



Access to Seafood in the U.S. Insights from the Economics of Aquatic Foods

**Martin D. Smith
Duke University**

**Presentation to NASEM Study Committee
The Role of Seafood Consumption in Child Growth and Development
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Thanks to many collaborators on individual pieces of this talk, especially Frank Asche, Julia Bronnmann, Andreea Cojocaru, Håkan Eggert, Atle Oglend, Tess Petesch, and Cathy Roheim

1. Prices are extremely important

People consume more seafood when:

- seafood prices are low
- prices of substitutes (e.g. other animal proteins, vegetable-based proteins, or other seafood products) are high
- income is high

Recent Studies of U.S. Consumer Demand Using Scanner Data

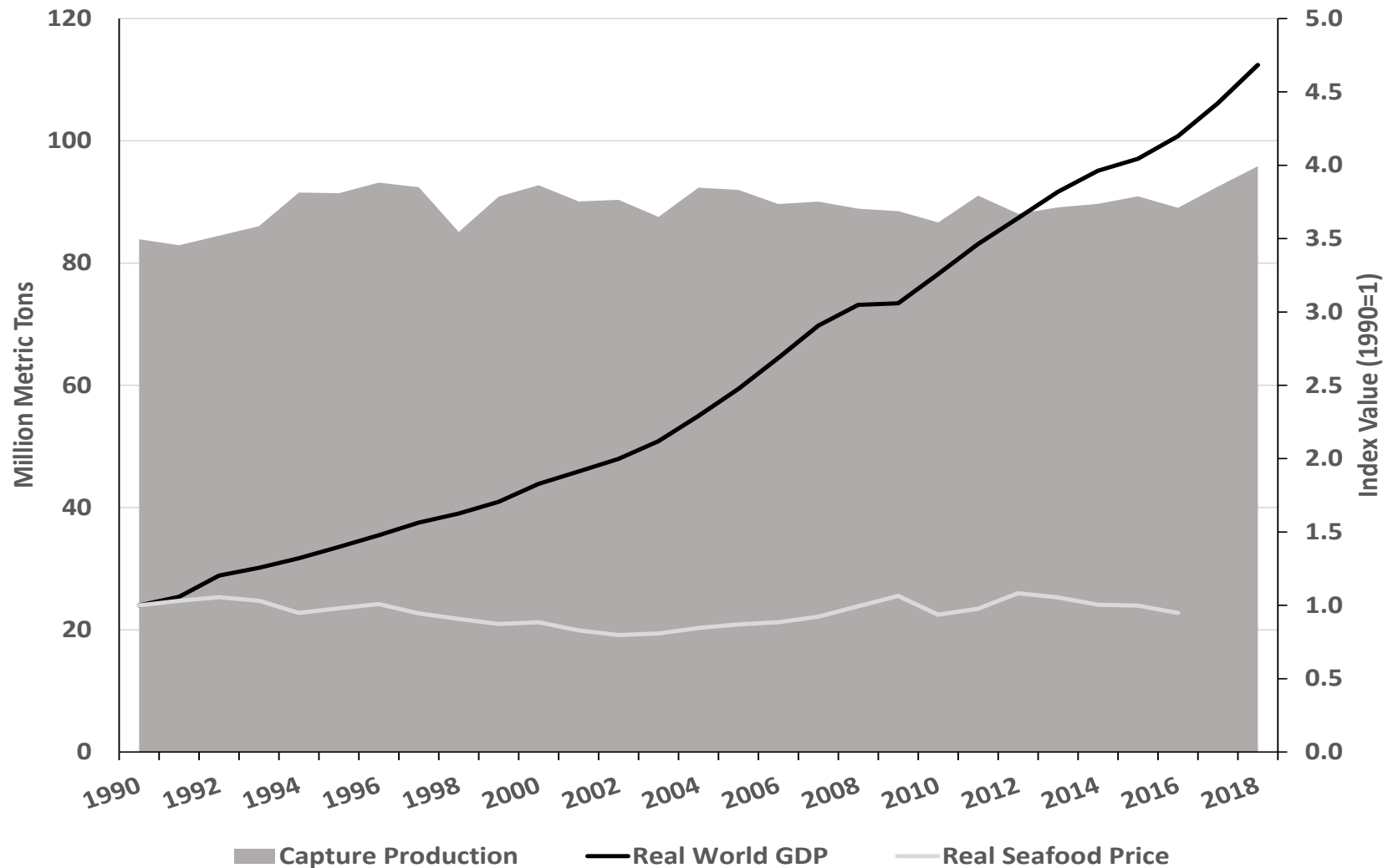
- Price and income elasticities of demand for seafood are heterogeneous across commodities
- Seafood consumption is geographically heterogeneous
- Demand for most seafood products is own-price elastic or near unit-elastic (1% price increase leads to $\geq 1\%$ consumption decrease)
 - Consumption quite responsive to price
- Demand for seafood is typically income inelastic (a necessity)
 - Expenditures on seafood go up as people get wealthier, but share of seafood in the budget shrinks

Dey, M.M., Surathkal, P., Chen, O.L. and **Engle, C.R.**, 2017. Market trends for seafood products in the USA: Implication for Southern aquaculture products. *Aquaculture Economics & Management*, 21(1), pp.25-43.

2. Real seafood prices have remained low despite massive growth in demand

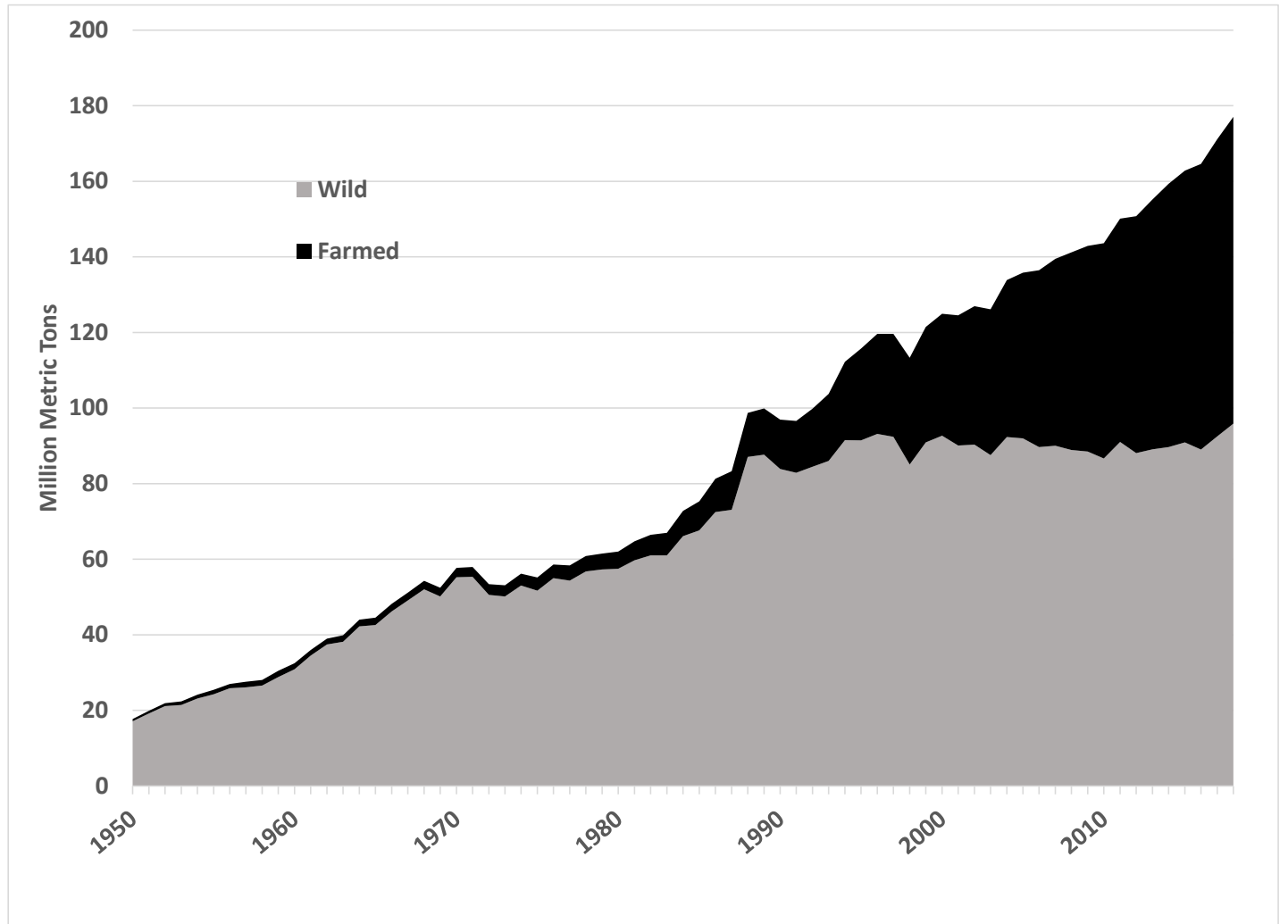
Access to affordable seafood has increased!

Why have global seafood prices remained stable despite rising demand and flat capture fishery landings?

