Distant Water Fishing and Food Security in Coastal Tanzania

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Abstract

This study investigates how natural-resource extraction by distant-water fishing (DWF) nations affects food security in coastal communities. I study this question in Tanzania, using Somali piracy as an exogenous shock to the spatial allocation of industrial fishing fleets in the Western Indian Ocean. Combining high-frequency vessel-location data with piracy incidents from 2012 to 2015, I show that piracy in the Gulf of Aden displaced DWF activity toward Tanzanian waters, approximately doubling foreign fishing activity near the Tanzanian coast. I then use household-level survey data to estimate the effects of this shift on food consumption and food security. A one-standard-deviation increase in the instrument reduces the quantity of fresh fish consumed by about 20 percent and raises its price by around 11 percent. Households respond by substituting toward other foods and relying more on self-produced foods, altering the nutritional composition of the diet: intake of the micronutrients supplied mainly by fish—vitamin D, vitamin B12, selenium, and omega-3 fatty acids—falls, even as caloric intake is maintained. These changes translate into higher short-run food insecurity, with effects across food-insecurity measures ranging from 15 to 76 percent of their means. Longer-run reduced-form results suggest increases in mortality and pregnancies over a two-year horizon, together with changes in household composition consistent with mortality, fertility responses, and possible migration. Overall, the findings show that international fishing pressure can generate substantial local welfare costs by reducing access to key micronutrients. More broadly, the paper documents how the mobility of industrial fishing fleets in weakly regulated marine spaces can transmit resource-extraction shocks across regions, with consequences for nutrition, household coping strategies, and demographic outcomes in vulnerable coastal communities.

Keywords: food insecurity; fisheries; piracy; industrial fishing; development economics; health.

JEL classifications: Q22, Q56, O13, I15

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1 Introduction

Natural resources can raise living standards in poor economies, but only when the communities that depend on them can capture their value. Where property rights are weak and enforcement at the resource frontier is costly, outside actors with superior technology, capital, or political power can extract local resources without compensating those who rely on them. Extraction then opens a wedge between its private returns and its local social cost, and this wedge widens when extraction rights are mispriced, poorly enforced, or allocated in settings with little local bargaining power. A large literature examines these forces for land, minerals, and oil (Sachs and Warner, 2001; Collier and Hoeffler, 2004; Ross, 2004; Mehlum et al., 2006; Dube and Vargas, 2013; Berman et al., 2017). This paper studies them for a resource that is mobile, difficult to monitor, and central to the diets of the world's poor: ocean fish.

I ask whether industrial fishing by foreign fleets reduces coastal households' access to fish and, through that channel, worsens their nutrition, food security, and ability to cope. The marine context sharpens the property-rights problem in three ways: fish stocks are mobile, fleets can relocate across vast distances within days, and monitoring the open ocean is prohibitively costly. Together these features make extraction rights hard to price and the local costs of foreign fishing hard to internalize, so that the social costs of extraction may be borne locally while the private returns accrue to foreign vessels, firms, and consumers.

Fish is a natural place to look for such costs because it anchors diets and livelihoods across the developing world. The sector supports more than 600 million livelihoods worldwide (FAO, 2026), and aquatic foods supply about 17 percent of animal-source protein globally—a share that exceeds 50 percent in parts of Africa and Asia (FAO, 2022). Tanzania is a well-suited setting for two reasons. First, domestic capture fisheries supply almost all national fish consumption, so distant water vessels are unlikely to redistribute their catches to coastal communities directly. Second, fish consumption in coastal Tanzania is comparable to levels elsewhere in Africa and Asia where aquatic foods dominate animal-source protein intake. Using household data from National Bureau of Statistics (2015), I show that between 2008 and 2015 fresh fish accounted for roughly 15 percent of total protein and more than half of animal-source protein intake in coastal communities (Appendix Table B1), and that it ranks among the most frequently consumed and central items in household diets (Appendix Figures A1–A2). Fresh fish is also a key source of vitamin D, vitamin B12, omega-3 fatty acids, and selenium—micronutrients that are difficult to obtain from plant-based diets (Reksten et al., 2020), a pattern my own estimates confirm (Appendix Table B2).

These local food supplies are increasingly exposed to industrial fishing by distant water fleets. Distant water fishing nations operate vessels far outside their own waters (International Seafood Sustainability Foundation, 2025), typically large, capital-intensive ships averaging about 40 meters in length and 428 tons (Global Fishing Watch, 2025). Because such vessels are highly mobile and fish in spaces that are costly to monitor, they raise concerns about regulatory evasion and environmental externalities, from greenhouse-gas emissions to pollution from abandoned, lost, or discarded gear (Macfadyen et al., 2009; Gutierrez et al., 2020; UNCTAD, 2023). These concerns are magnified by the scale of global fisheries subsidies, about

$35 billion in 2018 (Sumaila et al., 2019), and by illegal, unreported, and unregulated (IUU) fishing, estimated at roughly 30 percent of the global catch (FAO, 2026). The perceived local costs are documented well beyond the academic literature: fishers in Senegal, Ghana, and Sierra Leone report declining catches, conflict with industrial trawlers, labor abuses on foreign vessels, and displacement toward more distant and dangerous fishing grounds (Yeung, 2022; BBC News, 2018, 2022). In the South West Indian Ocean, distant water fleets take a large share of tuna catches and IUU fishing remains a central policy concern (Bova et al., 2023).

The central empirical challenge is that fishing vessels do not locate at random. They respond to marine productivity, enforcement, prices, weather, and port access—all of which may also be correlated with local food availability and household welfare. Identifying the local effects of distant water fishing therefore requires variation in foreign fishing pressure that is plausibly unrelated to contemporaneous local conditions. I obtain such variation from Somali piracy, which reallocated distant water fleets across the Western Indian Ocean. Somali waters are among the most productive fishing grounds in the region (Appendix Figure A3) and are therefore attractive to fleets in normal times. Over my 2012–2015 study period, I show that piracy in and around the Gulf of Aden raised the cost and risk of operating near these waters and pushed vessels toward safer grounds, including those closer to Tanzania. The identifying variation comes from piracy shocks that change the relative cost of fishing in different grounds.

The empirical design combines daily, vessel-level fishing data with geolocated piracy incidents and household survey data collected on different days and in different locations across coastal Tanzania. My main endogenous variable is distant water fishing activity within 36 nautical miles of the coastal point nearest the household, measured over the 60 days before the interview; the instrument uses piracy-driven variation in this pressure while controlling directly for piracy incidents near Tanzania. The high-frequency structure lets me measure exposure immediately before the food-consumption reference period, and it lets me test the mechanism directly: if piracy moves vessels, their behavior should change after nearby attacks. A stacked event study around piracy incidents in FAO Area 51 confirms this—vessels near an attack increase their traveled distance immediately afterward, while distant vessels do not—consistent with avoidance behavior that reallocates fishing effort across space.

The first stage shows that piracy in the Gulf of Aden raises distant water fishing near Tanzania: a one-standard-deviation increase in the instrument adds about 20 fishing hours. The IV estimates show that this foreign pressure sharply reduces household access to fresh fish. A one-standard-deviation increase in the instrument lowers total fresh-fish consumption by about 20 percent and raises the price of fresh fish by around 11 percent relative to the mean.

Households absorb this shortfall by changing what they eat. They substitute mainly toward vegetables and plant-based items, and rely more on self-produced foods. This cushions the quantity of food consumed but does not restore its quality. Intake of carbohydrates and fiber rises, while nutrients tied to fish—such as vitamin D, selenium, and DHA—fall steeply. Essential amino-acid intake also declines, even though total protein does not fall significantly. Households thus compensate in calories and bulk while their diet quality deteriorates.

This deterioration translates into worse short-run food security. Using the food-security module of National Bureau of Statistics (2015), I find that higher distant-water fishing pressure raises both the overall probability of food insecurity and the likelihood of a range of specific coping behaviors, all measured over the previous seven days. A one-standard-deviation increase in the instrument raises the probability of food insecurity by about 4.1 percentage points, or 16 percent of the mean, with relative effects on individual components ranging from roughly 15 to 76 percent of their means. The largest relative effects appear for the most severe and least common outcomes—having no food at home and going a full day without food—where the low baseline incidence magnifies the percentage change even though the absolute increases are small. I find little evidence of an immediate rise in health-care visits, suggesting that the mechanism runs first through consumption, substitution, and nutrition rather than through acute health shocks observed over short reference periods.

I also examine longer-run outcomes over a two-year exposure window. Because vessel-activity data begin only in 2012, the first stage cannot be estimated for this longer recall period, and I therefore interpret these results as reduced-form evidence. They are nonetheless informative: exposure to piracy-driven fishing pressure is associated with higher mortality and higher pregnancy over two years, and these patterns are not mechanically driven by an increase in the number of women of reproductive age. Household composition also shifts, with declines in the number of consumers and in adult-equivalent size. This configuration is consistent with several demographic responses—mortality, fertility adjustment, and migration (Libois, 2016)—and I read it as suggestive evidence that the consequences of reduced fish access may extend beyond immediate consumption responses.

The paper contributes to three literatures. First, it adds to work on natural resources, development, and conflict (Sachs and Warner, 2001; Mehlum et al., 2006; Collier and Hoeffler, 2004; Ross, 2004; Dube and Vargas, 2013; Berman et al., 2017; Armand and Kim Taveras, 2025; Alfano and Cornelissen, 2026) by showing that the local costs of extraction can arise without violence in the affected community: piracy occurs almost 3000 km far from Tanzania yet reallocates foreign fishing effort and degrades local access to a key resource. Second, it advances the literature on fisheries and socio-economic stability, which has documented aggregate overexploitation and the role of foreign fleets (Fluckiger and Ludwig, 2015; Zeller et al., 2020; Dasgupta et al., 2021; Ahn and Pomeroy, 2024; Carvalho et al., 2025), by providing household-level causal evidence on how foreign industrial fishing affects local consumption, nutrition, and food security. Third, it contributes to the literature on nutrition and human capital development (Black et al., 2013; Golden et al., 2016; Zhao et al., 2016; Hicks et al., 2019; Jiang et al., 2021; Byrd et al., 2022; Viana et al., 2023) by showing that consumption smoothing through food substitution can be nutritionally incomplete: households replace fresh fish with bulkier foods, increasing carbohydrates and fiber, while losing fish-related micronutrients and experiencing higher food insecurity.

More broadly, the results show how the mobility of industrial fleets in weakly monitored marine spaces can transmit resource-extraction shocks across regions. When enforcement is incomplete and extraction rights do not internalize local welfare costs, global fishing activity can erode access to foods that are central to household nutrition. Measuring these local social costs is therefore essential to the design of extraction rights, monitoring systems, and

enforcement policy.

The remainder of the paper proceeds as follows. Section 2 provides background on distant water fishing, Somali piracy, and the Tanzanian fish economy. Section 3 describes the data, and Section 4 the empirical strategy. Section 5 presents the results, and Section 6 concludes.

2 Background

2.1 Somali Piracy

Like much criminal activity, Somali piracy has economic roots (Becker, 1968): it emerged amid acute poverty, the near-collapse of the state, and the degradation of the marine resources on which coastal Somalis depend. The last was made vivid in 2004, when the Indian Ocean tsunami unearthed toxic and radioactive waste illegally dumped along the Somali coast.[1] Piracy initially took the form of resistance by local fishermen against foreign industrial fishing vessels operating in unprotected Somali waters (Bahadur, 2011), but it soon hardened into a structured, well-financed enterprise tied to transnational criminal networks (Hansen, 2009; Murphy, 2012); crews typically operated in groups of small skiffs, posing as fishermen before revealing their weapons (Murphy, 2008).

The phenomenon drew global attention with the 2009 hijacking of the *Maersk Alabama* and attacks peaked in 2011 at 245 recorded incidents and fell sharply from 2012 onward as naval counter-piracy operations intensified (Appendix Figure A4) (Ronalds-Hannon, 2013). Two features of the data provided by Benden et al. (2021) matter for what follows. First, attacks concentrate off the Somali coast yet reach far offshore: a skiff travelling from Mogadishu to the Indian coast covers roughly 3,000 km, some 10–12 days of navigation (Appendix Figure A5). Second, to maximize expected ransom, pirates strike tankers and cargo ships far more often than fishing vessels. Piracy therefore displaces fishing effort across space rather than destroying the fleet, and it does so far from the Tanzanian households I study.

Piracy is also economically significant in its own right: estimates place its annual burden on the global economy at $7–12 billion, spanning ransoms, insurance, re-routing, naval patrols, and onboard security (SPF, 2011), and Appendix Figure A11 shows the additional transit time vessels incur to avoid the Suez Canal. The threat remains live. As naval attention has shifted toward Houthi attacks on Red Sea shipping, observers warn that Somali networks may re-emerge (Anderson, 2024); since November 2023 the region has recorded 133 incidents, including 18 vessels hijacked by Somali pirates (The African Center for Strategic Studies, 2024).

[1] A former member of the 'Ndrangheta, the Italian crime syndicate, accused it of sinking at least 30 ships carrying toxic and radioactive waste off the Somali coast (Camera dei Deputati e Senato della Repubblica, 2010).

2.2 Distant Water Fishing in the Western Indian Ocean

Foreign vessels fishing in the Western Indian Ocean differ widely in capacity and gear, and hence in the ecological pressure they place on a given area (Glaser et al., 2019). A vessel that fishes intensively in a given area for an entire day imposes a very different pressure from one that only briefly passes through it. I therefore measure foreign fishing activity using fishing hours, the most spatially precise measure of fishing pressure available in the data, which I describe in detail in the data section. Its main advantage is that it is constructed from individual AIS (Automatic Identification System) pings, rather than from simple counts of vessels entering or crossing an Exclusive Economic Zone (EEZ) (Global Fishing Watch, 2023). Vessel counts would obscure substantial variation in the intensity with which different vessels exploit a given fishing ground.

Illegal, unreported, and unregulated (IUU) fishing is a first-order policy concern (FAO, 2025), and it complicates both measurement and welfare analysis. The data include several of the world's most notorious illegal fishing fleets, though such identification is necessarily imperfect: I observe the flag a vessel flies, but flags can be changed at will (FAO Guidelines). The FAO defines unreported fishing as operating inside a country's EEZ without authorization. EEZ access is governed by country-specific law,[2] access rights are neither uniform across countries nor fixed over time, and captains may legally switch off their AIS transponders—itself a potential marker of illicit activity.

2.3 Conceptual Framework

These institutional features point to a simple mechanism, which I formalize with a minimal model of household diet choice. Households value foods not for themselves but for the nutritional characteristics they deliver (Lancaster, 1966). Consider two such characteristics: dietary energy (calories), E, and an index N of the micronutrients for which fish is the dominant local source—vitamin D, vitamin B12, long-chain omega-3 fatty acids, and selenium (Appendix Table B2). A household allocates its budget between fresh fish, q_f, and a composite of all other foods, q_o, which deliver characteristics through a linear nutritional technology,

$$E = e_f\, q_f + e_o\, q_o, \qquad N = n_f\, q_f + n_o\, q_o,$$

where e_k and n_k denote the energy and micronutrient content per unit of food $k \in \{f, o\}$. Preferences $U(E, N)$ are increasing in both characteristics, and the household maximizes U subject to the budget constraint $p_f q_f + p_o q_o \leq y$, with prices p_f, p_o and income y. The single fact that drives the results is an asymmetry in this technology: fish and other foods are close substitutes in calories—e_o is comparable to e_f, and other foods are cheaper and more storable—but fish is far more micronutrient-dense per calorie,

$$\frac{n_f}{e_f} > \frac{n_o}{e_o},$$

[2] Tanzania's framework sets specific rights and restrictions for foreign vessels (United Republic of Tanzania, 2003).

with the limiting case $n_o \to 0$, in which fish has no substitute in N at all. Appendix Table B2 shows that this gap is large in the data.

Foreign fishing enters through local supply. Because inshore stocks are depleted by fishing that is both close and intense, distant-water pressure D within a narrow coastal band shifts the local fish-supply schedule inward, $S = S(D)$ with $S'(D) < 0$; clearing the local market against household demand then raises the fish price and lowers the quantity households obtain,

$$\frac{dp_f}{dD} > 0, \qquad \frac{dq_f}{dD} < 0,$$

consistent with the joint price increase and quantity decline documented below. Trace the household's response in the empirically relevant case, where caloric adequacy is the binding priority and adjustment occurs on other margins. Holding E approximately at a target $\bar{E}$, a rise in p_f induces substitution toward other foods along the iso-calorie locus, $e_f\, dq_f + e_o\, dq_o = 0$, so that $dq_o = -(e_f/e_o)\, dq_f > 0$. Substituting into the micronutrient technology gives

$$dN \;=\; \left(n_f - \tfrac{e_f}{e_o}\, n_o\right) dq_f \;=\; e_f \left(\tfrac{n_f}{e_f} - \tfrac{n_o}{e_o}\right) dq_f,$$

which is negative whenever fish consumption falls, precisely because of the density gap. Calories are replaced; micronutrients are not. Equivalently, diet quality—the micronutrient density $\mu \equiv N/E$—declines, $d\mu/dD < 0$. This yields the paper's central prediction: *rising foreign fishing pressure leaves the quantity and caloric content of the diet roughly intact while degrading its micronutrient quality and pushing households toward the coping behaviors that define food insecurity.* The last step follows because holding calories near $\bar{E}$ as fish becomes scarcer requires exactly such adjustments—shifting toward less-preferred and self-produced foods, cutting dietary variety, and reducing portions—the margins recorded by the food-security module.

Two features make this a welfare cost rather than a simple relative-price movement. First, the loss is real and largely uncompensated. By the envelope theorem, the first-order money-metric loss from the induced price change is

$$\frac{dW}{dD} \;\approx\; -\, q_f\, \frac{dp_f}{dD} \;<\; 0,$$

the household's fish consumption scaled by the price increase. Because vessels fishing just outside the EEZ pay nothing, and authorization and payment are incomplete even inside it, this loss is not the counterpart of a transfer to a domestic producer: the resource is extracted by non-paying foreign fleets, so the contraction in local supply represents a genuine local welfare cost rather than a redistribution within the local economy—which is what motivates the policy discussion in Section 6. Second, identifying that cost is difficult because vessels sort toward productive, well-enforced waters that may themselves predict local conditions, so D is endogenous. The empirical strategy (Section 4) breaks this correlation by exploiting Somali piracy, which raised the cost of the productive Somali grounds and pushed foreign effort toward safer waters near Tanzania, as a source of variation in local fishing pressure that is plausibly unrelated to contemporaneous food conditions.

3 Data

Piracy. Benden et al. (2021) provides daily records of piracy incidents, including the date, location, type of attack and when available a small description of the event. The geographic location of each incident is crucial for the empirical strategy, as it allows me to construct piracy exposure measures around specific maritime areas. The dataset covers the period 1993–2021, but in order to merge the dataset with the others I restrict my focus on piracy incidents between 2006 and 2015 in the Western Indian Ocean. Appendix Table B3 reports the frequency of attacks from 2012 to 2015. Appendix Figure A4 reports the annual frequency of piracy incidents by attack type, while Appendix Figure A5 maps the geographic location of all piracy incidents included in the analysis.

DWF Fleets. Version 3.0 of the Global Fishing Watch (GFW) AIS Apparent Fishing Effort dataset provides global daily vessel-level observations on DWF fleet activity from 2012 to 2024 (Global Fishing Watch, 2025). The dataset is based on positions from more than 190,000 unique AIS devices installed on fishing vessels that are identified through a combination of a machine learning model, vessel registry databases, and manual review by GFW and regional experts (Kroodsma et al., 2018). Each vessel is uniquely identified by its Maritime Mobile Service Identity (MMSI)[3]. The raw data are spatially binned into grid cells measuring 0.1 degrees on a side, and they include detailed information on fishing effort, vessel characteristics, including their size (length, tonnage and engine power) and their fishing gear. Vessel time is measured in hours, calculated by assigning to each AIS position the time elapsed since the vessel's previous AIS position. Time is counted as apparent fishing hours if the GFW fishing detection model—a neural network machine learning model—classifies the vessel as engaged in fishing activity (Kroodsma et al., 2018). Appendix Figure A7 provides a visual representation of the commercial fishing-vessel locations used in the analysis and of the distribution of total fishing activity exerted in FAO Area 51 from 2012 to 2015 (FAO, 2024). I also construct *Travel Distance*, a proxy for the total distance travelled by vessels each day. To construct this measure, I exploit the spatial displacement between pairs of AIS pings at the vessel level. Since the temporal ordering of pings within each zone is not observed, I compute two alternative path lengths: one obtained by ordering AIS pings by longitude and latitude, and the other by ordering by latitude and longitude. I then define *Travel Distance* as the minimum of these two values, under the assumption that vessels follow relatively efficient routes within a voyage.

Ocean Productivity. I measure ocean productivity using chlorophyll-a concentration from the Aqua MODIS Level-3 Global Mapped Chlorophyll data, version 2022.0, produced by the NASA Ocean Biology Processing Group and distributed by the NASA Ocean Biology Distributed Active Archive Center (NASA Ocean Biology Processing Group, 2025). Chlorophyll-a is a proxy for phytoplankton biomass and marine primary productivity. The dataset provides global, gridded composites of surface chlorophyll-a concentration, measured in mg m^{-3}, and is available from 4 July 2002 to the present. I use the Level-3 mapped product at approximately 4 km spatial resolution. The chlorophyll-a data have two important limitations. First, satellite-based measurements are not available when cloud cover prevents

[3]The first three digits, the Maritime Identification Digits (MID), indicate the vessel's flag state.

the sensor from observing the ocean surface. As a result, the dataset contains many missing values. This is especially problematic for short-run analyses, because observed chlorophyll-a may reflect ocean productivity only under clear-sky conditions, generating non-random measurement error if cloud cover is correlated with weather or seasonal ocean conditions. Second, chlorophyll-a concentrations are mechanically higher in shallow and near-shore waters. The satellite product is based on ocean-color algorithms that infer chlorophyll concentration from the spectral properties of the water surface. These measurements can therefore be influenced by coastal shallowness and other near-shore conditions, rather than only by underlying marine productivity. For this reason, I use pre-period averages and residualize chlorophyll-a with respect to local bathymetry before using it as the cross-sectional exposure component of the instrument.

