

H2020 VALUMICS Project

Norwegian salmon value chain: how does it influence the EU markets?

Economic and governance analyses

This brief summarises key findings from economic and governance analyses using a suite of tools to provide in-depth understanding of the functioning of the salmon aquaculture value chain. The scope of the analysis includes farming and primary processing in Norway and export to EU markets for further processing into consumer products and distribution

Hybrid governance

Third-party assessment and certification schemes enable new governance forms on top of the traditional model based on state-only regulations

Aquaculture salmon producers are key players in the EU seafood market

With the rapid growth in demand for farmed salmon, global production of Atlantic salmon increased threefold from 0.89 to 2.69 million metric tons (mt) between 2000 and 2020. Only a few countries such as Norway, Chile, Canada and the United Kingdom account for 94% of the total salmon production, with Norway accounting for about 55% (1.2 million mt in 2019)¹.

Atlantic salmon is the most consumed farmed fish species in the EU². Norway exported about 85% (1.06 million mt in 2019) of farmed salmon worldwide. Europe is the largest importing market, taking approximately 70% of total Norwegian export volumes in recent years. Poland, France and Denmark are the main importers. Secondary processors in those countries further process the salmon and sell products such as, e.g. fillets, smoked salmon and other value-added products mainly to EU countries without a customs duty, which otherwise has to be paid if the processed salmon is exported directly from Norway to the EU.

Structural changes through mergers and acquisition have influenced the development of the global aquaculture industry. These changes have facilitated knowledge transfer of technologies, uptake of standards, and access to the market. Salmon producers have been industry leaders in implementing new technologies to ensure cost-efficient production.

Governance of the Norwegian salmon value chain

Governance analysis was applied as a tool to identify lead actors, trading practices, inter-firm relations, and structural elements along the value chain to better understand if fairness, in terms of perceived market power and fair value distribution, is or could be an issue in the Norwegian salmon value chain.

The VALUMICS analysis of “Governance in the farmed salmon value chain from Norway” suggested that “Hybrid governance” best describes the current governance form of the global salmon value chain (Olafsdottir et al., 2019a, Deliverable 5.1 Ch7). Horizontal collaborations and vertical integration, including relations through networks, third-party assessment and certification schemes on top of the traditional model of state-only regulations characterises the hybrid governance³. This form of governance further entails that the global salmon value chain is influenced by international organizations and trade agreements, international civil society and industry initiatives, which on the other hand is motivated by societal pressures from non-governmental organizations e.g. through sustainability standard settings and auditing. In terms

¹ Iversen, A., Asche, F., Hermansen, Ø., and Nystøyl, R. (2020). Production cost and competitiveness in major salmon farming countries 2003–2018. *Aquaculture*, Vol. 522. <https://doi.org/10.1016/j.aquaculture.2020.735089>

² EUMOFA (2017 and 2020). Monthly highlights /The EU Fish Market. Source: <https://www.eumofa.eu>

³ Vince, J., Haward, M. (2017). Hybrid governance of aquaculture: Opportunities and challenges. *Journal of Environmental Management*, Vol. 201: 138-144.

Challenges

Main economic challenges for the salmon producers are mortality and additional costs for preventive measures, mitigation of salmon lice, diseases, algal blooms, and escapees

of innovation and industrial development, the success of salmon farming in Norway is based on close cooperation between industry actors, governmental bodies and research institutes.

Key uncertainties within the salmon farming industry relate to biomass development (growth and long production cycles), influenced by environmental, biological and political factors. The environmental challenges are reflected in the regulatory framework focused on aquaculture licenses, based on maximum allowable biomass and monitoring system to ensure sustainable growth. Companies address the biological challenges through the uptake of standards such as Aquaculture Stewardship Council and maintaining their reputation through corporate social responsibility initiatives. Political decisions heavily influence salmon aquaculture by regulating the location of farm sites and slaughter plants and their social impacts on communities. Limited availability of new licenses for salmon farming in Norway motivates Norwegian companies to operate and expand salmon production in other salmon producing countries (e.g., Chile, Scotland, US, Canada, and Iceland) ensuring continued growth and stable supplies of Atlantic salmon to markets.

