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Trade intervention: Not a silver bullet to address environmental externalities in global aquaculture

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ABSTRACT

Aquaculture has been the world's fastest growing food production technology in recent decades, and continued growth in aquaculture production is predicted. While creating economic opportunity, aquaculture is also a new way of using eco-systems, and there is substantial evidence that aquaculture creates negative environmental externalities. Although the most effective way to address these externalities may be improved governance, this approach is often difficult because most aquaculture production takes place in developing countries with limited management capacity. The fact that a large part of aquaculture production is traded motivates substantial interest in the use of trade measures to reduce environmental impacts. However, the wide variety of species, production practices, and governance systems present in aquaculture makes it unlikely that general trade measures will achieve environmental objectives. Rather, there is a real risk that trade measures will reduce economic opportunity, raise new equity concerns, and impinge on public health with little or no environmental impact.

1. Introduction

During the last 30 years, the world's seafood markets have changed profoundly [1]. Improved logistics, freezing and preserving technologies, and distribution as well as lower transportation costs have created global markets for a number of species, whereas previously regional or local markets dominated the seafood trade [2]. As a result, seafood is among the most traded groups of food products [3,4]. In 2010, 39% of the seafood production was traded and an estimated 77% of production was exposed to trade competition [5]. In addition, aquaculture has substantially changed how a large share of global seafood is being produced.

In 1970, most seafood was harvested from wild stocks in capture fisheries, and aquaculture made up just 3% of total production. By 2014, aquaculture appeared to surpass capture fisheries as the larger source of seafood for human consumption, although overall wild harvests remain larger due to non-food uses such as reduction for fishmeal [6]. The rise of aquaculture is attributed to a massive increase in productivity – knowledge and techniques from agriculture were employed to gain control of the production process [7,8] – paired with substantial growth in global seafood demand [9]. Nations and fish farmers have exploited this opportunity to meet protein needs and serve an ever growing global seafood market. Global aquaculture production increased from about 4 million metric tons in 1970 to 66.6 million metric tons in 2012. Forecasts of future aquaculture indicate a substantial increase in production in the coming decades [10]. However, aquaculture is also a new way of interacting with the environment, and with a potential to cause substantial environmental damage and social conflicts as it displaces other activities directly or indirectly due to the environmental damage [11,12].

Given projections for substantial growth in the aquaculture sector and the significant international trade presence, the purpose of this paper is to examine the future opportunities and challenges for aquaculture production and trade with implications for trade policy. Since seafood is considered an industrial product, not included as part of agricultural production with other foods, trade policy discussions regarding seafood have differed dramatically over the years from trade policy in other food products [13]. However, like the agricultural sector, trade barriers have existed particularly in the areas of non-tariff barriers and technical barriers to trade, in part due to perceived unfair subsidization, food safety, and environmental concerns associated with aquaculture production. In this paper it is argued that aquaculture involves two distinct types of environmental externalities that differ from food safety externalities associated with international trade in seafood: local externalities such as impacts on water quality near

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production facilities, and global externalities such as impacts on marine biodiversity. Failure to distinguish these types of externalities could compromise both effectiveness and fairness in trade policy. It is also argued that trade policies must avoid unrealistic conceptualization of the seafood trade as a vector of bilateral relationships and instead acknowledge the nuanced multilateral nature of seafood production, processing, and trade.

The remainder of the paper first provides background on the growth in aquaculture globally and its trade. Next the paper reviews the opportunities presented by aquaculture followed by the challenges (including food safety and environmental challenges), placing both in the framework of international trade and trade policy. The paper concludes with a review of possible trade policy changes that would address both opportunities and challenges faced by the aquaculture industry and communities dependent upon aquaculture.

2. Opportunities in production, innovation, and trade

Fig. 1 shows the substantial increase in aquaculture production over the last 30 years. The World Bank forecasts aquaculture production of 93.6 million metric tons in 2030 (a 50% increase over 2011) with estimates ranging from 90.7 million to 116.2 million metric tons [10]. Forecasts are of an average annual growth rate of roughly 2.5%, lower than in previous decades, but likely to maintain aquaculture's position as the fastest growing food production technology globally. The variability in projections from 90.7 million to 116.2 million metric tons reflects significant uncertainty stemming from a variety of factors, including projected growth in demand due to rising incomes in developing countries [9]. The World Bank's preferred estimate of 93.6 million metric tons suggests a much larger upside than downside potential.