Coastal Communities. I use georeferenced household data from the Tanzania National Panel Survey (NPS), which is part of the Living Standards Measurement Study (LSMS) and is implemented by the Tanzania National Bureau of Statistics (National Bureau of Statistics, 2015).[4] The survey is nationally representative and contains detailed information on household demographics, location, and food consumption. I rely primarily on the household questionnaire, which reports household composition and includes a detailed food-consumption module. Importantly, the module records fresh fish consumption and distinguishes the source of each food item, indicating whether it was purchased, obtained from own production, or received as a gift. I define coastal communities as households located within 100 km of the coastline. [5] I exclude non-rural households in Dar es Salaam, since this urban area is structurally different from the other coastal communities in the sample and represents an outlier in terms of market access, income opportunities, and food-consumption patterns. Appendix Figure A9 shows the location of all households in the survey, while Appendix Figure A10 shows the coastal communities used in the analysis. The NPS is designed as a household panel. The first three waves follow the same households over time, and the LSMS provides a harmonized panel dataset. However, the main empirical analysis cannot exploit household fixed effects. This is because distant water fishing data are available only from 2012 onward, which restricts the analysis to Waves 3 and 4. In addition, Wave 4 combines a small *Extended Panel* of households retained from earlier waves with a newly drawn *Refresh Panel* designed to preserve national and subnational representativeness. In my coastal-community sample, the households observed in Wave 4 do not belong to the Extended Panel. As a result, the main analysis is based on a repeated cross-section covering the period 2012–2015, obtained by combining Waves 3 and 4.

Nutrition. I construct measures of nutrient intake using the USDA FoodData Central Foundation Foods database (U.S. Department of Agriculture, Agricultural Research Service, 2024). FoodData Central provides food-composition information at the food-item level, including macronutrients, micronutrients, fatty acids, amino acids, vitamins, and minerals. I merge these data with the LSMS food-consumption module (National Bureau of Statistics, 2015) by constructing a crosswalk between each LSMS food item and the closest correspond-

[4]The survey waves are Wave 1 (2008–2009), Wave 2 (2010–2011), Wave 3 (2012–2013), and Wave 4 (2014–2015).

[5]The coastal regions are Dar es Salaam, Tanga, Pwani, Lindi, Mtwara, Kaskazini Pemba, Kusini Pemba, Kaskazini Unguja, Kusini Unguja, and Mjini Magharibi.

ing item in FoodData Central. For narrowly defined LSMS items, I match the item directly by name. For broader food categories I manually identify candidate representative foods using AI-assisted searches. The matching procedure is implemented through the FoodData Central API: for each LSMS food label, I query the database, select the closest food-item match, and retrieve its nutrient profile. I then convert household food quantities into nutrient intake by multiplying consumed quantities by the nutrient content per unit of food. After constructing total household nutrient intake, I normalize these measures by household adult equivalents. Adult equivalents are computed from the demographic composition of the household. I assign a weight of 1 to men aged 18–59 and 0.8 to women aged 18–59. Older adults receive weights of 0.85 for men and 0.75 for women. Adolescents aged 15–17 receive weights of 0.9 for boys and 0.8 for girls. Children aged 10–14, 5–9, 1–4, and below age 1 receive weights of 0.7, 0.55, 0.35, and 0.25, respectively (Weisell and Dop, 2012). Household adult equivalents are then defined as the sum of these individual weights within each household-wave. I divide total household nutrient intake by this adult-equivalent measure. This procedure produces household-level adult-equivalent measures of total calories, macronutrients, micronutrients, fatty acids, vitamins, minerals, and amino acids associated with the foods reported in the LSMS consumption data.

Additional Datasets. I use three additional datasets to construct the spatial measures used in the analysis and to describe the institutional environment of industrial fishing in the Western Indian Ocean. First, I use Exclusive Economic Zone (EEZ) boundaries from version 12 of Flanders Marine Institute (2023). EEZs typically extend up to 200 nautical miles from a coastal state's baseline and define the maritime area in which the coastal state has exclusive rights to exploit, manage, and regulate marine resources.[6] I use these boundaries to assign fishing activity to national maritime jurisdictions and to describe the spatial distribution of distant water fishing across EEZs and high-seas areas. Second, I use bathymetry data from GEBCO (GEBCO Compilation Group, 2026). The data report elevation relative to sea level. I retain ocean cells at the 4km resolution with negative elevation values and convert them into a measure of depth. This measure is used to construct the cross-sectional exposure component of the Bartik-style instrument.[7] Third, I use the fishing-rights dataset provided by Park et al. (2023). This dataset contains information on vessel-level fishing authorizations at the day–MMSI level. I use it descriptively to document the mismatch between observed fishing activity and recorded fishing rights in the Indian Ocean, which provides suggestive evidence on informality and incomplete authorization coverage. Two limitations are important. First, vessels flagged to Taiwan and China are not always fully covered in the dataset. Second, because the data are based on records from the Indian Ocean Tuna Commission, they cover vessels authorized to catch tuna and tuna-like species in FAO Area 51. The dataset therefore does not provide a complete registry of all fishing activity in the region, but it is informative about the institutional coverage of authorized industrial tuna fishing.

In conclusion, the main dataset consist in a cross-sectional dataset at the household-day

[6]When EEZ claims overlap across neighboring states, delimitation may depend on bilateral agreements, joint arrangements, or court rulings. These overlapping claims are explicitly recorded in the dataset.

[7]Specifically, for each household interview location, I identify the closest point on the coast and compute average bathymetry within 36 nautical miles of that point.

level with 2036 observations, interviewd in 446 different interview location from 2012 to 2015.

4 Empirical Strategy

4.1 The Instrument and the Regressor

Distant water fishing fleets do not choose fishing locations at random. Their spatial allocation may respond to different factors such as marine productivity, enforcement capacity, port access, market conditions, and many others. As a result, a simple comparison of households exposed to different levels of fishing activity may confound the effect of distant water fishing with unobserved determinants of both vessel location and household outcomes. I argue this concern is difficult to solve using controls alone since some relevant determinants are only imperfectly observed, and even the most natural proxy for marine productivity, chlorophyll-a, is affected by the missing-value and near-shore measurement issues discussed in the data section.

To address this issue, I exploit Somali piracy incidents in the Gulf of Aden between 2012 and 2015 as a source of exogenous variation in the spatial allocation of distant water fishing fleets. The identifying idea is that piracy shocks changed the relative risk of operating in different parts of the Western Indian Ocean, inducing vessels to reallocate across fishing grounds. These shocks are plausibly unrelated to contemporaneous food conditions in Tanzanian coastal households, except through their effect on distant water fishing pressure.

Regressor. The main regressor, denoted by $FHR_{l,t}$, measures the cumulative exposure of interview location l to DWF vessels' activity in the γ days preceding the interview date t:

$$FHR_{l,t}^{(\gamma)} = \sum_{s=t-\gamma}^{t} \sum_{f=1}^{F} \text{fishing hours}_{f,s} \cdot \mathbf{1}\{\text{dist}(l,f,s) \leq 36\,\text{nm}\}\,, \qquad \gamma \in [1, 730].$$

where $\text{dist}(l, f, s)$ denotes the distance between location l and vessel ping f at time s. [8] The choice of 36 nautical miles (NM) as the exposure threshold is motivated by the legal and ecological zoning of coastal waters. Coastal waters are commonly divided into distinct distance bands from the baseline: the territorial sea extends up to 12 NM, while the contiguous zone extends up to 24 NM (Flanders Marine Institute, 2023). I use a 36 NM threshold to capture the near-offshore fishing area beyond these legal zones. This cutoff is also consistent with marine ecology and fisheries evidence: Karleskint et al. (2013) describe continental shelves as highly productive areas where important fishing grounds are concentrated. Therefore, the 36 NM cutoff captures fishing activity in the coastal and near-offshore zone most relevant for local food availability, while excluding fishing activity farther offshore within the outer EEZ.

[8] Geographical distances are computed using the *geodist* package in Stata, which calculates great-circle distances based on the Haversine formula, accounting for the Earth's curvature.

Instrument. I construct a Bartik-style instrument that combines time variation in piracy activity with predetermined cross-sectional variation in marine productivity. The time-varying component, $Piracy_t^{(\gamma)}$, is the cumulative number of piracy incidents occurring in the Gulf of Aden over the exposure window γ. I focus on the Gulf of Aden because this area captures the main spatial concentration of piracy incidents during the period of analysis and also overlaps with a visible concentration of industrial fishing activity off the Somali coast. Figure 1 shows the spatial distribution of piracy incidents and fishing activity between 2012 and 2015. Specifically,

$$Piracy_t^{(\gamma)} = \sum_{s=t-\gamma}^{t} \sum_{p=1}^{P} \mathbf{1}\{p \in \mathcal{G}\}, \qquad \gamma \in [1, 730],$$

where $\mathcal{G}$ denotes the relevant piracy-risk area in the Gulf of Aden. I define the Gulf of Aden as the rectangular area bounded by latitudes 9.5°–17° N and longitudes 40°–53° E (Appendix Figure A6).

I need to add cross-sectional variation to this time series variation, since not every area of Tanzania is equally exposed to piracy risk (Appendix Figure A8). The cross-sectional component is built in order to capture predetermined differences in the suitability of nearby fishing grounds. To make the spatial support of the instrument consistent with the endogenous regressor, I compute the predetermined marine-productivity component within the same 36 nautical mile radius used to construct fishing hours around each interview location. Since hystorical fishing activity data do not exist, I use average chlorophyll concentration over the pre-period 2002–2006, before the main piracy shock and before the household survey waves. Since chlorophyll is mechanically related to bathymetry and shallow-water conditions, I residualize predetermined chlorophyll on sea depth:

$$\overline{Chl}_l^{pre} = \alpha + \beta Depth_l + u_l.$$

I then define the predetermined exposure share as the residual from this regression:

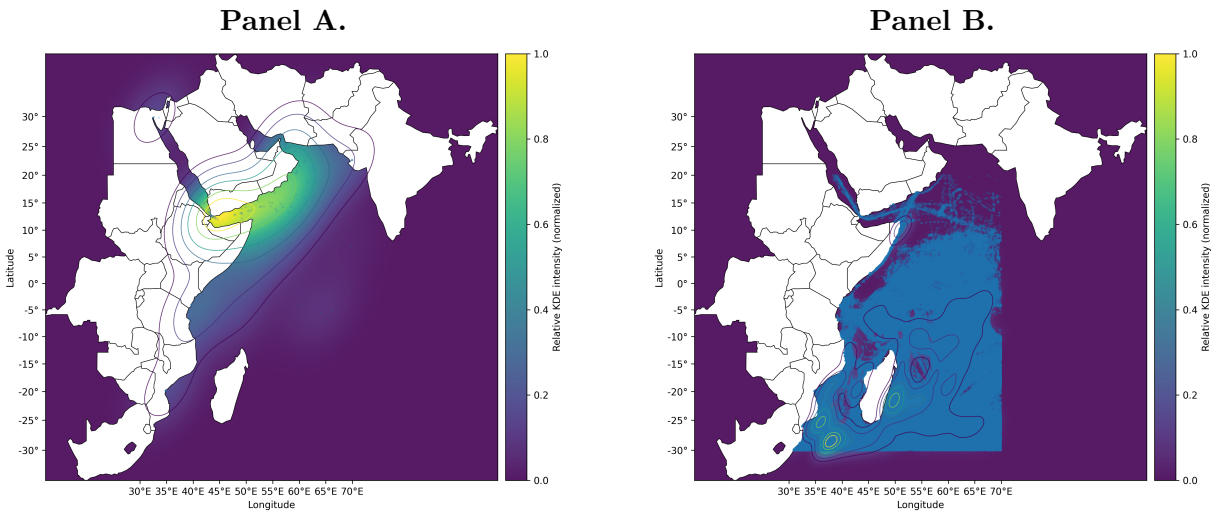
$$\widetilde{Chl}_l^{pre} = \widehat{u}_l.$$

The instrument is therefore given by

$$Z_{l,t}^{(\gamma)} = \widetilde{Chl}_l^{pre} \times Piracy_t^{(\gamma)}.$$

Intuitively, piracy incidents provide the time-series shock that affects the location decisions of distant water fishing vessels, while predetermined residual chlorophyll captures which coastal locations are more likely to be exposed to changes in fishing activity because of underlying marine productivity, net of depth. The identifying variation therefore comes from the interaction between remote piracy shocks and predetermined differences in local marine suitability. For most specifications, I set the exposure window to $\gamma = 60$ days.

This choice is intended to capture short-run responses to piracy shocks. In the data, the average vessel would take approximately 20 days to travel the 3000 km that separate Somalia from Tanzania. I therefore allow an additional 40 days for the relocation of fishing activity to translate into observable changes in coastal communities. The only exception is for mortality, fertility choices and household composition analysis, where the outcomes are measured over the previous two years. In that case, I set $\gamma = 730$ days to align the exposure window with the reference period of the outcome. Appendix Table B4 reports the summary statistics when $\gamma = 60$ days, and Appendix Table B5 reports the corresponding statistics when $\gamma = 730$ days.



Piracy Fishing Hours

Figure 1: The Spatial Distribution

Notes: The figure reports kernel density estimates of piracy incidents and industrial fishing activity in the Western Indian Ocean between 2012 and 2015. Panel A shows the spatial concentration of piracy incidents. Panel B shows the spatial concentration of industrial fishing activity, measured by fishing hours.

4.2 Two-Stage Least Squares

I estimate the effect of local distant water fishing pressure on household outcomes using a 2SLS specification in which fishing hours within 36 nautical miles of each interview location are instrumented with the interaction between Gulf of Aden piracy shocks and predetermined residual marine productivity.

1. **First stage:**

$$FHR_{l,t}^{(\gamma)} = \pi Z_{l,t}^{(\gamma)} + \delta Pirates_{l,t}^{near} + \nu_y + \theta_m + \rho_r + \nu_{l,t}, \tag{1}$$

   where $FHR_{l,t}^{(\gamma)}$ is fishing hours within 36 nautical miles of interview location l, $Z_{l,t}^{(\gamma)}$ is the shift-share instrument, and $Pirates_{l,t}^{near}$ controls for direct exposure to piracy incidents occurring within 500 km of interview location l over the same exposure window. I absorb fixed effects for year y, month m and rural r.

2. **Second stage:**

$$y_{i,l,t} = \beta \widehat{FHR}_{l,t}^{(\gamma)} + \delta Pirates_{l,t}^{near} + \nu_y + \theta_m + \rho_r + \varepsilon_{i,l,t}. \tag{2}$$

The outcome $y_{i,l,t}$ refers to household i, interviewed at location l on date t. Standard errors are clustered at the interview-location level.

The identifying variation comes from comparing locations with different predetermined marine productivity, net of bathymetry, before and after changes in piracy intensity in the Gulf of Aden. The exclusion restriction requires that Somali piracy affects Tanzanian household food outcomes only through its effect on the location and intensity of distant water fishing activity, conditional on local controls, fixed effects, and direct controls for nearby piracy exposure.

4.3 Identification

The validity of the empirical strategy relies on the assumption that piracy shocks in the Gulf of Aden affect Tanzanian household outcomes only through their effect on the spatial allocation of distant water fishing fleets. This is plausible for several reasons.

First, the piracy shocks used in the instrument occur far from the households in the survey. Piracy incidents are concentrated off the Somali coast and in the Gulf of Aden, while household outcomes are measured in Tanzania, roughly 3,000 km away. This geographic separation makes it unlikely that piracy directly affected Tanzanian households through local insecurity or direct disruptions to small-scale fishing activity. To further address this concern, the instrument is constructed using faraway piracy incidents, and the regressions control directly for piracy incidents occurring within 500 km of each interview location over the same exposure window.

Second, the timing and location of household interviews are unlikely to be systematically related to piracy shocks. The National Panel Survey interviews are distributed across locations

within each wave, and the spatial distribution of interviews does not display a systematic pattern across latitude or longitude that would mechanically align with piracy events in the Gulf of Aden (Appendix Figure A12; Appendix Figure A13).

Third, a direct trade channel is unlikely to explain the results. One might be concerned that Somali piracy affected goods transported through the Suez Canal and, in turn, food availability in Tanzania. However, food products imported through this route account for only a very small share of total food intake (Appendix Figure A14).

Taken together, these features support the exclusion restriction. Piracy shocks in the Gulf of Aden are geographically remote from Tanzanian households, interview timing and location are not systematically aligned with piracy events, and direct effects on Tanzanian small-scale fishermen or imported food consumption are unlikely to account for the results. The identifying variation is therefore interpreted as operating through changes in distant water fishing pressure around Tanzanian coastal communities.

5 Results

5.1 The First Stage

This is the first paper that empirically shows that fishing vessels react to piracy. Figure 2 provides graphical evidence that distant water fishing activity near Tanzania rises when piracy risk is high near Somalia. Panel A maps vessel activity in 2012, when 82 piracy attacks were recorded in the Western Indian Ocean, while Panel B maps activity in 2013, when the number of attacks fell to 22. The comparison is descriptive, but the greater concentration of fishing activity near Tanzania in the high-piracy year is consistent with fleets reallocating away from riskier waters.

Table 1 reports the first-stage estimates. The dependent variable is total distant water fishing hours within 36 nautical miles of the closest coastal point to each household interview location during the preceding 60 days. The excluded instrument is the standardized interaction between piracy shocks in the Gulf of Aden and predetermined residual marine productivity around the interview location. The coefficient is positive and statistically significant at the 1 percent level in every specification, ranging from 16.8 to 20.4 hours as fixed effects are added. In the preferred specification, which includes rural-status, month, and year fixed effects, a one-standard-deviation increase in the instrument raises fishing activity by 20.3 hours. This effect is slightly larger than the dependent-variable mean of 19.6 hours. The first-stage F-statistic is 18.8, indicating that the instrument remains relevant in the preferred specification.

The appendix reports several robustnes checks. The first-stage relationship is stable across alternative exposure windows and it shows no anticipation effects (Appendix Figure A20), alternative measures of vessel activity, an unstandardized instrument, the exclusion of the control for close piracy within 500 km, a standardized outcome, the inclusion of urban Dar es Salaam, and a Poisson Pseudo-Maximum Likelihood (PPML) specification (Appendix Tables B6–B10).

In the main specification, I verify that because the Somali area is dangerous, another area experiences higher industrial fishing pressure. It is also important to verify that the first stage holds at the vessel level. To this end, I estimate an event study showing that vessels relocate in response to pirate activity at sea. In Appendix Figure A21, I show that in the Western Indian Ocean (FAO Area 51), vessels located within 400 km of an attack travel almost 70 km farther the day after the attack than the day before. Unsurprisingly, there is no effect on the day of the attack itself, since the recording and transmission of information about a piracy event typically occur with some delay. I further motivate the first stage by showing that a substantial share of the vessels observed near Tanzania also operate in Somali piracy-related areas (Appendix Table B11). Finally, I test the reallocation mechanism directly using a daily vessel-level panel restricted to the 66 vessels observed in both the eligible Tanzanian area and the piracy area near Somalia. I estimate regressions with vessel, month, and year fixed effects. The dependent variables are indicators for whether a vessel is located in the Tanzanian eligible area or in the Somali dangerous area on a given day. The main regressors are cumulative piracy attacks over alternative windows of 7, 30, 60, and 90 days. The pattern is clear: the probability of being in Somalia falls after an attack, while the probability of being in Tanzania rises (Appendix Figure A22).

Taken together, the evidence supports the relevance of the instrument. The first-stage estimates show that the instrument strongly predicts fishing pressure around Tanzanian interview locations. The vessel-level event study shows that vessels exposed to piracy shocks adjust their behavior after attacks. The overlap exercise shows that a non-negligible share of vessels operate both near Tanzania and in piracy-risk areas. The daily vessel-level regressions then show that piracy shocks reduce the probability that these vessels operate near Somalia and increase the probability that they operate near Tanzania. These results support the interpretation that Somali piracy shifted distant water fishing activity away from the Gulf of Aden and toward Tanzanian coastal waters.

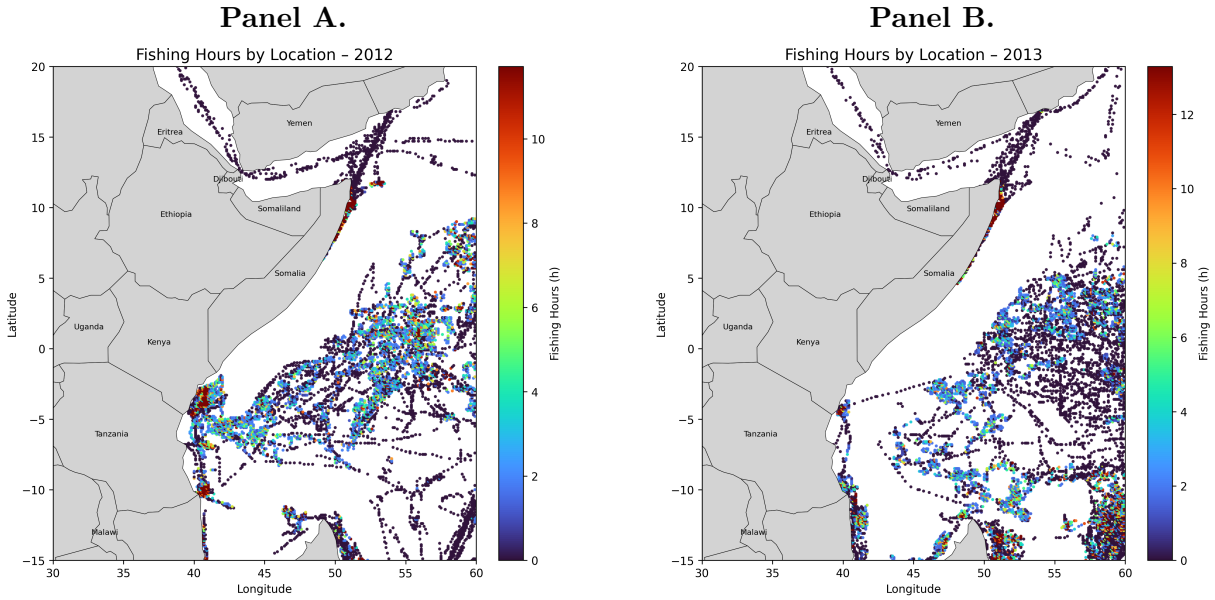


Figure 2: The First Stage in the Western Indian Ocean

Notes: The figure reports the spatial distribution of distant water fishing vessels, with darker points indicating higher fishing-hour intensity. Panel A shows vessel activity in 2012, when 82 piracy attacks were recorded in the Western Indian Ocean. Panel B shows the corresponding distribution in 2013, when the number of attacks was substantially lower, at 22. The comparison suggests that periods with more piracy attacks are associated with greater distant water fishing activity within the EEZs of Tanzania and Kenya.