The majority of farmed salmon in Norway is produced by large companies. Among them, MOWI is the largest Norwegian salmon producer dominating the global production of salmon with its 20% market share worldwide⁴. Norwegian salmon is mainly exported as a commodity and sold to the highest bidder on weekly spot markets. However, long-term contractual supplier-customer relationships also exist between the large aquaculture-producing companies and secondary processors and retailers in Europe.

Seller-driven chain

The value chain is driven by salmon producers who are in a favorable position while demand exceeds supply. Secondary producers and traders may suffer when spot price is high

Some large integrated enterprises like MOWI strategically govern all steps in the value chain from feed provision, production, processing to final products. Furthermore, the expansion of Norwegian companies in other salmon producing countries where natural conditions are favorable, may further influence the power imbalance within the salmon value chain. The value chain is seller driven by the producers with strong bargaining power against the retailers who in turn maintain a lead position in accessing the consumers. Even though there are no barriers to entry in trade activities, prevailing price volatility may discourage new entrants as it constrains the margins of secondary producers and traders. Furthermore, against the backdrop of strong bargaining position of producers, the allegations that the Norwegian companies influence high spot price were investigated within the scope of unfair practices⁵. According to the interviewed stakeholders, however, such behavior was unlikely because they consider that single companies are not able to influence salmon prices in the long run (Olafsdottir et al., 2019a, b).

Market competitiveness, efficiency and technical change in the Norwegian salmon industry

Market power

Reduction in price markup is assigned to the increased cost of salmon production rather than to the decrease in price of salmon

The analysis of competitiveness, efficiency and technical change are tools to provide an in-depth understanding of the underlying factors driving the competitive advantage of salmon value chain actors in Norway.

The VALUMICS study on the “Assessment of price formation and market power along the food chains” (Svanidze et al., 2020) investigates market power of Norwegian salmon producers and finds that the so-called Lerner index⁶ decreased after 2015 for the Norwegian salmon market. This reduction in market power could be assigned to the higher cost of salmon production rather

⁴ MOWI (2020). Salmon Farming Industry Handbook. <https://mowi.com/it/wp-content/uploads/sites/16/2020/06/Mowi-Salmon-Farming-Industry-Handbook-2020.pdf>

⁵ SeafoodSource (2019). More lawsuits filed as EC remains silent on Norwegian salmon price-fixing allegations. <https://www.seafoodsource.com/news/business-finance/more-lawsuits-filed-as-ec-remains-silent-on-norwegian-salmon-price-fixing>

⁶ Lerner index is an estimated measure of a firm’s output market power (the ability to charge markups of price over marginal costs), ranging from a low value of 0 (representing perfect competition where price is equal to marginal costs) to high value of 1 (representing monopoly).

Producers' financial performance

Certain degree of price markup over marginal costs is expected for the Norwegian salmon market due to the market and firm structure

Productivity growth

Productivity might be increased by improvements in the efficiency of input use and technological progress. This especially holds for small and medium-sized producers

Scale efficiency

Whereas large producers operate with optimal size of operations, small and medium-sized producers may increase their productivity by increasing their scales of operations

than the decrease in firms' revenues^{7,8}. The findings indicate that the Russian import ban imposed in August 2014 had a negligible effect on trade quantities since Norwegian companies could easily switch to other markets⁹. Subsequent to this, the devaluation of the Norwegian Krone and losses of biomass caused by outbreak of diseases, induced an increase in the price of salmon that should have naturally led to the increase of margin for producers. However, we rather observe the opposite effect, after 2015, suggesting that the increase in the production and processing costs was disproportionately higher compared to the increase in the salmon price. Therefore, there is room for further improvement with the future development of cost-efficient technologies that can effectively fight diseases and reduce production costs. However, this may again increase the Lerner index to pre-2015 levels.

Moreover, the limited number of production licenses in the hand of few larger actors may impede the exploitation of economies of scale and, therefore, increase the degree of market imperfections. To summarize, it is less likely that the salmon industry in Norway will ever be free from market imperfections (in terms of price markup); however, this can be mitigated in the Norwegian salmon industry by addressing those factors discussed above.

