# The economic contributions of U.S. seafood imports – a value chain perspective

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**The economic contributions of U.S. seafood imports – a value chain perspective**

## Executive Summary

This study explores the composition and uses of seafood imports throughout the supply chain of seafood products in the United States (U.S.) and estimates the broader economic contributions of these import-supported activities. Currently, the U.S. commercial fishing and aquaculture industries cannot sustainably produce the amount of seafood that U.S. consumers demand (Shamshak et al. 2019). Indeed, most of the seafood products consumed in the U.S. are imported, meaning the product was caught or raised outside U.S. territory. It is estimated that between 65% and 85% of seafood consumed in the U.S. is imported (Gephart et al. 2019; NOAA 2021).

To understand the extent to which the imported supply supports economic activity within different sectors of the economy, we estimated a multiplier matrix for the U.S. economy, based on a transformed input-output model generated from licensed IMPLAN© data for the U.S. for 2019 (Papadas and Dahl, 1999; Miller and Blair, 2022). Each cell of this matrix communicates the value of output supported within a certain industry because of an increase in the supply of a particular commodity. This is commonly referred to as forward linkage and corresponds to the economic activity supported by a specific increase in the supply of a product that is used by other industries in the economy.

It is estimated that the 2019 U.S. seafood imports of $22.4 billion support a total of $26.95 billion in direct industry output throughout the U.S. economy. These numbers represent only a portion of the economic activity supported by seafood imports as there are also backward linkages. The industries that produce the $26.9 billion of outputs rely on input goods and services that are produced within the U.S. These purchases of input goods and services, or interindustry dependencies, are referred to in the economic literature as “indirect effects”. In addition, the changes in spending associated with employee household income are referred as “induced effects”.

As shown in Table 1, the total contributions of seafood imports to the U.S. economy exceeds $70 billion in industry output or sales revenues, $37 billion in total value added, and $24 billion in labor income. In terms of employment, 512 thousand fulltime and part-time jobs throughout the U.S. economy are supported by U.S. seafood imports, concentrated in the Retail – food and beverage stores sector. Taxes associated with U.S. seafood imports are estimated to be $5.03 billion in total federal tax contributions and $3.9 billion in total state and local tax contributions.

**Table ES1: Economic contributions of U.S. seafood imports in 2019 (2019 USD)**

| | Employment (fulltime and part-time jobs) | Labor Income (M$) | Proprietor Income (M$) | Tax on production and imports (M$) | Value Added (M$) | Output (M$) |
|---|---|---|---|---|---|---|
| **Direct Effect** | 279,411 | $10,071 | $952 | $1,807 | $14,205 | $26,954 |
| **Indirect Effect** | 96,859 | $6,046 | $1,026 | $656 | $9,889 | $19,691 |
| **Induced Effect** | 135,940 | $7,681 | $1,034 | $1,139 | $13,632 | $24,295 |
| **Total Effect** | 512,210 | $23,798 | $3,014 | $3,602 | $37,726 | $70,940 |

**Glossary of Economic Impact Terms**

**Contribution** (economic) represents the level of economic activity associated with an industry, event, or policy in an existing regional economy.

**Domestic** refers to goods and services that are sourced from within the country.

**Employee Compensation** is comprised of wages, salaries, commissions, and benefits such as health and life insurance, retirement, and other forms of cash or non-cash compensation.

**Employment** is a measure of the number of jobs involved, including full-time, part-time, and seasonal positions. It is not a measure of full-time equivalents (FTE).

**Exports** are sales of goods to customers outside the region in which they are produced, which represents a net inflow of money to the region. This also applies to sales of goods and services to customers visiting from other regions.

**Final Demand** represents sales to final consumers, including households, governments, and exports from the region.

**IMPLAN**© is a computer-based input-output modeling system that enables users to create regional economic models and multipliers for any region consisting of one or more counties or states in the United States. The current version of the IMPLAN© software, IMPLAN Pro, accounts for commodity production and consumption for over 500 industry sectors, 10 household income levels, taxes to local/state and federal governments, capital investment, imports and exports, transfer payments, and business inventories. Regional datasets for individual counties or states are purchased separately. The IMPLAN© software and regional data are licensed by IMPLAN© Group, LLC, Huntersville, NC.

**Imports** are purchases of goods and services originating outside the region of analysis.

**Income** is the money earned within the region from production and sales.

**Input-Output (I-O) Model and Social Accounting Matrix (SAM)** is a representation of the transactions between industry sectors within a regional economy that captures what each sector purchases from every other sector to produce its output of goods or services. Using such a model, flows of economic activity associated with any change in spending or employment can be traced backwards through the supply chain.

**Margins** represent the portion of the purchaser price accruing to the retailer, wholesaler, and producer/manufacturer in the supply chain. Typically, only the retail margins of many goods purchased by consumers accrue to the local region, as the wholesaler, shipper, and manufacturer often lie outside the local area.

**Multipliers** capture the total effects, both direct and secondary, in a given region, generally as a ratio of the total change in economic activity in the region relative to the direct change. Multipliers are derived from an I-O model of the regional economy. Multipliers can be expressed as ratios of sales, income, or employment, or as ratios of total income or employment changes relative to direct sales. Multipliers express the degree of interdependency between sectors in a region's economy and therefore vary considerably across regions and sectors. A **sector-specific multiplier** describes the total changes to the economy associated with a unit change in output or employment in a given sector (i.e., the direct or initial economic effect) being evaluated. **Indirect effects** represent the changes in sales, income, or employment within the region in backward-linked industries supplying goods and services to businesses (e.g., increased

sales in input supply firms resulting from more industry sales). **Induced effects** represent the increased sales within the region from household spending of the income earned in the direct and supporting industries for housing, utilities, food, etc. An **imputed multiplier** is calculated as the ratio of the total impact divided by direct effect for any given measure (e.g., output, employment).

**Other Property Income** represents income received from investments such as corporate dividends, royalties, property rentals, or interest on loans.

**Output** is the dollar value of a good or service produced or sold and is equivalent to sales revenues plus changes in business inventories.

**Proprietor Income** is income received by non-incorporated private business owners or self-employed individuals.

**Sector** is an individual industry or group of industries that produce similar products or services or have similar production processes. Sectors are classified according to the North American Industrial Classification System (NAICS).

**Total Income** includes labor income such as wages, salaries, employee benefits, and business proprietor income, plus other property income.

**Taxes on Production and Imports** are a subset of business taxes paid by industries including sales and excise taxes, customs duties, property taxes, motor vehicle licenses, severance taxes, other taxes, and special assessments. This does not include all types of taxes paid by businesses (e.g., social insurance taxes and profits taxes).

**Value Added** is a broad measure of income, representing the sum of employee compensation, proprietor income, other property income, indirect business taxes and capital consumption (depreciation). Value added is a commonly used measure of the personal and business income contributions of an industry to a regional economy.

## 1. Introduction

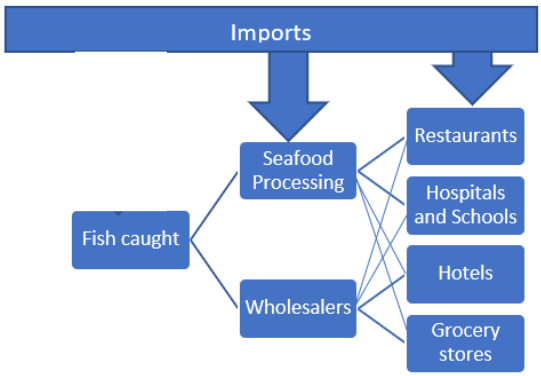
Seafood is an essential set of products and an important source of protein in the diet of American households. A recent report published by the United States (U.S.) Centers for Disease Control (CDC) estimates that around 20% of U.S. citizens eat the recommended two servings of seafood per week (Terry et al., 2018). The level of seafood within an individual diet can depend on demographic characteristics, with higher levels of seafood consumption in older age groups and for men (approximately 25%). This trend does not show any signs of slowing down since a new report published by the National Oceanographic and Atmospheric Administration (NOAA) highlights that U.S. per capita seafood consumption reached an all-time high in 2019 at 19.2 pounds per person (NOAA, 2020), and most of the seafood consumed is imported (Gephart et al. 2019; NOAA 2021). Imported seafood is an essential contributor to the processing, retail, and food service sectors in the U.S. and contributes to the macroeconomic performance of the U.S. economy through increased sales volume, number of jobs, level of income or, even, taxes collected throughout the broader economy.