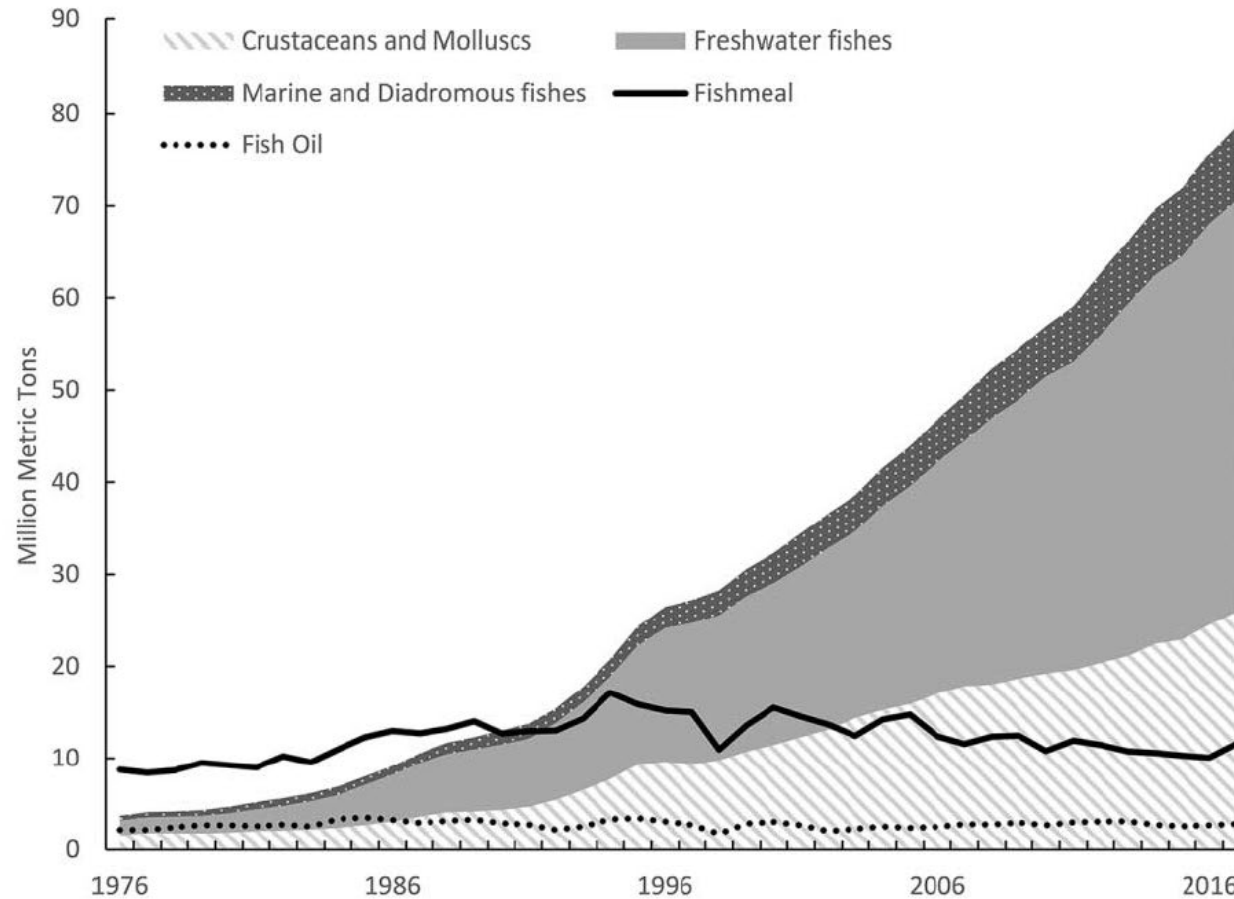


Asche, Eggert, Oglend,
Roheim, and Smith
REEP 2022

Aquaculture



Fishmeal and Fish Oil Production Has Not Limited Aquaculture Growth

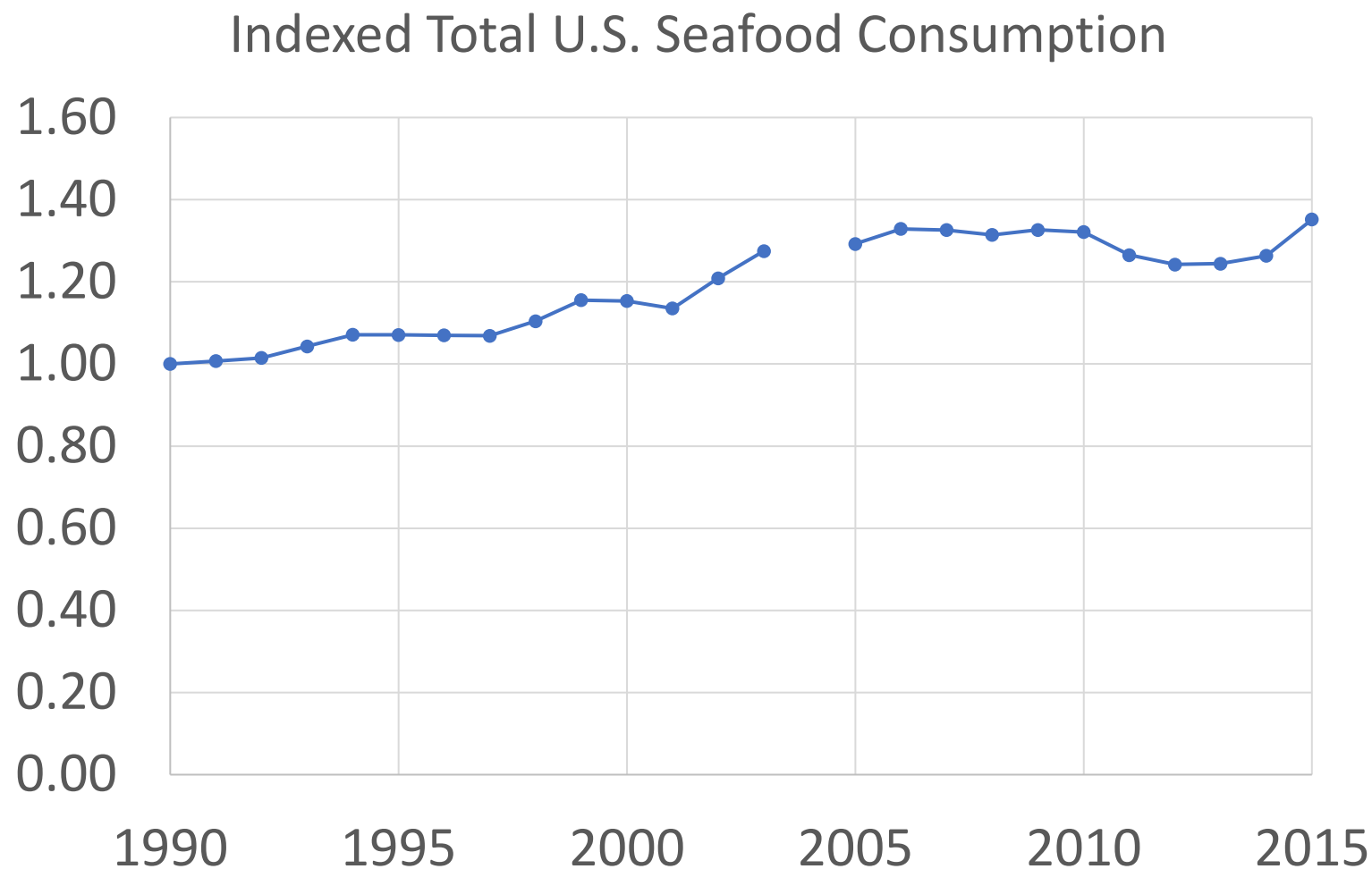


From Asche et al. REEP 2022

Figure 6 Aquaculture, fish meal, and fish oil production. All production is in million tons, from 1976 to 2017. Fish meal production is indicated by a black line; fish oil production is indicated by a black dotted line. Source: FAO FishStat Plus (<https://www.fao.org/fishery/en/statistics/software/fishstat/en>).

3. Seafood that people in the U.S. commonly consume has gotten cheaper, or at least has not increased in price, over time

U.S. Seafood Consumption Has Grown Substantially



Source: NFI data: US Population estimates

Per Capita U.S. Seafood Consumption (pounds edible meat)

Small number of species are large % of total

NFI's Annual Top 10 List

SPECIES	2020	CHANGE FROM 2019
Shrimp	5.00	0.30
Salmon	2.83	-0.26
Canned Tuna	2.60	0.40
Tilapia	1.07	0.07
Alaska Pollock	0.88	-0.09
Cod	0.57	-0.01
Crab	0.52	0.00
Catfish	0.52	-0.03
Pangasius	0.39	0.03
Scallops	0.22	-0.02

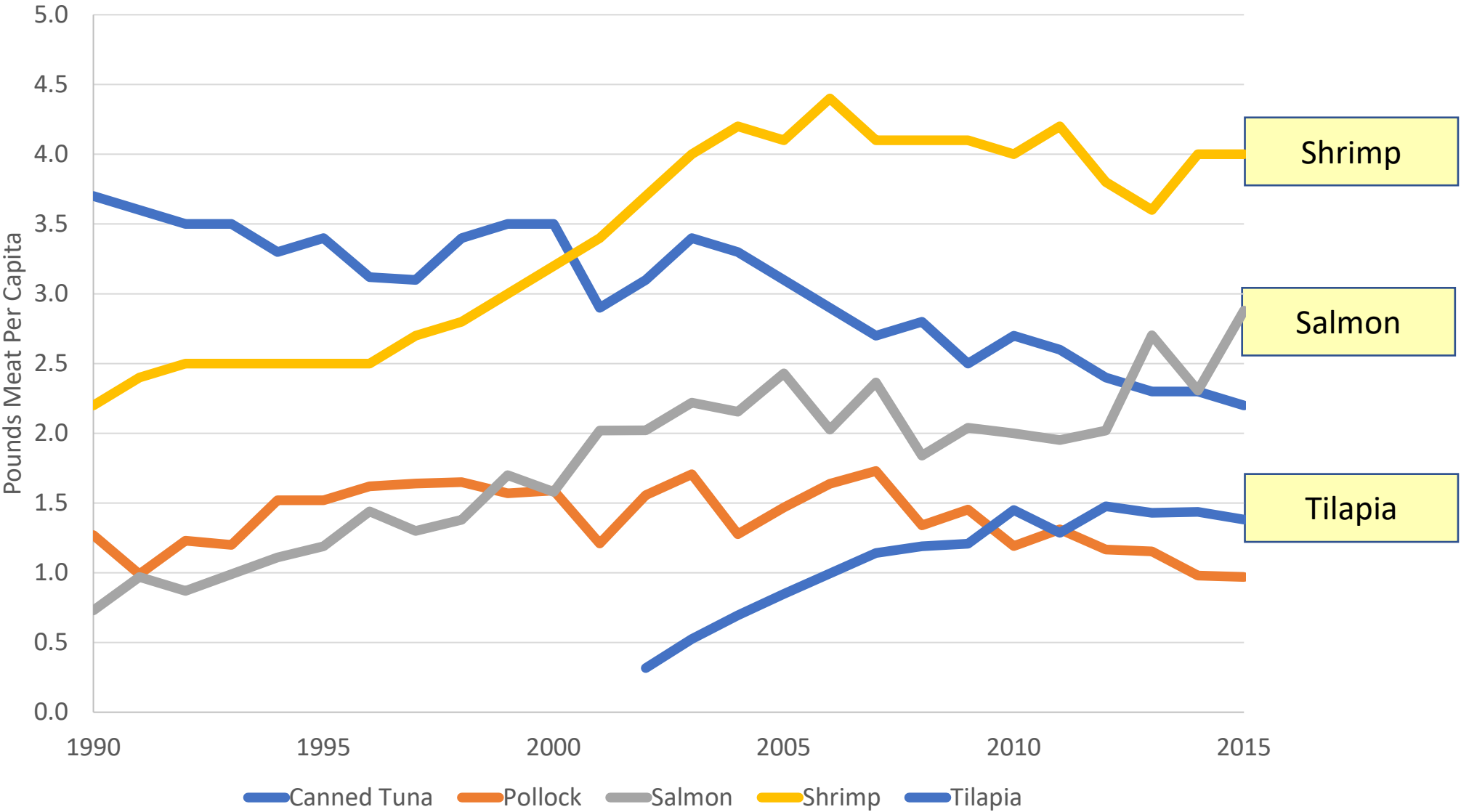
2020 Per Capita Consumption: 19
2020 Total Top 10: 14.60

All Other Species Consumption: 4.40
Top 10 as % of Total Consumption: 77%



US Per Capita Consumption of Top Seafood products

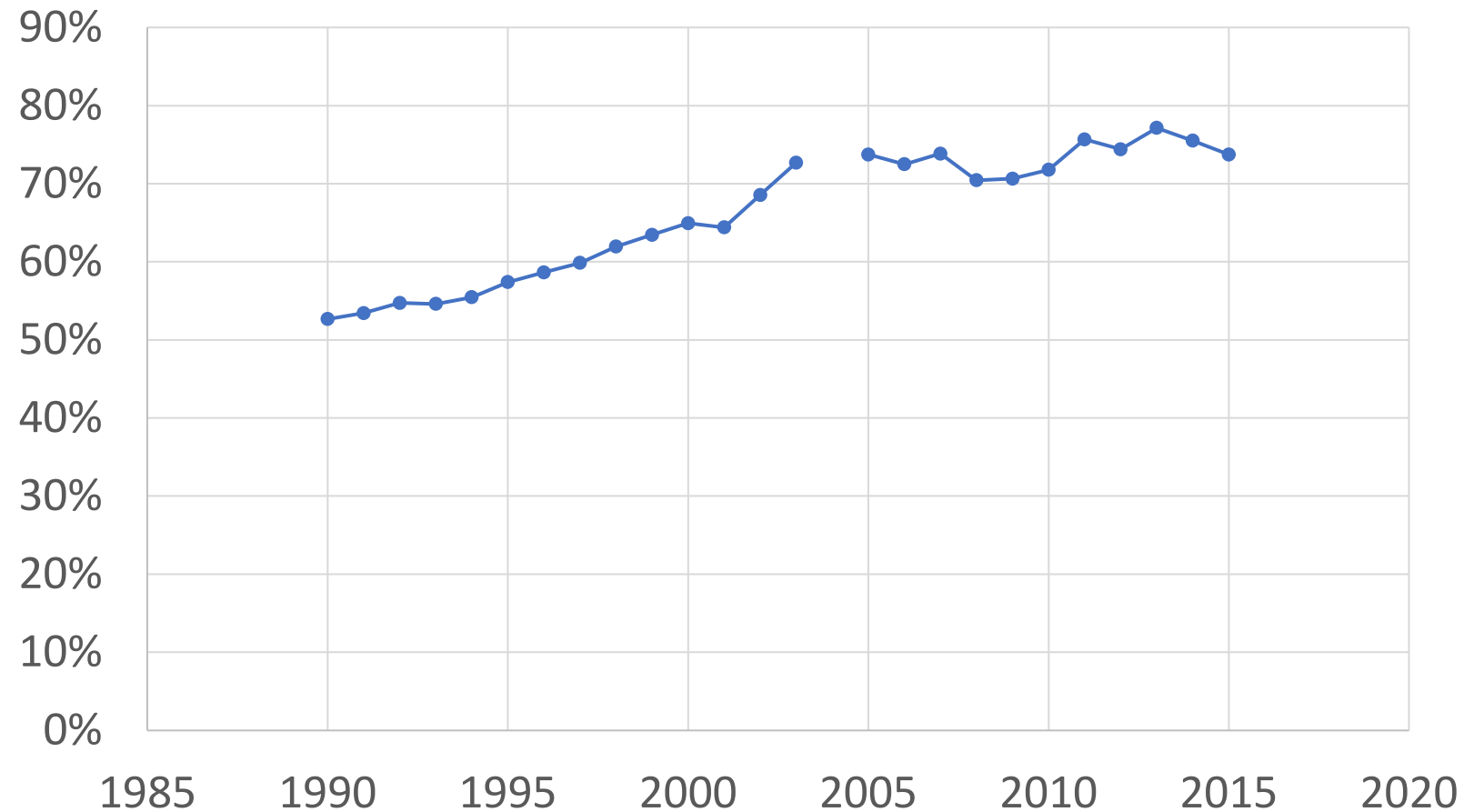
Source: National Fisheries Institute Data



