumers in the importing countries. Nominal incomes alone, however, do not reflect consumer purchasing power because of inflation and exchange rate changes over time. Because Norway exports to an average of over 130 countries each year, a single, trade-weighted and exchange-rate-adjusted measure of the real (deflated) Gross Domestic Products (GDP) across the top ten importing countries was calculated to represent the purchasing power of seafood consumers in importing countries. In each month of each year from 2003 to 2016, the real (inflation-adjusted) GDPs of the top ten countries were converted to NOK, multiplied by their corresponding shares of Norwegian seafood exports, and aggregated into a single real GDP measure (2010 NOK). To account for changes in the currency values of the top 10 importing countries against the NOK in each month in each year over the study period, the real aggregate GDP measure was multiplied by the monthly trade-weighted exchange rate index (base period 2010). Because the real GDP by country is only available quarterly, we imputed monthly values via statistical extrapolation from these quarterly values to generate the monthly real GDP value for each of the top 10 importing countries in each year. Because the GDP data for some of the top 10 importing countries are not reported on a timely basis (China, Russia, Ukraine, and Nigeria),

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[5] The top 10 importing countries over the full period of 2003 through 2016 are shown in Figure 2.
[6] The trade-weighted aggregate CPI and the trade weighted NOK exchange rate were developed by FABA staff using monthly Norwegian seafood export data to calculate the monthly trade weights and the monthly CPI and exchange rate data available from the International Monetary Statistics published by IMF (2017).

we were forced to use only the GDPs of the remaining to ten countries in the calculation of the exchange-rate and inflation adjusted GDP measure used in the analysis.

Export demand equations are also normally estimated with lagged exports as an explanatory variable in what is referred to as a partial adjustment model. Inertia or rigidities in a system like international trade due to adjustment costs, habit persistence, and incomplete information imply that the adjustment of exports to changes in the explanatory variables often is not instantaneous but rather takes time. Thus, changes in export demand in one period are expected to be positively related to changes in export demand in the previous period.

In order to properly isolate the impacts of NSC export promotion, we consider additional explanatory factors which are linked to the aggregate demand for all Norwegian seafood exports. For example, the seasonal pattern evident in the volume of monthly Norwegian seafood exports discussed earlier must be accounted for in the analysis (see Figure 1). As well, the analysis must attempt to account for the trend in preferences toward healthier, more nutritional diets, particularly in developed countries.

Accounting for the effects of NSC export promotion programs on Norwegian seafood export demand is not straightforward for several reasons. First, seasonal patterns (albeit different) are evident in both NSC expenditures and the aggregate volume of Norwegian seafood exports. To avoid confounding associated with seasonality, we seasonally adjust the NSC expenditures using the X13 technique (EVIEWS 8.0 software program).

Second, the nominal values of NSC expenditures do not reflect their purchasing power in foreign countries due to inflation and exchange rate changes in those countries as discussed earlier. Consequently, NSC nominal expenditures were deflated and exchange-rate-adjusted following the process used for the Norwegian seafood export price and the aggregate GDP measure as discussed earlier.

Third, as discussed earlier in connection with Figure 11, carryover effects in promotion expenditures are likely. That is, the impact of export promotion is not likely to affect export demand all at once in the month of expenditure but instead is more likely to be distributed over time. To capture the dynamic carryover effects of NSC export promotion programs, we implement a polynomial distributed lag specification in the econometric analysis consistent with quantitative evaluations of advertising and promotion programs in general as reflected in many of the econometric analyses referenced in Tables 2 and 3. Those studies and many more provide extensive evidence to support the hypothesis that promotion activities have carryover or lagged effects.

A fourth difficulty in accounting for the effects of the promotion investments on Norwegian seafood export demand is determining the specific nature of the lag structure of NSC expenditures to enhance Norwegian seafood export demand. Economic theory provides relatively little guidance as to the structure and length of this dynamic process, however. We follow the common procedure of using the Almon polynomial distributed lag (PDL) formulation to account for the time lag in the

impact of the promotion investments on Norwegian seafood export demand. The search for the pattern, polynomial degree, and time period over which the promotion expenditures influence Norwegian seafood export demand involved a series of nested OLS regressions. Conventionally, researchers, through the use of statistical criteria like the Akaike Information Criterion (AIC), the Schwarz Loss Criterion (SLC), or the Hannan-Quinn Criterion (HQC) allow the data to suggest the optimal number of lags to include in the specification. Previous research on a broad range of agricultural and food products suggests that full impacts of promotion expenditures within a given month occur within no more than a year following the expenditure. Hence, we consider lags of NSC expenditures up to twelve months. With the lags in export promotion expenditures, we are in position to capture short-run (immediate or contemporaneous) effects and long-run or (cumulative) effects as well as the average length of time (in months) before changes in export market development expenditures begin to affect the demand for Norwegian seafood exports.

Finally, to capture diminishing marginal returns to the export promotion expenditures over time associated with advertising wearout as discussed earlier, we implement a logarithmic transformation of the exchange rate-adjusted and deflated NSC export promotion expenditures as is commonly done in many of the econometric analyses of export promotion referenced in Tables 2 and 3.

While economic variables like purchasing power in importing countries, the export price of seafood, exchange rates, and other variables largely explain the longer term trends in Norwegian seafood export demand, various events account for much of the deviation of export demand around the trend from year to year. To determine what events have impacted exports, we sequentially tested the effects of 36 events in eight categories across different species that were identified as potentially having had an impact on the level of aggregate Norwegian seafood export demand over time. These factors were identified in discussion with NSC officials. Table 4 provides a listing of those events which are treated as indicator variables in the development of the econometric model of Norwegian seafood export demand. An indicator variable takes on the value of 1 in the period(s) of the hypothesized event and 0 in other periods. The qualitative variables for the algae bloom in Chile in 2016, the infectious salmon anemia (ISA) outbreak in Chile in 2008 to 2009, the jump in the cod quota in 2013, the jump in the haddock quota in 2011 and 2012, free trade agreements (FTA) with South Korea and South Africa that were implemented in 2006 and 2008, respectively, and the maximum allowable biomass (MTB) regime implemented in Norway in 2005 are all hypothesized to have a positive impact on the aggregate Norwegian seafood export demand (see Table 4). The remaining set of qualitative factors is hypothesized to negatively affect that demand.

Econometric Results

Similar to the use of the logarithmic transformation of NSC promotion expenditures, logarithmic transformations also were employed for the dependent variable, aggregate Norwegian seafood export demand, and the other continuous explanatory variables (transformed as discussed in the preceding section). As such, the estimated coefficients associated with these explanatory variables are elasticities, namely the own-price elasticity of export demand, the income elasticity, and the

Table 4: Indicator Variables of Potentially Key Events Impacting Norwegian Seafood Exports, 2003-2016