Table 1: The First Stage: The Effect of Piracy in Somalia on Distant Water Fishing in Tanzania

Dep. Var.	Fishing Hours				
	(1)	(2)	(3)	(4)	(5)
sd Z	16.779***	19.767***	19.585***	20.387***	20.282***
	(4.474)	(5.084)	(5.039)	(4.822)	(4.803)
Piracy ($\leq$ 500 km)	13.445**	6.419	7.304	13.099**	13.549**
	(5.686)	(5.624)	(5.516)	(5.502)	(5.437)
Obs.	2,036	2,036	2,036	2,036	2,036
FEs	w	y	r, y	m, y	r, m, y
F	8.63	9.05	9.39	18.30	18.81
R^2	0.15	0.23	0.23	0.35	0.35
Num c	446	446	446	446	446
Avg Dep Var	19.62	19.62	19.62	19.62	19.62

Note: In the specification, the dataset is a cross-section. The variable "sd Z" is the instrument standardized, while, the variable "Piracy ($\leq$ 500 km)" counts the number of piracy incidents within 500km from the Tanzanian coast. The outcome measures total fishing hours within 36 nautical miles of the closest coastal point to each household interview location during the preceding 60 days. FE notation is LSMS wave (w), rural (r), year (y) and month (m). Standard errors are clustered at the interview location level. *, **, *** denote statistical significance at the 10%, 5%, 1% level respectively.

5.2 Fish Consumption

Table 2 reports the main IV estimates for fresh-fish outcomes among Tanzanian coastal households. Columns 1 and 2 measure total consumption and purchased quantities in kilograms, column 3 reports the log price per kilogram, and columns 4 and 5 capture the probabilities of purchasing and consuming any fresh fish. Fishing Hours is instrumented with the standardized interaction between Gulf of Aden piracy and predetermined local marine productivity.

The estimates show a consistent deterioration in household access to fresh fish. An additional fishing hour reduces total fresh-fish consumption by 0.0045 kg and purchased fresh fish by 0.0038 kg. It also lowers the probabilities of purchasing and consuming fresh fish by 0.24 and 0.29 percentage points, respectively. At the same time, the log price per kilogram increases by 0.005 log points. All five coefficients are statistically significant at the 1 percent level. The joint pattern of lower quantities and higher prices is consistent with a contraction in the local availability of fresh fish rather than a decline in household demand alone.

The magnitudes are economically meaningful. Combining the preferred first stage with the IV coefficients implies that a one-standard-deviation increase in the instrument reduces total fresh-fish consumption by about 0.09 kg and purchased quantities by about 0.08 kg. Relative to their means of 0.46 kg and 0.38 kg, both effects are approximately 20 percent. The same change lowers the probability of purchasing fresh fish by about 4.9 percentage points and the probability of consuming it by about 5.9 percentage points. For the price sample, the implied

increase is approximately 0.12 log points. These results therefore indicate that greater distant water fishing pressure reduces fresh-fish consumption on both the intensive and extensive margins while increasing the price paid by households that purchase fish.

The appendix shows that these conclusions are not specific to the preferred 60-day exposure window (Appendix Figures A23–A27). The direction of the results is also supported by the non-IV specification and remains strong when urban Dar es Salaam is added to the sample (Appendix Table B12; Appendix Table B13). Outcome-specific specifications with alternative fixed effects, controls, and variable scalings yield the same broad pattern (Appendix Tables B14–B17).

Table 2: IV: The Effect of Distant Water Fishing on Fresh Fish Consumption in Tanzania

	(1)	(2)	(3)	(4)	(5)
	Tot Cons. (kg)	Purch. (kg)	Log P	Purch. (dummy)	Cons. (dummy)
Fishing Hours	-0.0045***	-0.0038***	0.0050***	-0.0024***	-0.0029***
	(0.0010)	(0.0008)	(0.0013)	(0.0007)	(0.0008)
Piracy ($\leq$ 500 km)	0.0841*	0.0716*	-0.1513***	0.0557	0.0710*
	(0.0473)	(0.0396)	(0.0428)	(0.0364)	(0.0372)
Obs.	2,036	2,036	1,319	2,036	2,036
FEs	r, y, m	r, y, m	r, y, m	r, y, m	r, y, m
First-stage coef.	20.28	20.28	23.62	20.28	20.28
First-stage s.e.	4.80	4.80	5.50	4.80	4.80
Kleib.-Paap F	17.83	17.83	18.43	17.83	17.83
Clusters	446	446	337	446	446
Mean Dep. Var.	0.46	0.38	8.05	0.65	0.73

Note: The table reports IV estimates using a cross-sectional sample. The instrumented endogenous regressor is *Fishing Hours*, measured as distant water fishing activity within 36 nautical miles of the closest coastal point to the household interview location in the previous 60 days to the interview date. *Piracy ($\leq$ 500 km)* counts the number of piracy incidents occurring within 500 km of the closest coastal point to the household interview location. Both fishing and piracy exposures are measured over the 60 days preceding the household interview. Food-consumption outcomes are measured over the previous 7 days. *Tot Cons. (kg)* measures total fresh fish consumed by the household in kilograms, while *Cons. (dummy)* is an indicator equal to one if the household consumed any fresh fish. *Purch. (kg)* measures the quantity of fresh fish purchased in kilograms, and *Purch. (dummy)* is an indicator equal to one if the household purchased any fresh fish. *Price* is computed, following the LSMS guidelines, as food expenditure divided by purchased quantity. Fixed-effect notation is as follows: LSMS wave (w), rural status (r), year (y), and month (m). Standard errors are clustered at the interview-location level. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

5.3 Substitution and Coping Strategies

The decline in fresh-fish consumption raises the question of how households adjust to this change. I examine this response along two margins. First, I study whether households substitute away from fresh fish toward other food categories. Second, I assess whether they rely more heavily on alternative coping strategies, such as own production or food received from others.

Figure 3 reports IV estimates for different food categories, where the outcome is total consumption of item i, in kilograms over the previous 7 days, weighted by adult-equivalent size. Each coefficient comes from a separate regression for a given item, in which I control for rural, year, and month fixed effects and explicitly control for piracy incidents within 500 km, as in the main specification. The pattern suggests that households substitute away from fresh fish and toward other foods. The strongest increases are concentrated in vegetables and plant-based foods. Additional results in Appendix Figure A28 report the corresponding effects on the extensive margin of consumption and purchases, on purchased quantities, and on log prices for individual food categories. These estimates support the interpretation that the response reflects a broad reorganization of the household food basket, rather than a change confined to a single outcome or food item.

Table 3 examines broader coping responses. Column 1 shows that total purchased quantities decline when distant water fishing pressure increases. The coefficient is negative, statistically significant at the 1 percent level, and implies that an additional fishing hour reduces total purchased food by 0.022 kg. Using the preferred first-stage coefficient of 20.28, a one-standard-deviation increase in the instrument reduces purchased food by about 0.45 kg, or roughly 7 percent of the mean. This result raises the question of whether an income effect is at work [9]. At the same time, column 2 shows that total consumed quantities increase, although the effect is significant only at the 10 percent level. The coefficient is positive and marginally significant, implying an increase of about 0.22 kg for a one-standard-deviation increase in the instrument, which corresponds to a 2.4 percent increase relative to the mean. This is not surprising: as shown in the previous figure, households substitute toward vegetables, which typically entails consuming a larger volume of food. Consistent with a potential income shock, column 4 shows that distant water fishing pressure increases the probability that households consume food from their own production. An additional fishing hour raises this probability by 0.32 percentage points, implying an increase of about 6.5 percentage points for a one-standard-deviation increase in the instrument. Column 5 shows a large increase in the quantity consumed from own production: an additional fishing hour raises own-produced consumption by 0.033 kg. This corresponds to about 0.67 kg, or roughly one-third of the mean, for a one-standard-deviation increase in the instrument.

By contrast, I find no evidence that households consume more gifted items. The coefficients on the gift dummy, gift kilograms, fish gifts, and fish-gift kilograms are all small and statistically insignificant. This suggests that the shock is diffused across a broad area rather than borne by individual households in isolation.

[9] I plan to investigate further through fieldwork scheduled for October 2026, since many households in coastal communities derive income from the fish value chain

Overall, these results indicate that households cope with the decline in fresh fish availability by changing the composition of consumption: they purchase less food and shift toward own-produced vegetables. The evidence therefore points to a substitution response that may reduce diet quality, especially if fresh fish is replaced by less protein-rich or less nutrient-dense alternatives.

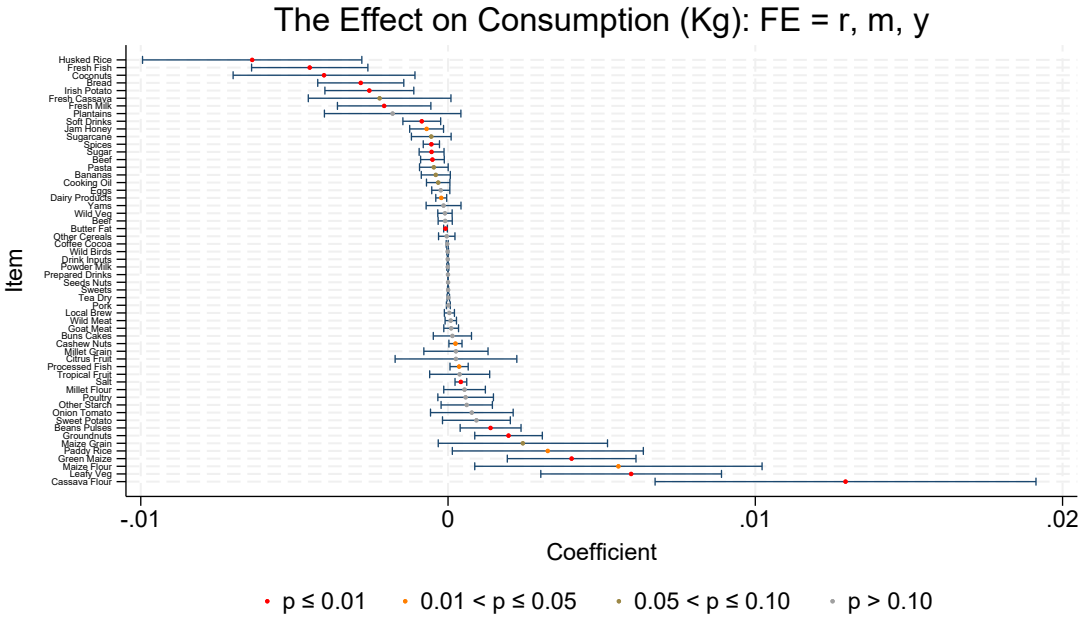


Figure 3: Substitution: Total Consumption (kg)

Notes: The figure reports IV estimates of the effect of distant water fishing hours on household consumption, in kilograms, across food categories. Each coefficient comes from a separate regression. Fishing hours are measured within 36 nautical miles of the closest coastal point to the household interview location over the preceding 60 days and are instrumented with the standardized interaction between piracy shocks in the Gulf of Aden and predetermined local marine productivity. Horizontal bars report 95% confidence intervals. All specifications include rural-status, month, and year fixed effects, and standard errors are clustered at the interview-location level.

Table 3: IV: The Effect of Distant Water Fishing on Coping Strategies

	(1) Total Purchased kg	(2) Total Consumed kg	(3) Diverse Items	(4) Own Prod. Dummy	(5) Own Prod. kg	(6) Gift Dummy	(7) Gift kg	(8) Fish Gifts Dummy	(9) Fish Gifts kg
Fishing Hours	-0.0222***	0.0110*	-0.0074	0.0032***	0.0330***	-0.0010	-0.0012	-0.0002	-0.0004
	(0.0060)	(0.0058)	(0.0065)	(0.0008)	(0.0071)	(0.0007)	(0.0023)	(0.0003)	(0.0002)
Piracy (≤ 500 km)	-0.0340	-0.3774	-0.0404	-0.0636	-0.4503	0.0555	0.1599	0.0013	0.0044
	(0.3601)	(0.3035)	(0.3662)	(0.0442)	(0.2783)	(0.0357)	(0.1081)	(0.0135)	(0.0062)
Obs.	2,036	2,036	2,036	2,036	2,036	2,036	2,036	2,036	2,036
FEs	r, y, m	r, y, m	r, y, m	r, y, m	r, y, m	r, y, m	r, y, m	r, y, m	r, y, m
First-stage coef.	20.28	20.28	20.28	20.28	20.28	20.28	20.28	20.28	20.28
First-stage s.e.	4.80	4.80	4.80	4.80	4.80	4.80	4.80	4.80	4.80
Kleib.-Paap F	17.83	17.83	17.83	17.83	17.83	17.83	17.83	17.83	17.83
Clusters	446	446	446	446	446	446	446	446	446
Mean Dep. Var.	6.06	9.12	13.68	0.56	2.04	0.59	1.10	0.05	0.01

Note: The table reports IV estimates using the cross-sectional sample. Fishing Hours is measured within 36 nautical miles of the closest coastal point to the household interview location and is instrumented with the standardized interaction between piracy shocks in the Gulf of Aden and predetermined local marine productivity. Fishing and piracy exposures are measured over the preceding 60 days, while food-consumption outcomes are measured over the preceding seven days. Fixed-effect notation is rural status (r), year (y), and month (m). Standard errors are clustered at the interview-location level. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

5.4 Nutritional Pathways

The previous results show that households respond to higher distant water fishing pressure by reducing fresh fish consumption and substituting toward other food categories, particularly plant-based foods. I next examine whether this change in the composition of consumption translates into changes in nutrient intake.

Figure 4 summarizes the nutritional effects. The figure reports the estimated coefficient β on Fishing Hours from separate IV regressions for each nutrient outcome. To make effects comparable across nutrients measured in different units, all nutrient outcomes are standardized to have mean zero and standard deviation one. Panel A reports nutrients for which the estimated effect is negative, while Panel B reports those with positive estimated effects. The separation into the two panels is purely for readability.

The results reveal a marked reallocation in the nutritional composition of household diets. On the positive side, higher fishing pressure is associated with increases in carbohydrates, dietary fiber, iron, magnesium, sodium, and riboflavin. The estimated effects on carbohydrates, fiber, iron, magnesium, and sodium are statistically significant, while total energy and protein intake show little evidence of a systematic response. This pattern is consistent with the substitution results above: households appear able to compensate partly for the reduction in fresh fish by increasing consumption of other foods, particularly foods supplying carbohydrates and fiber. Importantly, however, this adjustment does not imply that the nutritional composition of the diet is preserved.

The negative estimates are concentrated among nutrients that are important components of fish and other animal-source foods. Vitamin B12 declines, although the estimate is only marginally significant, while selenium and vitamin D display larger and precisely estimated negative effects. The standardized specification makes the relative magnitude of these effects directly comparable across nutrients: the coefficient on selenium is approximately -0.006

standard deviations per additional fishing hour, while the coefficient on vitamin D is approximately −0.008 standard deviations. In contrast, the coefficients on total protein, total fat, and energy are close to zero. The results therefore suggest that the adjustment occurs primarily through the *composition* of nutrient intake rather than through a uniform reduction in total food or macronutrient consumption.

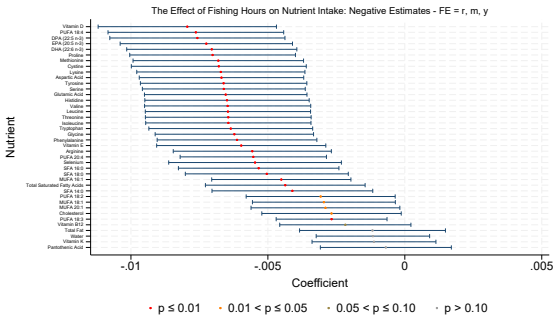
The fatty-acid results provide particularly strong evidence for this interpretation. The estimated coefficients for several polyunsaturated and monounsaturated fatty acids are negative, and the effects are especially pronounced for the long-chain omega-3 fatty acids EPA, DPA, and DHA. These nutrients are closely linked to fish consumption and all exhibit negative and highly statistically significant coefficients. DHA, EPA, and DPA are among the largest negative estimates in the figure. The decline in these nutrients is therefore consistent with the documented reduction in fresh fish consumption and is difficult to reconcile with a mechanism operating only through changes in the overall quantity of food consumed.

A similarly broad pattern appears among amino acids. Higher distant water fishing pressure is associated with negative effects on a wide range of amino acids, including lysine, leucine, isoleucine, methionine, threonine, valine, histidine, and tryptophan, as well as several other amino acids. Most of these estimates are precisely estimated and of similar magnitude. This is notable because total protein intake itself does not change significantly. The results therefore indicate that households may partially preserve the overall quantity of protein consumed while changing the sources and nutritional composition of that protein.

Taken together, Figure 4 strengthens the evidence for a nutritional substitution mechanism. Households respond to reduced access to fresh fish by shifting toward foods that provide more carbohydrates, fiber, and some micronutrients such as iron. At the same time, intake falls for a broad set of nutrients strongly associated with fish and animal-source foods, including vitamin D, vitamin B12, selenium, long-chain omega-3 fatty acids, and numerous amino acids. The consequences of higher distant water fishing pressure therefore extend beyond the quantity of food consumed: they alter the nutritional composition of the household diet, with households appearing to compensate for lost fish consumption in caloric and bulk terms but not fully replacing its nutrient profile.

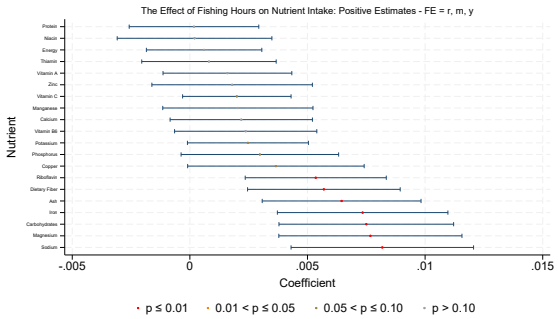
The appendix provides additional evidence on the importance of this channel. Estimates in the original measurement units reproduce the increase in fiber and carbohydrates and the declines in vitamin D, selenium, and polyunsaturated fatty acids (Appendix Tables B18–B20), showing that the pattern in Figure 4 is not an artifact of standardizing the outcomes. Fresh fish also accounts for a substantial share of total and animal-source protein intake in coastal Tanzania (Appendix Table B1) and supplies more than half of household intake for several of the nutrients that decline in the figure (Appendix Table B2). These supporting results help explain why substitution that preserves calories or total food volume need not preserve diet quality.

Panel A.



Negative

Panel B.



Positive

Figure 4: Nutrient Intake

Notes: The figure reports the estimated coefficients β on Fishing Hours from separate IV regressions for each nutrient outcome. All nutrient outcomes are standardized to have mean zero and standard deviation one. Fishing Hours is instrumented using the standardized instrument, Z. Each point represents the estimated β coefficient for a specific nutrient, with horizontal bars indicating 95% confidence intervals. Panel A reports nutrients with negative estimated coefficients, while Panel B reports nutrients with positive estimated coefficients. All regressions include rural, month, and year fixed effects. Standard errors are clustered at the interview-location level.

5.5 Short-Run Consequences: Food Insecurity

The previous results show that higher distant water fishing pressure reduces fresh fish consumption and induces households to substitute toward other foods, generating offsetting effects across different dimensions of nutrient intake. In this section, I examine whether these dietary adjustments translate into short-run food insecurity. Using Module H of the LSMS food-security questionnaire, Table 4 reports IV estimates for food-insecurity outcomes measured over the previous seven days.

The results show a consistent deterioration in short-run food security. Column 1 uses the standard indicator for whether the household worried that it would not have enough food during the previous seven days. An additional fishing hour increases this probability by 0.2 percentage points. Scaled by the preferred first stage, a one-standard-deviation increase in the instrument raises the probability of food insecurity by about 4.1 percentage points, relative to a mean of 25 percent.

The pattern is broad-based across the underlying components of food insecurity. Higher distant water fishing pressure increases the number of days in the previous week in which households consumed less preferred foods, reduced dietary variety or portion sizes, reduced the number of meals, restricted children's food consumption, borrowed food, had no food at home, or spent an entire day without food. The largest absolute effects are observed for eating less preferred foods and reducing the number of meals. A one-standard-deviation increase in the instrument raises these outcomes by approximately 0.26 and 0.18 days, respectively. The coefficients are positive for all nine outcomes and statistically significant at conventional levels, showing that the deterioration is not driven by a single component of the food-insecurity module. The results are also qualitatively robust to alternative estimation methods, including OLS and PPML for count outcomes, as well as to including urban Dar es Salaam in the sample. (Appendix Tables B21–B23). Outcome-by-outcome specifications that vary the fixed effects, nearby-piracy control, and scaling of the dependent variable and endogenous regressor yield the same broad conclusion (Appendix Tables B24–B32).

These findings are consistent with the substitution and nutrition results. Households do not simply replace fresh fish with equivalent alternatives. Instead, the decline in fresh fish availability appears to force households to adjust along several margins: they shift toward less preferred foods, reduce variety, and alter meal quantity and timing.

I also examine short-run health-care utilization in Table 5. These outcomes measure whether household members visited a health-care provider, reported separately for all members and for women, men, and children. The estimates provide little evidence of an immediate increase in health-care visits: the coefficients are small and statistically insignificant for the overall household measure and for adult women and men. The only exception is the child outcome, where the coefficient is positive but significant only at the 10 percent level; scaled by the first stage, it corresponds to an increase of about 2.4 percentage points.

I interpret this limited response as reassuring, and indeed as a useful robustness check. Nutritional deficiencies typically take time to manifest as conditions severe enough to require medical attention, so I would not expect large contemporaneous effects on health-care visits

over such a short reference period. Finding strong immediate effects would in fact have been a concern, since it might have indicated that coastal households were already experiencing some other shock capable of biasing the results. The mechanism documented above—reduced fresh-fish consumption, substitution toward other foods, and the resulting changes in nutrient intake—operates gradually, and the absence of an acute health response is consistent with a slow-moving health pathway rather than an immediate shock.