Species trending up are farmed

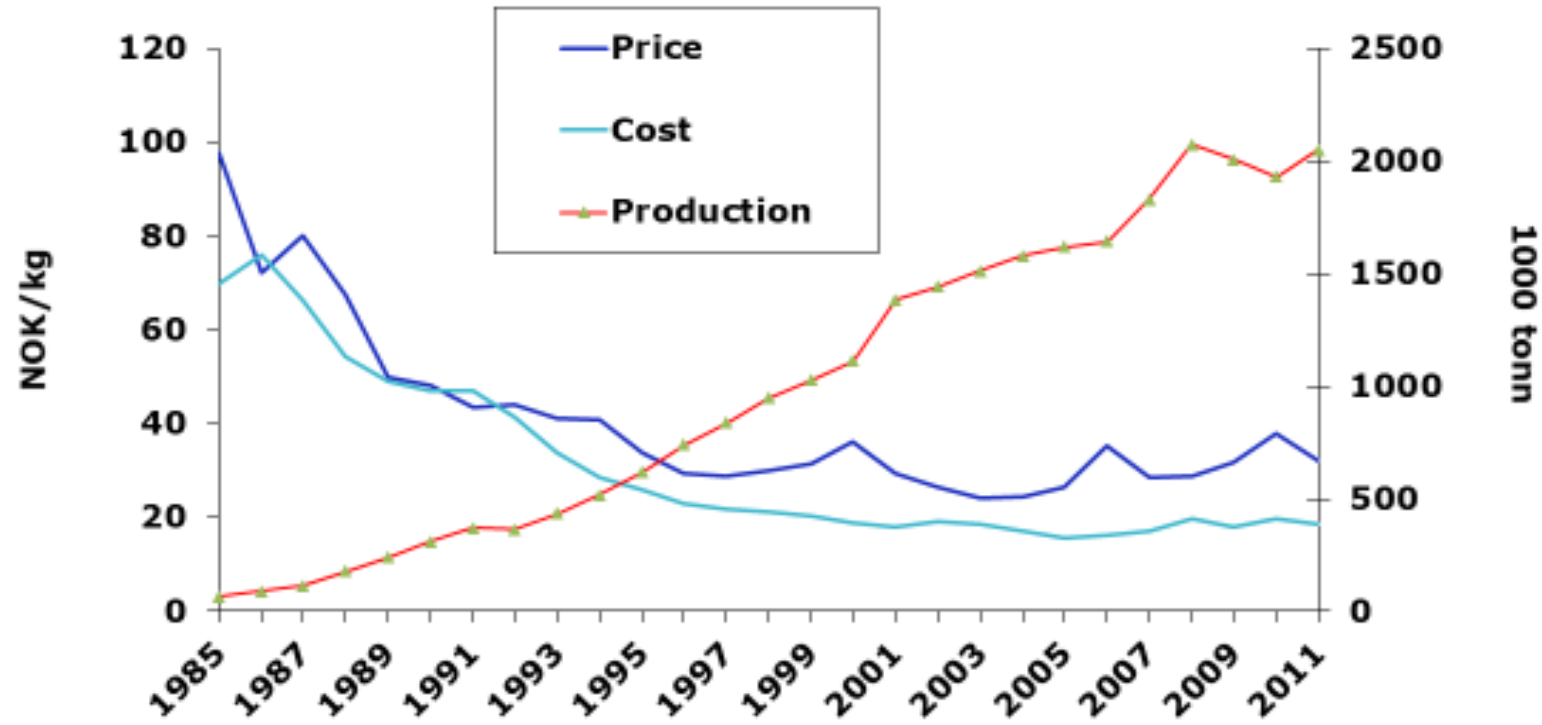
Top 5 Species are Most of U.S. Seafood Consumption

Share of Total U.S. Seafood Consumption
Shrimp, salmon, canned tuna, pollock, and tilapia



Innovation in Aquaculture = Lower Prices for Consumers

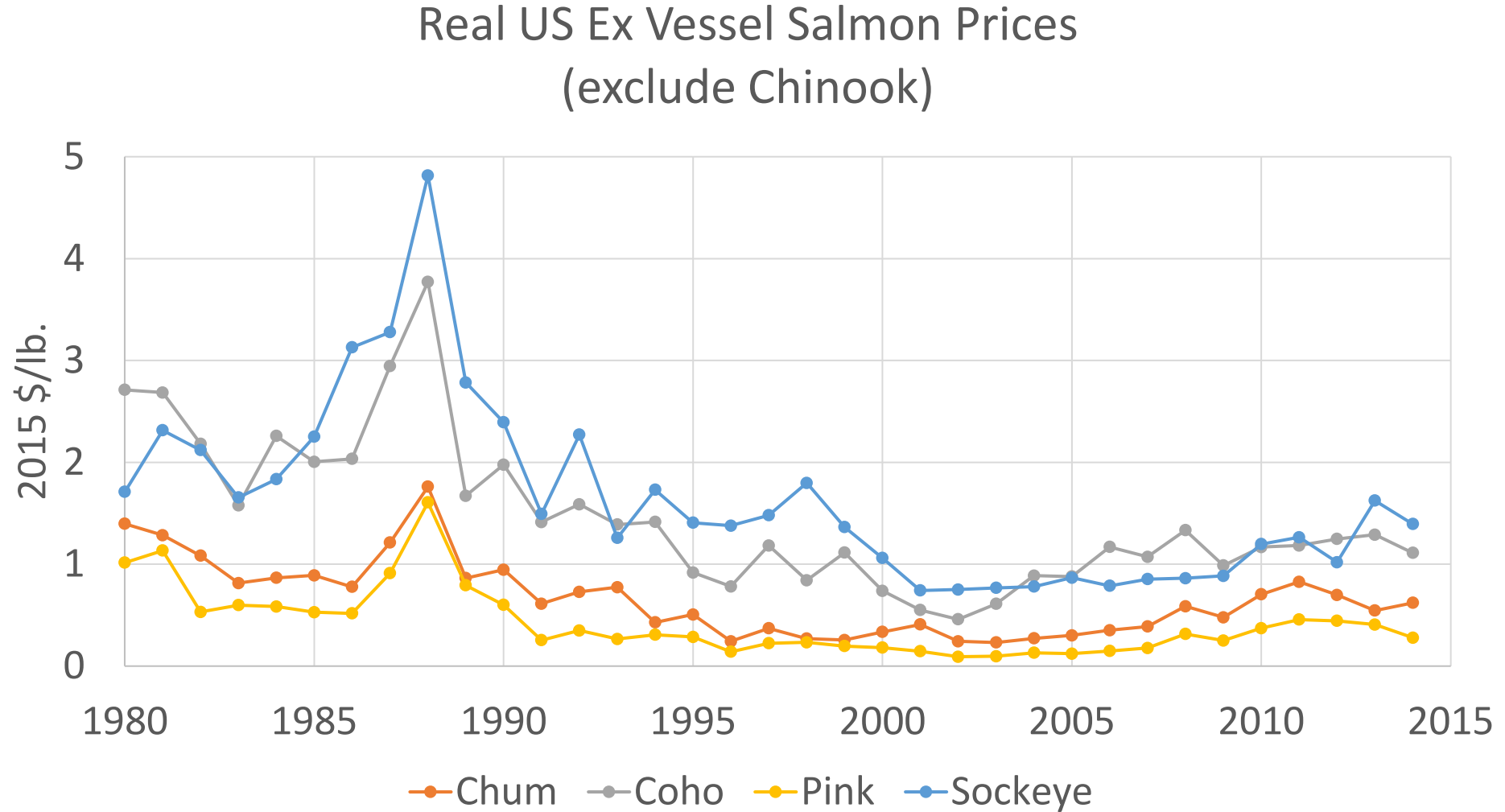
Dramatic Reductions in Farmed Salmon Production Costs



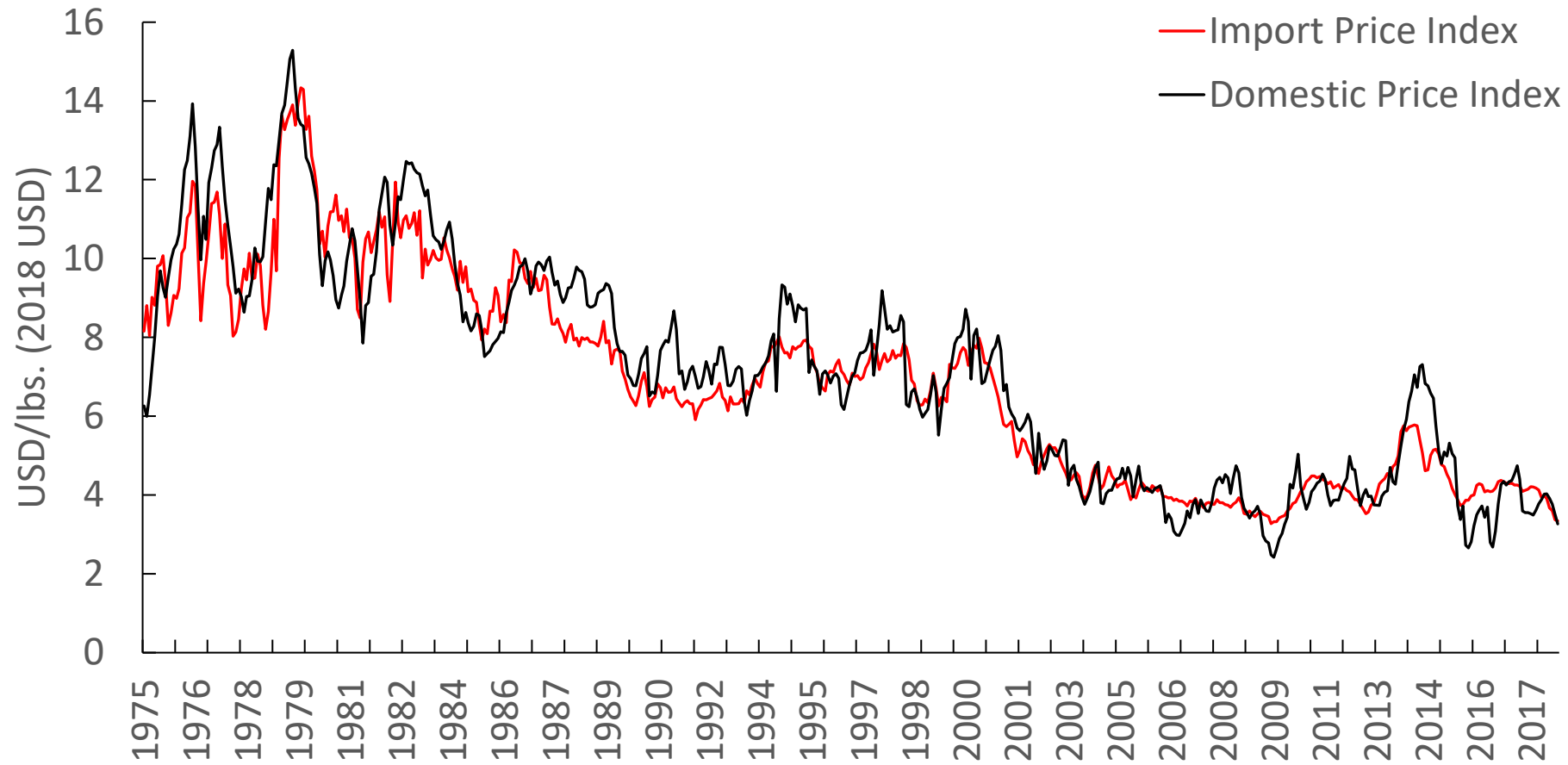
Source: Norwegian Directorate of Fisheries