Increased aquaculture production is in itself an indication that, in aggregate, production is profitable for fish farming companies, as profitability is the market's signal that a producer is competitive. Thus, aquaculture is an economic opportunity that provides income and improves lives for a number of people directly as producers or indirectly at other stages in the supply chain [3][1]. Aquaculture production is also vastly heterogeneous from subsistence farmers to multinational companies [15,16], and the social, economic and environmental impact varies between production methods and with scale.[2]

The farmed seafood industry has become increasingly export oriented, suggesting that aquaculture as a whole has continued to innovate. In other food-related value chains, an export orientation and innovation go hand-in-hand [18,19]. For aquaculture, the combination of (i) the significant investments needed to start up production and (ii) limited domestic markets for products (due for example to purchasing power constraints in developing countries, but also potentially due to the size of domestic population and other factors) provide incentives for the industry to adopt a global and innovative outlook on marketing of seafood products. China undertook a massive expansion of aquaculture beginning in the 1970s that was driven by farmed carp for domestic consumption. But in the modern seafood landscape, China is also a large exporter of farmed fish destined for industrialized countries. In 2012, the United States alone imported 612 million USD worth of frozen farmed tilapia fillets from China. Although the Chinese population is large enough to consume massive aquaculture production, per capita incomes have not been high enough to prevent the production of newer, export-oriented of high value-products. As China becomes wealthier, this trend could change. Expansion of salmon farming in Norway was also export-oriented but for different reasons; per capita incomes in Norway could afford high-value products, but the domestic Norwegian population was simply too small to support a large salmon industry focused on domestic consumption.

Innovations driving globalization in general have specifically contributed to the international orientation of the seafood industry [2]. Transportation and logistics have improved significantly. Substantial reductions in transportation costs by surface and air has promoted the international trade of fresh seafood and new products. Improved logistics have also created economies of scale and scope on all levels of the supply chain, particularly in the retail sector where supermarkets have replaced fishmongers and markets in a number of places. Progress in storage and preservation have allowed a wider range of seafood products to be traded. Freezing technology has improved to such an extent in recent years that many product forms can be frozen twice, allowing products to be processed in locations with comparative advantage in processing fish rather than in locations close to where the fish is

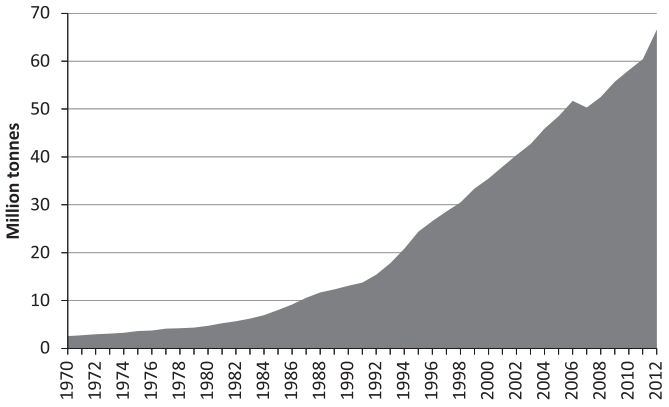

Fig. 1. Global aquaculture production.
Source: FAO [6].

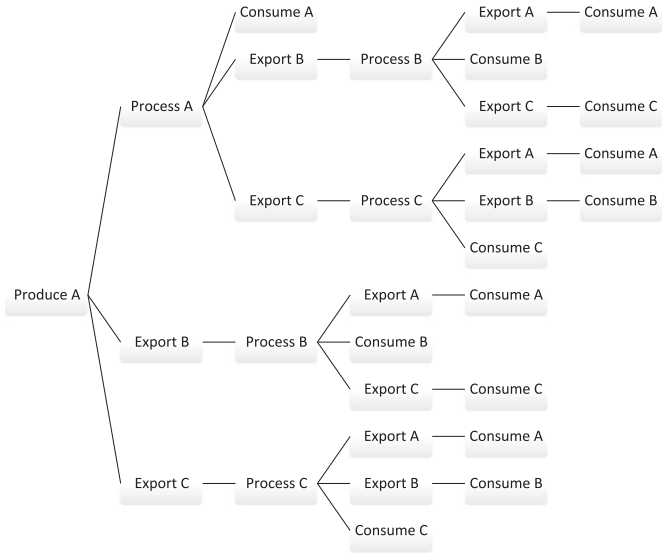

Fig. 2. The complexity of the modern seafood trade. For just a single seafood producer with two trading partners, the possible paths for seafood through trade and processing to end consumption proliferate dramatically.

[1] There are few studies documenting employment specifically in aquaculture. However, crises like the Chilean disease crises for salmon in 2007-2012 show that a number of people have gotten jobs in the industry as many loose them during crises [14].

[2] There is also very limited data available on foreign direct investment (FDI) in aquaculture. However, it is important in some industries like Chilean salmon aquaculture [17].

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