Years	Designation	2000				2001				2002				2003				2004				2005			
Quarters		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Weather & Natural Events																									
Salmon: Cold Winters in Norway	W1													1	1										
Late Cod run (Norway)	W2	1	1	1	1	1	1	1	1																
Quota/ events																									
Pelagic: Iceland start fishing Mackerel in int. waters	Q1																								
Pelagic: Faroese start fishing Mackerel in int. waters	Q2																								
Pelagic: Greenland start fishing Mackerel in int. waters	Q3																								
Pelagic: Japanese Catch of Big Mackerel	Q4																					1	1	1	1
Cod: Big jump in quota for Atlantic cod	Q5																								
Haddock: Big jump in quota for haddock	Q6																								
Salmon: Feed Quota	Q7													1	1	1	1	1	1	1	1	1	1	1	1
Salmon Disease / Sea lice / Algae Events																									
Salmon: ISA Chile	D1																								
Salmon: Algae Bloom Chile	D2																								
Salmon: Sea lice problems Norway	D3																								
Trade Issues / Events																									
All: Efta free trade agreement, South Africa	T1																								
All: Efta free trade agreement South Korea	T2																								
Salmon: EU safeguard measures/antidumping/MIP	T3																			1	1	1	1	1	1
Salmon: EU trout trade extra tariff	T4																		1	1	1	1	1	1	1
All: Russian import ban/ Ukraine issue	T5																								
Salmon: Russian import restriction	T6																								
Salmon: China non-tariff barrier against Norway	T7																								
Salmon: USA salmon trade dispute	T8	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Whitefish: Pangasius enters the EU market	T9																	1	1	1	1	1	1	1	1
Pelagic: Norway banned from EU zone (pelagic)	T10																								
Pelagic: Iceland Russia embargo	T11																								
Cod: China starts filleting whitefish from Norway	T12										1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Pelagic: Shetland Catch - outside of quota	T13									1	1	1	1	1	1	1	1	1	1	1	1				
Salmon: Fresh prepacked salmon enters Norway market	T14																								
Salmon: Fresh prepacked salmon enters German market	T15																								
All: Weak NOK to USD	T16	1	1	1	1	1	1	1	1	1	1	1	1	1	1										
All: Weak NOK to EUR	T17																								
Economic Events																									
All: Financial Meltdown	E1																								
All: Recession	E2																								
All: Euro Debt	E3																								
Pelagic/Cod: Nigeria Currency exchange restrictions	E4																								
All: Big drop in oil prices	E5																								
Farm Policy Events																									
Salmon: MTB regime Norway	F1																					1	1	1	1
Salmon: Sea lice limit (0.5) Norway	F2																								
Political Events																									
Salmon: 2.25 % additional levy on salmon going to the EU	P1									1	1	1	1	1	1	1	1								

Table 4 (continued): Indicator Variables of Potentially Key Events Impacting Norwegian Seafood Exports, 2003-2016

Years	Designation	2006				2007				2008				2009				2010				2011			
Quarters		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Weather & Natural Events																									
Salmon: Cold Winters in Norway	W1																	1	1						
Late Cod run (Norway)	W2	1	1	1	1																				
Quota/ events																									
Pelagic: Iceland start fishing Mackerel in int. waters	Q1					1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Pelagic: Faroese start fishing Mackerel in int. waters	Q2																	1	1	1	1	1	1	1	1
Pelagic: Greenland start fishing Mackerel in int. waters	Q3																								
Pelagic: Japanese Catch of Big Mackerel	Q4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Cod: Big jump in quota for Atlantic cod	Q5																								
Haddock: Big jump in quota for haddock	Q6																					1	1	1	1
Salmon: Feed Quota	Q7	1	1	1	1	1	1	1	1																
Salmon Disease / Sea lice / Algae Events																									
Salmon: ISA Chile	D1									1	1	1	1	1	1	1	1								
Salmon: Algae Bloom Chile	D2																								
Salmon: Sea lice problems Norway	D3																								
Trade Issues / Events																									
All: Efta free trade agreement, South Africa	T1									1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
All: Efta free trade agreement South Korea	T2			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Salmon: EU safeguard measures/antidumping/MIP	T3	1	1	1	1	1	1	1	1	1	1	1	1												
Salmon: EU trout trade extra tariff	T4	1	1	1	1	1	1	1	1	1	1	1													
All: Russian import ban/ Ukraine issue	T5																								
Salmon: Russian import restriction	T6	1	1																						
Salmon: China non-tariff barrier against Norway	T7																			1	1	1	1	1	1
Salmon: USA salmon trade dispute	T8	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Whitefish: Pangasius enters the EU market	T9	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Pelagic: Norway banned from EU zone (pelagic)	T10															1	1								
Pelagic: Iceland Russia embargo	T11																								
Cod: China starts filleting whitefish from Norway	T12	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Pelagic: Shetland Catch - outside of quota	T13																								
Salmon: Fresh prepacked salmon enters the market in Norway	T14																							1	1
Salmon: Fresh prepacked salmon enters the market in Germany	T15																								
All: Weak NOK to USD	T16																								
All: Weak NOK to EUR	T17									1	1	1	1	1	1	1									
Economic Events																									
All: Financial Meltdown	E1						1	1	1																
All: Recession	E2										1	1	1												
All: Euro Debt	E3																					1	1	1	1
Pelagic/Cod: Nigeria Currency exchange restrictions	E4																								
All: Big drop in oil prices	E5										1	1	1												
Farm Policy Events																									
Salmon: MTB regime Norway	F1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Salmon: Sea lice limit (0.5) Norway	F2																								
Political Events																									
Salmon: 2.25 % additional levy on salmon going to the EU	P1																								

Table 4 (continued): Indicator Variables of Potentially Key Events Impacting Norwegian Seafood Exports, 2003-2016

Years	Designation	2012				2013				2014				2015				2016			
Quarters		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Weather & Natural Events																					
Salmon: Cold Winters in Norway	W1					1	1														
Late Cod run (Norway)	W2													1	1	1	1				
Quota/ events																					
Pelagic: Iceland start fishing Mackerel in int. waters	Q1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Pelagic: Faroese start fishing Mackerel in int. waters	Q2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Pelagic: Greenland start fishing Mackerel in int. waters	Q3			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Pelagic: Japanese Catch of Big Mackerel	Q4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Cod: Big jump in quota for Atlantic cod	Q5					1	1	1	1												
Haddock: Big jump in quota for haddock	Q6	1	1	1	1																
	Q7																				
Salmon Disease / Sea lice / Algae Events																					
Salmon: ISA Chile	D1																				
Salmon: Algae Bloom Chile	D2																	1	1	1	1
Salmon: Sea lice problems Norway	D3									1	1	1	1	1	1	1	1	1	1	1	1
Trade Issues / Events																					
All: Efta free trade agreement, South Africa	T1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
All: Efta free trade agreement South Korea	T2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Salmon: EU safeguard measures/antidumping/MIP	T3																				
Salmon: EU trout trade extra tariff	T4																				
All: Russian import ban/ Ukraine issue	T5											1	1	1	1	1	1	1	1	1	1
Salmon: Russian import restriction	T6																				
Salmon: China non-tariff barrier against Norway	T7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Salmon: USA salmon trade dispute	T8																				
Whitefish: Pangasius enters the EU market	T9	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Pelagic: Norway banned from EU zone (pelagic)	T10																				
Pelagic: Iceland Russia embargo	T11															1	1	1	1	1	1
Cod: China starts filleting whitefish from Norway	T12	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Pelagic: Shetland Catch - outside of quota	T13																				
Salmon: Fresh prepacked salmon enters the market in Norway	T14	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Salmon: Fresh prepacked salmon enters the market in Germany	T15					1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
All: Weak NOK to USD	T16													1	1	1	1	1	1	1	1
All: Weak NOK to EUR	T17						1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Economic Events																					
All: Financial Meltdown	E1																				
All: Recession	E2																				
All: Euro Debt	E3																				
Pelagic/Cod: Nigeria Currency exchange restrictions	E4																		1	1	1
All: Big drop in oil prices	E5													1	1	1	1	1	1	1	1
Farm Policy Events																					
Salmon: MTB regime Norway	F1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Salmon: Sea lice limit (0.5) Norway	F2					1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Political Events																					
Salmon: 2.25 % additional levy on salmon going to the EU	P1																				

elasticity of adjustment. Further, by design these elasticities are constant over the time period of the analysis (January 2003 to December 2016).

The parameters of the model initially were estimated using ordinary least squares.[7] Despite the relatively large number of control or explanatory variables, to avoid the inadvertent omission of any other quantitative or qualitative factors, the residuals associated with the econometric specification were examined to determine if a systematic pattern exists in those residuals by testing the model for the presence of serial correlation or autocorrelation. The test concluded that serial correlation, a non-random pattern in the residuals, was present necessitating the use of generalized least squares in lieu of ordinary least squares to estimate the model parameters. The analysis determined that the pattern in the residuals was attributable to autoregressive processes of the error terms of orders 1 and 3, denoted as AR(1) and AR(3) in Table 5. These autoregressive patterns likely are associated with weather, production cycles, and government policies as well as other unspecified non-economic forces which affect the volume of Norwegian seafood exports.