Table 4: IV: The Effect of Fishing Hours on Food Insecurity

	(1) Food Insec.	(2) Less Pref. Food	(3) Limited Variety	(4) Portion Size	(5) N. of Meals	(6) Restrict Child	(7) Borrow Food	(8) No Food at Home	(9) No Food Full Day
Fishing Hours	0.002***	0.013***	0.003**	0.004**	0.009***	0.001*	0.003***	0.003***	0.001**
	(0.001)	(0.002)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.000)
Piracy ($\leq$ 500 km)	-0.089***	-0.399***	-0.244***	-0.165***	-0.399***	-0.066**	-0.071	-0.075**	-0.036***
	(0.027)	(0.108)	(0.079)	(0.064)	(0.111)	(0.029)	(0.045)	(0.032)	(0.013)
Obs.	2,036	2,036	2,036	2,036	2,036	2,036	2,036	2,036	2,035
FEs	r, y, m	r, y, m	r, y, m	r, y, m	r, y, m	r, y, m	r, y, m	r, y, m	r, y, m
Kleib.-Paap F	17.83	17.83	17.83	17.83	17.83	17.83	17.83	17.83	17.83
Clusters	446	446	446	446	446	446	446	446	446
Mean Dep. Var.	0.25	0.69	0.39	0.32	0.70	0.08	0.25	0.08	0.04

Note: The dataset is a cross-section. The dependent variables are food-insecurity outcomes measured over the previous 7 days. Fishing hours are instrumented using the standardized instrument. The variable Piracy ($\leq$ 500 km) counts the number of piracy incidents within 500 km from the coast. FE notation is rural (r), year (y), and month (m). Standard errors are clustered at the interview-location level. *, **, *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 5: IV: The Effect of Distant Water Fishing on Health Care Provider Visits

	(1) Visit	(2) Female	(3) Men	(4) Child
Fishing Hours	0.0007	0.0001	0.0008	0.0012*
	(0.0005)	(0.0005)	(0.0006)	(0.0007)
Piracy ($\leq$ 500 km)	-0.0392	-0.0021	-0.0430	-0.0443
	(0.0304)	(0.0241)	(0.0337)	(0.0270)
Obs.	2,036	2,036	2,036	2,036
FEs	r, y, m	r, y, m	r, y, m	r, y, m
First-stage coef.	20.28	20.28	20.28	20.28
First-stage s.e.	4.80	4.80	4.80	4.80
Kleib.-Paap F	17.83	17.83	17.83	17.83
Clusters	446	446	446	446
Mean Dep. Var.	0.58	0.24	0.47	0.21

Note: The table reports IV estimates using the cross-sectional sample. The outcomes indicate whether household members visited a health-care provider during the four weeks preceding the interview. Fishing Hours is measured within 36 nautical miles of the closest coastal point to the household interview location over the preceding 60 days and is instrumented with the standardized interaction between piracy shocks in the Gulf of Aden and predetermined local marine productivity. Fixed-effect notation is rural status (r), year (y), and month (m). Standard errors are clustered at the interview-location level. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

5.6 Longer-Run Consequences: Mortality, Fertility, and Household Composition

The previous results document short-run effects on food consumption, substitution patterns, nutrient intake, and food insecurity. I now examine whether these shocks are associated with longer-run demographic and health outcomes. For this part of the analysis, I set the exposure window to $\gamma = 730$ days. This choice reflects how the outcomes are measured: mortality and pregnancy are reported over the previous two years, so I match the exposure window to the reference period of the dependent variables. I also exclude waves 2 and 4. Wave 2 is dropped because its two-year recall period would overlap with the previous survey wave, and wave 4 because, as discussed above, it is not part of the balanced panel used in this specification. Finally, since fishing-activity data are not available before 2012, these regressions should be interpreted as reduced-form evidence: although the specification exploits the same source of variation as the main analysis, the corresponding first stage cannot be estimated directly for these longer-run outcomes. All specifications in this section include household, month, and survey-wave fixed effects.

Table 6 reports estimates for whether the household experienced any mortality event. The coefficient on the standardized instrument is positive and marginally significant for overall mortality: a one-standard-deviation increase in the instrument raises the probability that the household experienced any mortality event by 2.95 percentage points, relative to a mean of 6.9 percent, an increase of about 43 percent. The effect is concentrated in female mortality, which rises by 2.04 percentage points relative to a mean of 3.7 percent, while mortality among children aged 1–15 increases by 0.38 percentage points. I test the sensitivity of these longer-run results to alternative fixed effects, instrument and outcome scalings, the nearby-piracy control, and the inclusion of urban Dar es Salaam (Appendix Tables B33–B36). One might worry that these estimates are mechanical, simply reflecting that households are two years older at the later wave. To address this, I examine whether the results reflect changes in household composition. Appendix Table B37 shows that the instrument reduces the number of non-infant household members by about 0.30, or 5.7 percent of the mean, but does not produce a clear shift in mean or median age. In this setting, comparing the same household over time does not necessarily mean comparing a fixed set of individuals: household composition can change through births, deaths, marriage, fostering, temporary movements of relatives, or migration. The results therefore point to a broad adjustment in household membership rather than a response concentrated in a single age group. Mortality may explain part of this decline, but migration could also play an important role (Libois, 2016). Consistent with this, Appendix Table B40 shows no detectable change in the presence of fishermen, fishing ability, or fisherman mortality within households, making a purely mechanical change in fishing-household composition less likely.

Finally, Table 7 examines fertility-related outcomes. Since pregnancy is also measured over the previous two years, I again set $\gamma = 730$ days. A one-standard-deviation increase in the instrument raises the probability of pregnancy by 6.68 percentage points and the total number of pregnancies by 0.066, both marginally significant. There is no statistically significant effect on the number of women aged 15–49, so the result is not mechanically driven by an increase in the number of women of reproductive age. This fertility response is consistent with

a long literature in family economics and economic demography showing that, in low-income settings with incomplete insurance markets, fertility can partly reflect an informal-insurance motive: children may provide future household labor, intergenerational support, and within-family risk-sharing (Schultz, 1997; Rosenzweig and Stark, 1989; Kalemli-Ozcan, 2003; Rossi and Godard, 2022). In the appendix, I report the same robustness checks—alternative fixed effects, instrument and outcome scalings, the nearby-piracy control, and the inclusion of urban Dar es Salaam (Appendix Tables B38–B39).

Overall, the longer-run results are consistent with the broader mechanism documented in the paper. distant water fishing pressure reduces fresh-fish consumption, induces substitution toward other foods, alters nutrient intake, and worsens short-run food insecurity. These changes do not translate immediately into strong increases in health-care visits, but they are associated with suggestive longer-run effects on mortality, fertility, and household composition. I therefore interpret these results as complementary evidence that the consequences of reduced access to fresh fish extend beyond immediate consumption responses and materialize gradually over longer horizons.

Table 6: The Effect of Piracy in Somalia on Mortality (dummy) in Tanzania

	(1) (dummy)	(2) Fem	(3) Male	(4) ≤ 1	(5) (1-15]	(6) (15-64]	(7) > 64
sd Z	0.0295*	0.0204*	0.0114	0.0174	0.0038*	0.0020	0.0043
	(0.0153)	(0.0110)	(0.0131)	(0.0143)	(0.0022)	(0.0056)	(0.0046)
Piracy ($\leq$ 500 km)	-0.0003	-0.0006	-0.0003	0.0050**	-0.0014	-0.0036**	-0.0017
	(0.0037)	(0.0032)	(0.0022)	(0.0024)	(0.0009)	(0.0018)	(0.0013)
Obs.	2,190	2,190	2,190	2,190	2,190	2,190	2,190
FEs	i, m, w	i, m, w	i, m, w	i, m, w	i, m, w	i, m, w	i, m, w
F	1.93	1.71	0.40	3.29	1.94	2.11	1.12
R^2	0.52	0.52	0.52	0.51	0.51	0.51	0.52
Clusters	350	350	350	350	350	350	350
Mean Dep. Var.	0.069	0.037	0.037	0.049	0.003	0.010	0.009

Note: In the specification, the dataset is a panel at the househol-interview date level. The variable "sd Z" is the instrument standardized, while, the variable "Piracy ($\leq$ 500 km)" counts the number of piracy incidents within 500km from the coast. The outcome is measured over the previous 2 years. FE notation is LSMS wave (w), household(i) and month (m). Standard errors are clustered at the interview location level. *, **, *** denote statistical significance at the 10%, 5%, 1% level respectively.

6 Conclusion

This paper shows that distant water fishing can have large consequences for food security in coastal communities. I study this question in Tanzania by exploiting Somali piracy shocks as a source of exogenous variation in the spatial allocation of distant water fishing fleets. The first-stage results show that piracy shocks in the Gulf of Aden substantially increase distant water fishing activity closer to Tanzania. A one-standard-deviation increase in the instrument raises fishing hours around Tanzanian interview locations by about 20 hours, slightly above the sample mean, an increase of roughly 103 percent relative to the mean.

The main result is that this rise in distant water fishing pressure crowds out local access to

Table 7: The Effect of Piracy in Somalia on Fertility Choice in Tanzania

	(1) Pregnancy (dummy)	(2) Tot Pregnancy	(3) Number of Fem [15-49]
sd Z	0.0668*	0.0657*	-0.0674
	(0.0351)	(0.0361)	(0.0535)
Piracy ($\leq$ 500 km)	-0.0094	-0.0095	-0.0050
	(0.0069)	(0.0076)	(0.0140)
Obs.	2,190	2,190	2,190
FEs	i, m, w	i, m, w	i, m, w
F	2.45	2.17	0.92
R^2	0.59	0.58	0.75
Clusters	350	350	350
Mean Dep. Var.	0.310	0.318	1.370

Note: In the specification, the dataset is a panel at the househol-interview date level. The variable "sd Z" is the instrument standardized, while, the variable "Piracy ($\leq$ 500 km)" counts the number of piracy incidents within 500km from the coast. The outcome is measured over the previous 2 years. FE notation is LSMS wave (w), household(i) and month (m). Standard errors are clustered at the interview location level. *, **, *** denote statistical significance at the 10%, 5%, 1% level respectively.

fresh fish. It reduces both the quantity of fresh fish that households consume and purchase, lowers the probability of consuming or purchasing any fresh fish, and raises the price per kilogram. The magnitude is economically large: a one-standard-deviation increase in the instrument reduces fresh-fish consumption by about 20 percent relative to the mean.

Households respond by changing the composition of their food basket, substituting mainly toward vegetables and plant-based foods. This shifts their nutritional intake: on the one hand, higher distant water fishing pressure raises fiber and carbohydrate intake; on the other, it lowers the intake of vitamin D, vitamin B12, selenium, omega-3 fatty acids, and essential amino acids.

In the short run, these changes translate into worse food security, together with a rise in health-care visits that is observed only for children. Households become more likely to report food insecurity, to rely on less-preferred foods, to reduce dietary variety, to cut portion sizes, to eat fewer meals, and to face more severe food-access constraints.

Finally, the longer-run results provide suggestive evidence that these nutritional and food-security shocks may have broader demographic consequences. Using a two-year exposure window to match the reference period of the mortality and pregnancy outcomes, I find some evidence of increases in mortality and pregnancies, as well as changes in household composition. These estimates are less precise than the main consumption and food-insecurity results, but they are consistent with the idea that the consequences of reduced access to fresh fish may accumulate over time.

Overall, the paper documents a mechanism through which foreign industrial fishing affects local welfare. Somali piracy displaced distant water fleets away from high-risk areas and increased their presence closer to Tanzania. This reallocation reduced local access to fresh fish, induced substitution toward less nutritious foods, worsened the nutritional quality of diets, and increased food insecurity. The results show that the welfare costs of distant

water fishing are not limited to ecological pressure on marine resources: they also extend to household diets, nutrition, and food security in coastal communities that depend on fish as a key source of food.

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A Figures

A.1 Background, Data, and Identification

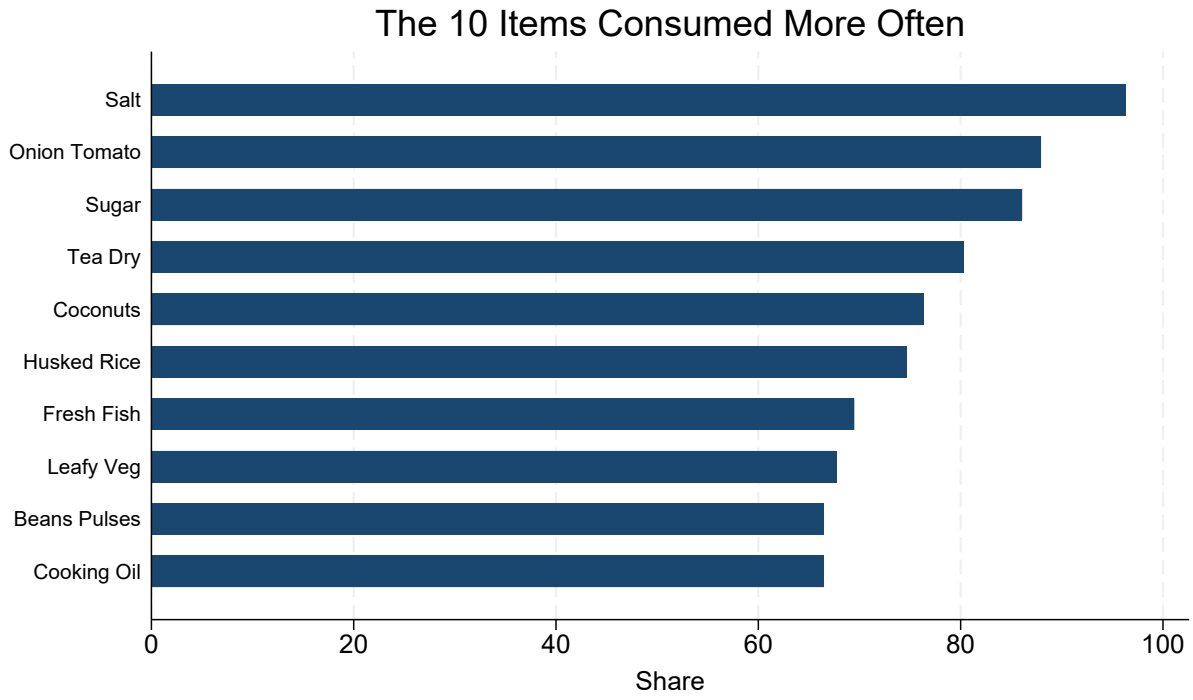


Figure A1: Frequency of Consumption

Notes: The figure reports the ten food items consumed most frequently by Tanzanian households. Frequency is measured as the share of households reporting consumption of each item during the seven days preceding the interview. The sample uses the available LSMS survey waves from 2008 to 2015.

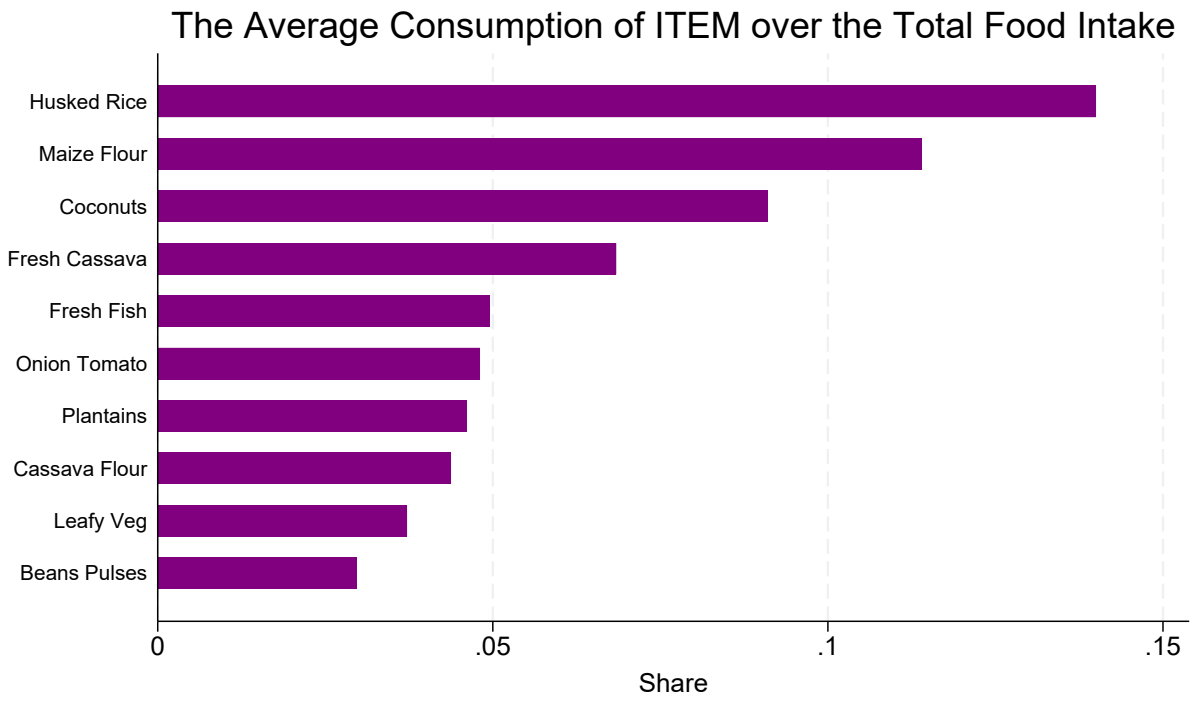


Figure A2: Centrality

Notes: The figure reports the ten food items with the largest average shares of total household food consumption. For each item, the share is defined as the quantity consumed, measured in kilograms, relative to the household's total quantity of food consumed. Item-level consumption is measured over the seven days preceding the interview using the available LSMS survey waves from 2008 to 2015.

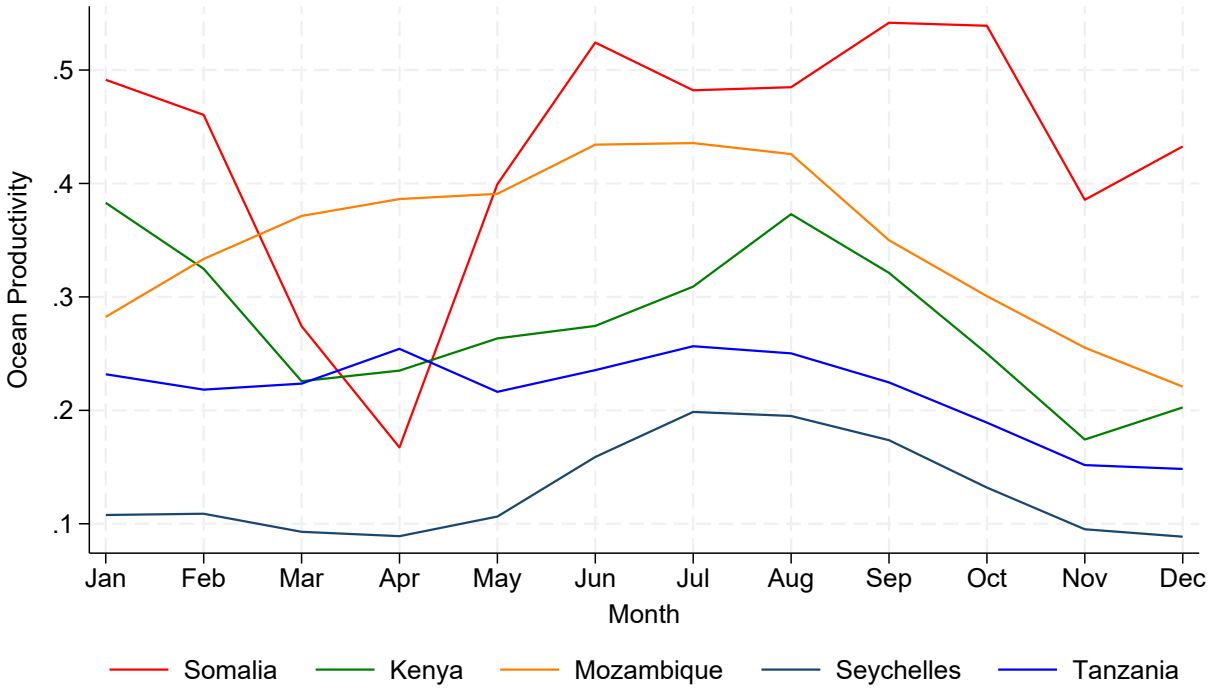


Figure A3: Ocean Productivity by Country

Notes: The figure reports differences in ocean productivity across countries' Exclusive Economic Zones between 2006 and 2015. Ocean productivity is proxied by chlorophyll-a concentration aggregated at the Exclusive Economic Zone level.

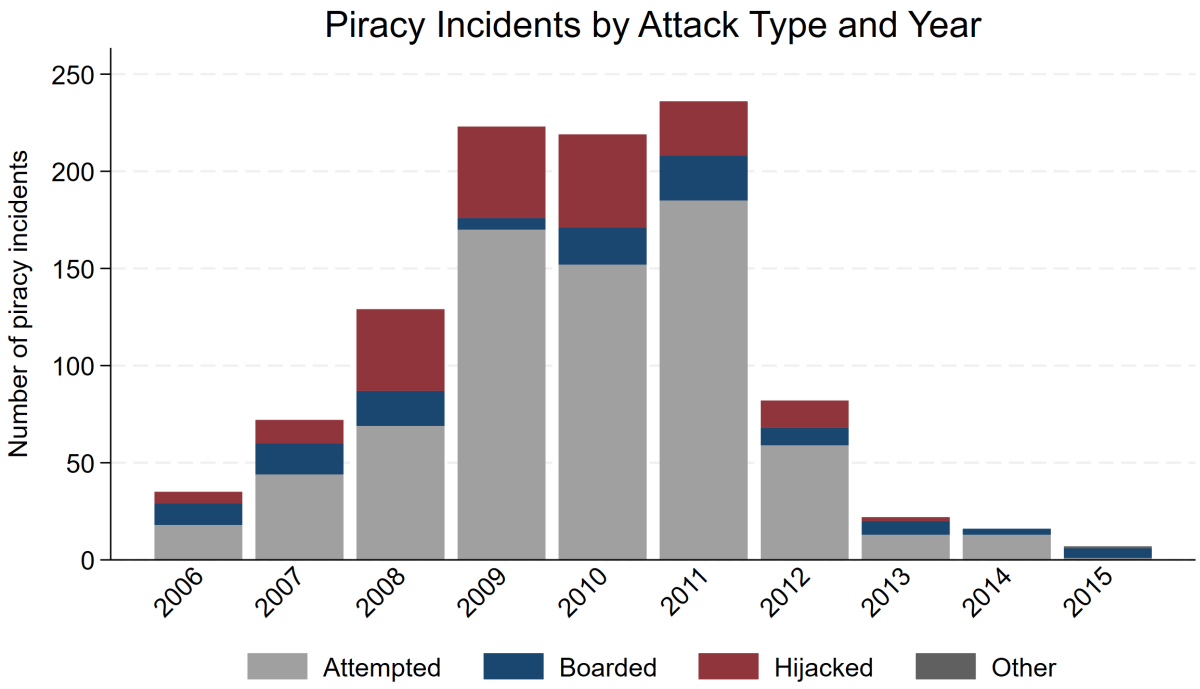


Figure A4: Piracy by Year and Type

Notes: The figure reports the annual number of piracy incidents by attack type in the Western Indian Ocean between 2006 and 2015. Each bar shows the total number of incidents in a given year, with colors distinguishing attempted attacks, boarded vessels, hijackings, and other events.