Another component of the study on scale/size efficiency investigates whether a firm operates at its "optimal size" (Čechura et al., 2020 Deliverable 5.6). The results indicate that Norwegian salmon producers operate on average almost with an optimal scale of operations. However, taking a closer look, the results suggest that the optimal size is a characteristic of the large producers only. Small and medium-sized enterprises operating with increasing returns to scale have a substantial potential to improve their productivity and profitability by increasing the scale of operations, however, licenses for increasing scale are limited in Norway. Assessing the efficiency of input use, the findings show that a considerable room for improvement exists with the potential of reducing costs further by 16% without any negative consequence for the level of production output. In addition, identified substantial systematic failures in the efficiency of input use might be caused by operational management issues and occurrence of biological hazards causing high mortality.

Furthermore, analyzing the developments in technical change (i.e., a change in the amount of output produced from the same amount of inputs), the technical regress (e.g. lack of technological progress), was identified as the predominant feature of large producers. However, the pace of technical regress was gradually decaying and turned to technical progress by 2017. This reversal indicates that the salmon producers have invested in new technologies to decrease production costs. On the contrary, small and medium-sized producers show strong positive technical change from 2014, suggesting that they have invested heavily to stay competitive on the market (Čechura et al., 2020).

Salmon trade duration

Trade duration analysis is a tool to assess the length of trade relationships, i.e. the speed with which firms enter and exit the salmon market and the risk associated with this activity. The trade survival rate indicates how likely the company's export activities survive over time with the same trading partner (e.g. importing company).

The results of the VALUMICS study (Jaghdani et al., 2020, Deliverable 5.3) show that the survival rate between the Norwegian salmon exporters and main global importers is rather low. In particular, for most of the firms, the likelihood that the trade in salmon survives after two years is about 28%, and after five years is about 12%. This rate is slightly different between EU and Non-EU countries after five years which largely vanishes in the long run. Most trade relations die out after two-three years on average, independent of the importers' origin (EU–

⁷ EYGM (2019). The Norwegian Aquaculture Analysis. https://assets.ey.com/content/dam/ey-sites/ey-com/no_no/topics/fiskeri-og-sj%C3%B8mat/norwegian-aquaculture-analysis_2019.pdf

⁸ KONTALI (2019). The salmon farming industry in Norway 2019. Kristiansund, Norway. Retrieved from www.kontali.no

⁹ Russia accounted for just 10% of the Norwegian salmon export according to "Russia's trade ban": <https://www.seafoodsource.com/features/norway-s-seafood-exports-unscathed-by-russia-s-trade-ban>

Trade relationships

The salmon supply chain does not depend on stable trading partners, but rather limited production and large demand are pushing Norwegian salmon export forward

Price formation

The value chain governance structure defines which actor dominates price formation (retailers in France and processors in Poland)

Export price

Salmon export price in Norway directly influences prices along the EU salmon value chain

Market integration

Strong market integration implies that any changes in export price will influence prices along the EU salmon value chain.

non-EU). As the trade partners are changing fast, at the same time overall trade quantity increases, this indicates that entry and exit in trade partnership are not very costly. Decomposing the results by type of exporting firm, after three years of trade, the rate of trade survival is higher for salmon wholesale and processing firms compared to the primary producers. This difference further widens as the duration of continuous trade increases. Furthermore, countries trading larger amounts of salmon are more often expected to stay longer in a trade partnership. To summarize, these results show that the salmon value chain does not depend on stable trading partners, but rather limited production and large demand globally are pushing Norwegian salmon export forward as the producers are able to easily sell salmon on export markets.

Price dependencies between the European and Norwegian salmon markets

The price transmission analysis is a tool to assess the level of market integration between exporting and importing markets. Furthermore, this tool helps understand to which extent price changes from Norway are passed through to the relevant markets and along the salmon value chain.

Salmon markets in Norway, France, and Poland have particular importance for the global salmon value chains. Norway is the largest salmon-producing country, and Poland and France, besides being the primary hub markets for processed salmon, are the largest importing countries of Norwegian salmon. The organization of salmon market structures greatly differ between France and Poland. In particular, Norwegian enterprises directly own secondary processing plants in Poland, whereas in France, large retailers have a strong position and hold long-term contracts with Norwegian salmon producers.