The estimated coefficients, the standard errors, t-statistics, p-values and other pertinent information associated with the econometric analysis are exhibited in Table 5. As previously discussed, model selection criteria (AIC, SIC, and HQC) are used to determine the most appropriate model specification. The model explains 98% (adjusted R^2) of the variation in the aggregate Norwegian seafood export demand over the period of analysis. Importantly, the signs and magnitudes of all the estimated coefficients are consistent with prior expectations. As well, the within-sample mean absolute percent error (MAPE) over the sample period is 4.09%. In other words, the absolute percent error between the actual values and the predicted values of Norwegian seafood export demand is approximately four percent on average. Simply put, the econometric analysis provides an excellent fit of the movements in the Norwegian seafood export demand over the study period (January 2003 to December 2016). The high goodness-of-fit and the low MAPE characteristics of the model indicate a high degree of reliability of the econometric estimates.

The econometric results in Table 5 indicate that Norwegian seafood export demand indeed is inversely related to export price with an export price elasticity of -0.945. That is, a 10% change in the export price of Norwegian seafood products leads to a nearly 9.5% change in export demand in the opposite direction. The results also indicate that Norwegian seafood export demand is directly related to income changes in importing countries. The econometric results indicate that the elasticity of seafood export demand with respect to the inflation- and exchange-rate-adjusted GDP of the major importing countries is 0.414. Thus, a 10% change in the real, exchange-rate-adjusted GDP of importing countries results in a 4.1% change in seafood export demand in the same direction.

As well, the model accounts for the trend toward healthier, more nutritional diets. To account for this change, we use a qualitative variable (Preference Trend in Table 5) for the years of 2008 through 2012 as a proxy for this trend. The use of a non-qualitative trend variable also could have been used. But such trend variables often lead to degrading collinearity problems with other explanatory

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[7] EVIEWS 8.0 was the software package used to carry out the estimation.

Table 5: Econometric Estimation Results for Norwegian Seafood Exports

Variables (in natural logs except indicator variables)	Parameter Estimate	Standard Error	t Value	P-Value
Intercept	2.199051	2.852993	0.770787	0.4423
@SEAS(1)	-0.130815	0.031397	-4.166552	0.0001
@SEAS(2)	-0.068124	0.034475	-1.976067	0.0504
@SEAS(3)	-0.036403	0.019751	-1.843100	0.0677
@SEAS(4)	-0.194289	0.030017	-6.472557	0.0000
@SEAS(5)	-0.180721	0.034603	-5.222724	0.0000
@SEAS(6)	-0.172639	0.029252	-5.901756	0.0000
@SEAS(7)	-0.263169	0.034828	-7.556177	0.0000
@SEAS(8)	-0.247615	0.037856	-6.540977	0.0000
@SEAS(9)	0.066778	0.033178	2.012713	0.0463
@SEAS(10)	0.184443	0.033535	5.500027	0.0000
@SEAS(11)	0.090294	0.029400	3.071220	0.0026
Norwegian Seafood Export Price(real, exchange-rate-adjusted)	-0.945196	0.043526	-21.71554	0.0000
GDP of importing countries (real, exchange-rate-adjusted)	0.414319	0.200659	2.064785	0.0410
Preference Trend	-0.146514	0.037161	-3.942724	0.0001
Exports$_{t-1}$	0.079827	0.037171	2.147545	0.0337
Algae Bloom in Chile (D2)	0.158218	0.039046	4.052073	0.0001
EU Trout Tariff (T4)	-0.133970	0.036405	-3.679985	0.0003
Recession (E2)	-0.056240	0.029877	-1.882390	0.0621
Salmon Feed Quota (Q7)	-0.106181	0.053148	-1.997836	0.0479
Multiple Event Factors:				
D2005M5	-0.197835	0.050998	-3.879246	0.0002
D2007M9	-0.176183	0.052508	-3.355359	0.0011
D2013M2	-0.227759	0.053248	-4.277357	0.0000
D2012M9	-0.174776	0.051433	-3.398143	0.0009
D2013M9	-0.138082	0.051482	-2.682141	0.0083
D2010M9	0.133522	0.053170	2.511243	0.0133
D2005M10	0.220909	0.051867	4.259166	0.0000
D2005M11	0.136484	0.051167	2.667444	0.0087
D2006M6	0.175813	0.051409	3.419878	0.0008
D2003M10	0.163225	0.053432	3.054812	0.0028
D2003M12	-0.195685	0.052203	-3.748548	0.0003
D2004M10	0.139948	0.051505	2.717179	0.0075
D2016M8	0.123786	0.051340	2.411096	0.0174
PDL01	0.015634	0.007725	2.023762	0.0451
AR(3)	0.651203	0.061201	10.64034	0.0000
AR(1)	0.168453	0.066407	2.536669	0.0124
Goodwill Variable of NSC Promotion Expenditures (Real, exchange-rate adjusted)				
NSC promotion expenditures in current period	0.01340	0.00662	2.02376	0.0451
NSC promotion expenditures lagged one period	0.02233	0.01104	2.02376	0.0451
NSC promotion expenditures lagged two periods	0.02680	0.01324	2.02376	0.0451
NSC promotion expenditures lagged three periods	0.02680	0.01324	2.02376	0.0451
NSC promotion expenditures lagged four periods	0.02233	0.01104	2.02376	0.0451
NSC promotion expenditures lagged five periods	0.01340	0.00662	2.02376	0.0451
Sum of Lags	0.12507	0.06180	2.02376	0.0451
Regression statistics: Adj. R^2 = 0.9758 DW = 2.0466 Durbin-h = -0.3446				

variables, most notably income of importing countries in our analysis. Because the trend toward healthier diets to include fish began in earnest about a decade ago and because the base period or reference period is 2013 to 2016, the coefficients for the Preference Trend qualitative variable used to capture that trend is negative as expected, consistent with the anticipated pattern of changes in preferences toward healthier, more nutritional diets. Holding constant other factors, this trend results in a rise in Norwegian seafood export demand on the order of 13.6% over the period 2013 to 2016 relative to the earlier period of 2008 to 2012.

Moreover, some inertia, rigidities, or habit persistence in the demand for Norwegian seafood exports are evident due to the significance of the estimated coefficient of the lagged dependent variable (Export$_{t-1}$ in Table 5). Based on the magnitude of the estimated coefficient in conjunction with the dependent variable, roughly 92% of the long-run response to changes in the demand for Norwegian seafood exports is made in one month. In essence, the demand for Norwegian seafood exports responds rather quickly to changes in economic and other market forces. Technically, the elasticity of adjustment is estimated to be 0.92.

Seasonality also plays a role in the demand for aggregate Norwegian seafood exports, holding all other explanatory factors invariant, as indicated in Table 5. To account for seasonality, we employ indicator or dummy variables associated with each month. These variables take on values of 0 or 1. The base or reference month in this analysis is December. Relative to December, exports of Norwegian seafood products are lower by 12.3% in January, lower by 6.6% in February, lower by 3.6% in March, lower by 17.7% in April, lower by 16.5% in May, lower by 15.9% percent in June, lower by 23.1% percent in July, and lower by 21.9% in August. But, relative to December, exports of Norwegian seafood products are higher by 6.9% in September, higher by 20.3% in October, and higher by 9.5% in November. This seasonal pattern is consistent with prior expectations.