Updated figure based on Asche *MRE* 2008

Wild-caught salmon less expensive than it used to be



Shrimp a lot less expensive than it used to be

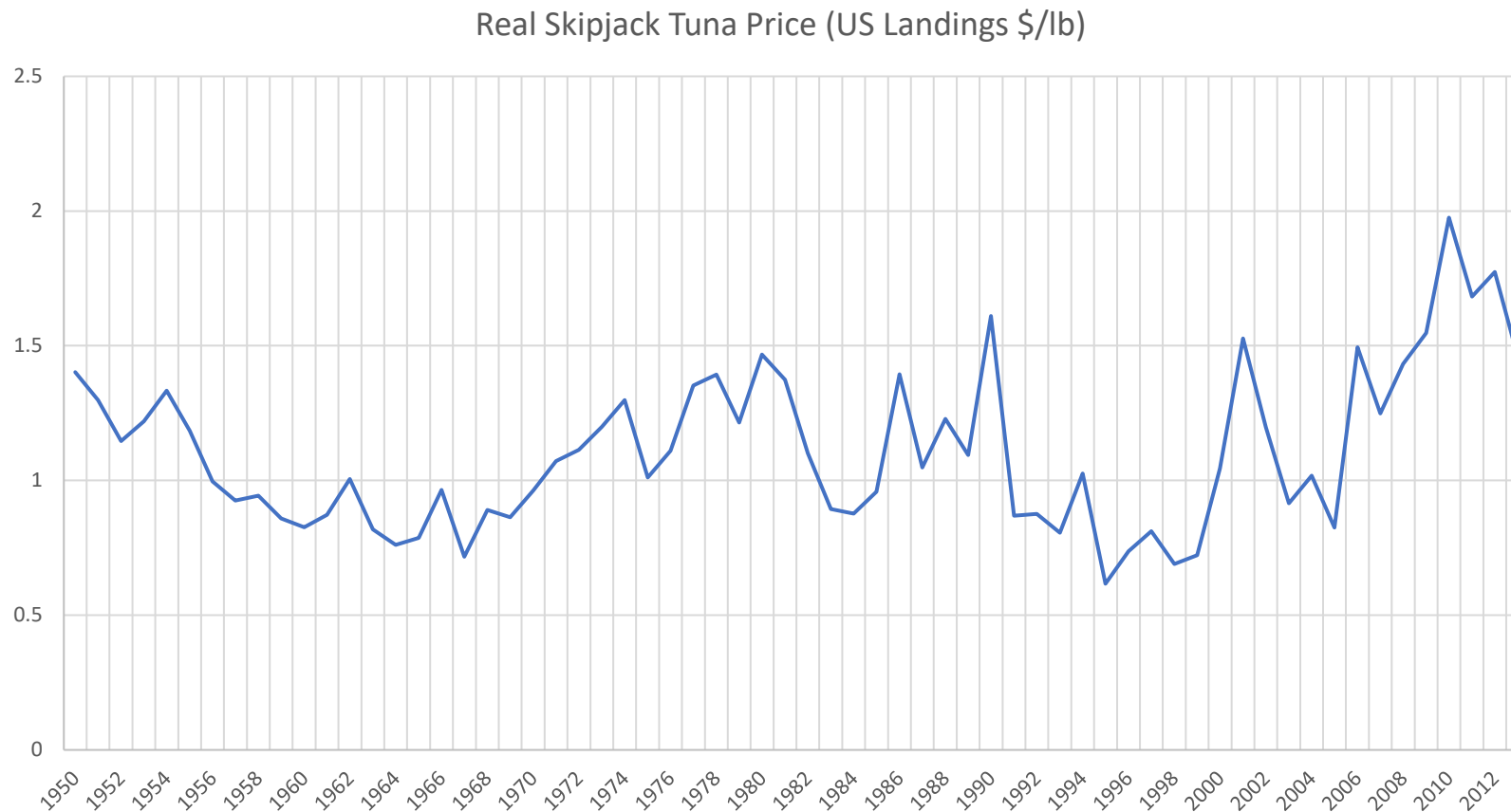


Notes on market developments

- Fresh shrimp and salmon were once high-end products that were only available to middle class and low-income consumers regionally
- Freezing technology has improved dramatically such that frozen is closer to fresh and re-freezing is possible
- Freezing enables re-exporting

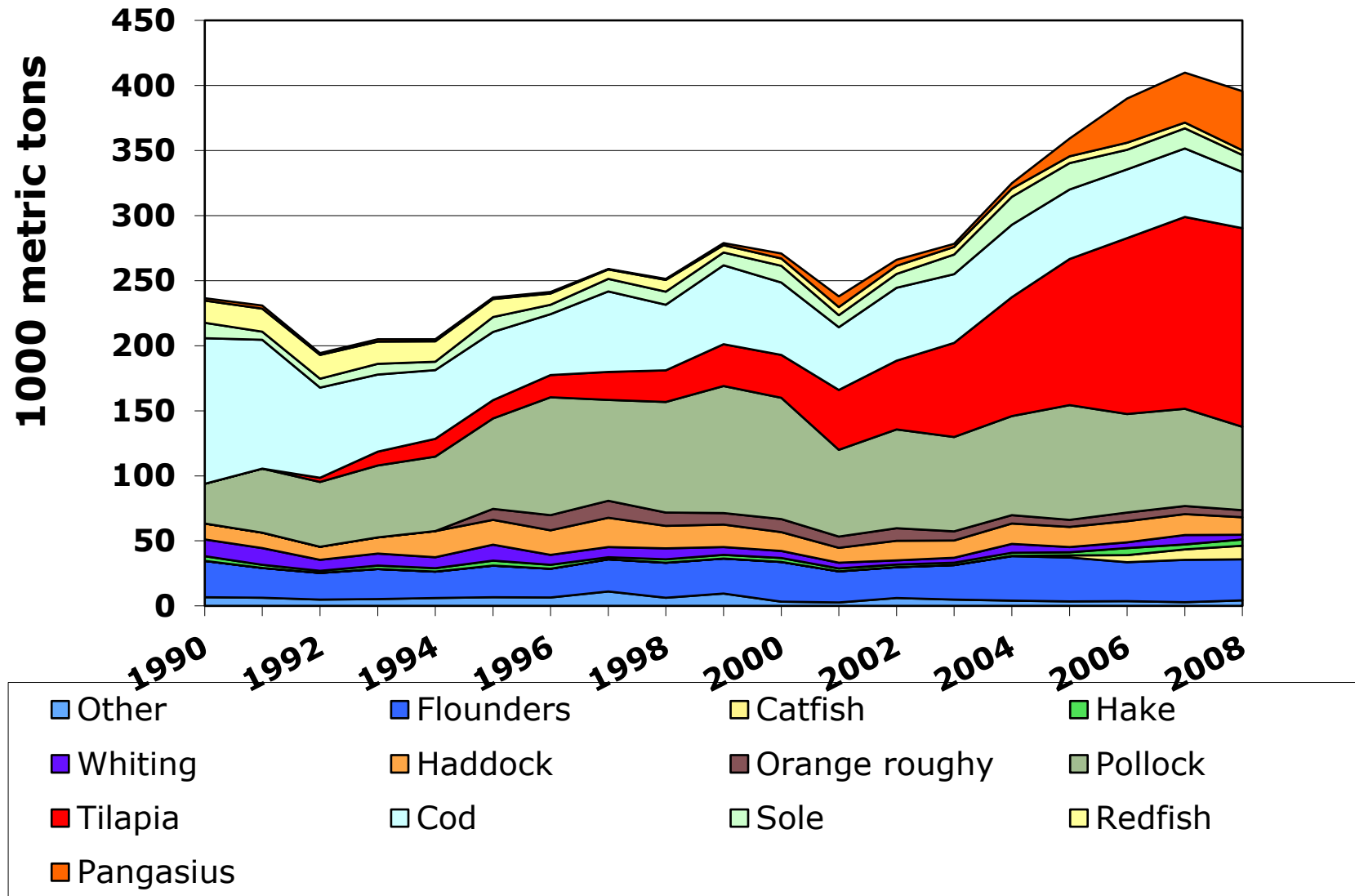
The screenshot displays the Science journal website. At the top, the Science logo is on the left, and navigation links for 'Current Issue', 'First release papers', 'Archive', and 'About' are in the center. A 'Submit manuscript' button is on the right, along with a 'GET OUR E-ALERTS' link. Below the navigation bar, a breadcrumb trail reads: 'HOME > SCIENCE > VOL. 375, NO. 6579 > CHINA'S SEAFOOD IMPORTS—NOT FOR DOMESTIC CONSUMPTION?'. The main article section features a lock icon, the text 'POLICY FORUM | SUSTAINABILITY', and social media sharing icons (Facebook, Twitter, LinkedIn, Reddit, WeChat, Email). The article title is 'China's seafood imports—Not for domestic consumption?' in large bold text. Below the title is a subtitle: 'An estimated 74.9% of China's seafood imports are reexported'. The authors listed are FRANK ASCHE, BIXUAN YANG, JESSICA A. GEPHART, MARTIN D. SMITH, JAMES L. ANDERSON, EDWARD V. CAMP, TARYN M. GARLOCK, DAVID C. LOVE, ATLE OGLEND, AND HANS-MARTIN STRAUME, with a link to 'Authors Info & Affiliations'. On the right side of the page, there is a 'CURRENT ISSUE' section featuring a cover image of the Science journal. The cover image shows a close-up of a textured surface, possibly a rock or a biological specimen. Text on the cover includes 'JWST spies galaxies blazing in the infant universe', 'Policy protections for kids in cyberspace', 'Pumping fluids using fiberoptics', and 'Science' in large white letters. A 'PDF' button and a 'Help' link are visible on the cover. At the bottom of the cover, there is a link to 'View Science current issue'.

Tuna for canning similar price to 1950



US Imports of Frozen Whitefish

Adding new species has grown the global supply of whitefish, also keeping prices down.