Exploring the salmon price relationships between the export market in Norway and the wholesale and retail markets in France and Poland (Figure 1), Svanidze et al. (2021; 2020 Deliverable 5.5) find that the salmon export price in Norway influences price formation along the French and Polish salmon value chains. However, the opposite is not observed, emphasizing the high importance of price developments on the Norwegian salmon export market for the determination of prices in downstream markets in salmon importing/processing countries.

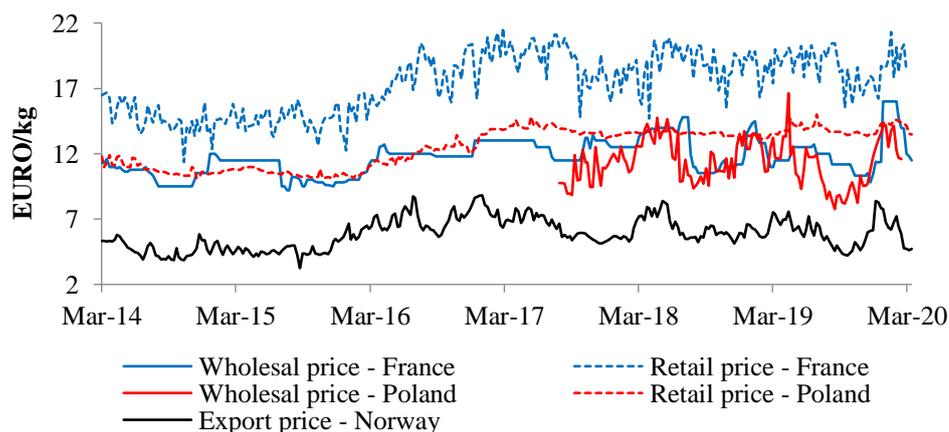


Figure 1. Salmon prices in France, Poland, and Norway. Source: EUMOFA (2020), FranceAgriMer (2020)¹⁰.

More specifically, for the whole head-on-gutted (HOG) salmon, the domestic wholesale market in France and Poland absorbs on average 89% and 83% of the export price changes, respectively. In contrast, for the salmon fillet—a product with a higher degree of processing—

¹⁰ FranceAgriMer (2020). Data base available at: <https://www.franceagrimer.fr/>

Lead actors

Retail sector in France and the secondary processing sector in Poland dominate the salmon trade business, reflected in the strong integration of these markets with the salmon export market in Norway

price linkages are much weaker in both countries, with on average 55% and 75% of the export price changes being transmitted to the wholesale price of the salmon fillet in France and Poland, respectively.

Within the domestic salmon value chain, the French retail sector dominates price formation on the salmon fillet market. In contrast, in Poland, where the culture of salmon consumption is not as established as in France^{11,12}, the retail market does not play a role in determining the salmon fillet price on the domestic market. In particular, it is disintegrated with the wholesale market, which is exclusively focused on the re-export of the processed salmon.

Moreover, the retail price of salmon in France and the wholesale price of salmon in Poland demonstrate higher responsiveness to price information derived from the export market in Norway. In France (Poland), the retail (wholesale) price adjusts five times quicker to changes in the export price of Norwegian salmon compared to the wholesale (retail) price.

Concluding remarks

Hybrid governance characterises the global Norwegian salmon value chain. Large integrated enterprises and their strategic development, including third party auditing and certification, has created a strong bargaining power against the supermarket chains who are the lead companies providing access to market.

At the producer level, technical improvements mainly driven by investments, are a considerable source of productivity growth especially in small and medium-sized producers. However, there is considerable room for further improvements in the efficiency of input use.

Furthermore, the analysis of the duration of the salmon trade suggests that the Norwegian salmon exporters do not sustain long-term contractual relationships with import markets. This could also signal low costs of entry and exit to a market due to the high demand which results in sellers' market of the commodity for the producers in the salmon value chain.

The main impact of the Norwegian salmon value chain on the European market is through the transmission of price shocks studied on the example of two major EU markets, France and Poland. Since the wholesale and retail markets in France and Poland are strongly integrated with the salmon export market in Norway, this also implies that Norwegian exporters' supply shocks and market environment will influence prices along the EU salmon value chain. Nevertheless, the magnitude of market response greatly depends on national value chain governance structures.