Besides seasonality, the econometric analysis suggests that various events related to world seafood markets (qualitative factors) were drivers of aggregate Norwegian seafood export demand. Attention to these influential observations is warranted in any economic analysis (Belsley, Kuh, and Welsch 1980). Of the 36 identified events discussed earlier (see Table 4), four were found to be clearly statistically significant in their effects on aggregate seafood export demand (captured, farmed, or both) over the study period. The *algae bloom in Chile* in 2016 (variable D2 in Table 4) led to a 15.8% increase in seafood export demand in 2016. The *EU trout tariff* in January 2004 through September of 2008 (variable T4 in Tables 4 and 5) reduced Norwegian seafood export demand by 13.4% over that period. The *world-wide economic recession* from July 2008 through June 2009 (variable E2 in Tables 4 and 5) negatively affected the demand for aggregate Norwegian seafood exports on the order of 5.6% during that period. The *salmon feed quota* (and after-effects) from 2003 through 2007 (variable Q7 in Tables 4 and 5) reduced Norwegian seafood export demand by 10.6%.

A number of the other qualitative factors identified in Table 4 also likely impacted Norwegian seafood export demand but their effects were in similar periods so that statistically separating their effects in the econometric analysis was difficult. Nevertheless, impacts on that demand in a number of months during various years associated with various events were found to be statistically

significant. The events and associated periods of statistically significant impacts included: (1) a large increase in the mackerel catch by Iceland, the Faroes, Greenland, and Japan (Q1, Q2, Q3, and Q4, respectively in Table 4); cold winters in Norway (W1 in Table 4); the halt in trade negotiations between China and Norway (T7 in Table 4); EU safeguard measures on imports of Norwegian salmon, EU antidumping duties, and the EU minimum import price (MIP) policy (Q7 in Table 4); and a punitive duty by the U.S. on imports of Norwegian salmon (T8 in Table 4) in all or some of the following periods: December 2003 (D2003M12 in Table 5), May 2005 (D2005M5 in Table 5), September 2007 (D2007M9 in Table 5), September 2012 (D2012M9 in Table 5), September 2013 (D2013M9 in Table 5), and February 2013 (D2013M2 in Table 5); (2) free trade agreements with South Africa and with South Korea in September 2010 (D2010M9 in Table 5); (3) implementation of the maximum allowable biomass (MTB) regime in Norway to promote sustainable growth of Norwegian salmon production in October and November 2005 (D2005M10 and D2005M11, respectively, in Table 5) and in June 2006 (D2006M6 in Table 5); (4) the shipment of Norwegian whitefish to China for filleting (T12 in Table 4) in October 2004 (D2004M10 in Table 5); (5) the 2.25% additional levy on salmon going to the EU (P1 in Table 4) in October 2003 (D2003M10 in Table 5); and (6) the drop in oil prices (E5 in Table 4) in August 2016 (D2016M8 in Table 5).

Although no statistical evidence was found regarding the impact of the other events listed in Table 4 on Norwegian seafood export demand that does not mean that they had no effects at all on that demand. Some of those other events likely have had offsetting effects, with some events pressuring export demand upwards in some months in some periods with others pressuring that demand downwards in the same time periods. Also, events that may have impacted the demand for one seafood product export (e.g., cod) may not have had a statistically significant effect with respect to aggregate Norwegian seafood export demand.

Most importantly for this analysis, the econometric estimation provides strong evidence that NSC expenditures have positively impacted the demand for Norwegian seafood products over the study period. In the analysis, we considered polynomial distributed lags of order 2 and order 3 with and without endpoint restrictions for lag lengths of order 1 through 12. As noted previously, we relied on model selection criteria (AIC, SIC, and HQC) to determine the most appropriate polynomial distributed lag specification. We found that the specification which minimizes the model selection criteria consists of a second degree polynomial with endpoint constraints together with a lag of five months. Thus, the impact of NSC export promotion is not felt all at once but instead is distributed over the current month of expenditure as well as the following five months. The impact grows from the current period impact through the second and third months out and subsequently dissipates over the fourth and fifth months. This finding is consistent with prior expectations in evaluations of export promotion programs.

Specifically, the econometric results indicate a short-run (contemporaneous) elasticity of NSC export promotion of 0.0134 with a long-run (cumulative) elasticity of NSC export promotion of 0.12507. Both results are in accord with export promotion programs in general. Hence, contemporaneously, a 10% change in NSC export promotion expenditures results in a 0.13% change in the demand for Norwegian seafood exports. Cumulatively, over a period of five months, that same 10% percent

change in NSC export promotion expenditures leads to a 1.25% change in the demand for Norwegian seafood exports. Based solely on the econometric analysis, <u>ignoring any price effects or supply response by Norwegian producers</u>, had there been no export promotion by the NSC over the period January 2003 to December 2016, the demand for Norwegian seafood exports would have been lower by 12.5%. Put another way, again ignoring price effects and supply response for now, export promotion by the NSC increased export demand on average by 21,996 tonnes per month over the period January 2003 to December 2016 compared to what it would have been in the absence of such promotion. Remember, however, that this measure assumes that the promotion had no price effects and that Norwegian seafood export supplies did not expand as a result. We return to this topic for a more accurate measurement of the effects of the NSC promotion in the next section.

To add perspective to this analysis, Kaiser (2015) found that the key factors associated with Norwegian salmon demand in the European Union (EU) were the export price of salmon, the GDP of importing countries, and export promotion. Although his findings for salmon are similar to ours for all seafood, Kaiser estimated the own-price elasticity of Norwegian salmon demand to be -0.491, about half of what we estimated for aggregate seafood exports. He also estimated the elasticity of Norwegian salmon export demand with respect to the GDP in specific EU importing countries to be only 0.108, roughly one-fourth of what we estimated for all seafood exports. Kaiser reported a Norwegian salmon export promotion expenditure elasticity of 0.036, again much smaller than we have estimated for all seafood exports. However, the Kaiser report does not indicate whether that is a short-run or long-run promotion elasticity or what the estimated lag length and lag pattern were. Also, Kaiser centered attention exclusively on salmon exports to the EU whereas our analysis focuses on the aggregate of all Norwegian seafood exports globally and accounts for more factors affecting Norwegian seafood export demand leading to more precise estimates of those parameters.

ANALYSIS OF NORWEGIAN SEAFOOD EXPORT PROMOTION

Recall that the two key questions that are the specific focus of this examination of the effectiveness of Norwegian seafood export promotion are: (1) What have been the effects of the NSC promotion program on exports of Norwegian seafood (captured and farmed) and (2) Have stakeholders in the Norwegian seafood industry (aquaculture and fisheries) benefitted from the promotion of Norwegian seafood and, if so, by how much? To answer these questions, two scenarios were analyzed using the econometric results discussed in the preceding section of this report: (1) a *with* NSC export promotion expenditures scenario (referred to as the "*with* scenario") and (2) a *without* NSC export promotion expenditures scenario (referred to as the "*without* scenario").

The *with* scenario represents actual history, that is, the level of Norwegian seafood export volume, value, and price which <u>include</u> any effects from the NSC seafood export promotion expenditures. The *without* scenario analysis was conducted by setting the historic values of Norwegian seafood export promotion expenditures to zero in the econometric model discussed earlier and then simulating the value of seafood exports under alternative plausible assumptions regarding the Norwegian export supply elasticity. As discussed earlier in connection with Figure 10, the increase in Norwegian seafood exports and price, and, therefore, export value achieved through export

promotion by the NSC depends critically on how responsive the Norwegian supply of seafood exports is to changes in the export price. Thus, using the plausible alternative assumptions of the Norwegian seafood export supply elasticity, we generate a range of plausible levels of the volume, value, and price of Norwegian seafood exports that would have existed if there would have been no export promotion programs. Because the changes in the seafood export volume, value, and price in these alternative *without* scenarios are generated by changing only the levels of promotion expenditures under different export supply elasticity assumptions, the resulting calculated levels for those variables represent those that would have existed over time *if there had been no NSC export promotion program.*

Differences in the simulated levels of Norwegian seafood export volume, value, and price in the *with* scenario from those in the alternative *without* scenarios (using alternative export supply elasticities) are then taken as direct measures of the effects of the NSC export promotion program. Because no other exogenous variables in the model (e.g., levels of inflation, exchange rates, income levels, etc.) other than the NSC promotion expenditures are allowed to change in either scenario, this process effectively isolates the effects of the NSC promotion expenditures on aggregate Norwegian seafood export volume, value, and value.