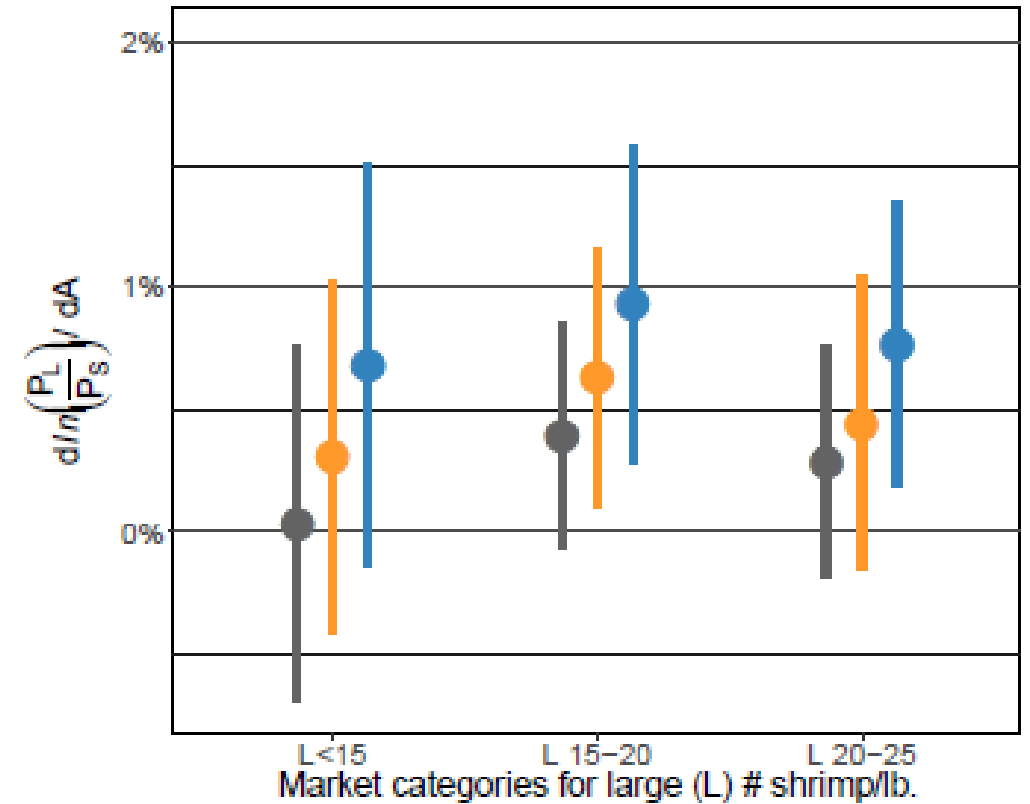
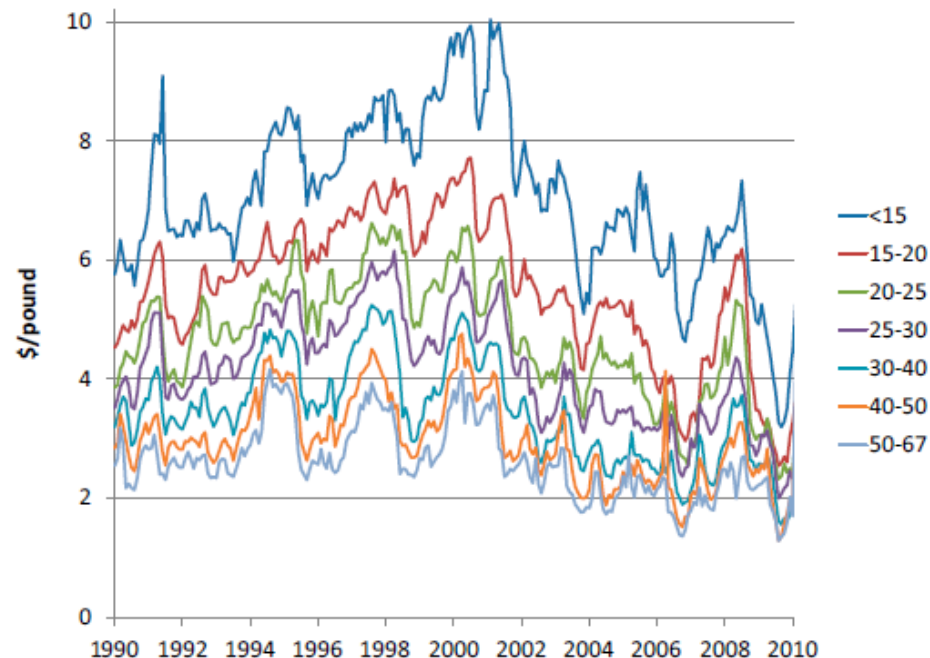
4. Globalization of seafood means access to and affordability of seafood in the U.S. is a function of what is happening around the world

Market integration is ubiquitous in seafood

- **Shrimp:** domestic and imported, multiple countries of origin, warm-water and cold-water, different size categories (Asche et al. 2012; Smith et al. 2017; Ankamah-Yeboah and Bronnmann 2018; Petesch et al. 2021)
- **Salmon:** farmed and wild-caught (Asche et al. 1999)
- **Whitefish:** cod and other major whitefish species (Asche et al. 2004)
- **Tuna:** Guillotreau et al. 2017
- An inland fish market in Namibia integrated with global fish price index (Bronnmann et al. 2020)
- Law of One price after the introduction of mobile phones in small-scale fisheries in Kerala, India (Jensen 2007)
- Tveteras et al. (2012) show between 53% and 98% of seafood globally exposed to international trade competition

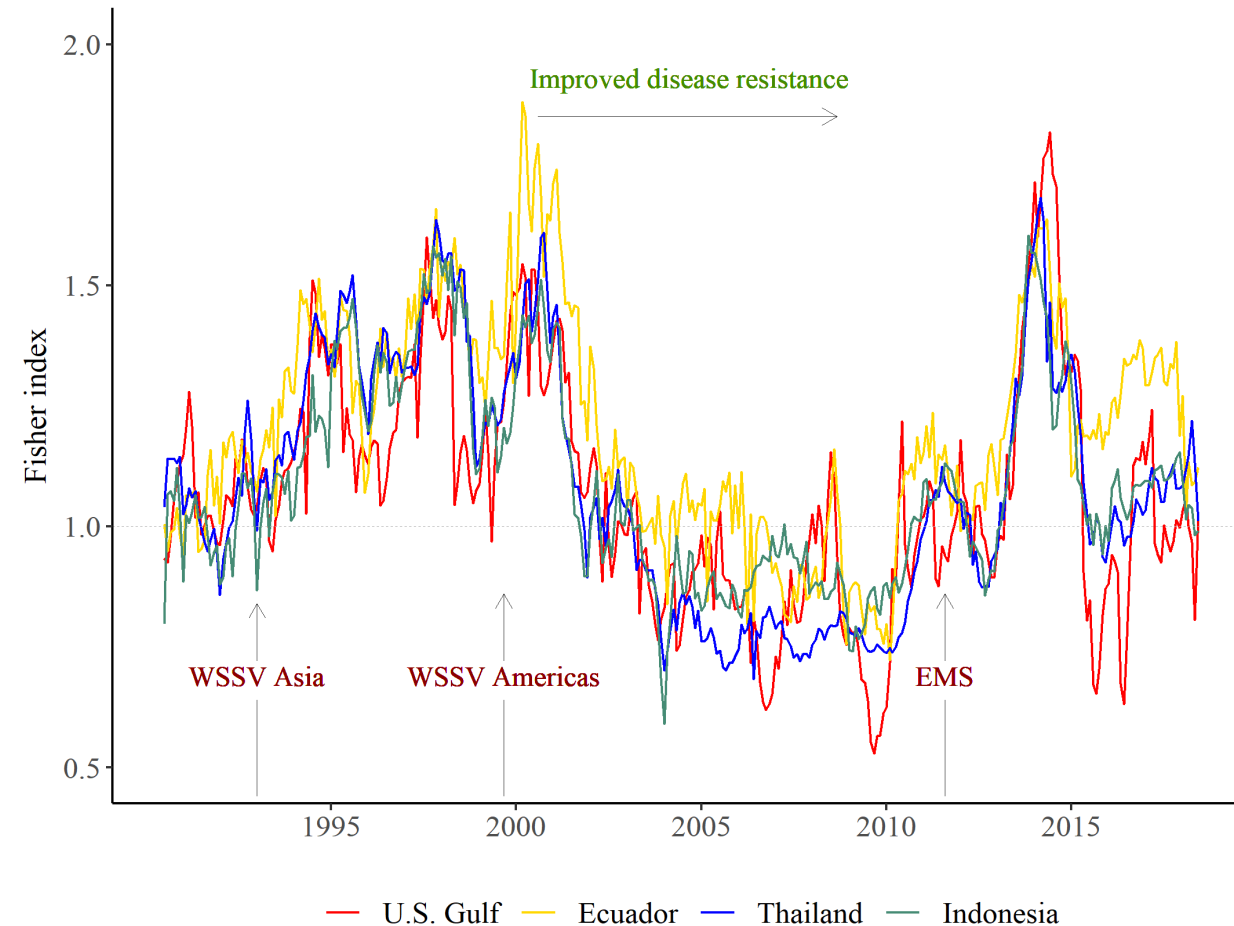
Seafood markets are so integrated that domestic supply shocks lead to small and transient price increases

- Hypoxia increases relative prices of large shrimp (imports adjust fast)
Smith et al. 2017, *PNAS*



Seafood markets are so integrated that **major global supply shocks lead to substantial price increases that are still short-lived**

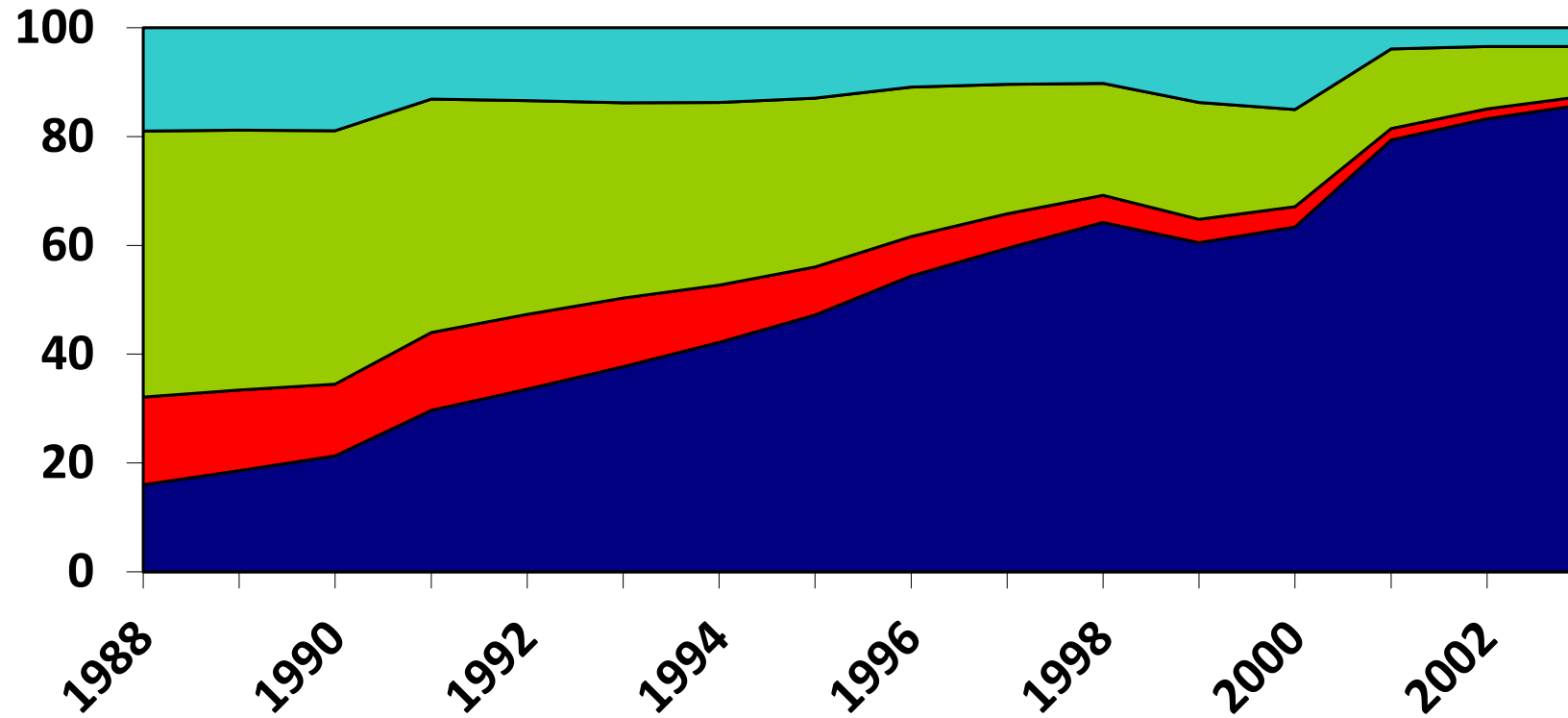
- Shrimp Early Mortality Syndrome massively decreased global shrimp production ~ 2011-15 (imports adjust pretty fast) Petesch, Smith, and Dubik *MRE* 2021



