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World Development Vol. 67, pp. 151–160, 2015

http://dx.doi.org/10.1016/j.worlddev.2014.10.013

Fair Enough? Food Security and the International Trade of Seafood

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Summary. — Does international trade make all parties better off? We study the relationship between food security and the international trade of fish and seafood between developing and developed countries. Specifically, we look at and discuss the evolution of trade flows – values, quantities, and prices – between developing and developed countries. The picture that emerges suggests that the quantity of seafood exported from developing countries to developed countries is close to the quantity of seafood imported by developing countries from developed countries. What takes place is a quality exchange: developing countries export high-quality seafood in exchange for lower quality seafood.

Key words — fish and seafood, food security, international trade

"*What does the fish remind you of?*"
"*Other fish.*"
"*And what do other fish remind you of?*"
"*Other fish.*"
[-Joseph Heller (1961), Catch-22.]

1. INTRODUCTION

Seafood contributed at least 15% of average animal protein consumption to 2.9 billion people worldwide in 2006,[1] and fisheries and aquaculture directly employed 43.5 million people, with 520 million people indirectly deriving their livelihoods from seafood-related industries (FAO, 2012).[2] Not only is seafood an important source of protein, it is also a highly traded good, which makes it a key source of income for many individuals, households, and firms across many countries. In fact, seafood is among the most traded of all food commodities, exceeding the combined trade value of sugar, maize, coffee, rice, and cocoa, as shown in Figure 1. The trade of seafood is also more important than that of pork and poultry combined (Figure 1). In 2009, 39% of the global seafood production was traded internationally, and as much as 78% of seafood products are estimated to be exposed to international trade competition (Tveteras *et al*., 2012).

As with food in general (Pinstrup-Andersen, 2002), there is disagreement about whether the benefits of exporting seafood outweigh the costs for developing countries. One reason for that disagreement is that the lens used to investigate this issue differs radically among studies (Béné *et al*., 2009). In particular, the focus of the studies that argue in favor of seafood trade tends to be aggregate flows measured in monetary value (Thorpe, 2004; Valdimarsson & James, 2001). The studies that argue against trade tend to be micro-oriented and to focus on socio-economic variables for specific sub-population (Ruddle, 2008), with Béné *et al*. (2009) as a partial exception, looking at seafood trade for a subset of African countries. By distinguishing among aggregate values, prices and quantities, we contribute a different insight into this debate.[3]

The annual aggregate Food and Agriculture Organization (FAO) of the United Nations seafood trade data are currently the only data that can address the link between food security and seafood trade at the global level. While micro-level studies based on more granular data can offer a more detailed picture of distributional aspects related to seafood trade in specific regions or countries, there is an inherent tradeoff between studying global phenomena and the level of detail one can attain. As such, it will take many years and several more such studies before a meta-analysis of micro-data can be used to draw any conclusions on the question we pose in this article. In the meantime, the FAO aggregate trade data we use can help generate several insights that can inform the debate surrounding the benefits of seafood trade, which is highly relevant given the importance of seafood for nutrition globally.

The impact of seafood trade on food security creates further controversies because it is perceived to move large volumes of fish of high nutritional value from poor (i.e., developing) to rich (i.e., developed) countries. For example, Troell *et al*. (2014) use aggregate data to conclude that demand for high-value seafood from aquaculture could threaten food security for low-income households. Indeed, in 2010, developing countries accounted for only 23% of the value of global seafood imports while they accounted for 50% of the value of global seafood exports. We refer to this concern as the *seafood trade deficit* throughout this paper. On the one hand, from a food security perspective, this could be interpreted as a substantial problem, as it might mean that poor countries are deprived of sorely needed proteins (Swartz, Sumaila, Watson, & Pauly, 2010). On the other hand, this could be interpreted as contributing to poverty alleviation due to the increased earnings and purchasing power resulting from export growth. Béné, Lawton, and Allison (2010) provide an overview of the literature on these different perspectives on seafood trade, summarizing, "While some claim that fish trade has a pro-poor effect, others denounce the negative effect of fish export on local populations' food security and doubt its contributions to the

* Final revision accepted: October 17, 2014.

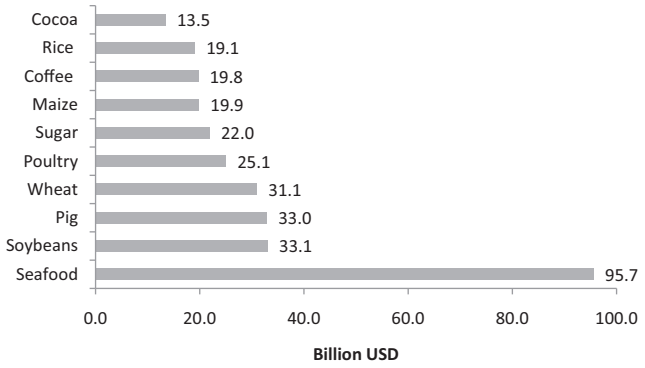

Figure 1. *Export value of selected food commodities in 2009. (Source: FAO, 2013)*