The simulation analysis of the effectiveness of the NSC export promotion program began by considering the first question posed earlier through an examination of the simulated effects of the promotion expenditures on Norwegian seafood export volume, value, and price, that is, the differences in values of those variable between the *with* and *without* scenario under the alternative export supply assumptions. Then the second question is considered by using the scenario analysis results to conduct a stakeholder benefit-cost analysis of the NSC export promotion program over the 2003 through 2016 period of analysis.

Effects of the NSC Promotion Program on Norwegian Seafood Exports

As noted in the preceding section, a comparison of the *with* and *without* scenario analyses results provides measures of the effectiveness of the Norwegian Seafood Council's export promotion program in increasing Norwegian seafood export volume, price, and value. The *with* scenario is represented by the historical values of those three variables because the actual levels of each achieved over time are due in part to the promotion program. The *without scenario* is represented by the values of each that would have existed if a fee had not been levied on Norwegian seafood exports to finance export promotion operations through the Norwegian Seafood Council. The simulated differences in the values for Norwegian seafood export volume, price, and value between the *with* and *without* scenarios represent the additions to each as a direct result of investment by Norwegian seafood industry (aquaculture and fisheries) in the NSC promotion programs. Those differences are often referred to as the "lift" provided by a promotion program over the period of analysis, in this case January 2003 to December 2016.

As discussed in previous section, a measure of the Norwegian price-elasticity of the aggregate export supply is the key to determining the particular lift provided by the NSC promotion program to

Norwegian seafood export volume, price, and value. Unfortunately, little is known in general about the price responsiveness of the Norwegian supply of particular seafoods and even less about the price responsiveness of the export supply of aggregate Norwegian seafood (captured and farmed). Even in the case of salmon, only a few studies have considered the response of supply to price resulting in only a limited understanding of how the supply of Norwegian salmon responds to market price (Asheim et. al 2011). The previous studies of the NSC export promotion program have focused primarily on salmon exports as discussed earlier. Many of those studies adopt some version of the domestic salmon supply elasticity of 1.54 estimated by Steen, Asche, and Salvanes (1997) in their analyses. Xie (2008 and 2015) calculated the elasticity of the excess supply of salmon to be 1.65. Kaiser (2015) assumed alternative export supply elasticities of 1.0 and 2.0. If the domestic short-run and long-run price responsiveness of salmon supply are low as estimated by Asheim, et al. 2011 (0.091 in the short run and 0.141 in the long-run), then the excess supply elasticity is also quite low. Given that exports account for over 90% of salmon exports in most years, a long-run domestic supply elasticity of about 1.4 to 1.5 as estimated by Steen, Asche, and Salvanes (1997), Asche, Kimbhakar, and Tveterås (2007), and Andersen, Roll, and Tveterås (2008), then the excess supply elasticity would be more likely to be closer to those used by Xie (2008 and 2015) and Kaiser (2015).

If we can assume that the price responsiveness of the aggregate supply of Norwegian seafood exports is similar to that of salmon, then a reasonable range of estimates for the price elasticity of the excess supply of Norwegian seafood would be zero to 2 representing a range of low to reasonably high responsiveness of Norwegian seafood export supply. Consequently, we simulate five alternative *without* scenarios assuming five different excess supply elasticities: (1) 0, (2) 0.5, (3) 1.0, (4) 1.5, and (5) 2.0 to provide a reliably accurate range of estimated impacts of the NSC seafood export promotion program on Norwegian seafood export volume, revenue, and price (Table 6). This range also seems reasonable if the captured seafood supply can be assumed to be more limited by production controls than farmed seafood supply since the latter accounts for 67% of exports.

The results indicate that over the January 2003 through December 2016 period of analysis, the investment by Norwegian stakeholders in export promotion through the NSC has added between 3.2% to 6.5% to the volume of Norwegian seafood exports, 9.3% to 10.5% to the value of Norwegian seafood exports, and 3.5% to almost 12% to the average price of Norwegian seafood exports. Note that as the excess supply elasticity increases, the estimated lift of aggregate export volume increases while the lift to the average export price declines. As the addition to the export volume increases while the addition to the export price decreases with higher excess supply elasticities, the addition to export revenue does not change much. The relative stability of the export revenue estimates across excess supply elasticity assumptions is largely the result of an estimated price elasticity of demand of just less than unity (-0.945).

Benefit-Cost Analysis

Clearly, based on a comparative analysis of the *with* and *without* NSC seafood promotion expenditure scenarios as summarized in the previous section and Table 6, the NSC export promotion program has effectively boosted the volume, value, and price of Norwegian seafood exports in the aggregate.

Table 6: Additions to Norwegian Aggregate Seafood Export Volume, Revenue, and Price Attributable to the NSC Seafood Export Promotion Program, 2003 - 2016

	Alternative Excess Supply Elasticities				
Addition to:	0	0.5	1	1.5	2.0
Exports (tonnes)					
- All Years	0	895,117	1,330,065	1,587,135	1,756,920
- Average Monthly	0	5,594	8,313	9,920	10,981
- Percent	0	3.2	4.9	5.9	6.5
Export Revenue (million NOK)					
- All Years	69,629.65	64,815.95	63,022.60	62,130.46	61,610.61
- Average monthly	435.2	405.10	393.89	388.32	385.06
- Percent	10.5	9.8	9.5	9.4	9.3
Export Price (NOK/tonne)					
- Average Monthly	2,495.55	1,632.15	1,212.62	964.66	800.89
- Percent	11.8	7.4	5.4	4.2	3.5

The more critical concern, however, is whether any gains in profit realized by Norwegian seafood industry stakeholders as a result of the export promotion program have been sufficient to more than pay for the cost of the program. That is, has the program run at a profit or a loss over time? Has the market lift induced by the NSC export promotion program been substantial enough to generate sufficient additional profits to stakeholders (those who pay the fees) over time to more than cover the cost of the program to them? If not, then the conclusion would be that the program should be discontinued because the program costs stakeholders more than it returns to them. On the other hand, if the profits generated more than cover the costs, the program would be deemed a successful investment opportunity for the Norwegian seafood industry. This section, then, provides a benefit-cost analysis of the NSC export promotion program to answer these questions based on the results of the scenario analyses discussed above.

Calculating the Benefit-Cost Ratio for the NSC Seafood Export Promotion Program

In evaluations of export promotion programs, a common measurement of the "benefit" of the program used in benefit-cost analyses is the additional export revenue generated. Another measurement of the "benefit" of export promotion relies on standard economic welfare analysis (consumer and producer surplus concepts) in which the calculated net changes to national economic welfare as a result of the promotion program are considered to be the "benefits" of the promotion program. The cost of the program is the total amount of funds invested in the promotion program.