This study explores the composition and uses of seafood imports throughout the supply chain of seafood products in the U.S. and estimates the broader economic contributions of these import-supported activities. A supply chain is defined as the complete set of goods, services, and activities involved in the process of producing raw products, processing them, and packaging and distributing a final product to consumers. U.S. seafood imports are associated with distinct products and supply chains. For example, some seafood imports are further processed or packaged, others are simply a component of a manufactured product such as frozen dinners or animal feed, and others arrive in a final-use state to be delivered directly or indirectly to consumers. Seafood imports have different uses depending on the species and location of import and as a result, are integrated with regional economies at different stages in product supply chains. Once a seafood product is imported, its path to the final consumer might include a seafood processor, a food product manufacturer, a wholesale distributor, transportation and logistics, and a restaurant, each activity supporting a distinct level of regional economic contributions across the U.S. economy. For example, canned seafood imports might have a shorter path, with less product transformation, to a grocery store than imports of frozen pollock block, which requires further processing in specialized facilities. Figure 1 summarizes the supply chain of seafood and the potential supply chain "stages" involved before a final product reaches the final consumer. The left-hand side of Figure 1 (downstream) is considered further from the final consumer while the right-hand side (upstream) is considered closer to the final consumer.

Further processing, packaging, and distribution of imported seafood products support employment, income, and tax revenues throughout the U.S. economy (e.g. seafood imports support multiplier effects)[1]. In practical terms, this suggests that some proportion of the activity in seafood processing plants, restaurants, and other businesses is supported by seafood imports.

Currently, the U.S. commercial fishing and aquaculture industries cannot sustainably produce the amount of seafood that U.S. consumers demand (Shamshak et al. 2019). Indeed, the majority of the seafood products consumed in the U.S. are imported, meaning the product was caught or raised outside U.S. territory. It is estimated that between 65% and 85% of seafood consumed in the U.S. is imported (Gephart et al. 2019; NOAA 2021). As many activities throughout various product supply chains are currently dependent on these seafood imports, it is useful to quantify the importance of seafood imports to these activities. Such information can improve the understanding of how seafood imports are related to regional economic activity in the U.S. and can inform decision-making processes related to trade policy that directly or indirectly affects seafood imports. As supply chains are increasingly more globalized (Anderson et al. 2018), a complete understanding of the interdependencies between nations has become essential to designing appropriate economic policies and trade regulations and avoid unintended consequences of uninformed decisions.

**Figure 1. Contribution of imports along the seafood value chain**




This project, supported by the National Fisheries Institute, Seafood Industry Research Fund (SIRF), estimates the total economic contributions of seafood imports, including multiplier effects, to the U.S.

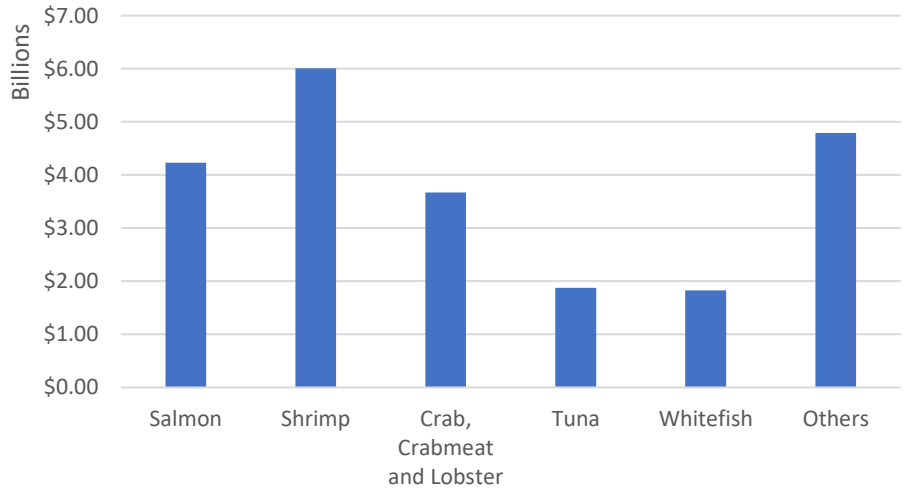
[1] This is not exclusive to seafood imports. Many other manufacturing activities that occur in U.S. soil also depend on imports. For example, Apple products rely on the production of components abroad and vehicle and transportation equipment manufacturing in the U.S. is increasingly reliant on the production of components abroad (Timmer et al., 2015).

economy and decomposes these estimates by use, by specific/product type, and by economic region. The report details the methodologies for estimating the national economic contributions of seafood imports and the allocation of these economic contribution estimates by use, species/product type, and region. Section 2 details the information on seafood imports according to the use of each species/product type. Then, because the supply of seafood imports affects the value of sales within several industries, we estimate the level of forward-linked economic activity in each relevant industry. The results of this process are detailed in section 3. In section 4, we estimate the economic contributions to the U.S. economy for activities that are assumed to be "dependent on" seafood imports. Finally, in section 5, the results of the distribution of economic contributions by use, species/product-type, and region are presented.

## 2. U.S. seafood imports

The term seafood comprises all forms of fish and aquatic animals, included as food for human and animal consumption. Seafood has multiple uses and is a vital input for many different industries that are positioned at different stages of the value chain. As examples, the U.S. economy imports frozen pollock block that is further processed in the U.S. and used as an ingredient for human food products; imported live lobster enters the U.S. as a product that is essentially "ready to sell" to a final consumer via a grocery store or a restaurant; and other products are imported to be used as input in animal food production. In 2019, U.S. seafood imports were valued at $22.4 billion (USD) distributed across the categories shown in Figure 2 (NOAA 2021b).

**Figure 2: U.S. seafood imports by type of seafood[2]**

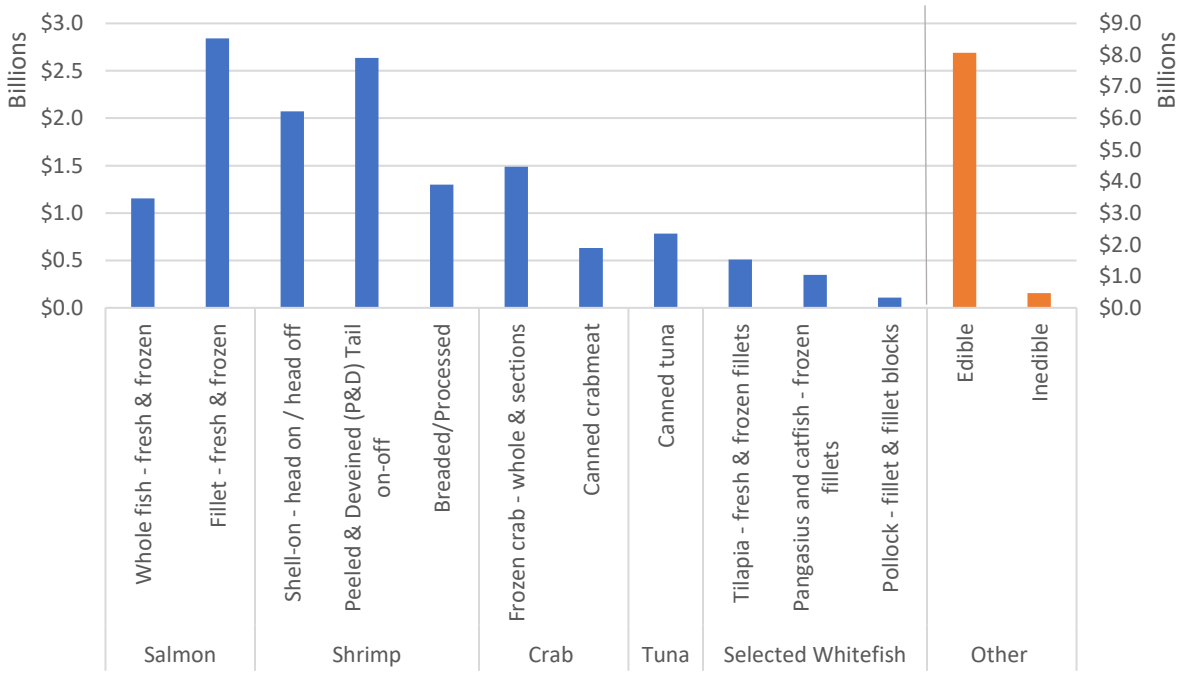



[2] Whitefish includes imported products of tilapia, cod, pollock, catfish, haddock and hake

Shrimp imports were valued at more than $6 billion in 2019, which corresponds to 27% of all U.S. seafood imports. Salmon is the second largest import category by value at 19% of total U.S. seafood imports. Imported Crab, Crabmeat, and Lobster are valued at nearly $4 billion (16%) and Tuna and Whitefish are valued at $2 billion (9%). A significant share of U.S. seafood imports is categorized as "Other" and includes other types of edible and inedible (for humans) seafood.

Detailing U.S seafood imports by species is only the first step in determining how these imports might support economic activity further along the supply chain as there can be different uses of the seafood product, even within the same species classification. For example, the economic activity supported by imported canned tuna is distinct from the import of a whole tuna that still needs to be cut, packed, or processed. With the objective of decreasing the heterogeneity within each species group, we used data on U.S. seafood imports (NOAA, 2021b) to establish a more detailed classification of products by key imported product forms. The results of this classification process are presented in Figure 3.