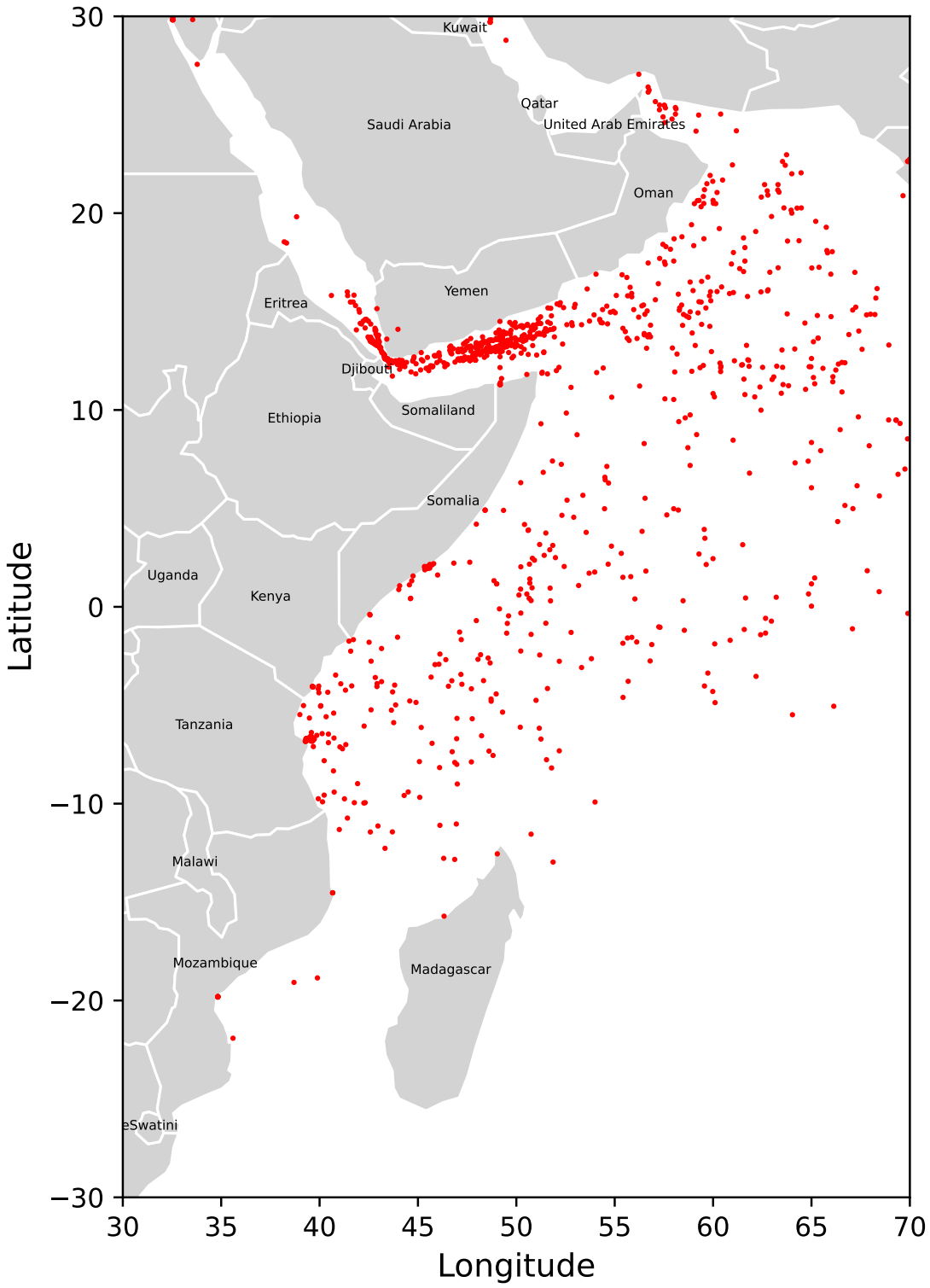


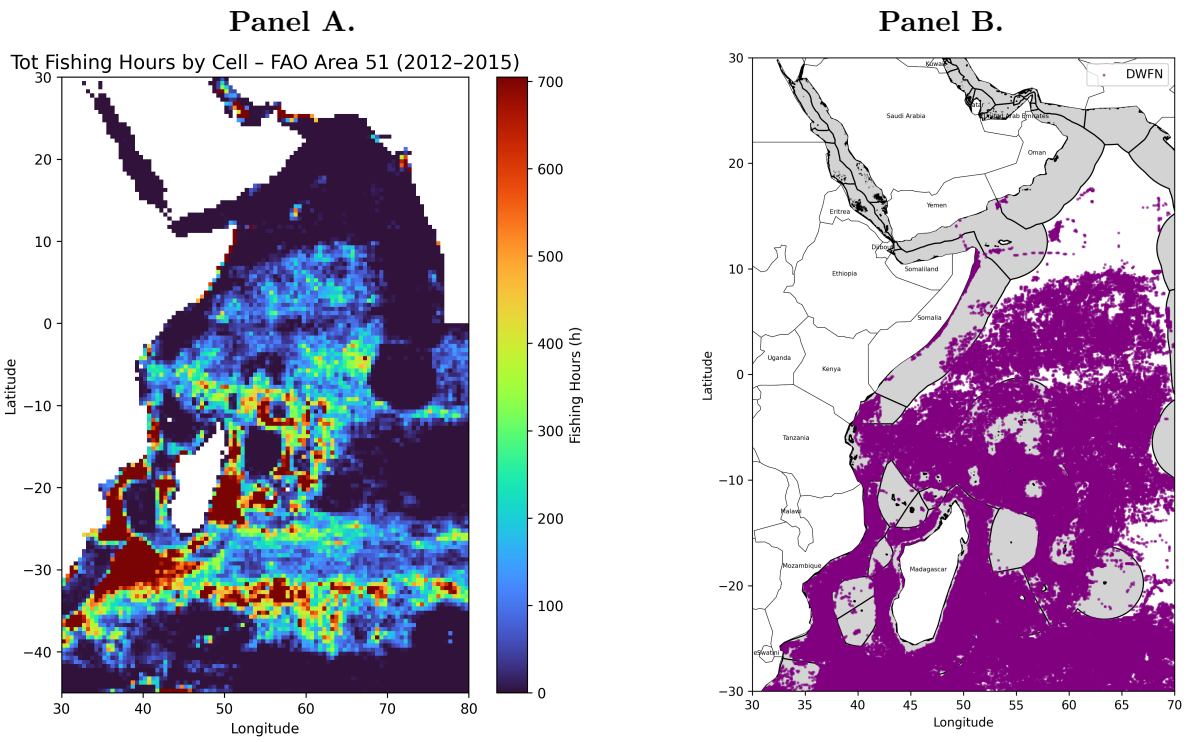
Figure A5: The Location of Piracy Events

Notes: The figure reports the geographic location of piracy incidents in the Indian Ocean between 2006 and 2015. Each point corresponds to one recorded piracy event. The map highlights the spatial concentration of attacks around the Somali coast and the Gulf of Aden, which motivates the use of Somali piracy as a shock to distant water fishing activity in the Western Indian Ocean.



Figure A6: The Gulf of Aden

Notes: The red rectangle identifies the Gulf of Aden area used to construct the piracy shock in the empirical analysis. The area is defined by latitudes 9.5°–17° N and longitudes 40°–53° E. Piracy incidents falling inside this box are used to compute the time-varying shift component of the instrument. This region is selected because it captures the main concentration of Somali piracy incidents during the period of analysis and it includes the area where industrial fishing activity is spatially concentrated off the Somali coast.



Fishing Hours

Active Vessels

Figure A7: Distant Water Fishing in FAO Area 51

Notes: Panel A reports total fishing hours exerted in FAO Area 51 between 2012 and 2015. The ocean is divided into $0.5^\circ \times 0.5^\circ$ grid cells, and each cell is colored according to the total number of fishing hours recorded over the period. Panel B plots, in purple, the location of active vessel pings over the same period and, in grey, the Exclusive Economic Zones of countries in FAO Area 51. Active pings are defined as vessel-location-day observations with strictly positive activity and are mapped on a $0.01^\circ \times 0.01^\circ$ spatial grid.

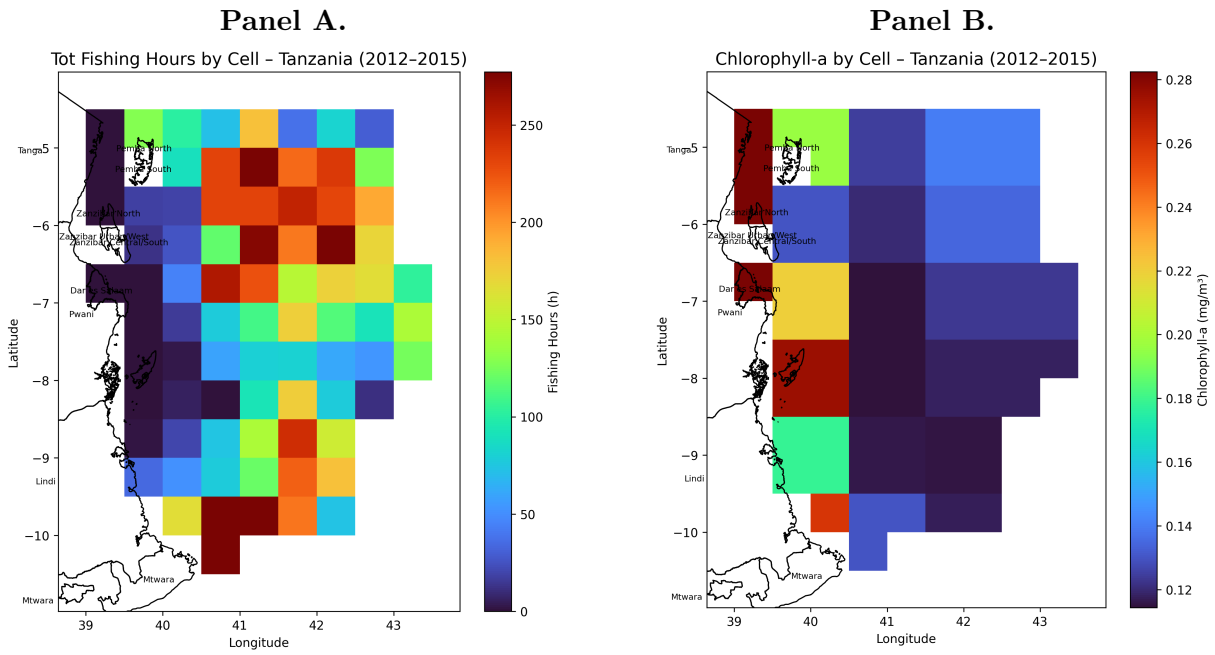


Figure A8: Concentration in Tanzania

Notes: The figure maps fishing activity and marine productivity in Tanzania's Exclusive Economic Zone between 2012 and 2015. Panel A reports total distant water fishing hours in $0.5^\circ \times 0.5^\circ$ grid cells, with darker cells indicating greater activity. Panel B reports chlorophyll-a concentration over the same area and period; chlorophyll-a is used as a proxy for marine productivity.

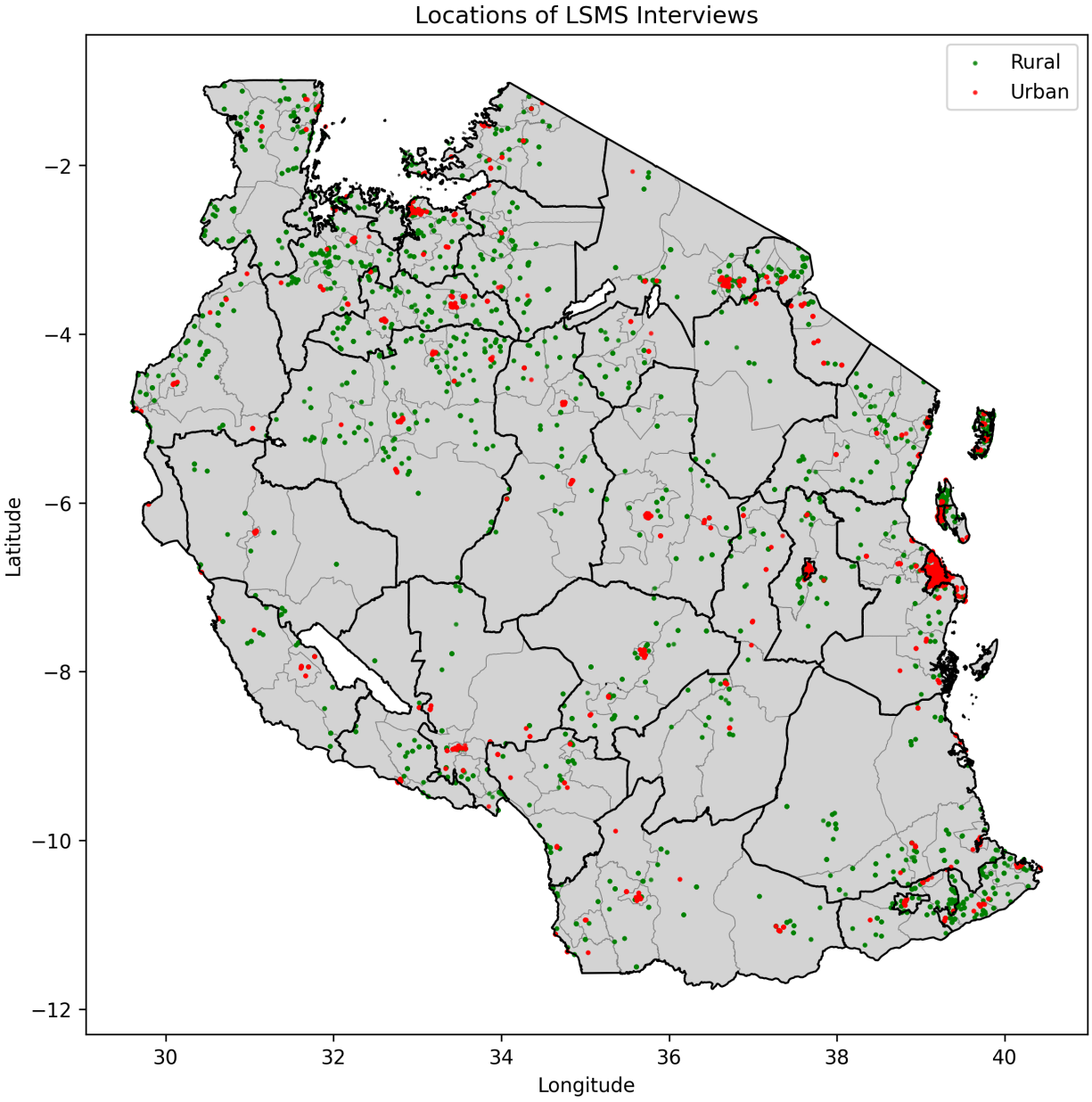


Figure A9: Location of National Panel Respondents - Wave 3 and 4 (2012 - 2015)

Notes: The figure shows the location of all LSMS interview points in Tanzania. Blue points indicate rural locations, while red points indicate urban locations.

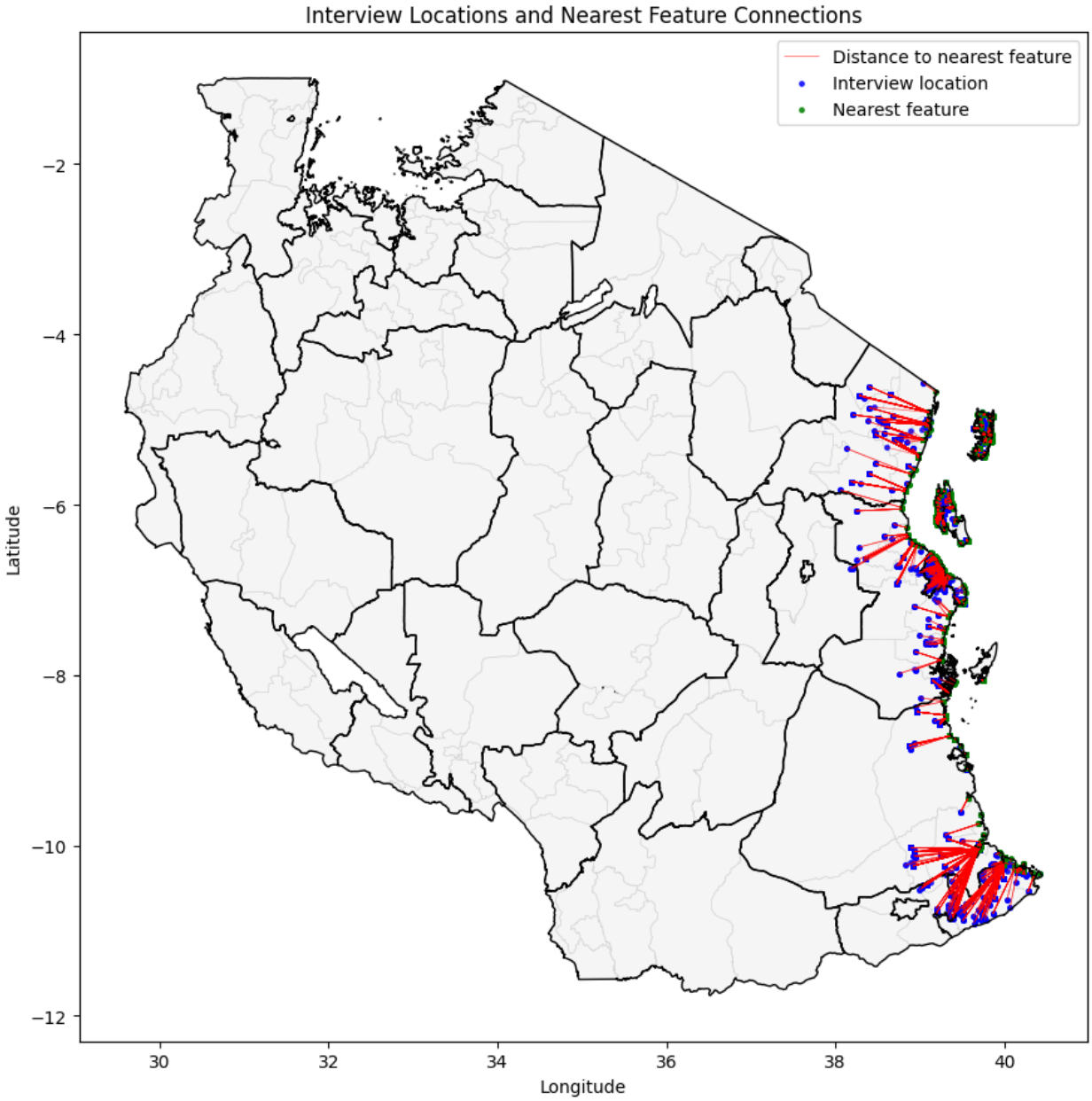


Figure A10: Coastal Communities

Notes: I define coastal communities as households interviewed within 100 km of the coastline. The figure shows the interview locations that satisfy this definition. Each point corresponds to a household interview location included in the coastal-community sample. The blue line marks the 100 km inland boundary from the coast and therefore illustrates the spatial cutoff used to define the estimation sample. Households located between the coastline and this boundary are classified as coastal communities.

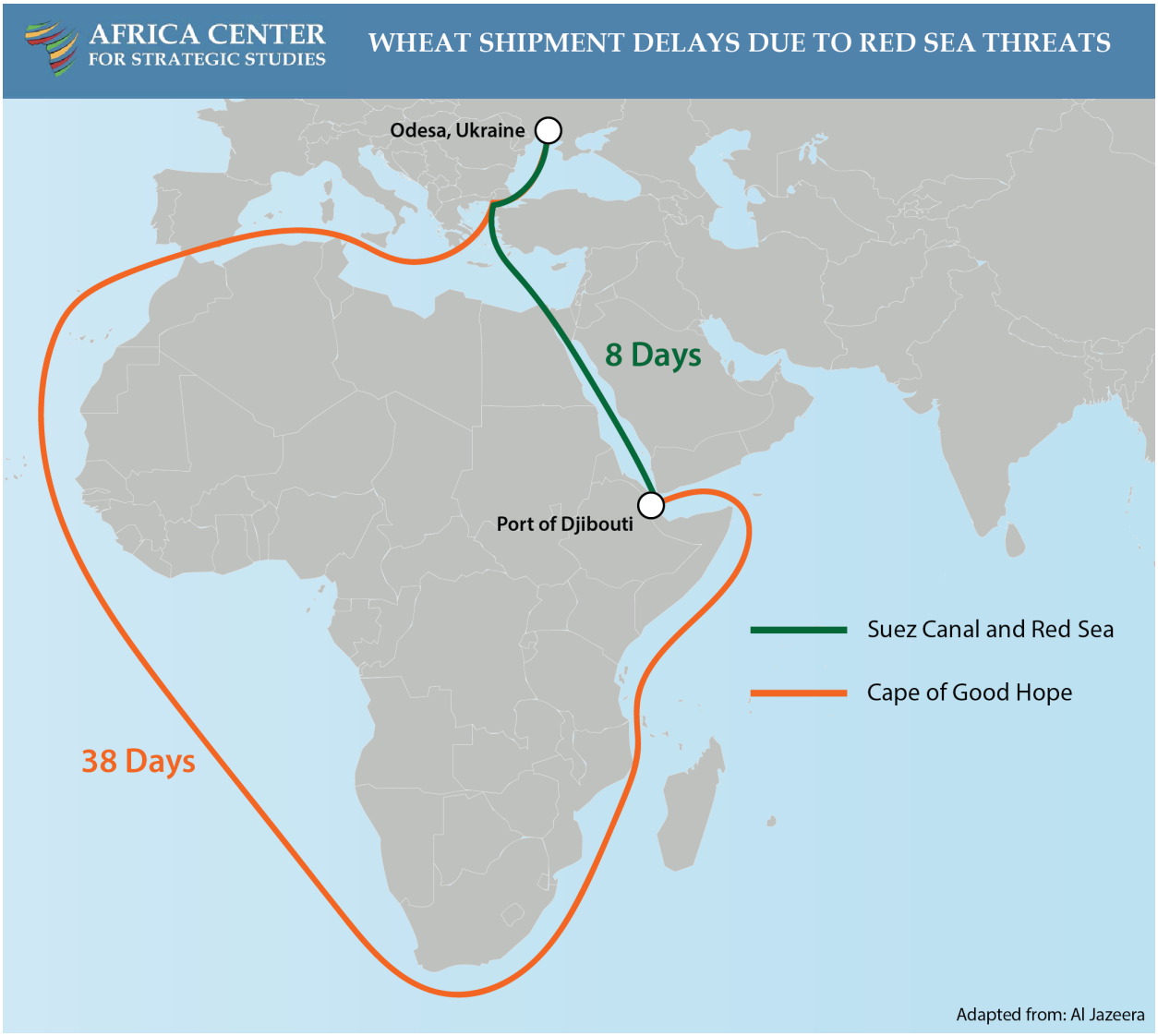


Figure A11: Reorganize Maritime Trade Routes

Notes: The figure illustrates the reorganization of maritime trade routes in response to piracy risk, including route diversion away from high-risk waters and the associated increase in sailing distance.