5. How we purchase seafood has changed and reflects broader market trends

Seafood Retail is Changing

Market Share by Value of Fish in the UK



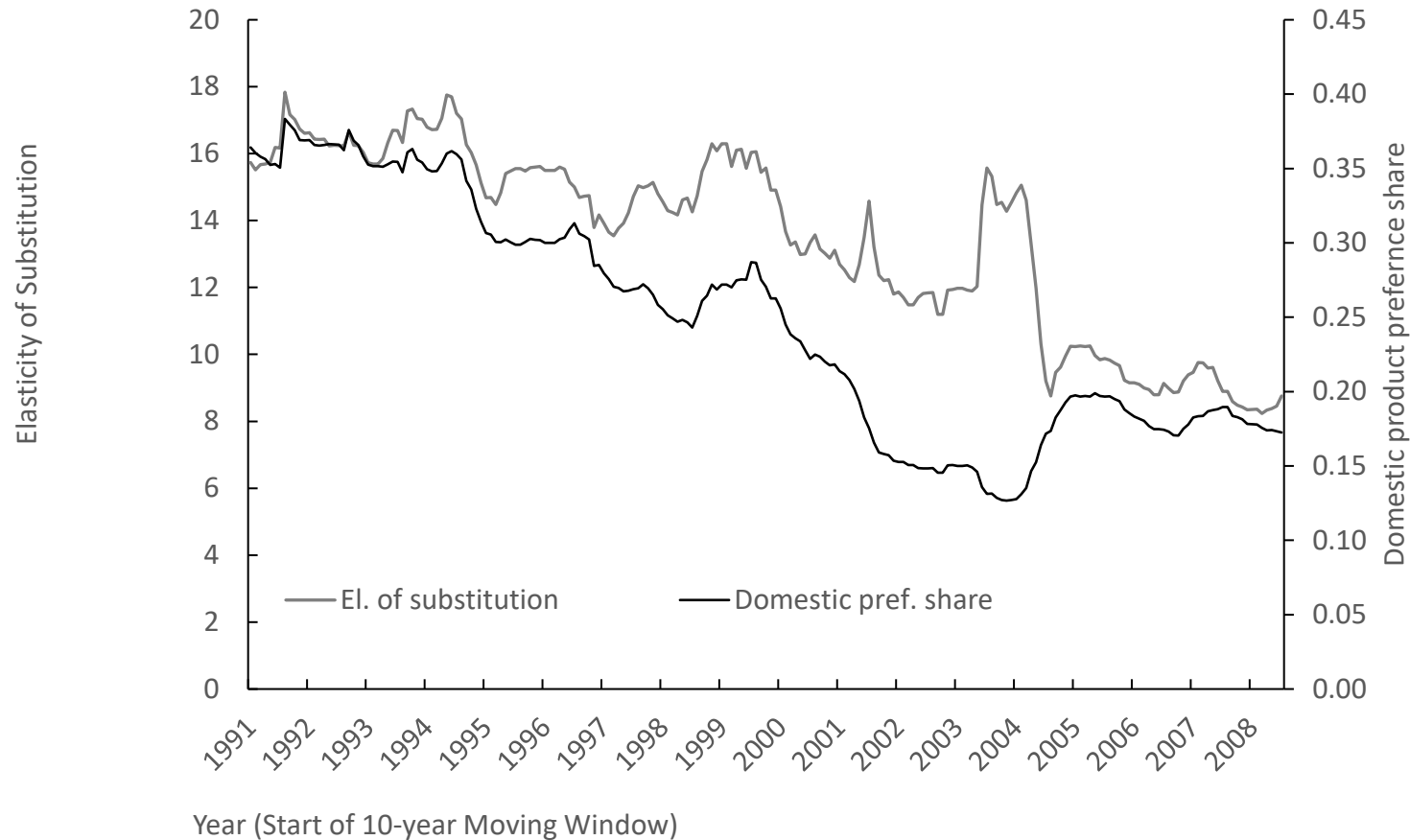
Source: Sea Fisheries Industry
Authority (SFIA)

Slide courtesy of Frank Asche

■ Supermarkets	■ Market stalls
■ Mongers	■ Other outlets

U.S. Shrimp Market

Increasing Preference for Imports

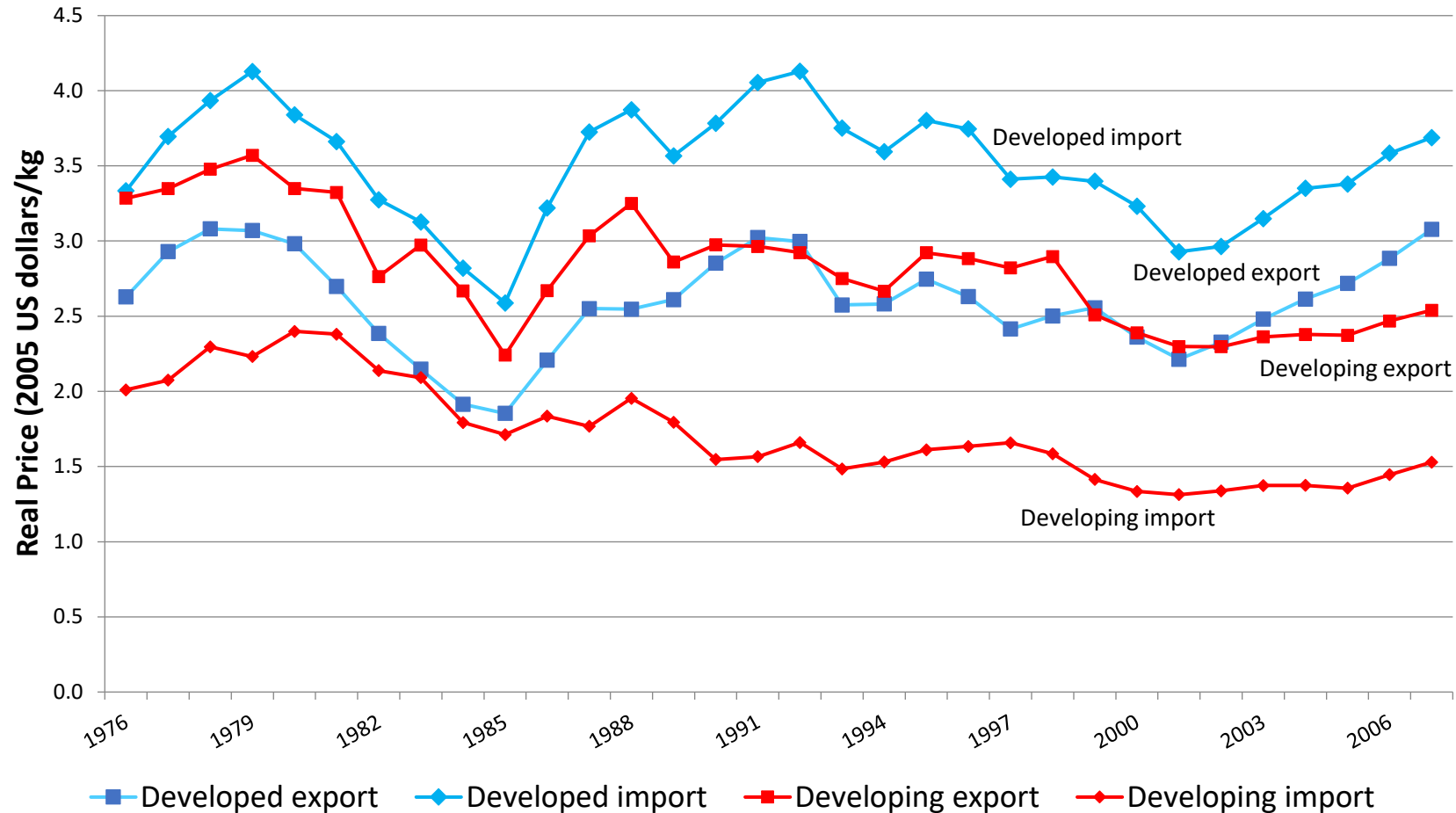


Asche, Oglend, and Smith 2022 *Env Research Letters*

6. U.S. demand is not denying the rest of the world nutrition

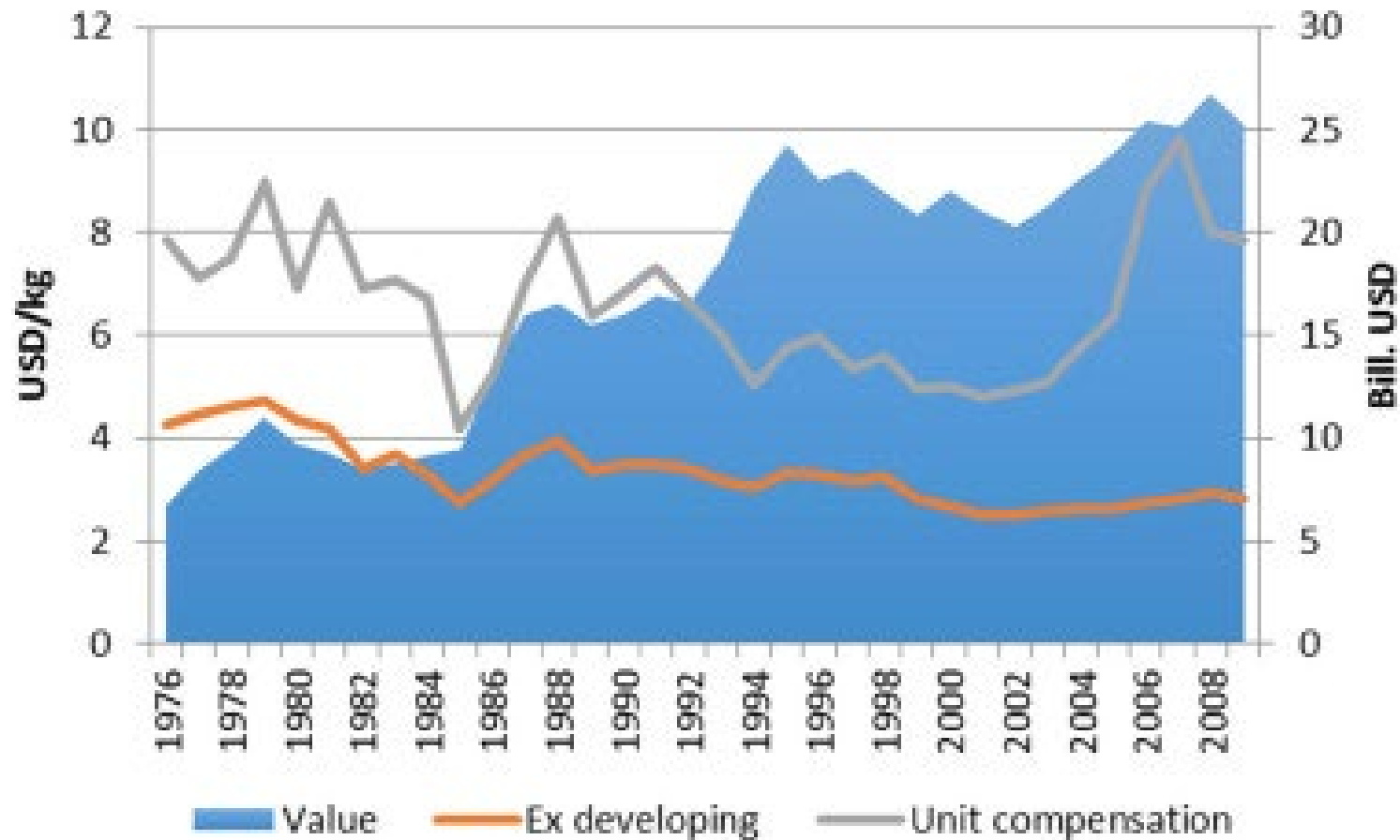
Real Unit Prices of Seafood

Developing Countries Pay Less



Source: Asche et al. 2015; FAO, FishStat Plus,

Net exports modest, and developing countries highly compensated for them



In Review

Lower-priced developing country imports are not less nutritionally dense

- Developing nation imported seafood **higher in macronutrients and micronutrients per dollar** compared to developed nation imported seafood
- Differences are explained partly by high-income markets paying premiums for
 - Fresh or live
 - Convenient product forms (e.g., fillet)
 - Other value-added products (e.g., smoked)
 - Specific premium species
 - High trophic level fish

7. Health and sustainability advice about seafood needs to acknowledge opportunity costs

Should I eat fish?

- Most consumer advice is binary as if people are being advised not to smoke
- You have to eat something
- Sustainable is not binary
- Healthy is not binary
- What would you eat instead?
 - Flax-encrusted tofu
 - A cheeseburger



Illustration Artist: Bruno Mallart

A wide-angle photograph of a calm body of water, likely a lake or a wide river, under a clear, light blue sky. The water is very still, acting as a perfect mirror for the sky above. In the foreground, a dark, pebbly shoreline is visible, with small stones and shells scattered across it. A single, rectangular concrete block floats in the shallow water near the shore, its reflection clearly visible below it. The horizon line is straight and distant, with a faint outline of land or mountains visible on the far side. The overall mood is peaceful and serene.