**Figure 3. Seafood imports by seafood product**




In Figure 3, salmon, shrimp, crab, tuna, and whitefish are decomposed into distinct product types. Most salmon are imported in the form of a fillet. Nearly half of the $2 billion USD of tuna is imported as canned

tuna. In the case of shrimp, around $2.5 billion USD are imported in peeled form, $2 billion USD are imported as shell-on, and more than $1 billion USD are imported in processed form. All other seafood imports, including other product types for named species, such as non-canned forms of tuna, and imports of other species are included in the "Other" categories and are disaggregated into "Other Edible" and "Inedible (for humans)" categories (denoted in orange in Figure 3).

Finally, it is necessary to determine the destination of U.S. seafood imports within the country, both in terms of geographic location as well as destination along the supply chain (e.g., imported for further processing or for distribution via retail and food service sectors). Since this information is not available in publicly accessible databases, it was necessary to consult with industry experts to identify the share of each product type (Figure 3) that was destined for further processing or for distribution to final consumer via retail and food service sectors. In September 2021, four large U.S. seafood importers and two seafood trade experts were asked to estimate the flow of 2019 seafood imports after they enter the U.S. The responses were voluntary and anonymous. To keep the request manageable, the participants were provided with data on the 2019 seafood imports for selected products by region (Northeast, Southeast, West, and Midwest). The selected products were salmon (fresh & frozen whole and fresh & frozen fillet), frozen shrimp (shell-on, head on/off, peeled & deveined, and breaded/processed), crab (frozen whole & sections, and canned), canned tuna, tilapia (fresh & frozen fillets), pangasius & catfish (frozen fillets), and frozen pollock block.

The respondents provided estimates for 1) the share of U.S. imports that were sent for additional processing within the U.S. for each of the selected products by region, 2) the share of U.S. imports directly allocated to retail and food service outlets for each of the selected products by region, and 3) the share of U.S. imports allocated to final consumption outlets for each of the select products by region. This information on how U.S. seafood imports are integrated with the relevant U.S. supply chain is essential for the economic contribution analysis. The results of these consultations are show in Figures 4 and 5.

**Figure 4: U.S. seafood imports by species, product type, and use**

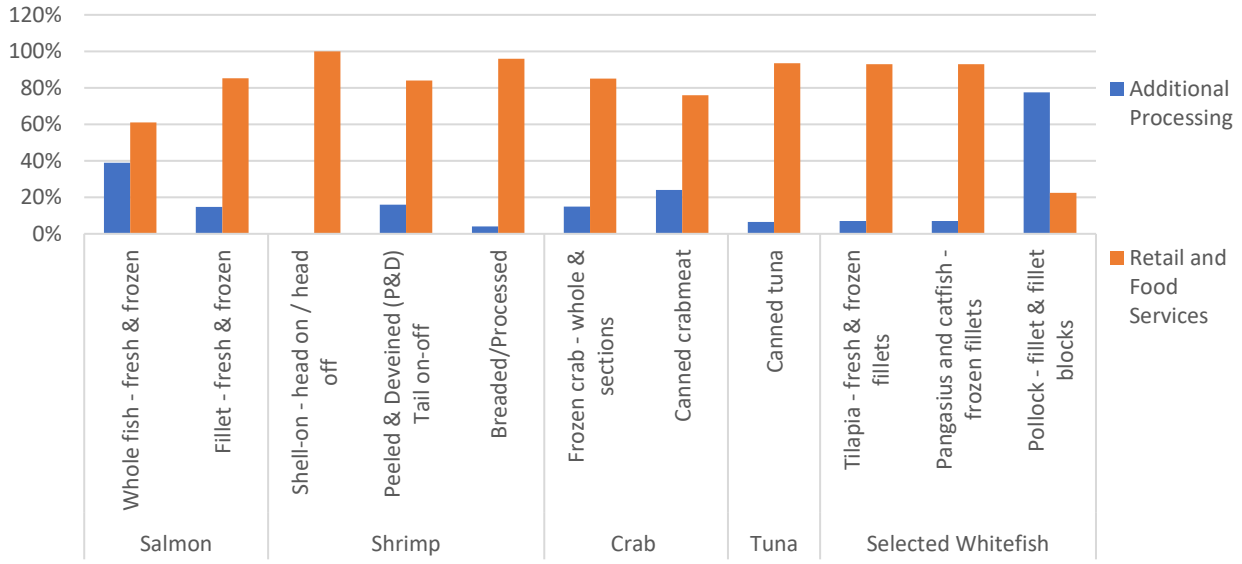
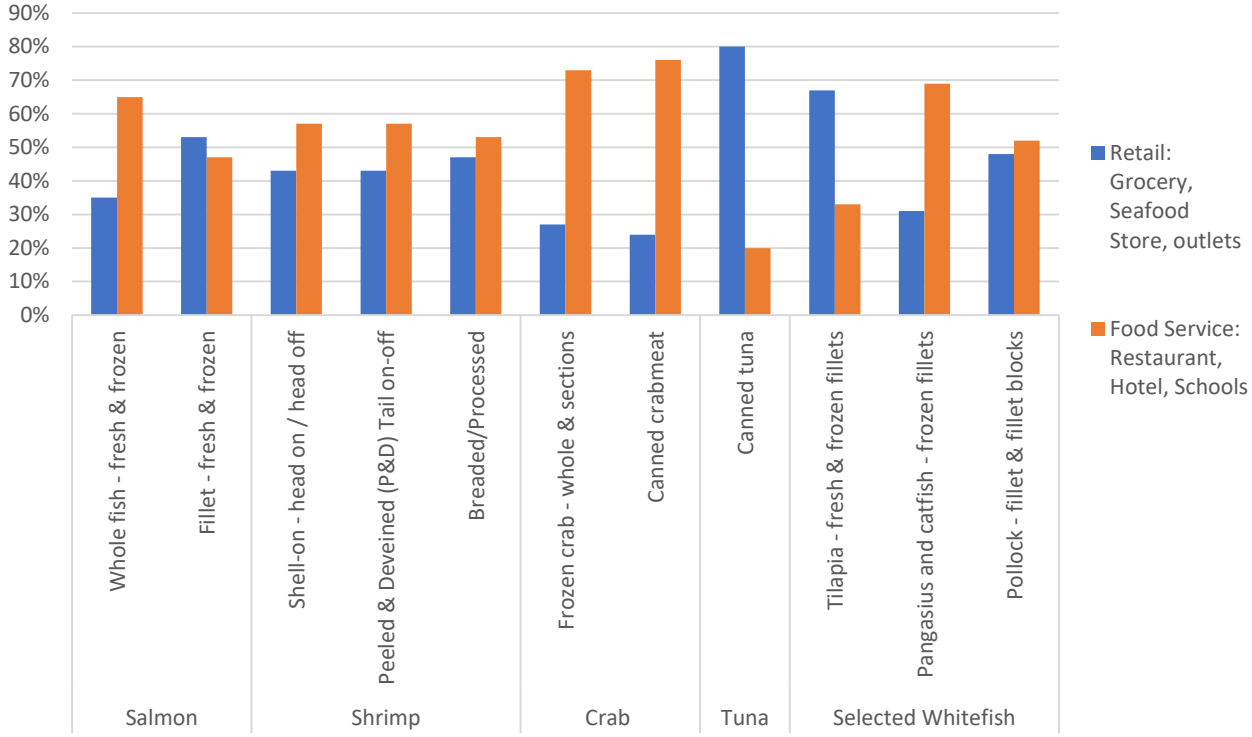



Figure 4 highlights the fact that U.S. seafood imports are nearly ready for consumption as more than 80% of U.S. seafood imports in each category, except for pollock fillets or fillet blocks, are destined for retail and/or food services (grocery stores, restaurants, etc.). Experts were also asked to estimate the proportion of each product sold in retail and food service markets. Imported products by final consumption outlet (i.e., Retail [Grocery, Seafood Store, outlets] versus Food Service [restaurants, schools, hotels]) are presented in Figure 5. These results suggest that a higher proportion of canned tuna and tilapia fillets are sold in grocery stores, while frozen or canned crabs, pangasius, and catfish are more likely to be destined for restaurants and hotels.

**Figure 5: U.S. seafood imports for Retail and Food Services by species, product type, and detailed use category**




The information provided through the consultation process was cross-checked with other sources of information, such as IMPLAN© data for 2019 and benchmark input-output data for 2012 published by the Bureau of Economic Analysis (BEA), and a final consistent distribution was obtained using a bi-proportional adjustment technique known as the RAS method[3].