Figure 13 illustrates the expected export revenue "benefits" of export promotion in general. As discussed earlier, the objective of export demand promotion is to shift out the export demand curve (a shift of ED out to ED' in Figure 13) and, thereby, increase the export price (P_x to P_x') on a higher volume of export sales over time (Q_x to Q_x'). The result is an increase in export revenue represented in Figure 13 as the sum of the dark and light red areas in the right-hand panel of that figure. A

Figure 13: Export Revenue and Economic Surplus Effect of Export Promotion
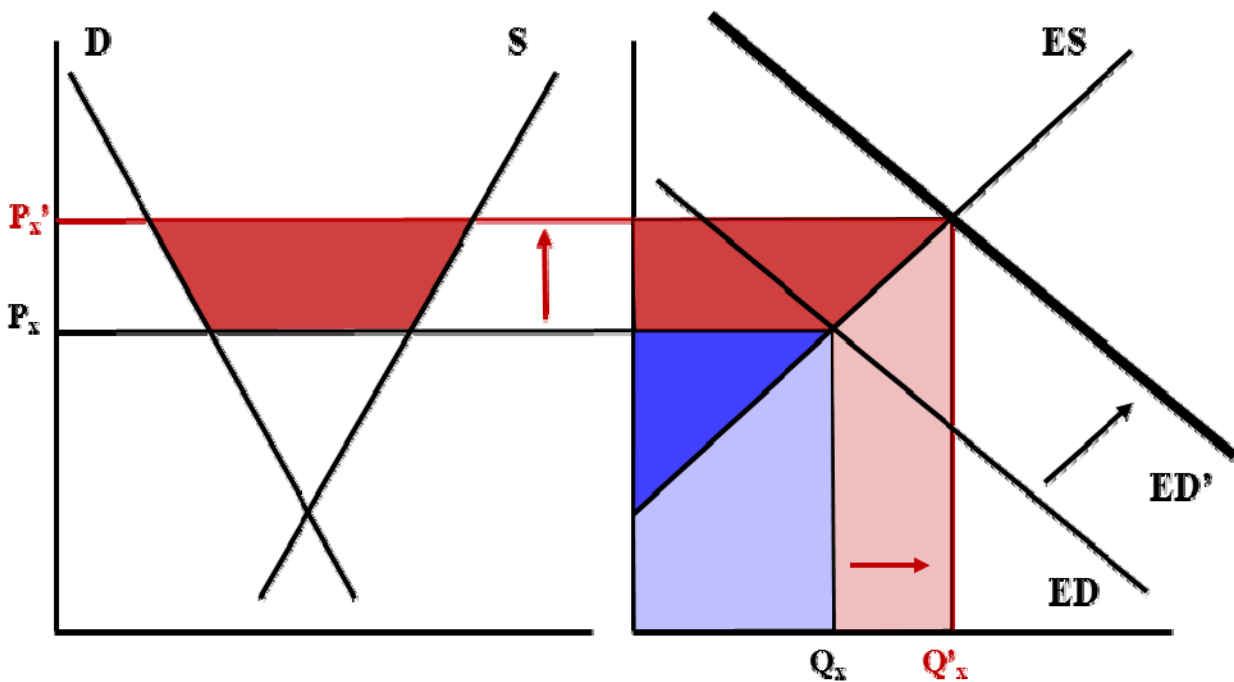
plausible range of increase in seafood export revenue generated by the NSC export promotion program was measured through the simulation analyses reported in the preceding section.

The simulated additions to Norwegian seafood export revenue induced by the NSC export promotion program over time are used as the export revenue "benefits" of the program for the benefit-cost analysis. Several export revenue BCRs are often computed. The Gross Revenue BCR (GRBCR) is calculated as the additional export revenue generated over the period of promotion (R) per NOK of promotion expenditures (E) over that period:

(1) $\text{GRBCR} = \sum_{t=1}^{T} \frac{R_t}{E_t}$

where t represents a given year and T represents the last year of the promotion period.

Because the promotion represents a cost of generating the additional export revenue, the promotion expenditures in each year must be netted out of the additional export revenue generated (R_t) in each corresponding year to arrive at the *net* export revenue BCR:

(2) $\text{NRBCR} = \sum_{t=1}^{T} \frac{R_t - E_t}{E_t}$

A shortcoming of export revenue BCR measures is that they account for the additional export revenue associated with additional exports but do not subtract the additional costs required to generate the additional exports. Such costs include the additional production costs, inland transport costs, freight, and insurance costs, and so on. To account for those costs, we can calculate a measure referred to as the export "economic surplus". This measure is the difference between the

amount that exporters receive for their exports and the minimum amount they would be willing to accept to just cover their costs. In Figure 13, the export supply curve (ES) indicates the prices that exporters would be willing to accept for each additional unit of export sales to just cover costs. Thus, the area under ES (the Norwegian export supply curve) at Q_x where the excess demand curve (ED) crosses ES (the light blue area in Figure 13) is a measure of the minimum total amount exporters would be willing to accept for the level of exports demanded in the market. Of course, however, producers do not sell each additional quantity of exports at the price that would just cover their costs. Rather, they sell all units of exports at the export market price of P_x. Thus, their export revenue for selling Q_x units of exports is the sum of the dark and light blue areas. The dark blue area then is the "export surplus" of export revenue over and above the costs of exporting that export volume. Although not precisely the same thing, "export surplus" can be thought of as a measure of exporters' profit from exporting.

When export promotion shifts the export demand out to ED' in Figure 13, export revenue increases by the amount represented by the sum of the dark and light red areas in the right hand graph in Figure 13 but the light red represents the additional costs of that additional level of exports. Thus, the dark red area on the right side of the exhibit represents the additional "export surplus" to exporters for the additional exports up to Q'_x. That area is equal to the difference between what economists call the additional "producers surplus" and the additional "consumer surplus" in the domestic market (the dark red area in the left-hand panel of Figure 13). Because the ES curve is just the difference between the domestic supply curve (S) and the domestic demand curve (D) in the left-hand panel of Figure 13, the red area in that panel is equal to the red area in the right-hand panel. Thus, the "export surplus" is a measure of the net change in economic welfare as a result of exporting. Because Figure 13 represents the Norwegian seafood export sector, the red area (in both panels) represents the net additional economic welfare to the Norwegian seafood industry and to the overall Norwegian economy resulting from the NSC seafood export promotion.

The export surplus or net additional welfare from export promotion is calculated through the same simulation scenario process used to calculate the additional export revenue from export promotion over time described above. In the process, however, the additional export surplus portion of the additional export revenue is calculated using simple formulas. Then the additional export surplus (call it "S") is used as the measure of the "benefit" of export promotion in place of export revenue (R) in equations (1) and (2) to calculate a Gross Export Surplus BCR (GSBCR) and/or a Net Export Surplus BCR (NSBCR), respectively.

Export Promotion Benefit-Cost Analysis Results

Based on equations (1) and (2), we calculated the BCRs for the NSC seafood export promotion program (GRBCR, NRBCR, and NSBCR) over the period of January 2003 to December 2016. A BCR that is greater than 1 is interpreted as meaning that the program has more than paid for itself. Otherwise, the program would be considered to have created an economic loss because the revenue generated would be less than the cost of the program.

Table 7: Export Revenue and Surplus Benefit-Cost Ratios (BCRs) for the NSC Seafood Export Promotion Program, 2003-2016

Addition to:	Alternative Excess Supply Elasticities				
	0	0.5	1	1.5	2.0
Additional Export Revenue (million NOK)	69,630	64,816	63,023	62,130	61,611
NSC Promotion Investment (million NOK)	4,173	4, 173	4, 173	4, 173	4, 173
Gross Export Revenue BCR (NOK added/NOK spent)	16.7	15.6	15.1	14.9	14.8
Net Export Revenue BCR (NOK added/NOK spent)	15.7	14.6	14.1	13.9	13.8
Net Export Surplus Benefit (Profit) BCR (NOK added/NOK spent)	15.7	9.8	7.0	5.3	4.2

The net export revenue benefit-cost ratio (NRBCR) of the NSC seafood export promotion program over the 2003 to 2016 period of analysis is calculated to be between 13.8 and 15.7 (from higher to lower export supply elasticity) (Table 7). That is, for every krone of export promotion expenditure, the net return to stakeholders in additional export revenue, net of the promotion expenditures, ranges from 13.8 kroner to 15.7 kroner depending on the responsiveness of Norwegian excess supply of seafood. If domestic Norwegian seafood supply is fairly responsive to changes in price over the long run, as determined by Stern, Asche, and Salvanes (1997), Asche, Kimbhakar, and Tveterås (2007), and Andersen, Roll, and Tveterås (2008), then the excess supply elasticity is likely around 1.5 to 2.0 as calculated by Xie (2008 and 2015) so that the NRBCR is around 13 to 14. On the other hand, if the responsiveness of Norwegian seafood supply is quite low as determined by Asheim, et al. (2011), then the elasticity of excess supply would more likely be around 0 to 0.5 so that the NRBCR would be about 15 to 16.