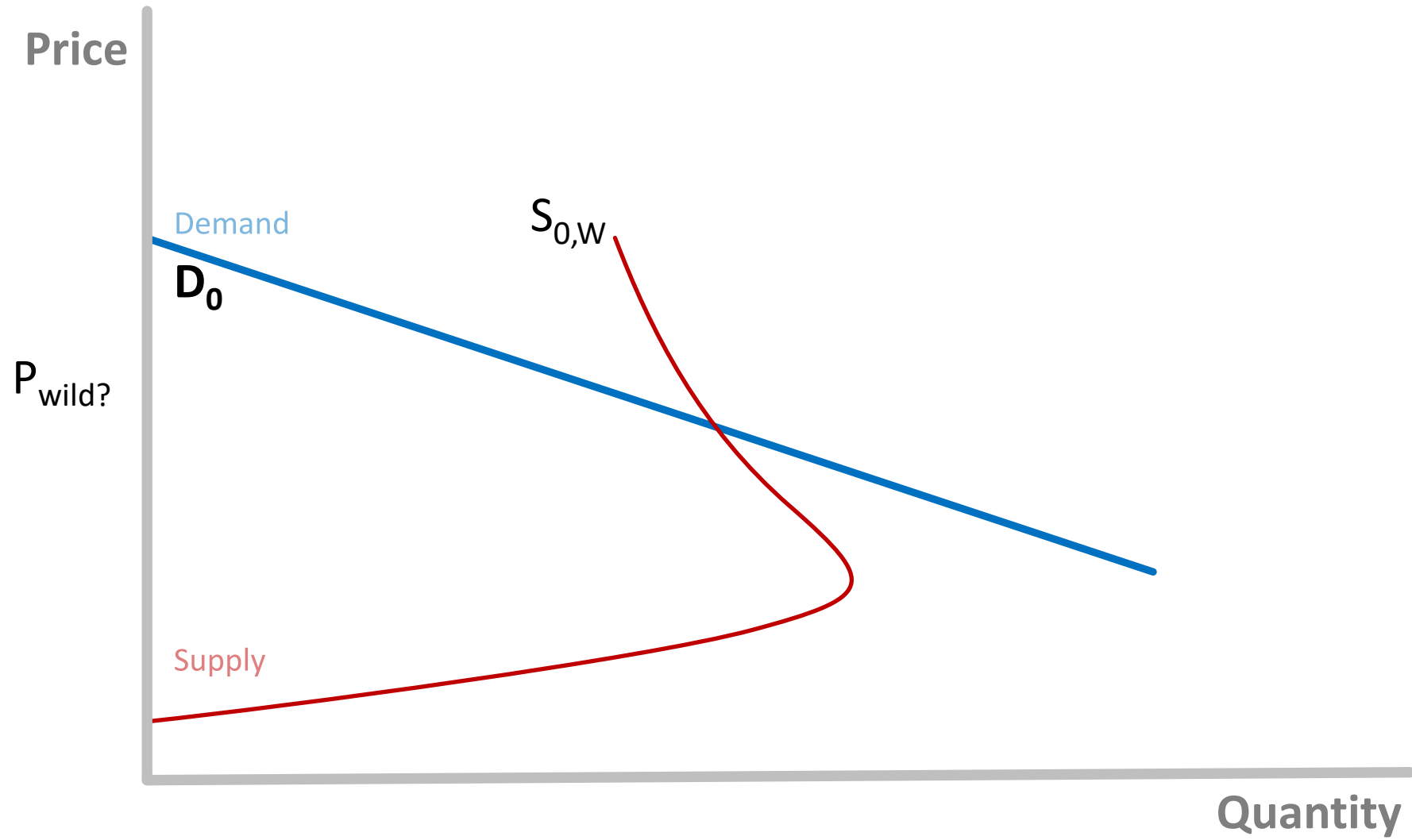
Thank you!

Extras

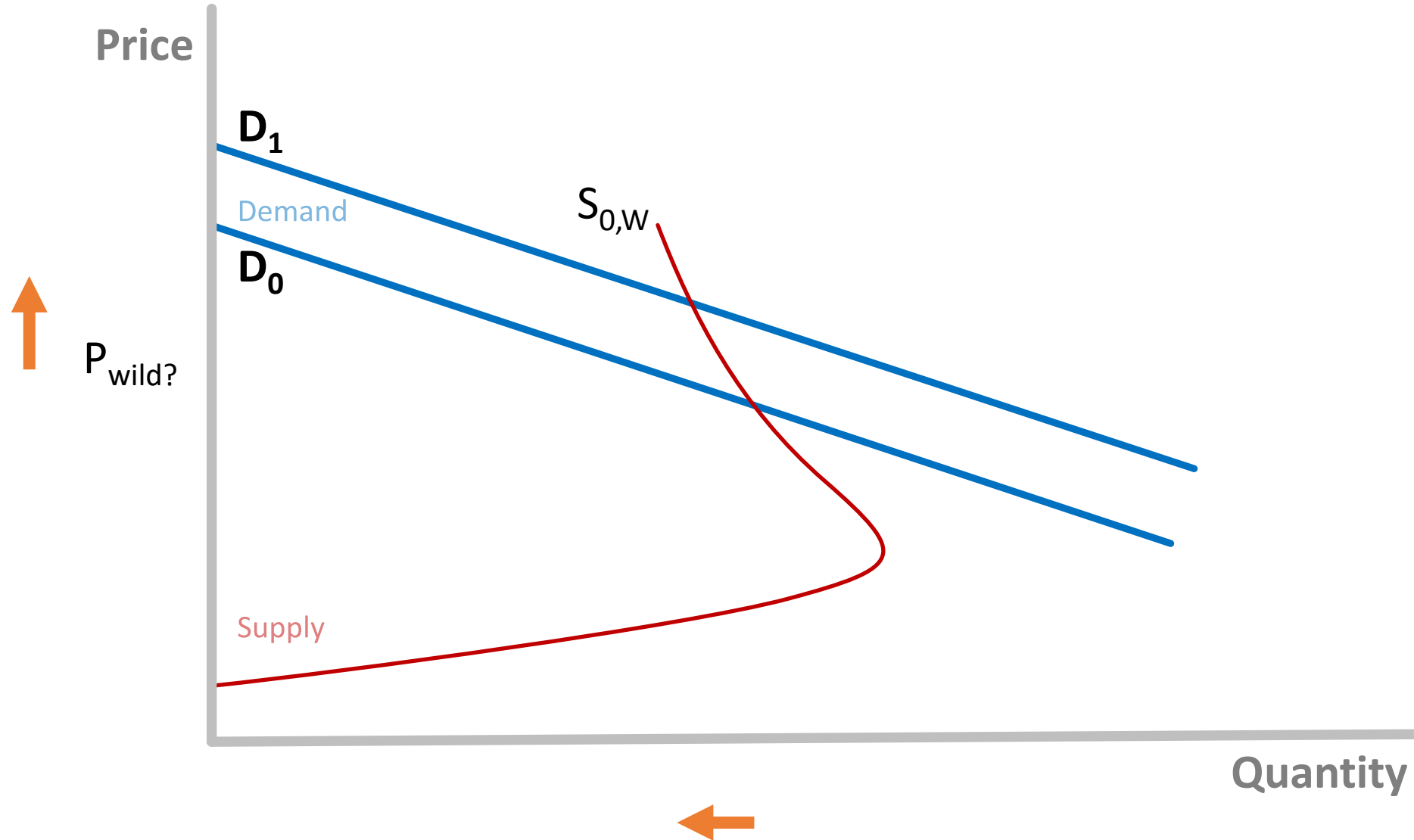
References

- Ankamah-Yeboah, I. and Bronnmann, J., 2018. Market integration in the crustaceans market: Evidence from Germany. *Marine Policy*, 87, pp.72-77.
- Asche, F., 2008. Farming the sea. *Marine Resource Economics*, 23(4), pp.527-547.
- Asche, F., H. Eggert, A. Oglend, C. Roheim, and M.D. Smith. 2022. Aquaculture: Externalities and Policy Options. *Review of Environmental Economics and Policy*, Summer 2022
- Asche, F., Bellemare, M.F., Roheim, C., Smith, M.D. and Tveteras, S., 2015. Fair enough? Food security and the international trade of seafood. *World Development*, 67, pp.151-160.
- Asche, F., Oglend, A. and Smith, M.D., 2021. Global Markets and the Commons: The Role of Imports in the U.S. Wild-caught Shrimp Market. *Environmental Research Letters*
- Asche, F. and Smith, M.D., 2018. Induced innovation in fisheries and aquaculture. *Food Policy*, 76, pp.1-7.
- Bronnmann, J., Smith, M.D., Abbott, J., Hay, C.J. and Næsje, T.F., 2020. Integration of a local fish market in Namibia with the global seafood trade: Implications for fish traders and sustainability. *World Development*, 135, p.105048.
- Cojocar, A.L., Y. Liu., M.D. Smith W. Akpalu, C. Chávez, M.M. Dey, J. Dresdner, V. Kahui, R.B.M. Pincinato, N. Tran. 2022. The 'Seafood' System: Aquatic Foods, Food Security, and the Global South. *Review of Environmental Economics and Policy*, Summer 2022
- Dey, M.M., Surathkal, P., Chen, O.L. and Engle, C.R., 2017. Market trends for seafood products in the USA: Implication for Southern aquaculture products. *Aquaculture Economics & Management*, 21(1), pp.25-43.
- Guillotreau, P., Squires, D., Sun, J. and Compeán, G.A., 2017. Local, regional and global markets: what drives the tuna fisheries?. *Reviews in Fish Biology and Fisheries*, 27, pp.909-929.
- Petes, T., Dubik, B. and Smith, M.D., 2021. Implications of Disease in Shrimp Aquaculture for Wild-Caught Shrimp. *Marine Resource Economics*, 36(2), pp.191-209.
- Roheim, C., F. Asche, M.D. Smith. Market Interactions Between Wild and Farmed Fish. Report to the Walton Family Foundation and the David and Lucille Packard Foundation
- Smith, M.D., Oglend, A., Kirkpatrick, A.J., Asche, F., Benneer, L.S., Craig, J.K. and Nance, J.M., 2017. Seafood prices reveal impacts of a major ecological disturbance. *Proceedings of the National Academy of Sciences*, 114(7), pp.1512-1517.
- Tveterås, S., Asche, F., Bellemare, M.F., Smith, M.D., Guttormsen, A.G., Lem, A., Lien, K. and Vannuccini, S., 2012. Fish is food-the FAO's fish price index. *PLoS One*, 7(5), p.e36731.

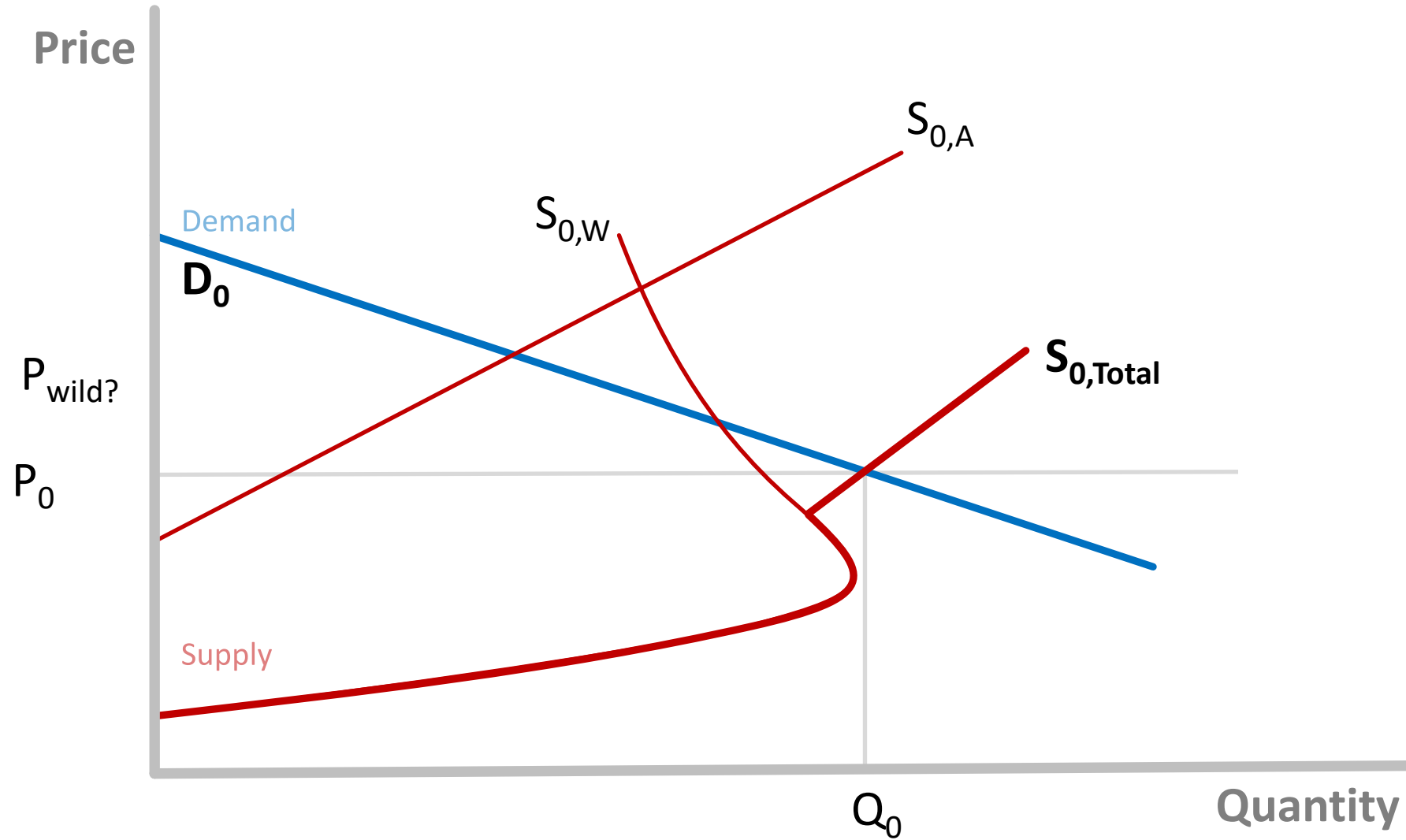
The Econ 101 Story (1)