Key Outcome of economic and governance analysis of the Norwegian salmon value chain and EU market

- *Producer driven global value chain*
 - *Hybrid governance*
 - *Trading partners easily switched*
 - *Efficiency comes from scale*
 - *Productivity driven by technical efficiency*
 - *Export price in Norway influences price along the value chain*
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¹¹ Eurofish (2021). Member Countries Profile – Poland. Source: <http://www.eurofish.dk/poland>

¹² Rickertsen, K., Alfnes, F., Combris, P., Enderli, G., Issanchou, S., and Shogren, J. F. (2017). French Consumers' Attitudes and Preferences toward Wild and Farmed Fish. *Marine Resource Economics*, Vol. 32: 59-81.

Key sources for further information

This brief highlights results from the VALUMICS salmon case study analysis as reported in the deliverables and publications listed below. To discuss the research presented in this brief, please contact respective authors:

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- Leibniz Institute of Agricultural Development in Transition Economies (IAMO), *Contacts:* Ivan Đurić: duric@iamo.de, Miranda Svanidze, svanidze@iamo.de; Tinoush, J. Jaghdani, jaghdani@iamo.de
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Deliverable reports:

Olafsdottir, G., Mehta, S., Richardsen, R., Cook, D., Gudbrandsdottir I. Y. Thakur, M., Lane, A. and Bogason S. G (2019) Governance of the farmed salmon value chain from Norway, Chapter 7. *In* Barling, D. and Gresham, J. (Eds.) (2019) **Governance in European Food Value Chains**. VALUMICS “Understanding Food Value Chains and Network Dynamics”, funded by European Union’s Horizon 2020 research and innovation programme GA No 727243. **Deliverable: D5.1**, University of Hertfordshire, UK, 237p. **DOI 10.5381/zenodo.5188542**

Jaghdani T. J., Johansen, U., Thakur, M., Đurić, I. (2020). **Assessment of persistence of business/ trade relationships along the selected food chains of different European countries and sectors**. The VALUMICS project funded by EU Horizon 2020 G.A. No 727243. **Deliverable: D5.3**, Leibniz Institute of Agricultural Development in Transition Economies (IAMO), Germany, 43 pages. **DOI 10.5281/zenodo.5161193**

Svanidze, M., Čechura L., Đurić, I., Jaghdani, T. J., Olafsdottir, G., Thakur, M., Samoggia, A., Esposito, G., and Del Prete, M. (2020). **Assessment of price formation and market power along the food chains**. The VALUMICS project funded by EU Horizon 2020 G.A. No 727243. **Deliverable: D5.5**, Leibniz Institute of Agricultural Development in Transition Economies (IAMO), Germany, 114 pages. **DOI 10.5281/zenodo.5161247**

Čechura, L., Žáková Kroupová, Z., Rumánková, L., Jaghdani, T.J., Samoggia, A., Thakur, M. (2020). **Assessment of Economies of scale and technical change along the food chain**. The VALUMICS project funded by EU Horizon 2020 G.A. No 727243. **Deliverable: D5.6**, Czech University of Life Sciences, Prague, 169 pages. **DOI 10.5281/zenodo.5161193**

Published proceedings and articles:

Jaghdani, T.J., Čechura, L., Ólafsdóttir, G., & Thakur, M. (2020). Market power in Norwegian Salmon Industry. *des Landbaues e.V. (Society for Economic and Social Sciences of Agriculture) (GEWISOLA)*, September 23-25, Halle, Germany. <https://doi.org/10.22004/ag.econ.305590>

Olafsdottir, G., Mehta, S., Richardsen, R., Cook, D., Gudbrandsdottir, I.Y., Thakur, M., Lane, A. and Bogason S.G. (2019b). Governance of the farmed salmon Value Chain from Norway to the EU. *Aquaculture Europe* 44 (2): 5-19. <https://valumics.eu/wp-content/uploads/2019/10/Valumics-AES-vol44-2-sept2019.pdf>

Svanidze, M., Ólafsdóttir, G., Duric, I., and Thakur, M. (2021). Price Transmission along the Salmon Value Chain in France and Poland. Paper presented at the XVI EAAE Congress, July 20-23, Prague, Czech Republic.

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