The net economic surplus BCR (NSBCR) is calculated to range from 4.2 to 15.7 depending on the assumed price elasticity of the excess supply of Norwegian seafood. These results imply a net addition to Norwegian economic welfare (industry profit) of 4.2 to 15.7 kroner per krone spent on export promotion through the NSC seafood export promotion program (Table7). This BCR measure is necessarily smaller than the NRBCR because additional economic costs have been netted out of the additional export revenue to calculate the additional export surplus (industry profit) generated by the program.

These calculated returns to the NSC seafood export promotion program compare quite favorably to the BCRs calculated across the many U.S. agricultural commodity export promotion programs that range from 3.5 to 60.0 with an average of 10.8 (revised in Table 2 to 10.1). The NSBCR result also compares well to the similar measure calculated for the USDA Export Market Development

Programs of 13.9 (Williams et al. 2016). The results tend to be somewhat higher than the BCRs calculated in the various studies by Kinnucan and Myrland for salmon promotion but surprisingly in line with those calculated by Xie (2015) and Kaiser (2015) also for salmon promotion (see Table 3). However, the BCRs are substantially higher overall than those calculated for cod and skrie by CAPIA (2016).

Stakeholders in promotion programs often erroneously assume that high BCRs are the objective of their programs. In fact, the objective is to generate additional sales that add to stakeholders' profits. Nevertheless, the level of the BCR is often taken as an indication of the level of the impact of their programs so that a high BCR implies a high impact and a low BCR implies a low impact of the program. Nothing could be farther from the truth. For example, a BCR from a one krone investment that returns 5 kroner is the same (5 to 1) as the BCR for a 1 billion krone investment that returns 5 billion kroner. Obviously the more that is spent, the larger the impact on exports. As spending increases, however, each additional krone spent has a declining effect so that the total additional revenue achieved increases at a declining rate. Thus, the ratio between additional revenue and additional funding (the BCR) declines as funding increases. That is the law of diminishing returns. Thus, just because a BCR is lower during one time period than another or for one commodity than another does not mean that the program is less effective in one time period than another or for one commodity than another.

Stakeholders also tend to assume erroneously that promotion programs with the highest BCRs are the most effective promotion programs. In fact, however, a high BCR indicates that a promotion program is underfunded. For example, the net export revenue BCR of between 13.8 and 15.7 indicates that for every krone increase in the levy to fund promotion seafood export promotion that is NOT made, the Norwegian seafood industry loses an average of 13.8 to 15.7 kroner in potential additional export revenue. That is, between 13.8 and 15.7 kroner in additional seafood export revenue is forfeited for every additional krone not levied against seafood exports to support promotion. In other words, the opportunity cost of the funds NOT invested in seafood export promotion is between 13.8 kroner and 15.7 kroner per krone not invested in export promotion. Of course, increases in promotion funding through increases in the export levy would be accompanied by a reduction in the corresponding BCR (again, the law of diminishing returns). With such a high estimated BCR range of 13.8 to 14.6, however, funding for seafood export promotion could be increased substantially before the BCR would decline to the lower levels reported for salmon by Kinnucan and Mryland and others in various studies (see Table 3). Indeed, the desired BCR is 1 to 1 because that would indicate that funding has increased to such a level that every additional krone of funding would generate only one additional krone in export revenue.

CONCLUSIONS, IMPLICATIONS, AND NEXT STEPS

The main conclusions of this study are that the Norwegian Seafood Council export promotion program has been highly effective in boosting the volume, value, and price of Norwegian seafood exports (captured and farmed) and in enhancing the profitability of the Norwegian seafood industry. Among the major findings of this study are the following:

- *The Norwegian Seafood Council seafood export promotion program has generated between NOK 61.6 billion and NOK 69.6 billion (9.3% to 10.5%) in* **additional aggregate seafood export revenue** *(captured and farmed) over 2003 to 2016, a monthly average of between NOK 374.0 million and NOK 435.2 million in additional seafood export revenue.*

Between 9.3% and 10.5% of the value of Norwegian aggregate seafood exports (captured and farmed) since 2003 is directly attributable to the NSC export promotion program. In other words, Norwegian seafood industry revenues from exports would have been 9.3% to 10.3% lower if there had not been an NSC export promotion program

- *The additional export revenue generated by the Norwegian Seafood Council resulted from a combination of:*
  - ➢ *an* **addition to the aggregate seafood export price** *(average of captured and farmed) of between 801 NOK/tonne and 2,496 NOK/tonne (3.5% to 12%) over 2003 to 2016 and*

  - ➢ *an* **addition to the aggregate seafood export volume** *(captured and farmed) of up to 1.76 million tonnes (6.5%), a monthly average of up to 10,981 tonnes of additional aggregate seafood exports, over the same period.*

    Between 3.5% and 11.8% of the price and up to 6.5% of the volume of Norwegian seafood exports (captured and farmed) are directly attributable to the NSC export promotion program since 2003. In other words, both the export price and volume of Norwegian seafood exports would have been substantially lower (3.5% to 11.8% and up to 6.5%, respectively) if there not been an NSC promotion program.

- *The Norwegian Seafood Council seafood export promotion program has generated a* **high rate of return** *to Norwegian seafood industry of between 13.8 NOK and 15.7 NOK in additional export revenues per NOK of promotion expenditure and between 4.2 NOK and 15.7 NOK of additional industry profit per NOK of promotion expenditure.*

These BCRs indicate that for every krone of export promotion expenditure, the net return to stakeholders in additional export revenue, net of the promotion expenditures, ranges from 13.8 kroner to 15.7 kroner. The return in profit to stakeholders ranges from 4.2 kroner to 15.7 kroner. The less responsive Norwegian seafood production is to the higher price generated by the promotion, the higher the benefits in terms of export revenue and stakeholder profits.

- *The state-of-the-art econometric model used in the analysis explains 98% of the variation in Norwegian aggregate seafood export demand (captured and farmed) over the period of analysis.*

The excellent fit of the model to movements in the aggregate seafood export demand and other statistics indicate a high degree of reliability of the econometric estimates used in the analysis.

- *The econometric analysis identified the key drivers of Norwegian seafood export demand, including the following:*
  - The price of seafood exports. Norwegian seafood export demand was found to be fairly responsive to changes in the export (deflated) price of seafood. A 10% increase in the price of seafood exports results in a 9.45% decrease in export demand (elasticity of -0.945).
  - Consumer purchasing power in importing countries. Norwegian seafood export demand was found to be responsive to changes in purchasing power in importing countries. A 10%

increase in purchasing power (the aggregate inflation- and exchange-rate-adjusted GDP) in importing countries leads to a 4% increase in seafood export demand (elasticity with respect to the real, exchange-rate-adjusted GDP of major importing countries of 0.414).

- The trend in preference towards healthier foods in importing countries. This trend has increased Norwegian seafood export demand by 13.6% between 2013 and 2016 compared to the earlier period of 2008 to 2012.

- Seasonality. Seasonal changes in seafood demand related to various events in various countries, seasonal biological processes in seafood production, and other factors cause seasonal variation in Norwegian seafood exports. Export demand tends to be highest in September, October, and November and lowest in April through August.