## 3. Imported seafood in the supply chain – forward linkages

Methods for estimating the economic contributions of national domestic production have been long established in the economic literature, and it is a common analysis employed by researchers (Mohsin et al, 2015; U.S. Department of Commerce, 2018). However, quantifying the economic contributions

[3] According to Sargento (2002), this is a bi-proportional algorithm adjustment method applied with the goal of estimating a final matrix, departing from an initial matrix with relevant information and recalculating the distribution among the cells, keeping stable the total values of each row and each column. Miller and Blair (2009), who also address and describe this method, point to a newer reference: a special issue of Economic Systems Research (2004), on "Biproportional Techniques in Input–Output Analysis" and, most specifically, the article by the editors (Lahr and De Mesnard, 2004).

associated with commodity imports are not as straightforward. The economic literature considers an import to be a good that can be substituted by domestic consumption of the same or similar products. Like many agriculture commodities or raw materials, seafood products are limited resources and cannot be produced or substituted in an unlimited capacity to satisfy increasing demand. This work assumes that U.S. seafood imports cannot be offset by increased domestic production of seafood (commercially caught or aquaculture) therefore, in the short-term increasing seafood demand in the U.S. will result in increasing levels of U.S. seafood imports (Shamshak et al. 2019).

U.S. seafood imports correspond to an additional source of seafood supply that is available to U.S. industries and consumers. According to economic theory, supply does not necessarily imply economic growth but surely allows the economic activity of a region to increase, since it boosts the supply chain. Many food service establishments have customers, pay wages to workers, and make profits because they serve seafood products to their clients. Many factories that prepare, process, and pack seafood products rely on the imports of fish or shellfish and might not exist, or would lose a significant proportion of their inputs, if seafood imports were nonexistent. Grocery stores that sell canned tuna from Thailand or frozen cod fillets from China earn a retail margin in the process of buying and selling these products that is then used to pay for the space the store is using, to buy other inputs, or to distribute as wages or profits. When considering the relevant U.S. supply chains, the economic activity associated with processing and distributing imported seafood products takes place within the U.S. suggesting that the value-added generated from these activities stays within the U.S. economy and positively contributes to other macro-economic indicators.

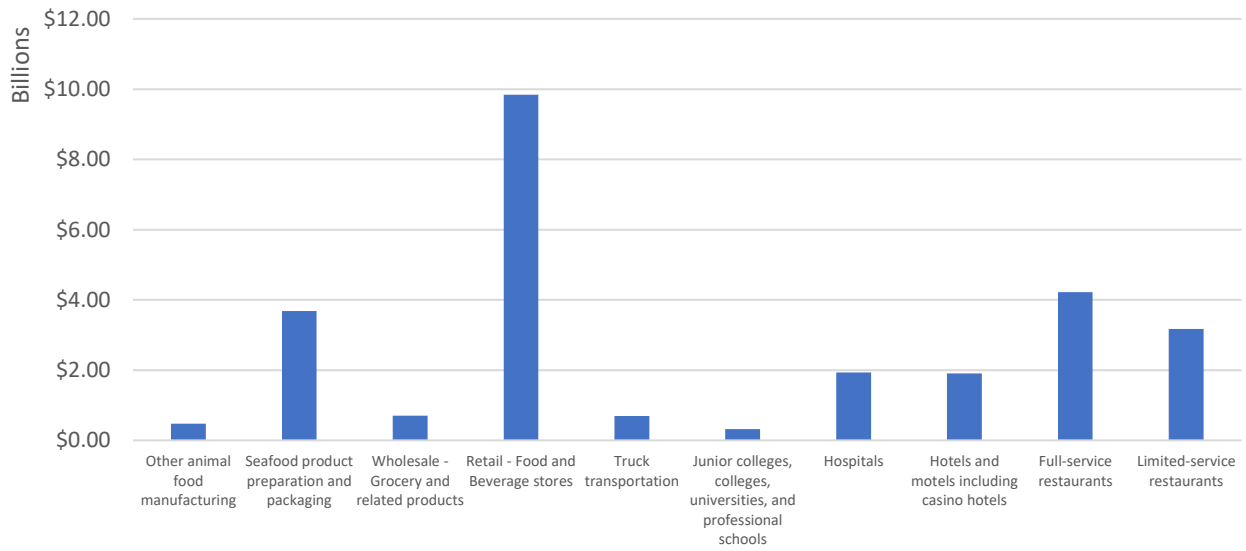
To understand the extent that additional supply supports economic activity within different sectors of the economy, we estimate the Ghoshian multiplier matrix for the U.S. economy, based on a transformed input-output model generated from licensed IMPLAN© data for the U.S. for 2019 (Papadas and Dahl, 1999; Miller and Blair, 2022). Each cell of this table communicates the value of output supported within a certain industry as a result of an increase in the supply of a particular commodity. By doing this, we have identified which of the 546 sectors included in the IMPLAN© model respond to a positive shock in the supply of the commercial fishing sector and seafood (in this case additional imported supply)[4]. This is commonly referred to as forward linkage and corresponds to the economic activity supported by a specific increase

[4] In the case of retail trade, wholesale trade, and truck transportation, instead of using the Ghoshian values, we used the margin information available within the IMPLAN© 2019 data for the U.S.

in the supply of a product that is used by other industries in the economy. IMPLAN© (2021) adds that "an Industry has significant forward linkages when a substantial amount of its Output is used by other Industries as Intermediate Inputs to their production", which is the case of imported seafood products.

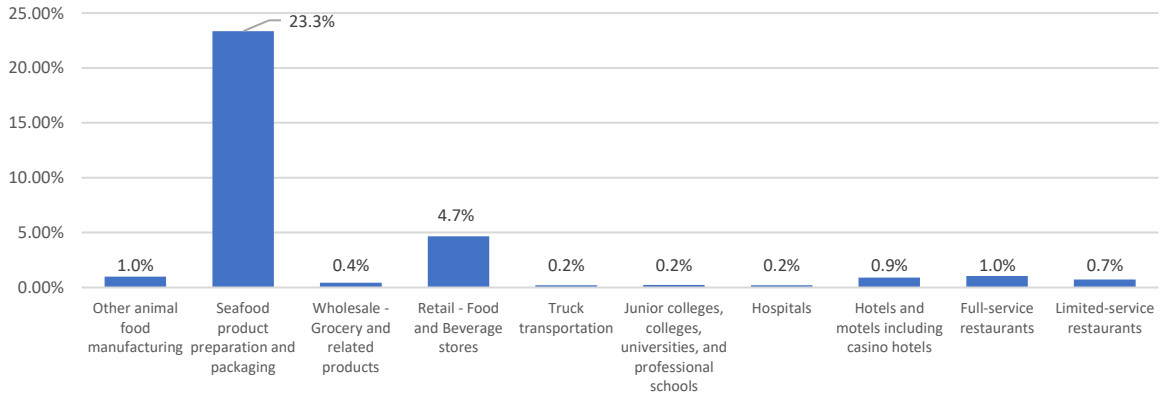
The results obtained in this step are consistent with the results in Figure 4 and 5. The multipliers were then weighted with the total imports per industry estimated by each of the sectors (the sum of the imports of the categories of salmon, shrimp, crab, tuna, and other as described in Figure 4 and 5). The results presented in Figure 6 represent the value of industry output that is supported by U.S. seafood imports plus the processing, distribution, and other economic activity associated with the use of imported seafood as an input by U.S. industries. A bridge was established between the economic activity and the IMPLAN© economic sectors (Appendix A). Figure 6 represent the estimated direct economic contributions of U.S. seafood imports after the conversion to IMPLAN sectors. Figure 7 shows the relative importance of seafood imports in the output of each sector.

**Figure 6: Direct economic contributions of U.S. seafood imports, by sector 2019**




It is estimated that the 2019 U.S. seafood imports of $22.4 billion support a total of $26.95 billion in industry output throughout the U.S. economy. More than half of this industry output is concentrated in "Retail – Food and Beverage Stores" (36.5%) and Restaurants (27.4% corresponds to full- and limited-service restaurants). "Seafood preparation and packaging" represents 14% of the total output generated. Results are structured differently when analyzing the importance of activity supported by U.S. seafood imports as a share of the total output (sales) of each industry in U.S. economy (Figure 7).

**Figure 7: The relative share of the imported seafood direct economic impact measured as a ratio of industry output**




Our estimations indicate that different levels of activity are supported by U.S. seafood imports across different sectors of the economy. For example, 23.4% of the "Seafood preparation and packaging" industry relies on the imports of seafood. In the case of the sales by food and beverages retail stores, this value is 4.7% and in terms of restaurants, imported seafood is responsible for 1% of the sales of full-service restaurants and 0.7% of the limited-service restaurants. The results presented in this section summarize the sales volume that accrue from the additional supply that are associated with the imports of seafood.