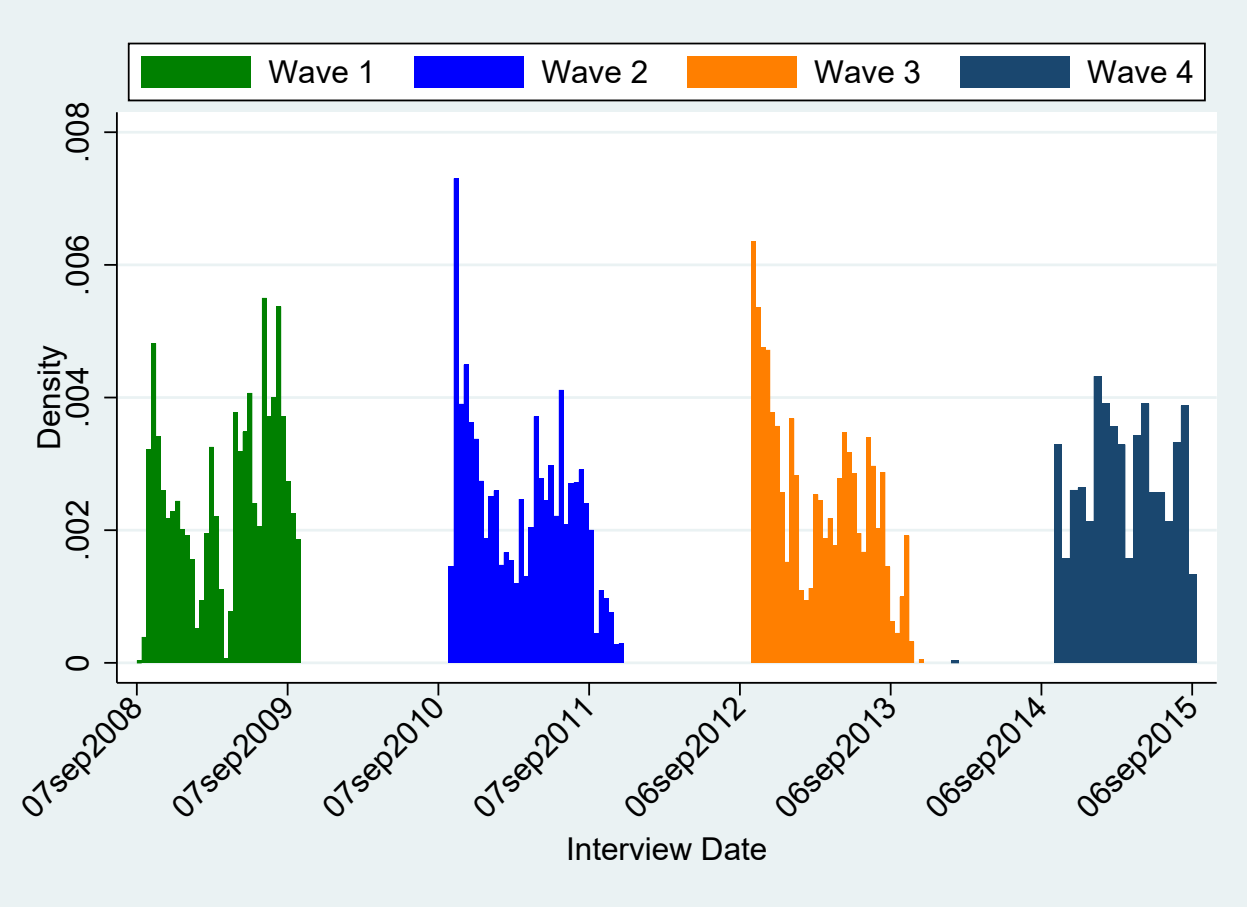
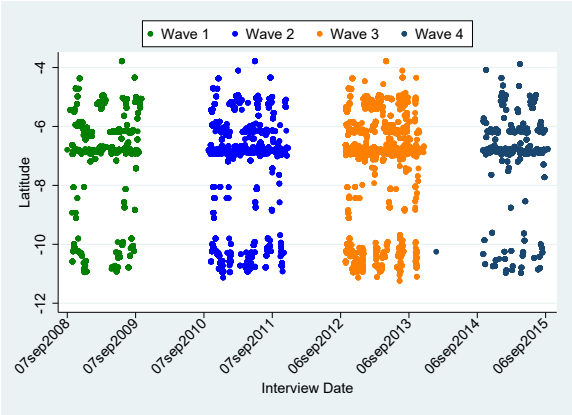


Figure A12: Coast: Histogram of Interview Date

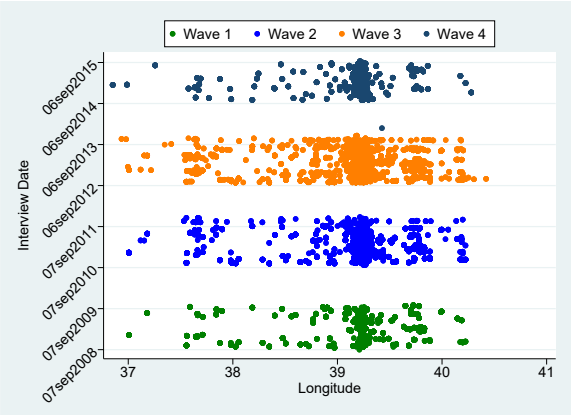
Notes: The figure reports the distribution of interview dates for households in Tanzanian coastal communities. The histogram shows that interviews are spread over time within each survey wave, rather than being concentrated on a single date. This helps address the concern that household exposure to piracy shocks is mechanically driven by a narrow or unusual timing of interviews.

Panel A.



Latitude

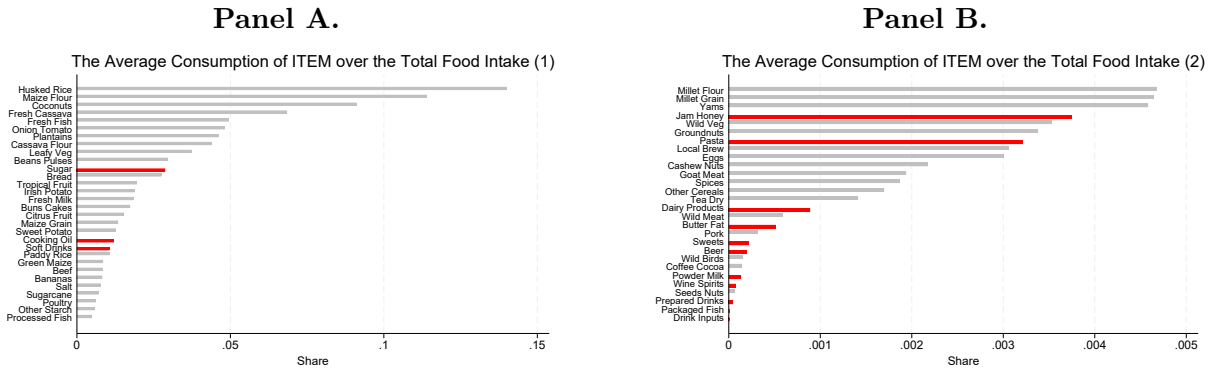
Panel B.



Longitude

Figure A13: Correlation between Interview Location and Interview Date

Notes: The figure relates survey timing to the spatial location of interviewed households in Tanzanian coastal communities. Panel A plots interview latitude against the interview date, while Panel B plots interview longitude against the interview date.



Top 30 Bottom 30

Figure A14: The Average Consumption of Food Items Eligible to be Imported Through the Suez Canal

Notes: The figure reports the consumption share of selected food goods in Tanzanian households. Goods are first ranked by their average consumption, measured as their share of total food consumption. The figure then shows the 30 most consumed and the 30 least consumed goods in this ranking. For these 60 goods, I manually identify the products that also appear in Tanzanian import data and could plausibly be transported by sea through the Suez Canal from exporting countries. These goods are highlighted in red in the figure.

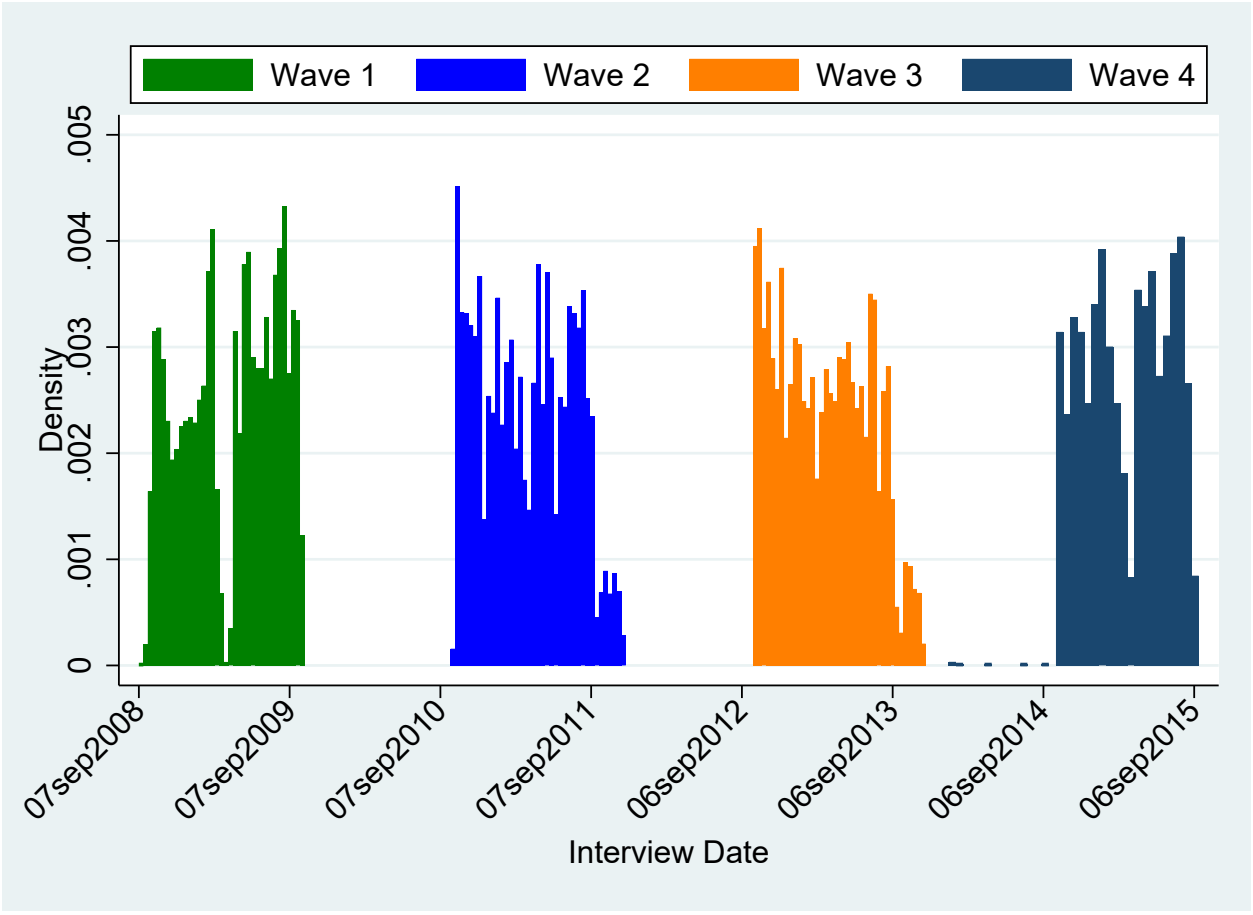


Figure A15: Full Sample: Histogram of Interview Date

Notes: The figure displays a density plot showing the distribution of interview dates across the full sample period.

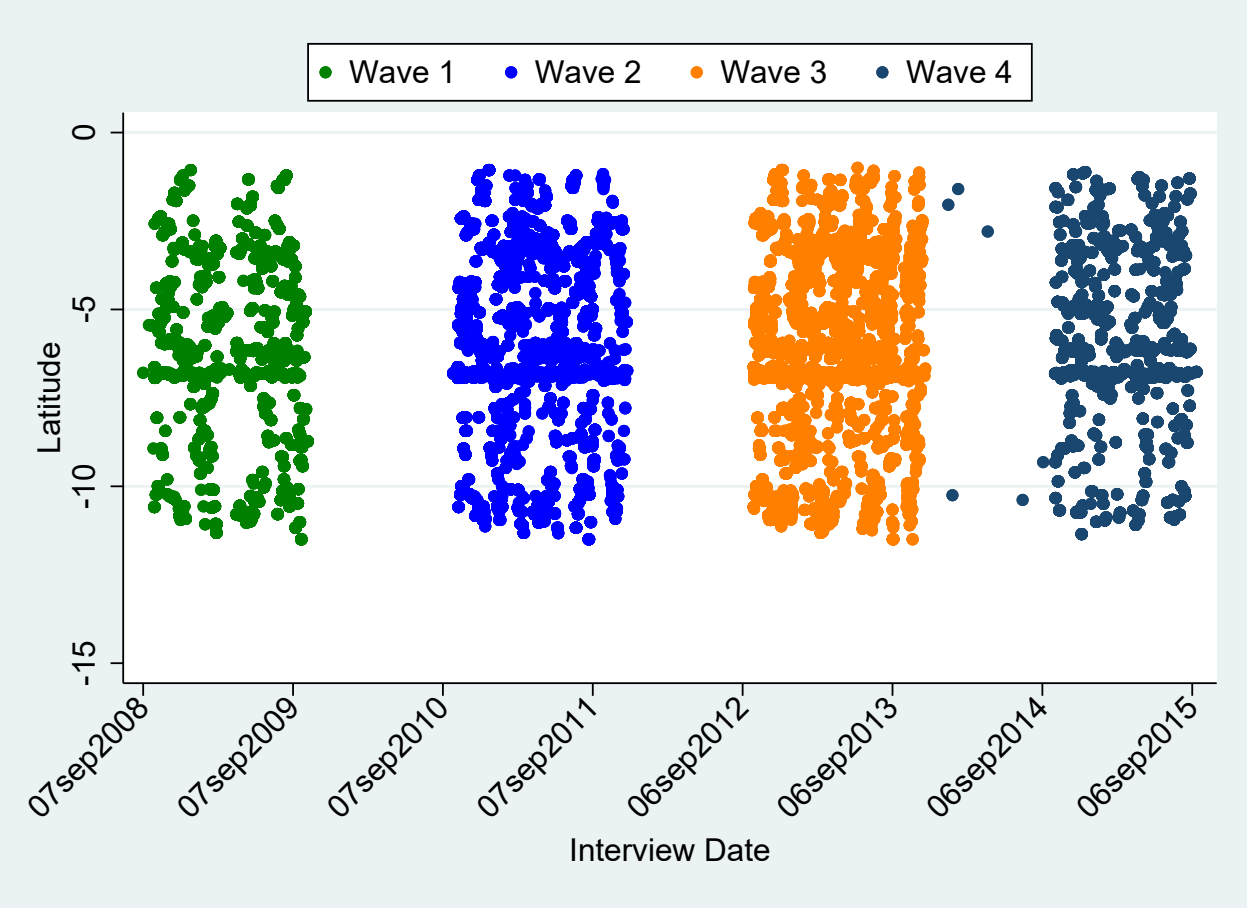


Figure A16: Full Sample: Correlation between Interview Latitude and Interview Date

Notes: The vertical axis shows the latitude of all surveyed locations across Tanzania, while the horizontal axis represents the day on which each interview was conducted.

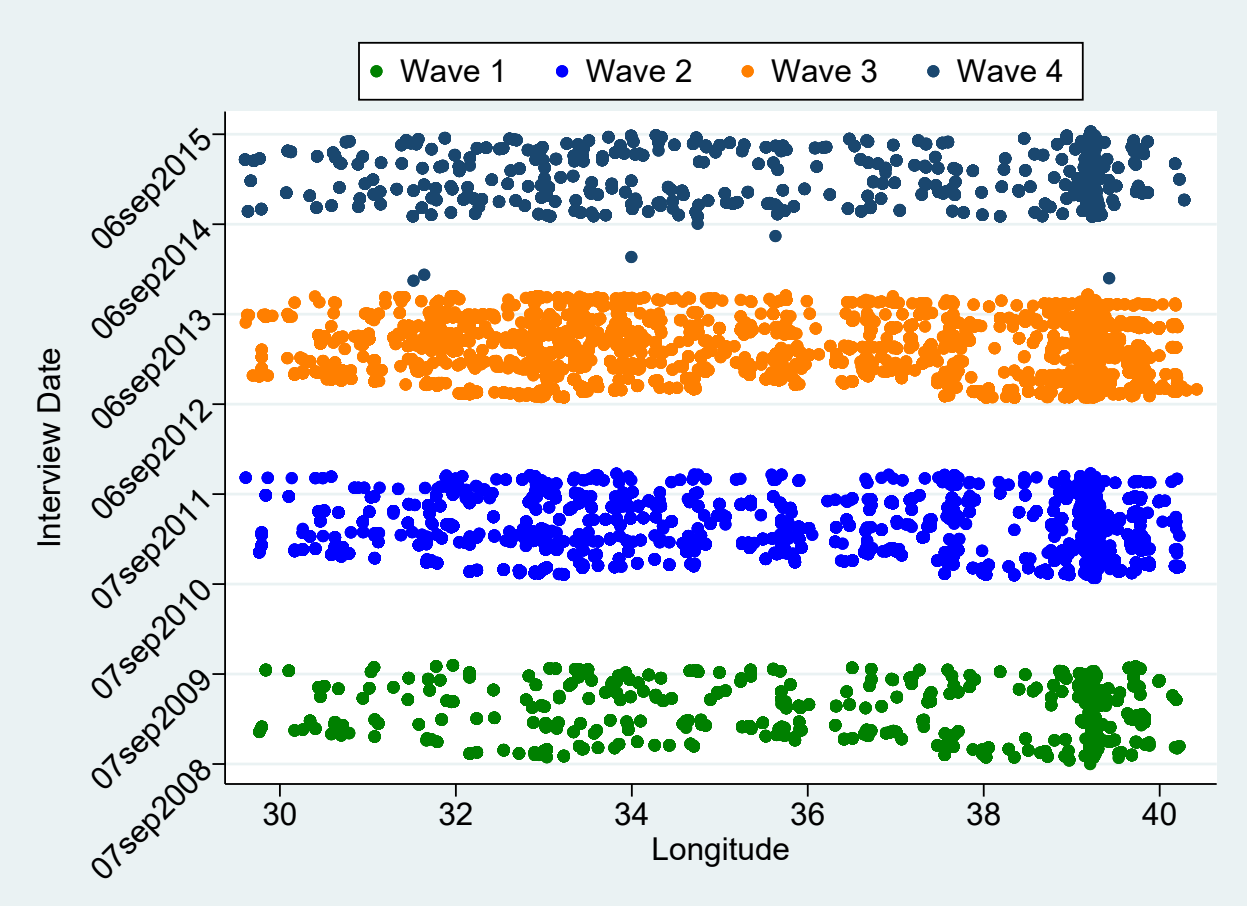


Figure A17: Full Sample: Correlation between Interview Date and Interview Longitude

Notes: The figure relates survey timing to interview longitude in the full Tanzanian sample. The horizontal axis reports longitude, while the vertical axis reports the interview date. Each point represents one household interview location.

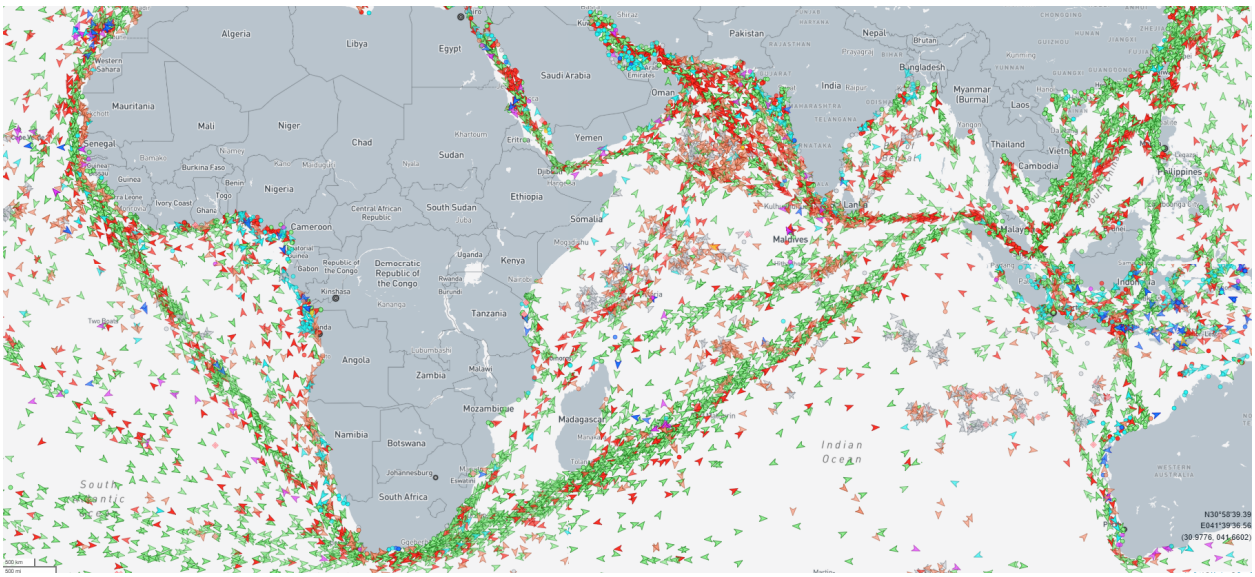


Figure A18: Maritime Routes of Cargo Vessels

Notes: The figure is a screenshot from the MarineTraffic website taken on March 10, 2025, showing the real-time navigation of cargo vessels, depicted as green triangles. The concentration of points illustrates the main maritime trade routes. Source: MarineTraffic.