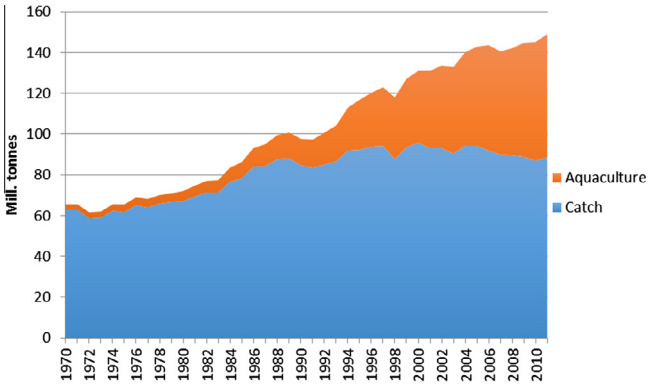

Figure 2. *Global production of seafood by production technology, 1970–2011. (Source: FAO, 2013)*

macro-economy." (p. 933). Studying data from Africa, the authors find neither evidence for nor against the seafood trade as a threat to food security. Thus, while the increase in trade flows is indisputable, the effect on poverty reduction, via economic growth, of those trade flows is contentious (Edward, 2006). Moreover, there are growing concerns that economic growth might have adverse effects on income distribution and equity (Basu, 2006; Goldberg & Pavcnik, 2007).

Our contribution is to use data on the prices and quantities of traded seafood to shed light on channels through which the seafood trade could contribute to or undermine food security. Studies such as Troell *et al.* (2014) raise important issues but do not analyze global seafood trade with an explicit decomposition of value into prices and quantities. The FAO seafood trade data allow us to distinguish between developing and developed countries' exports and imports. Based on these data, we can calculate unit prices for the actual trade flows, as well as the imputed value of the quantities that are obtained or given up by trade. Looking at prices and quantities, in addition to total value, shows a more nuanced picture of the actual effects of seafood trade; it shows gains and losses from different – but highly policy-relevant – perspectives.

The remainder of this paper is organized as follows. Section 2 provides background on the production and trade of seafood worldwide. In Section 3, we discuss the trade data. Section 4 characterizes the total values as well as the prices and quantities of the international trade flows of seafood, and discusses the seafood trade deficit between developing and developed countries. To more comprehensively explore variations in income and seafood consumption across nations, a stochastic frontier model is estimated. In Section 5, we offer policy recommendations and directions for future research.

2. THE PRODUCTION AND TRADE OF SEAFOOD WORLDWIDE

The international trade of seafood has grown rapidly over the last few decades, enabled by a corresponding increase in the global supply of seafood. The availability of seafood has more than doubled over the last 40 years as the total supply of seafood increased from 65.3 million metric tons in 1970 to 148.9 million metric tons in 2011 (FAO, 2012). Seafood supply originates from two main production technologies, namely capture fisheries and aquaculture. Until the 1970s, aquaculture was relatively unimportant as a source of seafood supply. Since then, however, there has been a virtual explosion in aquaculture as a seafood production technology. Figure 2 shows the relative shift in production from wild fisheries to aquaculture as well as total global edible seafood production. Aquaculture growth has been sufficient not only to maintain, but also to slightly increase, the global per capita consumption of seafood (FAO, 2012).

Capture fisheries supply, on the other hand, is not expected to increase very much, as the majority of fish stocks are either fully exploited or over-exploited (FAO, 2012). The world may thus be fairly close to extracting as much seafood as possible from ocean capture fisheries.

The increasing importance of aquaculture in global seafood supply helps explain the export-orientation of the seafood industry. As in other food-related value chains (Barrett *et al.*, 2012; Bellemare, 2012) the combination of (i) the significant investments needed to start up aquaculture production and (ii) limited domestic markets for aquaculture products (due for example to purchasing power constraints in developing countries, but also because of the size of domestic population and other factors) provide incentives for the industry to adopt a global outlook on marketing of seafood products. Likewise, fisheries have gradually become more capital-intensive worldwide, providing a similar incentive scheme for this industry. In addition, consumer preferences for different species of seafood do not necessarily align with those species available within the home country – i.e., due to differing seafood resource endowments and other factors of comparative advantage in fisheries and aquaculture production. Trade then is a way to align consumer preferences with seafood supplies.

Technological innovations have facilitated the international orientation of the seafood industry (Anderson, Asche, & Tveterås, 2010). Transportation and logistics have improved significantly, resulting in lower costs and expanding producers' access to the global market. Progress in storage and preservation has continued, allowing a wider range of seafood products to be traded. Lastly, the improved control in the harvesting process in fisheries and throughout the production process in aquaculture has enabled producers to better target the needs of the modern consumer and to further innovate in the supply chains.

While technological changes have been critical, institutional changes have also facilitated global seafood trade. Beginning in 1952, coastal nations adopted 200-mile exclusive economic zones (EEZs). By the time the U.S. instituted its 200-mile limit, 37 nations had already done so and by 1982 virtually all coastal nations had declared this limit (Roheim, 2004). This institutional shift created strong incentives to increase the trade of seafood. Countries with large distant-water fishing fleets, such as Spain and Japan, were negatively affected, as