- Various events related to the world seafood industry. Several events had a statistically significant effect on Norwegian seafood export demand, including:
    ➢ The algae bloom in Chile increased Norwegian seafood export demand by 15.8% in 2016.
    ➢ The EU trout tariff reduced Norwegian seafood export demand by 13.4% between January 2004 and September of 2008
    ➢ The world-wide economic recession from July 2008 through June 2009 negatively affected the aggregate Norwegian seafood export demand on the order of 5.6%.
    ➢ The salmon feed quota (and after-effects) from 2003 through 2007 reduced Norwegian seafood export demand by 10.6%.
    ➢ Various other events also had impacts in specific months in specific years including: (1) a large increase in the mackerel catch by Iceland, Greenland, Japan and the Faroes; (2) cold winters in Norway; (3) the halt in trade negotiations between China and Norway; (4) EU safeguard measures on imports of Norwegian salmon, EU antidumping duties, and the EU minimum import price (MIP) policy, (5) a punitive U.S. duty on imports of Norwegian salmon, (6) free trade agreements with South Africa and South Korea; (7) implementation of the maximum allowable biomass (MTB) regime in Norway to promote sustainable growth of Norwegian salmon production; (8) the shipment of Norwegian whitefish to China for filleting; (9) the 2.25% additional levy on salmon going to the EU; and (10) the drop in oil prices.

- NSC export promotion expenditures. These expenditures have positively impacted Norwegian seafood export demand over the study period. However, the effect is not felt all at once but instead is distributed over the current month of expenditure and the following five months. The impact grows from the current period impact through the second and third months out and dissipates over the following two months. The estimated short-run elasticity of NSC export promotion is 0.0134 and the estimated long-run is 0.12507. Thus, a 10% change in NSC export promotion expenditures in a given month results in a 0.13% change in Norwegian seafood export demand in that month. Over the following five months, however, that same 10% percent change in NSC export promotion expenditures leads to a cumulative 1.25% change in Norwegian seafood export demand.

These conclusions suggest a number of considerations for NSC promotion and program management purposes. First, despite the steady increase in funding of the NSC promotion program since 2004, the high estimated BCRs for the NSC promotion program indicate not only that the NSC promotion program has been effective and profitable for stakeholders in the Norwegian seafood industry over time but also that the industry is underinvesting in seafood export promotion. The opportunity cost of the funds NOT invested in seafood export promotion is between 13.8 kroner and 15.7 kroner in export revenue per krone not invested by the seafood industry in export promotion. As the level of expenditures increase, the BCR would be expected to drop to some extent because of diminishing returns. But because the current level of expenditure is still low relative to the value of Norwegian seafood exports (less than 1% on average), even an extraordinary expansion in the current level of investment in promotion would likely have only a modest negative effect on the benefit-cost ratio.

Second, a failure to maintain and enhance the growth in funding for seafood export promotion over some time period can have serious negative impacts on stakeholder profitability over many subsequent time periods. Promotion expenditures are intended to create a stream of new revenues over time. The market effects of expenditures in any given period are not realized immediately but rather are distributed over time. Consequently, any reduction in funding for even one year can erode the effectiveness of the program in boosting exports and raising stakeholder profits not just in that year but over a longer period of time. By the same token, increasing funding levels again after some period of lapse usually requires a protracted period of time before the benefits are fully realized once again. In the meantime, the returns from the program drop. The lack of growth in promotion expenditures since 2013 has imposed and will continue to impose a substantial opportunity cost on the industry in lost export revenue and profits over a long period of time. The consequence of the short-term gain to stakeholders from paying a lower levy fee may is likely a much larger long-term loss in export revenue and profits over time. Reductions in promotion funding when export revenue and prices are up sometimes occur because stakeholders no longer see a need for such programs. Our statistical analysis of this promotion program and of other promotion programs where funding has been reduced or growth in funding arrested demonstrate clearly that funding reductions can seriously damage the long-term ability of a promotion program to maintain much less build markets over a long period of time (e.g., Capps, Bessler, and Williams 2016). Long periods of time may be necessary for such programs to generate the additional sales necessary to re-capture lost revenues if and when funding increases once again.

Third, the BCR is not indicative of the magnitude of the lift in export sales provided by an export promotion program like the NSC seafood export promotion program. Despite the reasonably high range of BCRs calculated for the NSC promotion program, the total amount of funds spent is actually quite small relative to the value of Norwegian seafood exports - less than 1%. Consequently, the program could hardly be expected to have a large impact on seafood exports compared to other key drivers of those exports like price, incomes in importing countries, changes in exchange rates, seasonal swings in demand, and world events. Nevertheless, the research presented in this study demonstrates that the NSC promotion program has had an important impact on industry export revenues of about 9%-10% on average in each year resulting in a much higher return to the

investment of stakeholder funds than could have been obtained from just about any other investment opportunity, particularly in the current environment of low rates of interest.

Fourth, the BCRs calculated in this study provide a measure of the average return to stakeholders from their investments in seafood export promotion and not necessarily the return realized by each individual stakeholder. Because the BCR is an average metric of return on investment, some stakeholders have realized higher returns while others have earned lower. To suggest that all stakeholders benefit equally from the export promotion program would be to commit the inferential error termed "the fallacy of division" where one reasons that something true for the whole must also be true of all or some of its parts.

Finally, care must be taken in communicating these results to stakeholders. Past experience suggests that inevitably some stakeholders will ask a question like this: "If the returns were between 4.2 and 15.7 kroner for every krone invested in the seafood export promotion program, where are my 4.2 to 15.7 kroner for every krone that I have paid in marketing levy fees?" The question conveys a common lack of understanding not only of the results of export promotion evaluation analyses but also of how promotion programs return value to them. The basic problem is that all stakeholders can readily identify the line on their balance sheets for the cost to them of the levy on their seafood exports. But there is no line on their balance sheets for what that cost has returned to them in additional export revenues and profits. What they often fail to understand is that the benefits to them are included in the revenue line on their balance sheets. Some part of that revenue has come from the larger volume of seafood exports that the NSC export promotion program has enabled them to produce and sell at a higher price. The problem is that they cannot tell how many additional tonnes of seafood the promotion program has enabled them to produce and to sell at how much of a higher price. In essence, that is what this study does – identifies that part of the industry revenue stream that is the direct result of the export promotion program rather than of any other market event or force. This study concludes that the NSC seafood export promotion program has contributed 9%-10% of the revenues that Norwegian seafood exports have realized between 2003 and 2016 by boosting the export volume by up to 6% and the export price by between 3% to 12% on average over that period.

The research reported in this study was envisioned as the first step in the examination of the effectiveness of the Norwegian Seafood Council seafood export promotion program. Despite the positive results for the NSC promotion program reported in this study, many questions remain such as "Do these results hold for specific seafood products and for specific countries?" and "Is the NSC seafood export promotion program promoting the right products at the right level of expenditure and in the right countries?" Program evaluations like what is provided in this study indicate how efficient fund allocation decisions have been, that is, how much "bang for the buck" (or per krone) has been generated by the promotion programs that have been funded. However, a closer examination of how promotion funds are spent across seafood products and countries can provide insight as to whether the program has been effectively "doing the right things" and not just whether the program is efficient in "doing things right."

Consequently, the next steps in the evaluating the effectiveness of the NSC seafood export promotion program include the statistical examination of NSC export market development programs by selected promoted products, including: (1) salmon/trout, (2) whitefish (fresh, frozen), (3) whitefish (cured), (4) pelagics (herring, mackerel), and (5) crustaceans (prawns, crab). Various metrics of effectiveness and return on investment associated with NSC investments related to these seafood products are to be developed. An update of the analysis reported in this study could also be done. The development of similar metrics for major import markets could be done in a subsequent period including, for example, an analysis of frequency of purchase, volume per trip, and price and penetration for different seafood species in those markets.

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