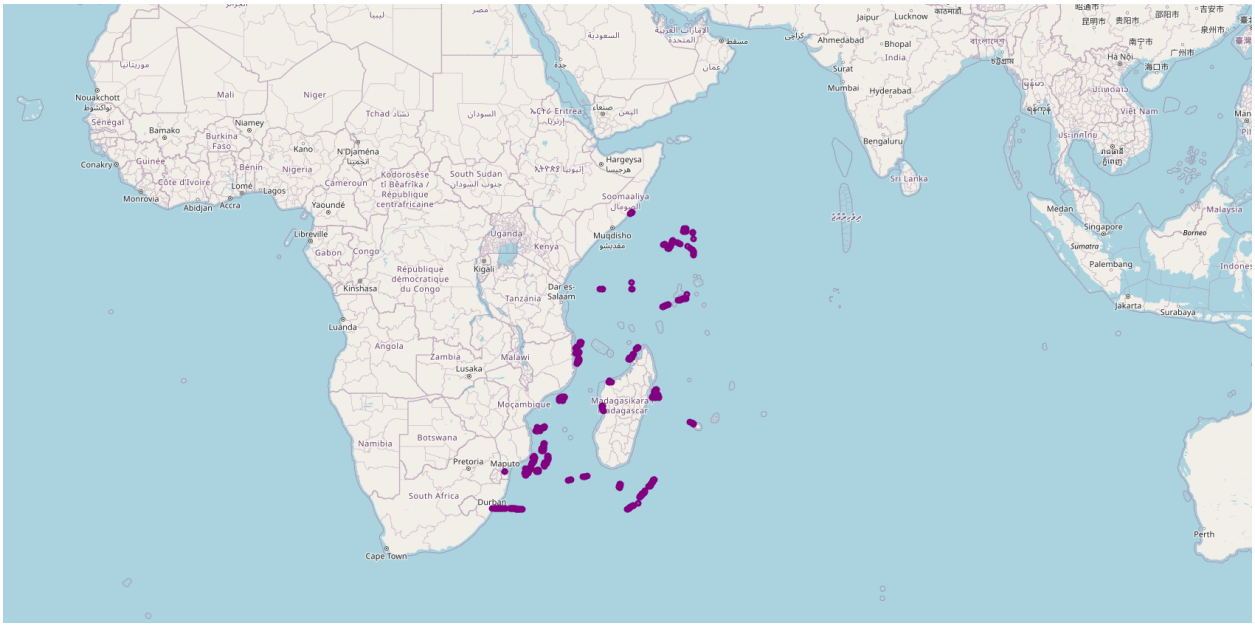


Figure A19: Maritime Routes of DWF Vessels

Notes: The figure reports the location of fishing vessels in the database on March 10, 2015, selected to ensure comparability with the MarineTraffic screenshot. distant water fishing vessels are concentrated in areas distinct from the main cargo routes, illustrating the spatial separation between commercial fishing activity and maritime trade corridors.

A.2 The First Stage

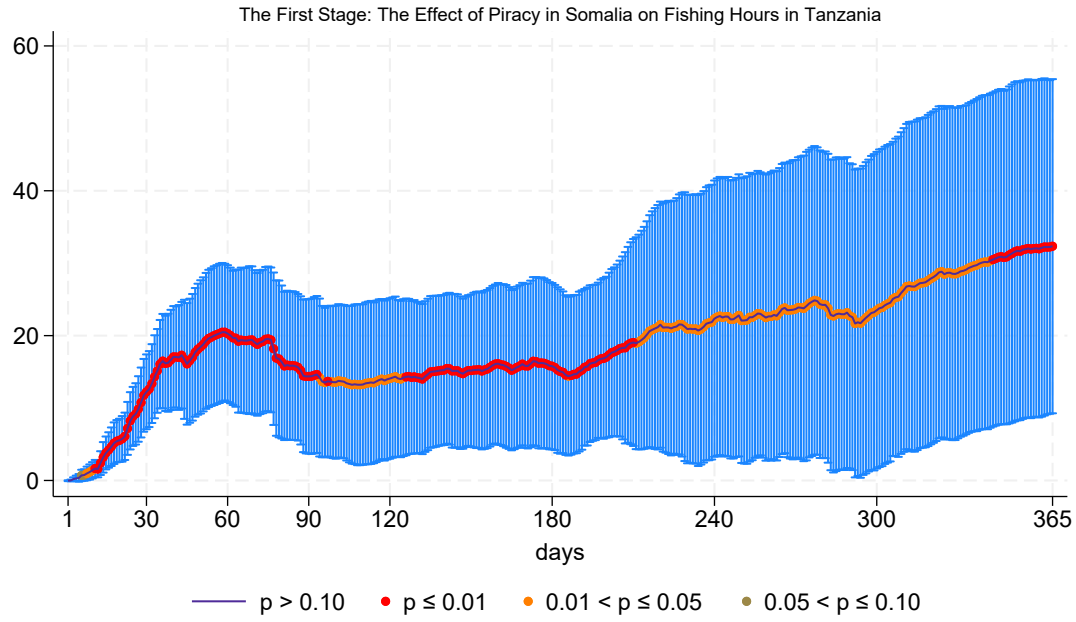


Figure A20: The First Stage when $\gamma \in [0, 365]$

Notes: The figure reports first-stage coefficients obtained when fishing activity and piracy exposure are measured over alternative windows of γ days, with γ ranging from 1 to 365. The dependent variable is distant water fishing hours within 36 nautical miles of the closest coastal point to the household interview location. The instrument is the standardized interaction between piracy shocks in the Gulf of Aden and predetermined local marine productivity. The solid line reports point estimates, the shaded area reports 95% confidence intervals, and the vertical line marks the preferred 60-day exposure window. Specifications include rural-status, month, and year fixed effects; standard errors are clustered at the interview-location level.

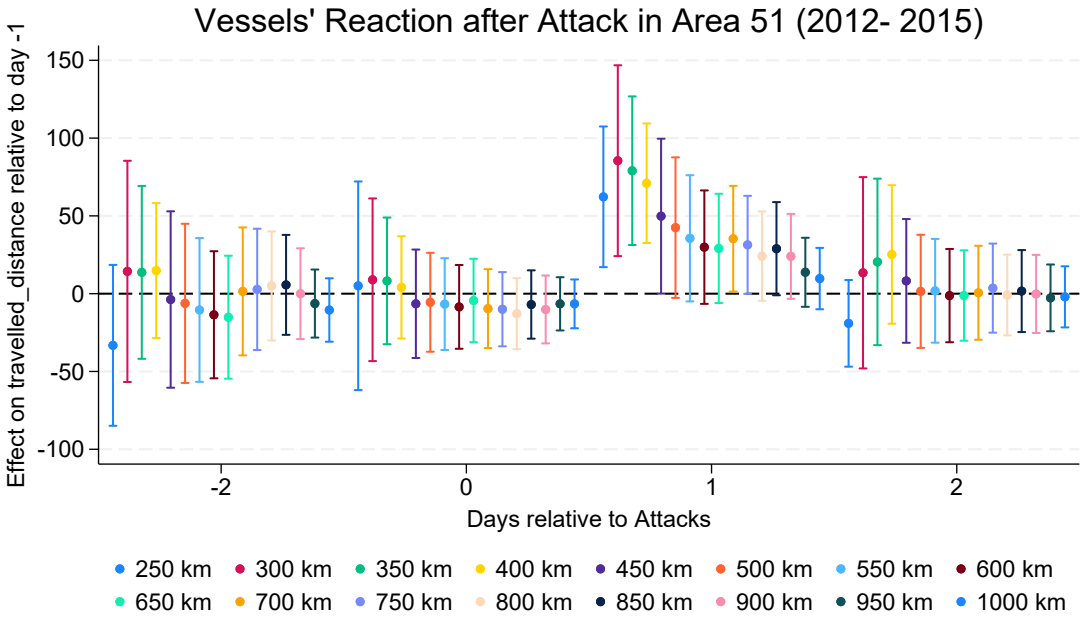


Figure A21: Travel Distance

Notes: The figure reports stacked event-study estimates of vessel travel distance in the days surrounding piracy attacks in FAO Area 51 during 2012–2015. Separate estimates are shown for cumulative distance bands from 0–250 km to 0–1,000 km around each attack location. The omitted period is the day before the attack. Regressions include vessel and attack fixed effects. Points report coefficient estimates and bars report 95% confidence intervals.

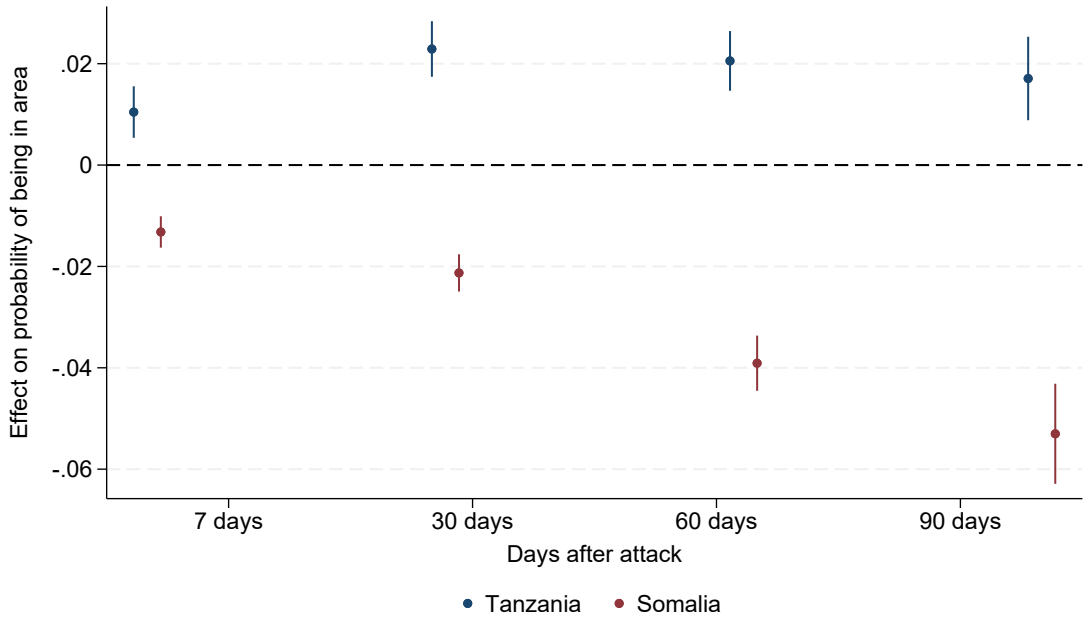
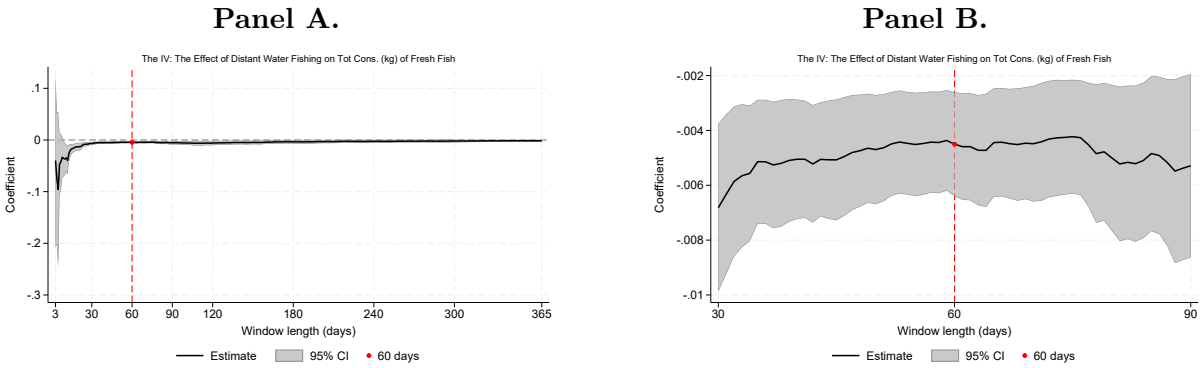


Figure A22: Eligible vs. Dangerous Area

Notes: The figure reports vessel-level estimates of the effect of cumulative piracy attacks on the probability that a vessel is observed in the eligible Tanzanian area or in the dangerous area near Somalia and the Gulf of Aden. The sample is restricted to the 66 vessels observed in both areas. Estimates are reported for piracy exposure windows of 7, 30, 60, and 90 days. Regressions include vessel, month, and year fixed effects. Points report coefficient estimates and bars report 95% confidence intervals.

A.3 Fish Consumption

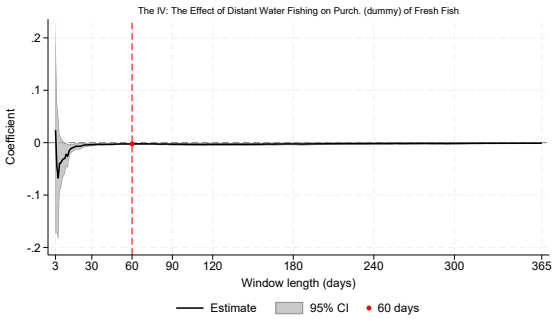


2012 Zoom

Figure A23: The IV: The Effect on Consumption (kg) of Fresh Fish when $\gamma \in [0, 365]$

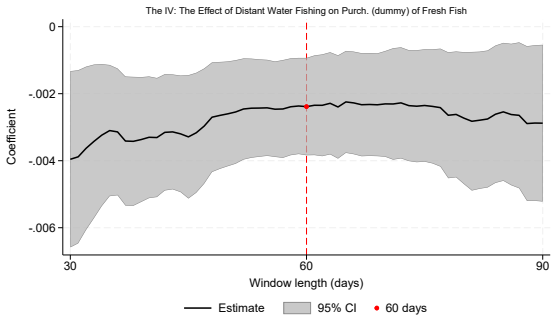
Notes: The figure reports IV estimates of the effect of distant water fishing hours on total fresh-fish consumption, measured in kilograms, using alternative exposure windows γ from 1 to 365 days. Panel A reports the full range of estimates, while Panel B enlarges the region around the preferred 60-day window. Fishing hours are instrumented with the standardized interaction between piracy shocks in the Gulf of Aden and predetermined local marine productivity. Solid lines report point estimates, shaded areas report 95% confidence intervals, and vertical lines mark 60 days. Specifications include rural-status, month, and year fixed effects; standard errors are clustered at the interview-location level.

Panel A.



2012

Panel B.

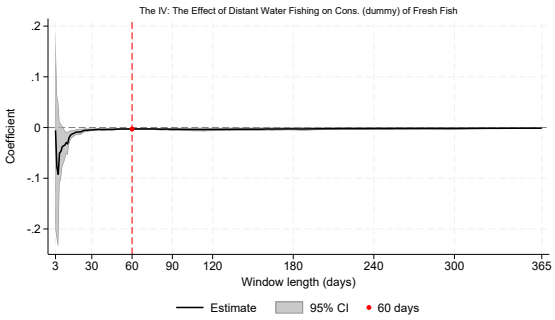


Zoom

Figure A24: The IV: The Effect on Purchase (dummy) of Fresh Fish when $\gamma \in [0, 365]$

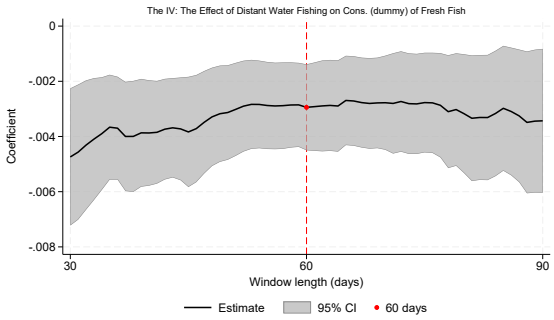
Notes: The figure reports IV estimates of the effect of distant water fishing hours on an indicator equal to one if the household purchased fresh fish during the previous seven days, using alternative exposure windows γ from 1 to 365 days. Panel A reports the full range of estimates, while Panel B enlarges the region around the preferred 60-day window. Fishing hours are instrumented with the standardized interaction between piracy shocks in the Gulf of Aden and predetermined local marine productivity. Solid lines report point estimates, shaded areas report 95% confidence intervals, and vertical lines mark 60 days. Specifications include rural-status, month, and year fixed effects; standard errors are clustered at the interview-location level.

Panel A.



2012

Panel B.

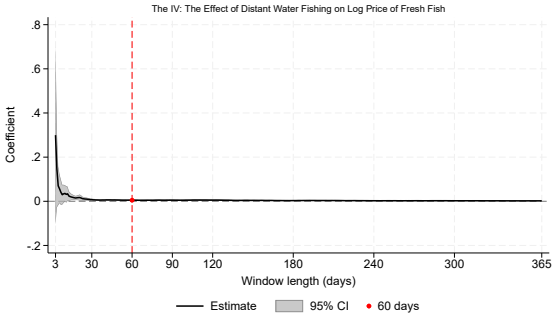


Zoom

Figure A25: The IV: The Effect on Consumption (dummy) of Fresh Fish when $\gamma \in [0, 365]$

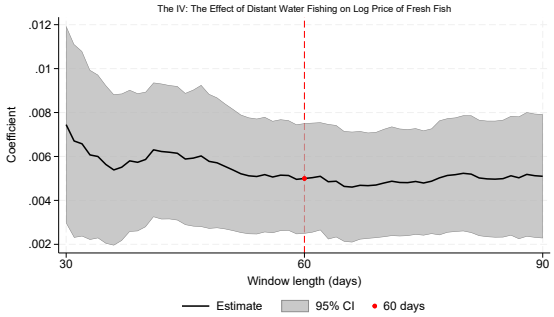
Notes: The figure reports IV estimates of the effect of distant water fishing hours on an indicator equal to one if the household consumed fresh fish during the previous seven days, using alternative exposure windows γ from 1 to 365 days. Panel A reports the full range of estimates, while Panel B enlarges the region around the preferred 60-day window. Fishing hours are instrumented with the standardized interaction between piracy shocks in the Gulf of Aden and predetermined local marine productivity. Solid lines report point estimates, shaded areas report 95% confidence intervals, and vertical lines mark 60 days. Specifications include rural-status, month, and year fixed effects; standard errors are clustered at the interview-location level.

Panel A.



2012

Panel B.

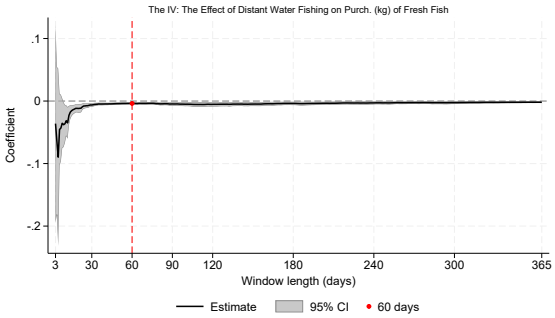


Zoom

Figure A26: The IV: The Effect on Log Price of Fresh Fish when $\gamma \in [0, 365]$

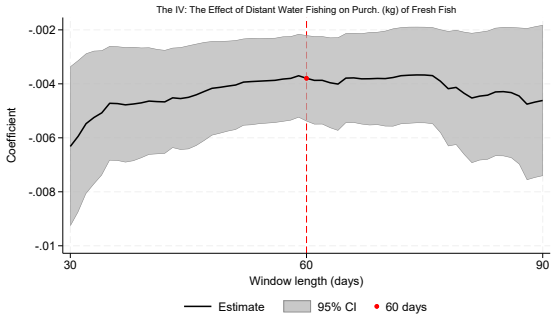
Notes: The figure reports IV estimates of the effect of distant water fishing hours on the log price per kilogram of fresh fish, using alternative exposure windows γ from 1 to 365 days. Panel A reports the full range of estimates, while Panel B enlarges the region around the preferred 60-day window. Fishing hours are instrumented with the standardized interaction between piracy shocks in the Gulf of Aden and predetermined local marine productivity. Solid lines report point estimates, shaded areas report 95% confidence intervals, and vertical lines mark 60 days. Specifications include rural-status, month, and year fixed effects; standard errors are clustered at the interview-location level.

Panel A.



2012

Panel B.



Zoom

Figure A27: The IV: The Effect on Purchase (kg) of Fresh Fish when $\gamma \in [0, 365]$

Notes: The figure reports IV estimates of the effect of distant water fishing hours on the quantity of fresh fish purchased, measured in kilograms, using alternative exposure windows γ from 1 to 365 days. Panel A reports the full range of estimates, while Panel B enlarges the region around the preferred 60-day window. Fishing hours are instrumented with the standardized interaction between piracy shocks in the Gulf of Aden and predetermined local marine productivity. Solid lines report point estimates, shaded areas report 95% confidence intervals, and vertical lines mark 60 days. Specifications include rural-status, month, and year fixed effects; standard errors are clustered at the interview-location level.

A.4 Substitution and Coping Strategies

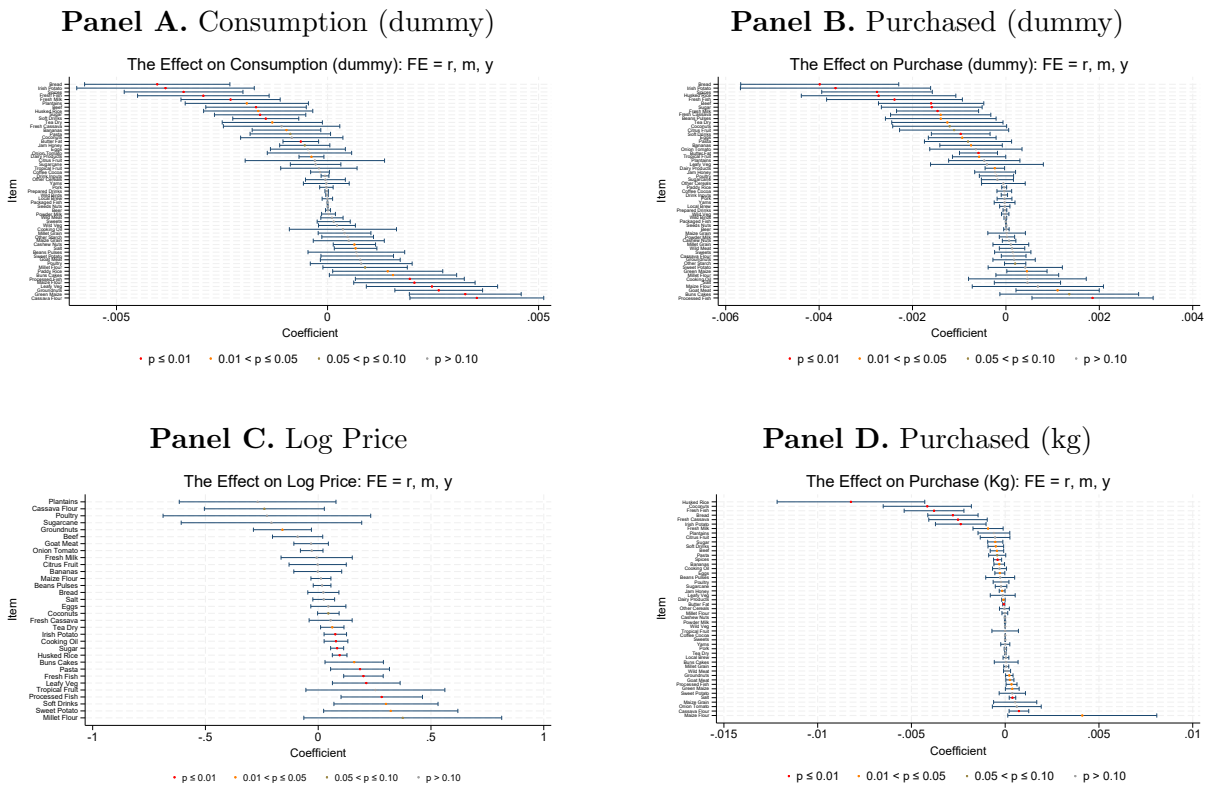


Figure A28: Substitution

Notes: The figure reports IV estimates of the effect of distant water fishing hours on household outcomes for individual food categories. Panel A reports indicators for consumption during the previous seven days, Panel B indicators for purchase, Panel C log unit values for purchased quantities, and Panel D purchased quantities in kilograms. Each coefficient comes from a separate regression. Fishing hours are measured within 36 nautical miles of the closest coastal point to the household interview location over the preceding 60 days and are instrumented with the standardized interaction between piracy shocks in the Gulf of Aden and predetermined local marine productivity. Horizontal bars report 95% confidence intervals. Specifications include rural-status, month, and year fixed effects; standard errors are clustered at the interview-location level.