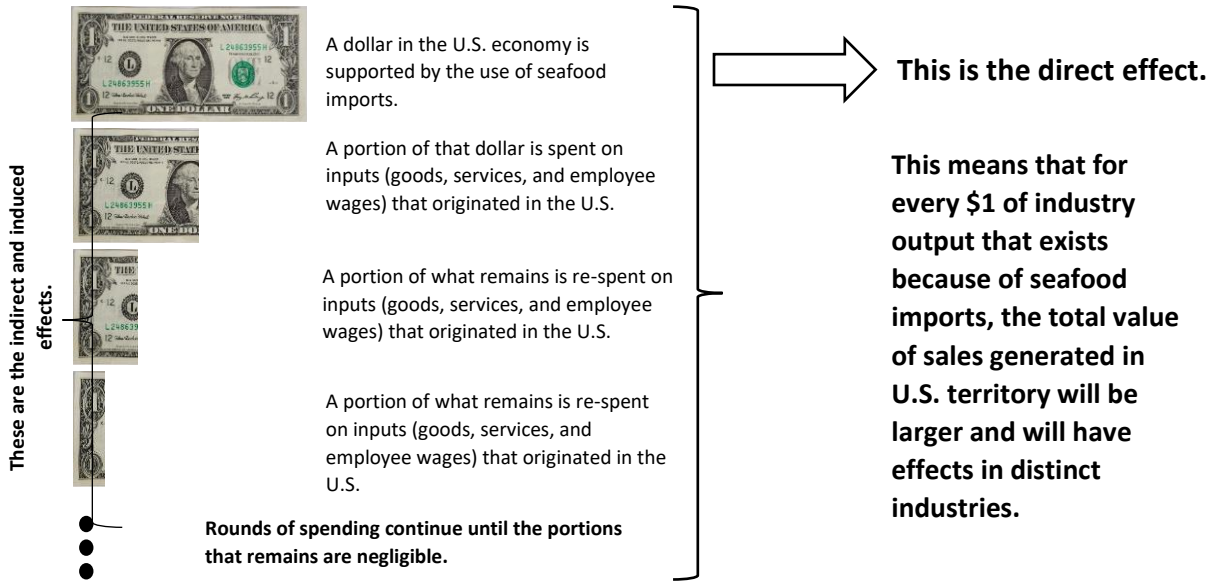
## 4. Economic contribution of seafood imports

The forward linkage analysis suggested that the $22.4 billion in U.S. seafood imports is associated with $26.9 billion in economic activity distributed across a variety of different industries, as shown in Figures 5 and 6. However, these numbers represent only a portion of the economic activity supported by seafood imports as there are also backward linkages. The industries that produce the $26.9 billion of outputs rely on input goods and services that are produced within the U.S.[5] These purchases of input goods and services, or interindustry dependencies, are commonly referred to in the economic literature as "indirect effects". In addition, the changes in income transferred to households as wages or profits are commonly referred as "induced effects". Together, the direct effects described in Section 3 plus the indirect and induced effects (i.e., backward linkages or multiplier effects) represent the total effects that are the usual

[5] Hirschman (1958) is considered one of the first economists to examine linkage studies and suggested that a forward linkage must always be accompanied by backward linkage, which is a result of the 'pressure of demand'.

standardized measure in economic contribution studies. A diagrammatic explanation of multiplier effects is presented in Figure 8.

**Figure 8: Multiplier effects – Direct, Indirect and Induced**




Source: Adapted from Hughes, 2018

The multipliers described in Figure 8 are known as Type II multipliers, which include both indirect and induced effects and are estimated using an input-output model that is closed with respect to households (Miller and Blair, 2022).

The analysis presented here employs licensed IMPLAN© software and national and state databases for the U.S. for 2019 (IMPLAN Group, LLC 2019). Data are derived from the National Income and Product Accounts for the U.S. (U.S. Department of Commerce, Bureau of Economic Analysis), the Quarterly Census of Employment and Wages (U.S. Bureau of Labor Statistics), the Census of Agriculture (U.S. Department of Agriculture), and numerous other sources. IMPLAN© characterizes 540 industry sectors, of which 10 are directly associated with U.S. seafood imports. IMPLAN© enables construction of input-output models and social accounting matrices that represent the structure of a national or regional economy in terms of transactions among industry sectors, households, and governments. In this section, we use the U.S. national model constructed with specifications for the commodity trade flows gravity model representing the share of commodities purchased from local sources, and social-institutional accounts for households treated as endogenous within the model to estimate the total economic contributions supported

by U.S. seafood imports. These results are summarized in terms of several distinct economic metrics and type of effect in Table 1.

**Table 1: Economic contributions of U.S. seafood imports in 2019**

| | Employment (fulltime and part-time jobs) | Labor Income (M$) | Proprietor Income (M$) | Tax on production and imports (M$) | Value Added (M$) | Output (M$) |
|---|---|---|---|---|---|---|
| **Direct Effect** | 279,411 | $10,071 | $952 | $1,807 | $14,205 | $26,954 |
| **Indirect Effect** | 96,859 | $6,046 | $1,026 | $656 | $9,889 | $19,691 |
| **Induced Effect** | 135,940 | $7,681 | $1,034 | $1,139 | $13,632 | $24,295 |
| **Total Effect** | 512,210 | $23,798 | $3,014 | $3,602 | $37,726 | $70,940 |

The total contributions of seafood imports to the U.S. economy exceeds half a million jobs, and $70 billion in industry output or sales revenues, $37 billion USD in total value added, and $24 billion in labor income. Additional components of total value added include proprietor income (with a total contribution of $3 billion) and taxes on production and imports, which correspond to more than $3.6 billion USD. Table 1 indicates that 19% of the total employment contributions (96,589 jobs) and 28% of output contributions are the result of indirect effects while the induced effects represent 27% of total employment contributions and 34% of total output contributions. Note that each of these metrics are distinct measures of economic activity and should not be added together.

The total economic contributions are distributed across the sectors of the U.S. economy. The pattern of interindustry relationships in 2019 determines the degree to which economic activity within that sector is supported by U.S. seafood imports. The top 10 sectors in terms of economic contributions of U.S. seafood imports, as measured by industry output, are shown in Table 2.

**Table 2: Sectoral decomposition of total economic contributions of U.S. seafood imports in 2019**

| IMPLAN Sector # | Sector Description | Output (M$) | Employment (fulltime and part-time jobs) | Labor Income (M$) | Value Added (M$) |
|---|---|---|---|---|---|
| 406 | Retail - Food and beverage stores | $10,078 | 132,322 | $4,646 | $6,280 |
| 509 | Full-service restaurants | $4,746 | 69,827 | $1,925 | $2,845 |
| 92 | Seafood product preparation and packaging | $3,929 | 9,347 | $585 | $757 |
| 510 | Limited-service restaurants | $3,653 | 46,757 | $1,068 | $1,741 |
| 447 | Other real estate | $3,191 | 15,734 | $458 | $1,342 |
| 490 | Hospitals | $3,006 | 15,758 | $1,364 | $1,605 |
| 507 | Hotels and motels, including casino hotels | $2,178 | 18,679 | $795 | $1,445 |
| 449 | Owner-occupied dwellings | $1,885 | 0.0 | $0 | $1,485 |
| 469 | Management of companies and enterprises | $1,597 | 6,521 | $866 | $1,003 |
| 417 | Truck Transportation | $1,314 | 8,558 | $547 | $658 |

Sectors with higher levels of economic contributions supported by U.S. seafood imports are retail, restaurants, and seafood preparation and packaging. Sectors that are not as tightly linked to U.S. seafood imports, including Other real estate or Management of companies and enterprises, also have a portion of their activity supported by U.S. seafood imports after accounting for backward linkages.

Retail – food and beverage stores contribute $10 billion in sales revenue as a result of U.S. seafood imports followed by $4.7 billion contributed by Full-service restaurants, $3.6 billion in limited-service restaurants and $2.2 billion in hotels and casinos. Nearly $4 billion is contributed by the seafood preparation and packaging industry. In terms of employment, there is a different ranking of sectors due to significant differences in labor productivity across sectors. About a quarter of the 512 thousand fulltime and part-time jobs that are supported by U.S. seafood imports throughout the U.S. economy are concentrated in the Retail – food and beverage stores sector. More than 100 thousand jobs are also supported in the Full-

service and Limited-service restaurants, and the Hotels and motels, including casino hotels sector also supports 19 thousand jobs.

Another metric by which economic contributions of U.S. seafood imports can be measured is taxes collected by federal, state, and local governments. Taxes associated with U.S. seafood imports are displayed in Table 3, including $5.03 billion in total federal tax contributions and $3.9 billion in total state and local tax contributions.

**Table 3: Total federal and state and local tax contributions associated with U.S. seafood imports**

| Level of Government | Tax Category | Tax Contributions (M$) |
|---|---|---|
| State and Local | Dividends and Corporate Related | $114 |
| | Social Security | $39 |
| | Taxes on Production and Imports* (paid by firms) | $3,164 |
| | Personal Taxes* (paid by households) | $626 |
| | TOTAL | $3,943 |
| Federal | Dividends and Corporate Related | $324 |
| | Social Security | $2,414 |
| | Taxes on Production and Imports* (paid by firms) | $437 |
| | Personal Tax: Income Tax (paid by households) | $1,856 |
| | TOTAL | $5,031 |

*Includes sales, property, motor vehicle, and other personal taxes

The following two sub-sections present the results for total economic contributions by use and by the species/product type to better understand the partial contributions of each used and species/product type to the U.S. economy.