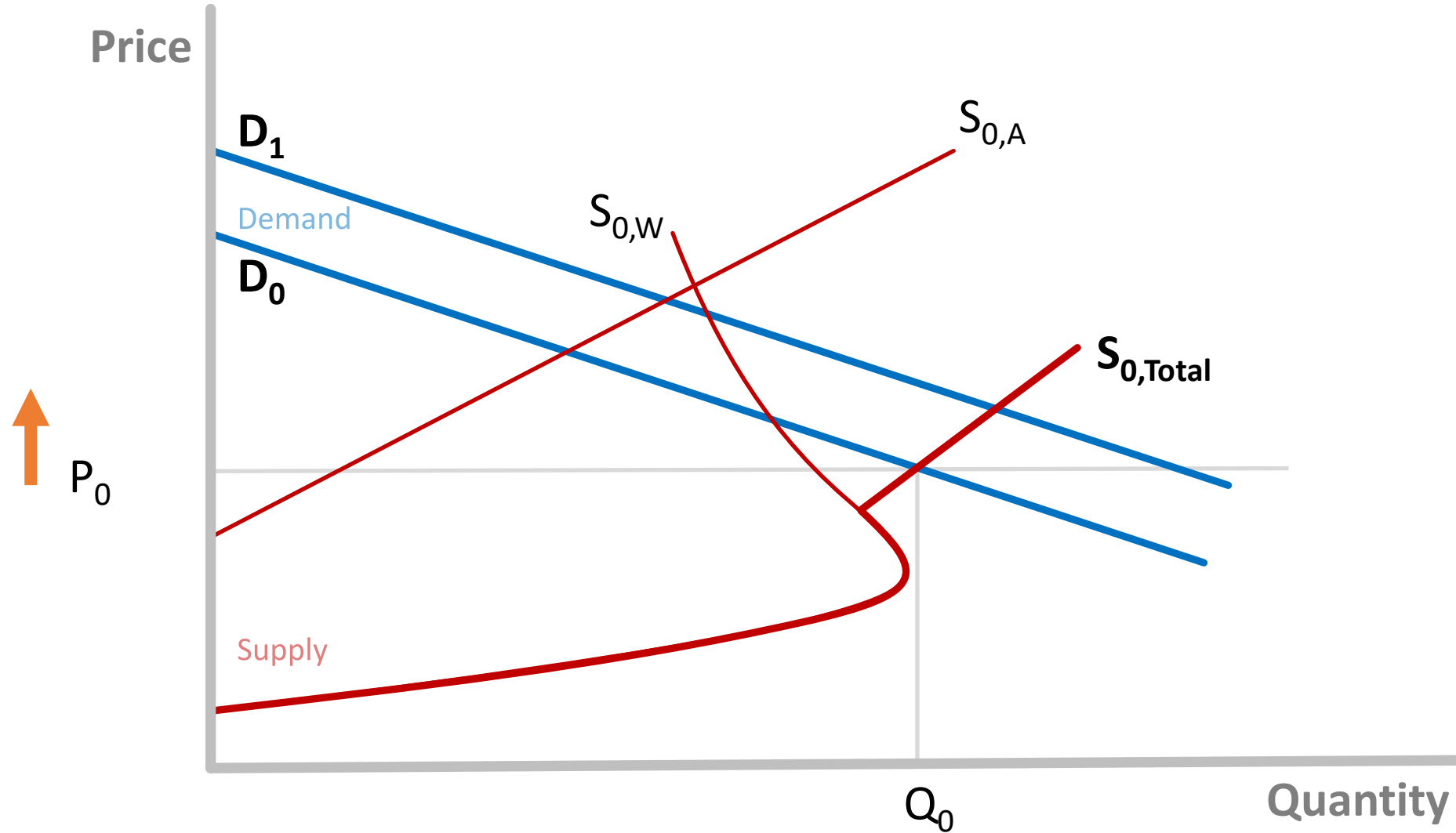
The Econ 101 Story (2) – Higher Price and Lower Quantity, **BUT IT DIDN'T HAPPEN**



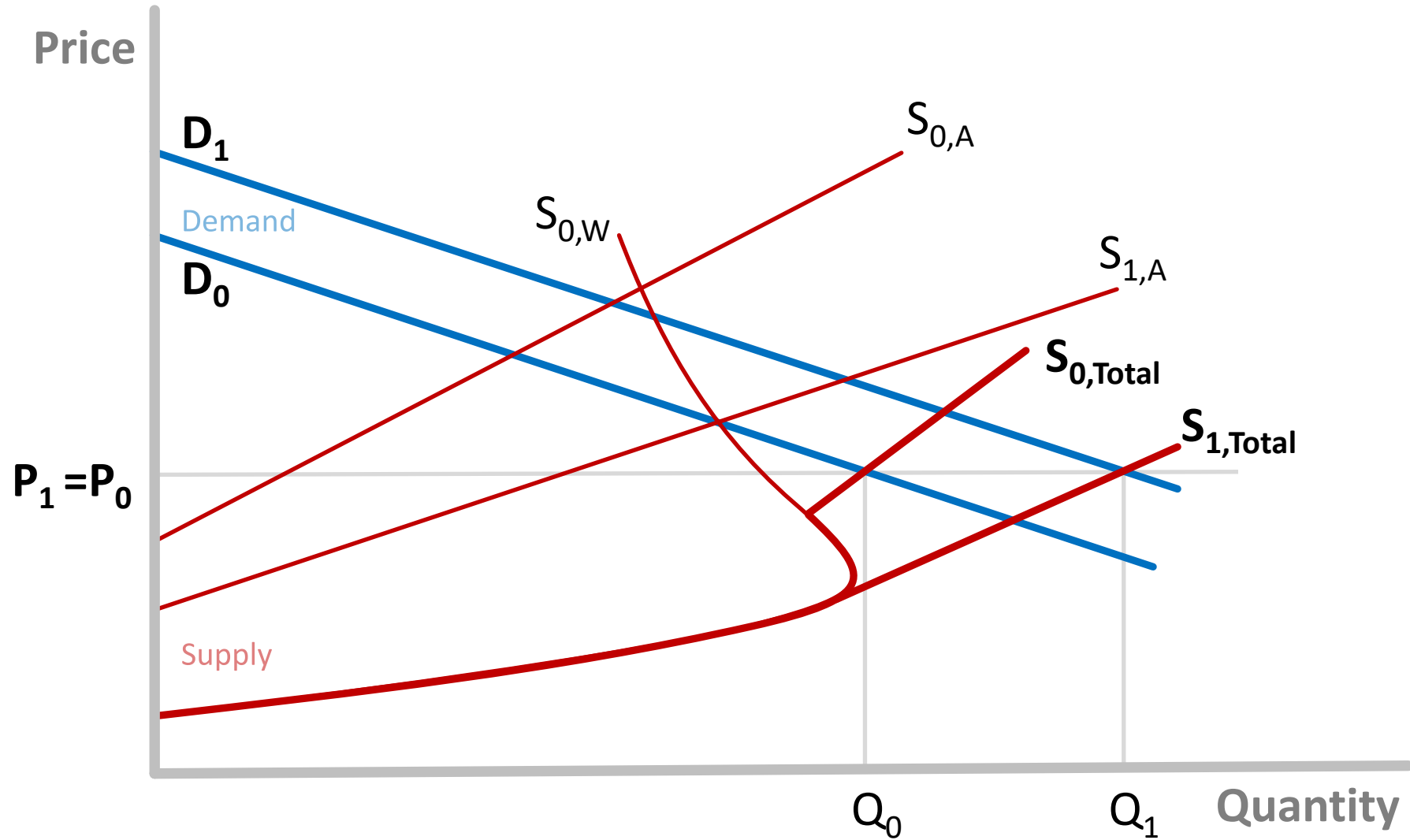
The Econ 101 Story (3) - Add Aquaculture



The Econ 101 Story (4) – Higher Price, **BUT IT DIDN'T HAPPEN**



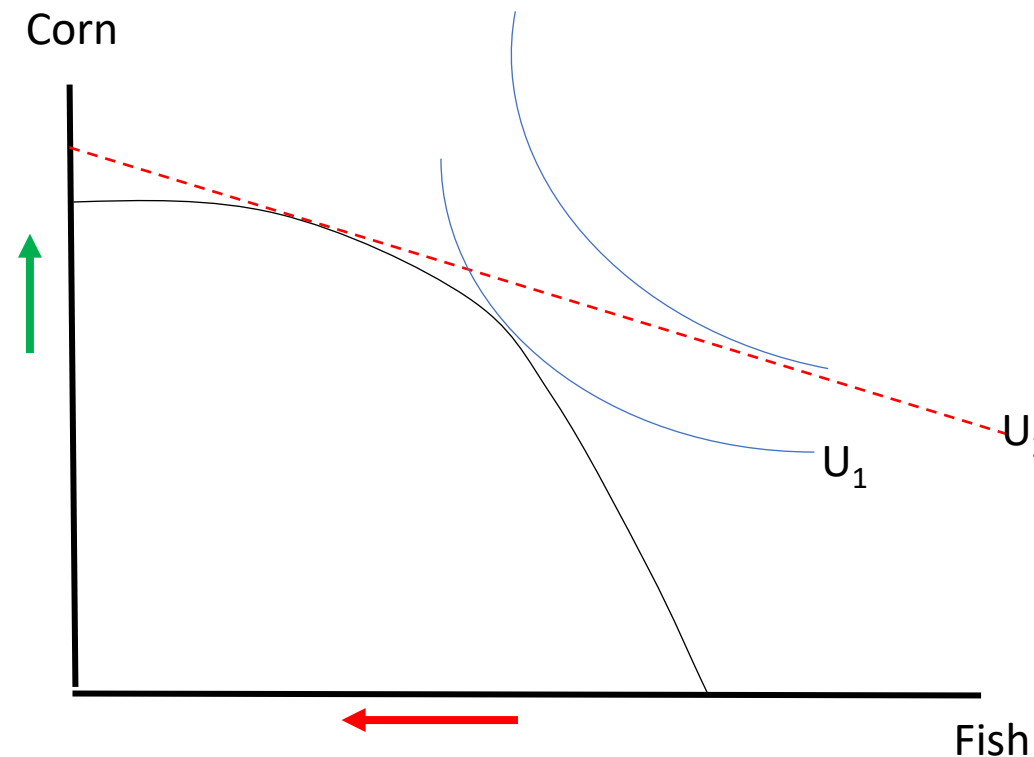
The Econ 101 Story – What did happen



There is no reason that each sector of an economy should run a trade surplus

In fact, basic economics teaches us just the opposite – some sectors will run a surplus and others a deficit

U.S.



Some other country