### 4.1. Total economic contributions by U.S. seafood import use

Seafood products are imported for a variety of different uses. Some imported seafood products will be further processed and packaged, while others are directly imported for wholesale or retail distribution through a seafood market, grocery store, or restaurant. Table 4a shows the results for the total economic

contributions by import use in absolute terms, and Table 4b highlights the relative contribution of each import use as a proportion of the total economic contributions of U.S. seafood imports.

**Table 4a: Total economic contributions by import use**

| | Other animal food manuf. | Seafood preparation and packaging | Food Services | Accommodation | Canteens (Hospitals, Schools) | Retail | Wholesale and Transportation | Total |
|---|---|---|---|---|---|---|---|---|
| Output ($M) | $1,613 | $8,237 | $20,087 | $4,538 | $6,294 | $26,234 | $3,937 | $70,940 |
| Value-Added ($M) | $560 | $3,179 | $10,702 | $2,704 | $3,487 | $14,988 | $2,106 | $37,726 |
| Employment (FT/PT jobs) | 5,239 | 34,427 | 166,458 | 30,061 | 35,643 | 218,896 | 21,486 | 512,210 |

**Table 4b: Economic contributions by import use as a share of total economic contributions**

| | Other animal food manuf. | Seafood preparation and packaging | Food Services (Restaurants) | Accommodation (Hotels, casinos & other) | Canteens (Hospitals, Schools) | Retail | Wholesale and Transportation | Total |
|---|---|---|---|---|---|---|---|---|
| Output | 2.3% | 11.6% | 28.3% | 6.4% | 8.9% | 37.0% | 5.5% | 100% |
| Value-Added | 1.5% | 8.4% | 28.4% | 7.2% | 9.2% | 39.7% | 5.6% | 100% |
| Employment | 1.0% | 6.7% | 32.5% | 5.9% | 7.0% | 42.7% | 4.2% | 100% |

According to Tables 4a and 4b, U.S. seafood imports destined for Retail support the largest share of the total economic contributions, $26 billion in industry output (37.0%), $15 billion in value-added (39.7%), and nearly 220 thousand jobs (42.7%). U.S. seafood imports destined for Food services (restaurants) support around 28% of both the total output contributions and the total value-added contributions along with almost 33% of the total employment. U.S. seafood imports destined for the broader food services sector (restaurants, hotels, casinos, schools, and hospitals) support around 43.6% of the total output contributions and 44.8% the total value-added contributions along with 45.4% of the total employment. Finally, U.S. seafood imports destined for Seafood preparation and packaging is responsible for nearly 12% of the total output contributions and 7% of the total employment contributions.

### 4.2. Total economic contributions by seafood species/product type

In section 3, we highlight how U.S. seafood imports of different species and product types serve distinct purposes. While imported pollock is frequently further processed in the U.S. and used to manufacture different food products, other product types, such as crab or canned tuna, immediately enter wholesale or retail distribution services that provide products to final consumers. In this sub-section, we disaggregate the total economic contributions of U.S. seafood imports by species and product type, the results of which are presented in Tables 5a and 5b.

**Table 5a: Total economic contributions by species and product type**

| | Salmon | Shrimp | Crab | Canned Tuna | Selected Whitefish* | Others | Total |
|---|---|---|---|---|---|---|---|
| Output ($M) | $12,524 | $19,058 | $6,645 | $2,501 | $3,048 | $27,164 | $70,940 |
| Value-Added ($M) | $6,572 | $10,379 | $3,497 | $1,387 | $1,634 | $14,257 | $37,726 |
| Employment (FT/PT jobs) | 88,501 | 142,826 | 46,950 | 19,491 | 22,335 | 192,107 | 512,210 |

* Selected Whitefish includes fresh & frozen tilapia fillets, frozen pangasius & catfish, and frozen pollock block

**Table 5b: Economic contributions by species and product type as a share of the total economic contributions**

| | Salmon | Shrimp | Crab | Canned Tuna | Selected Whitefish* | Others | Total |
|---|---|---|---|---|---|---|---|
| Output | 17.7% | 26.9% | 9.4% | 3.5% | 4.3% | 38.3% | 100% |
| Value-Added | 17.4% | 27.5% | 9.3% | 3.7% | 4.3% | 37.8% | 100% |
| Employment | 17.3% | 27.9% | 9.2% | 3.8% | 4.4% | 37.5% | 100% |

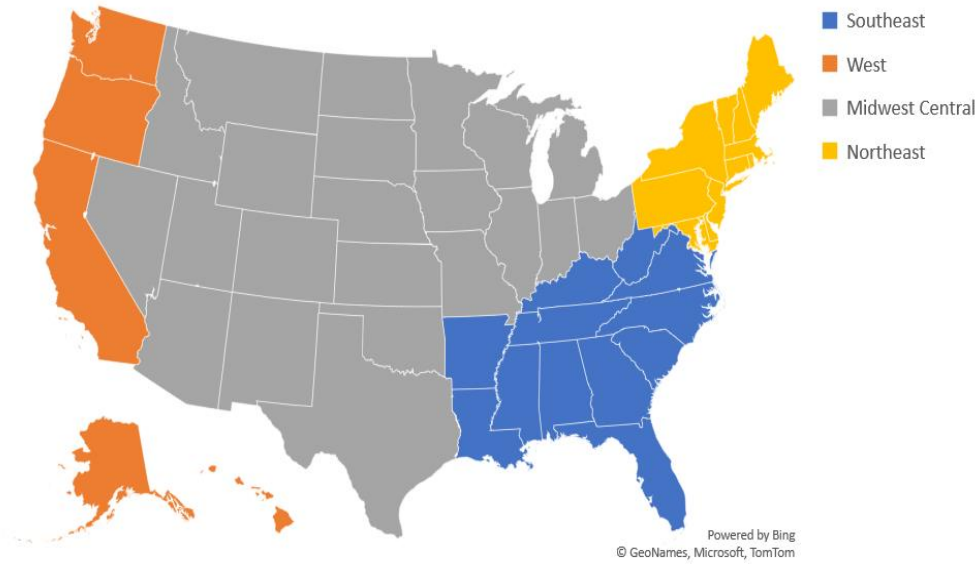
* Selected Whitefish includes fresh & frozen tilapia fillets, frozen pangasius & catfish, and frozen pollock block

When attributing total economic contributions to species/product types specified within this study, the most significant category is shrimp imports. U.S. shrimp imports correspond to 27% of the total output contributions ($19 billion) and 28% of the total value-added ($10 billion) and employment contributions (nearly 143,000 jobs). Salmon and Crab are the second and third most significant categories supporting 88 thousand and 47 thousand jobs in the U.S. economy, respectively. Roughly 38% of the total economic contributions (by all metrics) are attributed to the "Others" category, which includes all other species and product forms not specified within other categories.

## 5. Regional distribution of economic contributions

Total economic contributions of U.S. seafood imports are estimated to exceed half a million jobs and $70 billion in industry output or sales revenues, but the regional distribution of these impacts does not happen equally across the U.S. Economic contributions tend to concentrate in places where seafood processing facilities are located or in regions where grocery stores and restaurants are relatively more dependent on the import of seafood products. Available data on the port of entry (seaport or airport) of U.S. seafood imports are not sufficient to regionalize the national economic contributions of seafood imports because U.S. seafood imports that enter through Newark, NJ, Wilmington, DE, New Orleans, or Los Angeles can be transported, processed, or stored in a warehouse in a different state or region. The U.S. economic regions defined in this study are presented in Figure 9.

**Figure 9: U.S. economic regions**




Since seafood imports can be incorporated into the supply chain in states or regions far from the place where the commodity enters the U.S., the industry experts were asked to distribute each species/product type by use (i.e., sent for further processing or for final consumption) and economic region. Figure 10a details the regional distribution of each species/product type when used as an input for further processing and Figure 10b details the regional distribution by species/product type when used to satisfy final demand (independent of being a restaurant, hotel, cafeteria, or grocery store).

**Figure 10a: Regional distribution of U.S. seafood imports sent for additional processing**

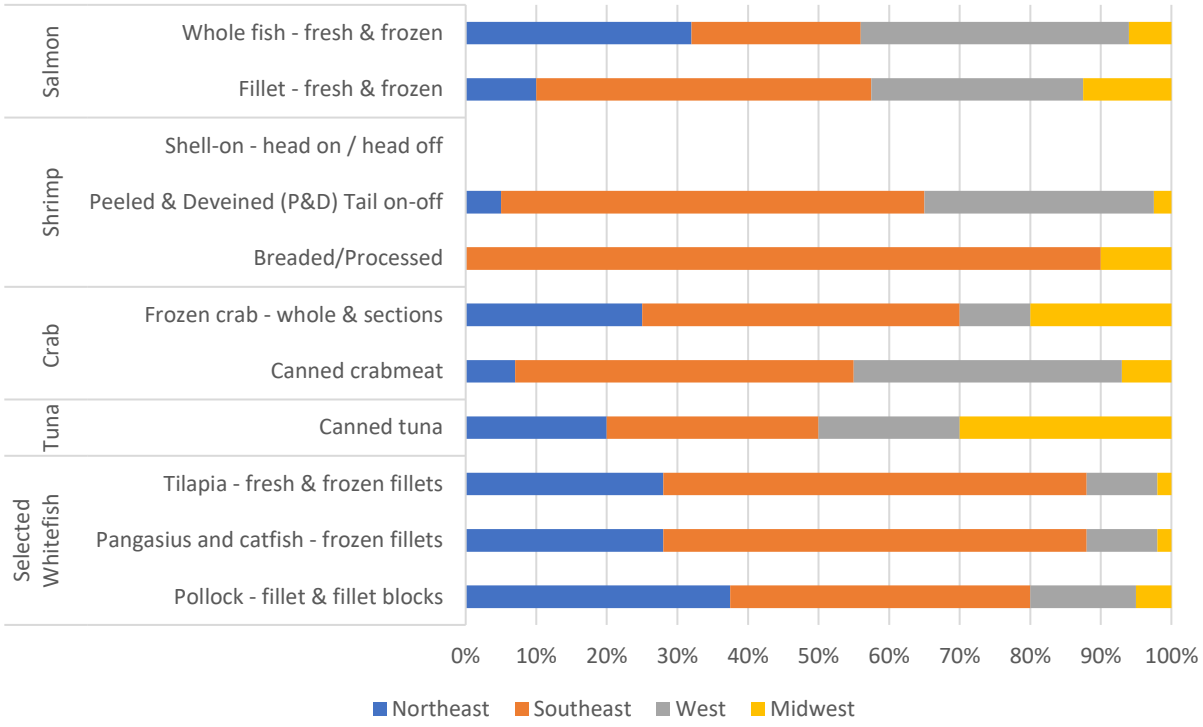
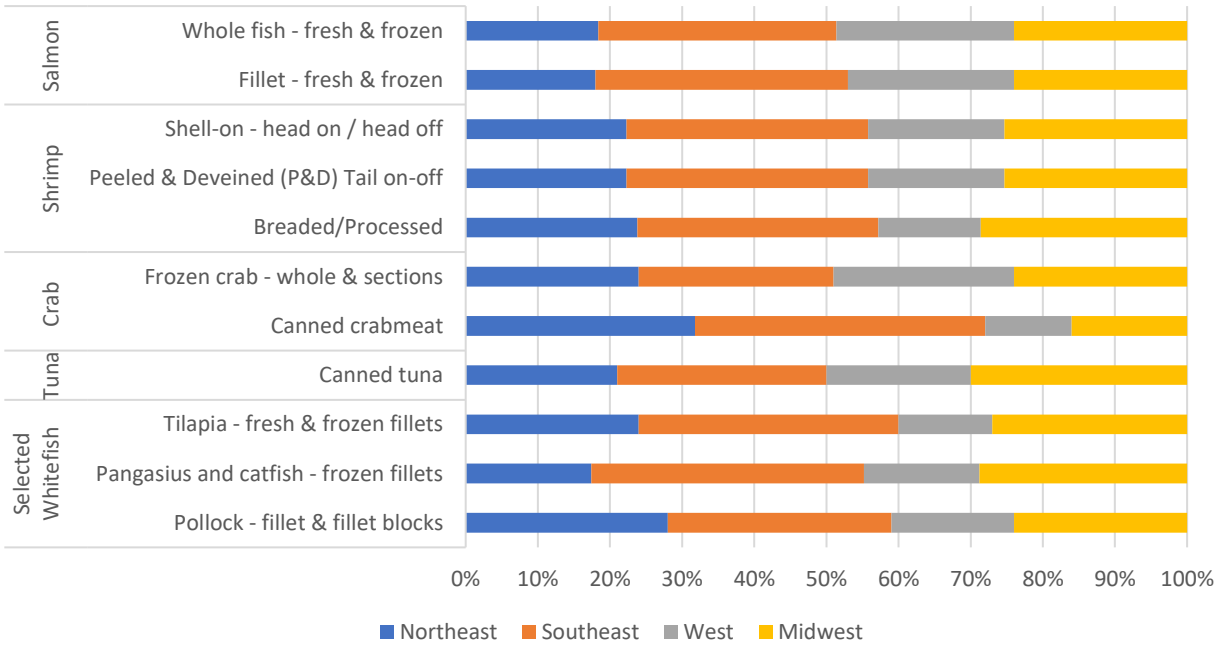



**Figure 10b: Regional distribution of U.S. seafood imports sent directly to retail and food service outlets**



Figures 10a and 10b highlight how imported canned crabmeat and pollock are used in the Northeast and Southeast while the West uses relatively more imported shrimp, canned tuna, and pangasius. This different pattern of distribution by product and first step in the supply chain shapes the regional economic contributions of U.S. seafood imports.

These estimates and region-specific input-output models were used to allocate the national-level total economic contributions to U.S. regions. Four multi-state, single region input-output models were derived and then applied for the West, Midwest, Northeast, and Southeast regions. These models were also constructed with specifications for the commodity trade flows gravity model and social-institutional accounts for households were treated as endogenous. Each model was used to estimate the economic contributions of U.S. seafood imports that are used in each region. Due to the interregional leakage effects, the sum of the regional economic contributions for the four regions is less than the estimated national economic contributions. Sector-specific adjustments were made to allocate the small, remaining values according to the regional distribution of output of each sector in the U.S. economy. Results for the regional allocation of total output and employment contributions are shown in Tables 6 and 7, respectively.

**Table 6: Distribution of total output contributions by economic region**

| | Output M$ | % | % of total regional output |
|---|---|---|---|
| West | 14,257 | 20.1% | 0.22% |
| Midwest | 21,146 | 29.8% | 0.15% |
| NorthEast | 14,628 | 20.6% | 0.19% |
| SouthEast | 20,907 | 29.5% | 0.26% |

**Table 7: Distribution of total employment contributions by economic region**

| | Employment (FT/PT jobs) | % | % of total Regional employment |
|---|---|---|---|
| West | 92,442 | 18.0% | 0.31% |
| Midwest | 153,772 | 30.0% | 0.18% |
| NorthEast | 102,871 | 20.1% | 0.26% |
| SouthEast | 163,125 | 31.8% | 0.39% |

In absolute terms, the region with the largest output contributions attributed to U.S. seafood imports is the Midwest and the region with the largest total employment contribution is the Southeast. The Northeast and West have closer numbers with total output contributions of around $14 billion USD and total employment contributions of around 100 thousand jobs in each region. The Midwest is the largest regional economy in the analysis, and it includes non-coastal states of the West, the Midwest, Texas, and several of the most important urban areas in the U.S like Chicago, Dallas, Houston, Detroit. The Midwest represents almost 60% of US territory. The relative importance of economic activity associated with U.S. seafood imports is quite different. In relative terms, the total economic contributions of U.S. seafood imports support more activity in the economies of the Southeast and West, representing more than 0.2% of total output and 0.3% of total employment in each region. Economic contributions of U.S. seafood imports are less relevant in the Midwest.

Finally, the region-level economic contributions were proportionally allocated to individual states according to each state's distribution of output per economic sector. The results for the ten states with the largest economic contributions in terms of output and employment are presented in Figures 11 and 12. Figures 13 and 14 display the total economic contributions for all 50 U.S. states for output and employment, respectively.

**Figure 11: Top 10 states in terms of total output contributions of U.S. seafood imports (absolute values)**

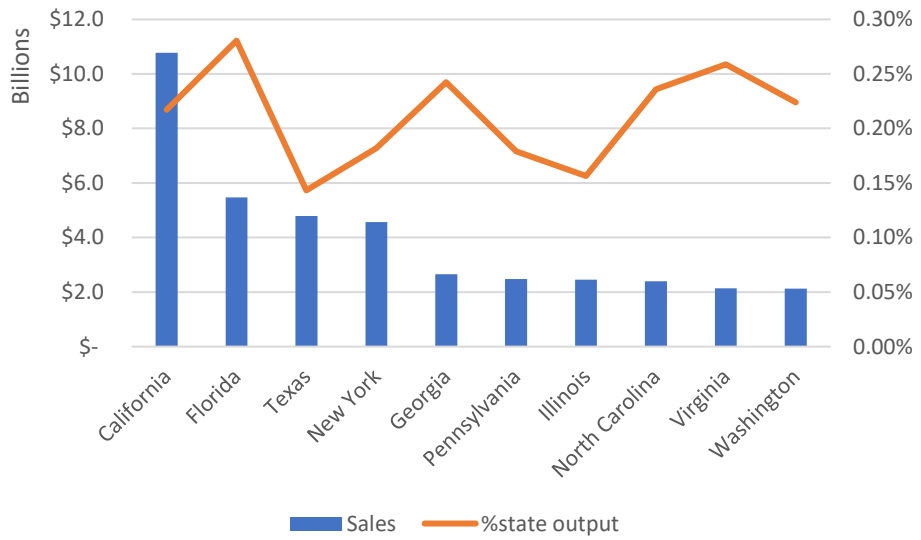


**Figure 12. Top 10 states in terms of total employment contributions of U.S. seafood imports (absolute values)**

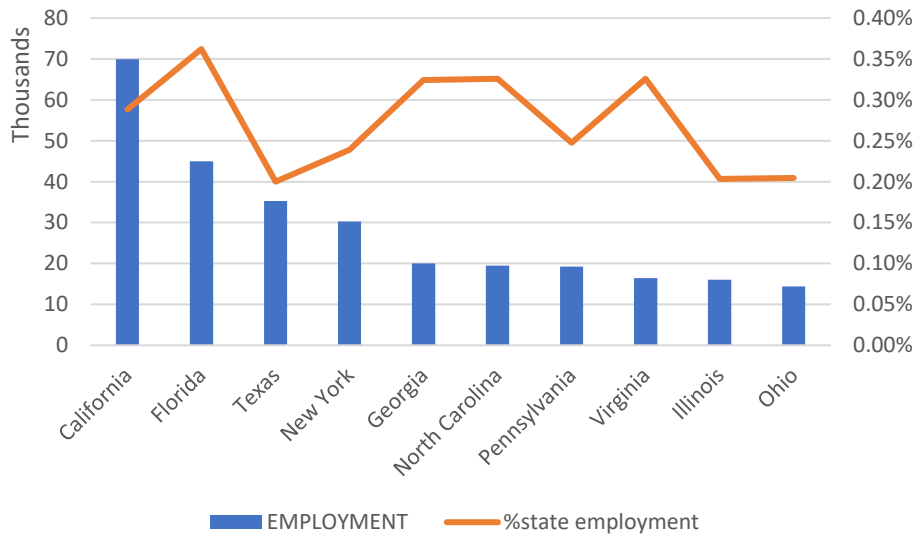



**Figure 13: Total output contributions of U.S. seafood imports by state**

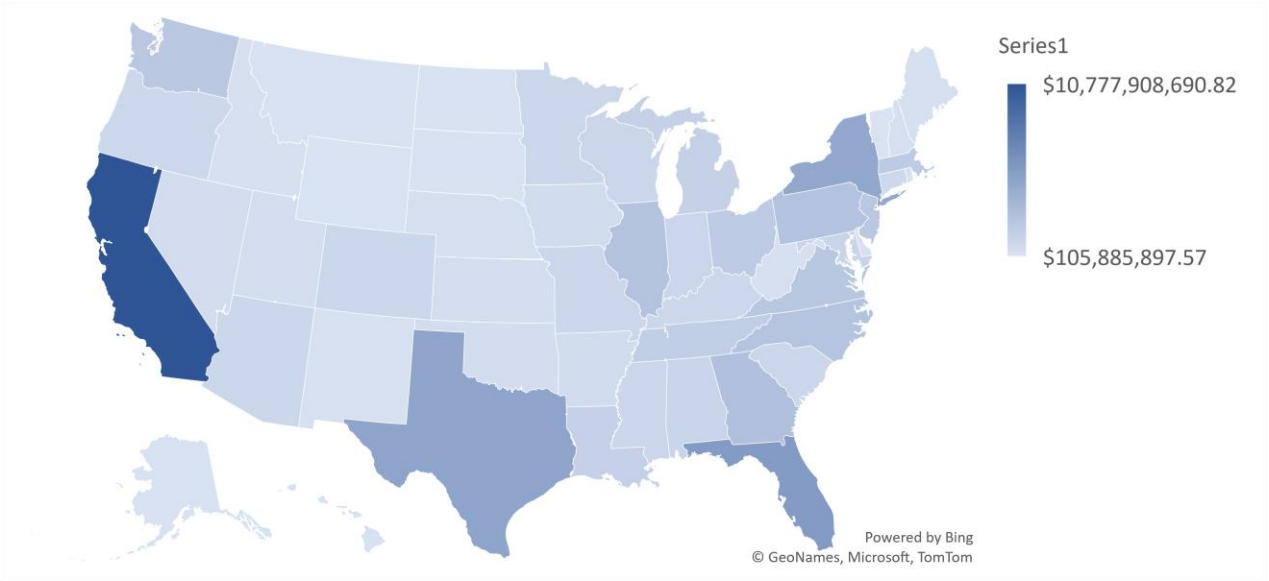
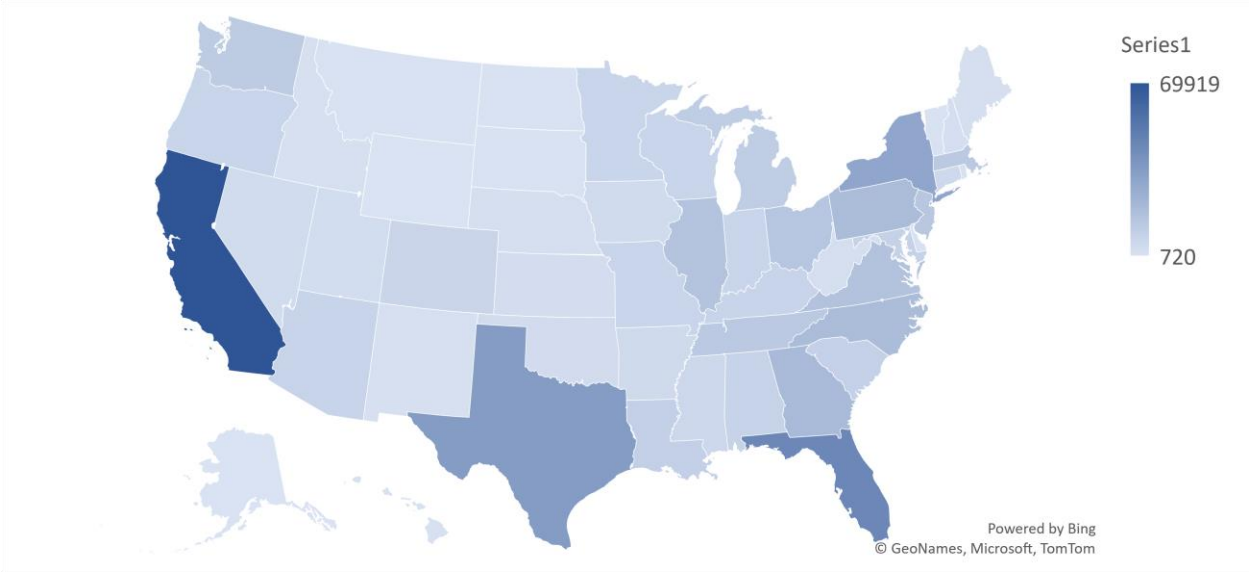


**Figure 14: Total employment contributions of U.S. seafood imports by state**




The largest absolute values for total output contributions and total employment contributions by state are in California, however the economic contributions of U.S. seafood imports represent about 0.22% of total output and less than 0.3% of employment in the state. In relative terms, the total economic contributions of U.S. seafood imports support a larger percentage of economic activity in states such as Florida, North Carolina, and Virginia. Illinois is the only non-coastal state among the top 10 states both in terms of total output contributions and total employment contributions. This is due to the relevance of wholesale activity and truck transportation within this state as well as the overall size of the state. Similar to Texas, Illinois has significant total economic contributions in absolute terms for both output and employment, but these contributions are much lower in relative terms once compared with the size of their economy. In other smaller states such as Maine, Louisiana, and Alabama, the total economic contributions of U.S. seafood imports represent more than 0.25% of the state output. In terms of employment, besides the states shown in Figure 12, total employment contributions of seafood imports in Mississippi, Louisiana, Maine, South Carolina, Tennessee, West Virginia, or Oregon represents more than 0.30% of the total state employment.

In summary, the total economic contributions of U.S. seafood imports are more concentrated in coastal areas but economic activity in other non-coastal areas is also supported by U.S. seafood imports as seafood products are processed, packaged, and sold in retail and food service outlets in these states. Also, the dependence on wholesale trade, warehouses, and truck transportation along the supply chain spreads the

economic contributions across more regions, including some non-coastal states within the Midwest. These results demonstrate how economic activity across the whole country is supported by U.S. seafood imports.

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## Appendix A

IMPLAN economic sectors associated with direct economic activity of imported seafood: code and description

| Code | Description |
|---|---|
| 64 | Other animal food manufacturing |
| 92 | Seafood product preparation and packaging |
| 398 | Wholesale - Grocery and related products |
| 406 | Retail - Food and Beverage stores |
| 417 | Truck transportation |
| 481 | Junior colleges, colleges, universities, and professional schools |
| 490 | Hospitals |
| 507 | Hotels and motels including casino hotels |
| 509 | Full-service restaurants |
| 510 | Limited-service restaurants |