B Tables

B.1 Background, Data, and Identification

Table B1: Fresh Fish Protein Intake in Coastal Tanzania

	Fish protein / total protein	Fish protein / animal protein
Urban	0.16	0.62
	(0.13)	(0.38)
	[0, 0.79]	[0, 1]
Rural	0.14	0.52
	(0.15)	(0.44)
	[0, 1]	[0, 1]
Overall mean	0.15	0.55

Notes: This table reports summary statistics for the share of protein intake accounted for by fresh fish. The first column reports fresh-fish protein as a share of total protein intake, while the second column reports fresh-fish protein as a share of animal-source protein intake. Statistics are computed using all available LSMS data from 2008 to 2015 and are based on household food consumption over the previous seven days. Standard deviations are reported in parentheses, and minimum and maximum values are reported in square brackets.

Table B2: Share above 50% Derived from Fresh Fish

Nutrient	Share
PUFA 18:4	0.999
Vitamin D3	0.799
Vitamin D (D2+D3)	0.799
Vitamin D IU	0.798
DHA (22:6 n-3)	0.779
DPA (22:5 n-3)	0.755
EPA (20:5 n-3)	0.686
PUFA 20:4	0.646
Vitamin B12	0.592

Note: In this table the variable "Share" measures the share of total micronutrient intake obtained exclusively from fresh fish consumption. **PUFA 18:4** – Intake of stearidonic acid, an omega-3 fatty acid mainly found in marine foods. **PUFA 20:4** – Intake of arachidonic acid, a long-chain polyunsaturated fatty acid. **EPA (20:5 n-3)** – Intake of eicosapentaenoic acid, an omega-3 fatty acid abundant in fish. **DPA (22:5 n-3)** – Intake of docosapentaenoic acid, a long-chain omega-3 fatty acid from seafood. **DHA (22:6 n-3)** – Intake of docosahexaenoic acid, an omega-3 fatty acid important for brain function. **Vitamin D (D2+D3)** – Total intake of vitamin D from ergocalciferol and cholecalciferol. **Vitamin D (IU)** – Total vitamin D intake expressed in international units. **Vitamin D3** – Intake of cholecalciferol, the primary vitamin D form found in fish. **Vitamin B12** – Intake of cobalamin, essential for neurological function and red blood cell formation

Table B3: Piracy Attacks by Type, 2012–2015

Attack type	Number of attacks	Share of attacks
Attempted	86	67.72%
Boarded	24	18.90%
Hijacked	16	12.60%
Suspicious	1	0.79%
Total attacks	127	100.00%
Total days, 2012–2015	1461	
Attacks over total days	127/1461	8.69%

Notes: The table reports the number and share of piracy attacks by type over the period 2012–2015. The last row reports the total number of attacks divided by the total number of calendar days between 2012 and 2015. Since 2012 is a leap year, the period includes 1,461 days.

Table B4: Descriptive Statistics

	Mean	SD	P10	Median	P90
Fresh fish consumption outcomes					
Tot Cons. (kg)	0.46	0.59	0.00	0.31	1.09
Purch. (kg)	0.38	0.53	0.00	0.20	0.98
Price	3713.17	2362.46	1666.67	3333.33	6666.67
Own Prod (kg)	0.04	0.27	0.00	0.00	0.00
Food insecurity outcomes: number of days in the previous week					
Less Pref Food	0.69	1.71	0.00	0.00	3.00
Variety	0.39	1.42	0.00	0.00	0.00
Portion Size	0.32	1.16	0.00	0.00	0.00
N of Meals	0.70	1.83	0.00	0.00	3.00
Restrict Child	0.08	0.56	0.00	0.00	0.00
Borrow	0.25	0.99	0.00	0.00	0.00
No Food Home	0.08	0.54	0.00	0.00	0.00
No Food Full Day	0.04	0.30	0.00	0.00	0.00
Distant-water fishing activity					
DWF (200NM)	211.73	263.43	0.00	74.00	601.00
DWF (36NM)	25.04	80.79	0.00	0.00	37.00
DWF (24NM)	12.10	43.60	0.00	0.00	17.00
DWF (12NM)	3.66	16.03	0.00	0.00	5.00
Endogenous regressor					
Fishing Hours	19.62	60.88	0.00	0.00	57.24
Instrument and piracy controls					
Piracy ($\leq$ 500 km)	0.19	0.47	0.00	0.00	1.00
Z	-0.04	0.16	-0.26	0.00	0.05
sd Z	0.00	1.00	-1.36	0.24	0.54

Table B5: Descriptive Statistics: Longer-Run Outcomes

	Mean	SD	P10	Median	P90
Instrument and piracy controls					
Piracy ($\leq$ 500 km)	19.57	8.05	10.00	18.00	31.00
Z	-2.41	17.22	-19.50	-7.41	16.53
sd Z	-0.00	1.00	-0.99	-0.29	1.10
Mortality outcomes: total events over the previous two years					
Mortality events	0.08	0.29	0.00	0.00	0.00
Female deaths	0.04	0.21	0.00	0.00	0.00
Male deaths	0.04	0.20	0.00	0.00	0.00
Female deaths [15–49]	0.01	0.08	0.00	0.00	0.00
Deaths ≤ 1	0.06	0.25	0.00	0.00	0.00
Deaths (1–15]	0.00	0.05	0.00	0.00	0.00
Deaths (15–64]	0.01	0.12	0.00	0.00	0.00
Deaths > 64	0.01	0.08	0.00	0.00	0.00
Household composition					
Mean age	26.03	12.51	14.86	22.67	41.33
Median age	22.91	14.34	10.00	19.00	41.50
Household size	5.60	3.03	2.00	5.00	10.00
Number of consumers	5.25	2.94	2.00	5.00	9.00
Number of infants	0.34	0.51	0.00	0.00	1.00
Adult-equivalent HH size	4.07	2.22	1.80	3.65	7.00
Working-age composition					
Individuals 15–64	3.02	1.87	1.00	2.00	5.00
Females 15–64	1.61	1.12	1.00	1.00	3.00
Males 15–64	1.41	1.18	0.00	1.00	3.00
Fertility outcomes over the previous two years					
Number of pregnancies	0.37	0.50	0.00	0.00	1.00
Women 15–49	1.40	1.05	0.00	1.00	3.00

B.2 The First Stage

Table B6: The First Stage: The Effect of Piracy in Somalia on DWF Pings in Tanzania

Dep. Var.	Pings				
	(1)	(2)	(3)	(4)	(5)
sd Z	25.655***	29.303***	29.116***	26.992***	26.907***
	(8.477)	(9.087)	(9.000)	(7.510)	(7.478)
Piracy ($\leq$ 500 km)	39.291***	33.520***	34.425***	39.609***	39.972***
	(13.263)	(11.873)	(11.817)	(9.695)	(9.712)
Obs.	2,036	2,036	2,036	2,036	2,036
FEs	w	y	r, y	m, y	r, m, y
F	6.60	7.72	7.86	13.84	13.91
R^2	0.20	0.28	0.28	0.44	0.44
Clusters	446	446	446	446	446
Avg Dep Var	25.04	25.04	25.04	25.04	25.04

Note: In the specification, the dataset is a cross-section. The variable "sd Z" is the instrument standardized, while, the variable "Piracy ($\leq$ 500 km)" counts the number of piracy incidents within 500km from the coast. The outcome is measured over the previous 60 days. FE notation is LSMS wave (w), rural (r), year (y) and month (m). Standard errors are clustered at the interview location level. *, **, *** denote statistical significance at the 10%, 5%, 1% level respectively.

Table B7: The First Stage: The Effect of Piracy in Somalia on DWF Hours in Tanzania

Dep. Var.	Hours				
	(1)	(2)	(3)	(4)	(5)
sd Z	71.707***	80.777***	80.379***	76.196***	76.005***
	(20.904)	(22.496)	(22.313)	(19.142)	(19.070)
Piracy ($\leq$ 500 km)	87.728***	72.802***	74.737***	81.892***	82.708***
	(30.562)	(27.006)	(27.044)	(23.239)	(23.295)
Obs.	2,036	2,036	2,036	2,036	2,036
FEs	w	y	r, y	m, y	r, m, y
F	7.15	8.22	8.32	12.88	12.94
R^2	0.23	0.32	0.32	0.45	0.45
Clusters	446	446	446	446	446
Avg Dep Var	61.63	61.63	61.63	61.63	61.63

Note: In the specification, the dataset is a cross-section. The variable "sd Z" is the instrument standardized, while, the variable "Piracy ($\leq$ 500 km)" counts the number of piracy incidents within 500km from the coast. The outcome is measured over the previous 60 days. FE notation is LSMS wave (w), rural (r), year (y) and month (m). Standard errors are clustered at the interview location level. *, **, *** denote statistical significance at the 10%, 5%, 1% level respectively.

Table B8: The First Stage: The Effect of Piracy in Somalia on DWF Fishing Hours in Tanzania

Dep. Var.	Fishing Hours		Sd Fishing Hours
	(1)	(2)	(3)
sd Z	20.625***		0.333***
	(4.922)		(0.079)
Z		125.981***	
		(29.837)	
Piracy ($\leq$ 500 km)		13.549**	0.223**
		(5.437)	(0.089)
Obs.	2,036	2,036	2,036
FEs	r, m, y	r, m, y	r, m, y
F	17.56	18.81	18.81
R^2	0.34	0.35	0.35
Num c	446	446	446
Avg Dep Var	19.62	19.62	-0.00

Note: In the specification, the dataset is a cross-section. The variable "sd Z" is the instrument standardized, while, the variable "Piracy ($\leq$ 500 km)" counts the number of piracy incidents within 500km from the coast. The outcome is measured over the previous 60 days. FE notation is LSMS wave (w), rural (r), year (y) and month (m). Standard errors are clustered at the interview location level. *, **, *** denote statistical significance at the 10%, 5%, 1% level respectively.

Table B9: Including Urban Dar es Salaam: The Effect of Piracy in Somalia on DWF Fishing Hours in Tanzania

Dep. Var.	Fishing Hours				
	(1)	(2)	(3)	(4)	(5)
sd Z	9.631***	10.646***	11.781***	10.047***	11.213***
	(3.157)	(3.245)	(3.300)	(2.963)	(3.050)
Piracy ($\leq$ 500 km)	7.875**	4.285	5.413	9.254**	10.436***
	(3.618)	(3.621)	(3.438)	(4.137)	(3.956)
Obs.	3,335	3,335	3,335	3,335	3,335
FEs	w	y	r, y	m, y	r, m, y
F	5.27	5.48	6.93	8.96	11.82
R^2	0.08	0.13	0.17	0.19	0.24
Num c	803	803	803	803	803
Avg Dep Var	11.98	11.98	11.98	11.98	11.98

Note: In the specification, the dataset is a cross-section. The variable "sd Z" is the instrument standardized, while, the variable "Piracy ($\leq$ 500 km)" counts the number of piracy incidents within 500km from the coast. The outcome is measured over the previous 60 days. FE notation is LSMS wave (w), rural (r), year (y) and month (m). Standard errors are clustered at the interview location level. *, **, *** denote statistical significance at the 10%, 5%, 1% level respectively.

Table B10: PPML: The Effect of Piracy in Somalia on DWF Fishing Hours in Tanzania

Dep. Var.	Fishing Hours				
	(1)	(2)	(3)	(4)	(5)
sd Z	0.339***	0.303***	0.295***	0.378***	0.376***
	(0.067)	(0.062)	(0.063)	(0.071)	(0.073)
Piracy ($\leq$ 500 km)	0.842***	0.426	0.405	1.130***	1.151***
	(0.273)	(0.289)	(0.292)	(0.295)	(0.286)
Obs.	2,036	2,036	2,036	1,656	1,656
FEs	w	y	r, y	m, y	r, m, y
Wald χ^2	32.28	24.57	22.42	43.69	43.50
Pseudo R^2	0.30	0.39	0.40	0.61	0.61
Num c	446	446	446	372	372
Avg Dep Var	19.62	19.62	19.62	24.12	24.12

Note: In the specification, the dataset is a cross-section. The variable "sd Z" is the instrument standardized, while, the variable "Piracy ($\leq$ 500 km)" counts the number of piracy incidents within 500km from the coast. The outcome is measured over the previous 60 days. FE notation is LSMS wave (w), rural (r), year (y) and month (m). Standard errors are clustered at the interview location level. *, **, *** denote statistical significance at the 10%, 5%, 1% level respectively.

Table B11: Overlap between Vessels Operating in Tanzania and Vessels Exposed to Somali Piracy Areas

	Vessels in Tanzania
Total	35
Vessels not in Somalia	24
Vessels also observed in Somalia	11
Share also observed in Somalia	0.33
	Vessels in Eligible Area
Total	152
Vessels not in Dangerous Area	86
Vessels also observed in Dangerous Area	66
Share also observed in Dangerous Area	0.44

Notes: The table reports the overlap between vessels operating in Tanzania and vessels observed in Somali piracy-related areas. The eligible area refers to the area included in the computation of the piracy shock, while the danger area refers to the area where piracy shocks may occur.

B.3 Fish Consumption

Table B12: The Effect of Distant Water Fishing on Fresh Fish Consumption

	(1)	(2)	(3)	(4)	(5)
	Tot Cons. (kg)	Purch. (kg)	Log P	Purch. (dummy)	Cons. (dummy)
Fishing Hours	-0.0007*	-0.0007*	0.0012**	-0.0004	-0.0003
	(0.0004)	(0.0004)	(0.0005)	(0.0003)	(0.0003)
Piracy ($\leq$ 500 km)	0.0216	0.0211	-0.1130***	0.0234	0.0286
	(0.0409)	(0.0345)	(0.0409)	(0.0341)	(0.0332)
Obs.	2,036	2,036	1,319	2,036	2,036
FEs	r, m, y	r, m, y	r, m, y	r, m, y	r, m, y
F	1.46	1.95	6.88	1.01	1.05
R^2	0.03	0.04	0.11	0.06	0.05
Clusters	446	446	337	446	446
Mean Dep. Var.	0.46	0.38	8.05	0.65	0.73

Note: In the specification, the dataset is a cross-section. The variable "sd Z" is the instrument standardized, while, the variable "Piracy ($\leq$ 500 km)" counts the number of piracy incidents within 500km from the coast. The outcome is measured over the previous 60 days. FE notation is LSMS wave (w), rural (r), year (y) and month (m). Standard errors are clustered at the interview location level. *, **, *** denote statistical significance at the 10%, 5%, 1% level respectively.

Table B13: Including Urban Dar es Salaam: The Effect of DWF on Fresh Fish Consumption in Tanzania

	(1) Tot Cons. (kg)	(2) Purch. (kg)	(3) Log P	(4) Purch. (dummy)	(5) Cons. (dummy)
Fishing Hours	-0.0073***	-0.0066***	0.0083***	-0.0042***	-0.0048***
	(0.0018)	(0.0017)	(0.0022)	(0.0013)	(0.0013)
Piracy ($\leq$ 500 km)	0.0761*	0.0712*	-0.1149**	0.0537	0.0622*
	(0.0429)	(0.0384)	(0.0477)	(0.0340)	(0.0365)
Obs.	3,335	3,335	2,112	3,335	3,335
FEs	r, y, m	r, y, m	r, y, m	r, y, m	r, y, m
First-stage coef.	11.21	11.21	11.45	11.21	11.21
First-stage s.e.	3.05	3.05	2.93	3.05	3.05
Kleib.-Paap F	13.51	13.51	15.29	13.51	13.51
Clusters	803	803	611	803	803
Mean Dep. Var.	0.36	0.31	8.21	0.63	0.69

Note: In the specification, the dataset is a cross-section and the regressor is not instrumented. The outcome is measured over the previous 60 days. FE notation is LSMS wave (w), rural (r), year (y) and month (m). Standard errors are clustered at the interview location level. *, **, *** denote statistical significance at the 10%, 5%, 1% level respectively.

Table B14: Robustness: The Effect of Piracy in Somalia on Fresh Fish Consumption

Dep. Var.	Tot Cons. (kg)						std Tot Cons. (kg)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Fishing Hours	-0.005***	-0.005***	-0.005***	-0.005***	-0.004***	-0.005***	-0.008***	
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	
Piracy ($\leq$ 500 km)	0.074*	0.048	0.042	0.090*		0.084*	0.143*	0.143*
	(0.041)	(0.039)	(0.039)	(0.046)		(0.047)	(0.080)	(0.080)
sd Fishing Hours								-0.465***
								(0.099)
Obs.	2,036	2,036	2,036	2,036	2,036	2,036	2,036	2,036
FEs	w	y	r, y	y, m	r, m, y	r, m, y	r, m, y	r, m, y
F	7.01	8.33	8.08	10.98	20.93	10.94	10.94	10.94
Kleib.-Paap F	14.07	15.12	15.11	17.87	17.56	17.83	17.83	17.83
Clusters	446	446	446	446	446	446	446	446
Mean Dep. Var.	0.46	0.46	0.46	0.46	0.46	0.46	0.00	0.00

Note: The dataset is a cross-section. The dependent variable is total fresh-fish consumption, measured in kilograms over the previous 7 days. Columns (1)–(6) report the outcome in levels, while Columns (7) and (8) use its standardized counterpart. Fishing hours are instrumented using the standardized instrument in all specifications except Column (6), which uses the instrument in levels. Column (1) includes LSMS-wave fixed effects; Column (2) year fixed effects; Column (3) year and rural-status fixed effects; and Column (4) year and month fixed effects. Column (5) includes rural-status, month, and year fixed effects but omits the control for nearby piracy. Column (6) adds the nearby-piracy control to the same fixed-effect specification and uses the instrument in levels rather than in standardized units. Column (7) retains the preferred specification and standardizes only the dependent variable, while Column (8) standardizes both the dependent variable and fishing hours. Except in Column (5), all specifications control for the number of piracy incidents within 500 km of the coast. FE notation is LSMS wave (w), rural status (r), year (y), and month (m). Standard errors are clustered at the interview-location level. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table B15: Robustness: The Effect of Piracy in Somalia on Fresh Fish Consumption

Dep. Var.	Purch. (kg)						std Purch. (kg)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Fishing Hours	-0.005***	-0.004***	-0.004***	-0.004***	-0.004***	-0.004***	-0.007***	
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	
Piracy ($\leq$ 500 km)	0.082**	0.044	0.033	0.081**		0.072*	0.136*	0.136*
	(0.036)	(0.035)	(0.034)	(0.040)		(0.040)	(0.075)	(0.075)
sd Fishing Hours								-0.438***
								(0.094)
Obs.	2,036	2,036	2,036	2,036	2,036	2,036	2,036	2,036
FEs	w	y	r, y	y, m	r, m, y	r, m, y	r, m, y	r, m, y
F	7.49	8.10	7.75	10.94	20.91	10.95	10.95	10.95
Kleib.-Paap F	14.07	15.12	15.11	17.87	17.56	17.83	17.83	17.83
Clusters	446	446	446	446	446	446	446	446
Mean Dep. Var.	0.38	0.38	0.38	0.38	0.38	0.38	0.00	0.00

Note: The dataset is a cross-section. The dependent variable is the purchased quantity of fresh-fish, measured in kilograms over the previous 7 days. Columns (1)–(6) report the outcome in levels, while Columns (7) and (8) use its standardized counterpart. Fishing hours are instrumented using the standardized instrument in all specifications except Column (6), which uses the instrument in levels. Column (1) includes LSMS-wave fixed effects; Column (2) year fixed effects; Column (3) year and rural-status fixed effects; and Column (4) year and month fixed effects. Column (5) includes rural-status, month, and year fixed effects but omits the control for nearby piracy. Column (6) adds the nearby-piracy control to the same fixed-effect specification and uses the instrument in levels rather than in standardized units. Column (7) retains the preferred specification and standardizes only the dependent variable, while Column (8) standardizes both the dependent variable and fishing hours. Except in Column (5), all specifications control for the number of piracy incidents within 500 km of the coast. FE notation is LSMS wave (w), rural status (r), year (y), and month (m). Standard errors are clustered at the interview-location level. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table B16: Robustness: The Effect of Piracy in Somalia on Fresh Fish Consumption

Dep. Var.	Purch. (dummy)						std Purch. (dummy)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Fishing Hours	-0.003***	-0.003***	-0.003***	-0.002***	-0.002***	-0.002***	-0.005***	
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	
Piracy ($\leq$ 500 km)	0.069*	0.039	0.027	0.066*		0.056	0.116	0.116
	(0.036)	(0.035)	(0.033)	(0.038)		(0.036)	(0.076)	(0.076)
sd Fishing Hours								-0.304***
								(0.094)
Obs.	2,036	2,036	2,036	2,036	2,036	2,036	2,036	2,036
FEs	w	y	r, y	y, m	r, m, y	r, m, y	r, m, y	r, m, y
F	4.71	4.79	4.39	5.36	9.99	5.30	5.30	5.30
Kleib.-Paap F	14.07	15.12	15.11	17.87	17.56	17.83	17.83	17.83
Clusters	446	446	446	446	446	446	446	446
Mean Dep. Var.	0.65	0.65	0.65	0.65	0.65	0.65	0.00	0.00

Note: The dataset is a cross-section. The dependent variable is any purchase of fresh-fish over the previous 7 days. Columns (1)–(6) report the outcome in levels, while Columns (7) and (8) use its standardized counterpart. Fishing hours are instrumented using the standardized instrument in all specifications except Column (6), which uses the instrument in levels. Column (1) includes LSMS-wave fixed effects; Column (2) year fixed effects; Column (3) year and rural-status fixed effects; and Column (4) year and month fixed effects. Column (5) includes rural-status, month, and year fixed effects but omits the control for nearby piracy. Column (6) adds the nearby-piracy control to the same fixed-effect specification and uses the instrument in levels rather than in standardized units. Column (7) retains the preferred specification and standardizes only the dependent variable, while Column (8) standardizes both the dependent variable and fishing hours. Except in Column (5), all specifications control for the number of piracy incidents within 500 km of the coast. FE notation is LSMS wave (w), rural status (r), year (y), and month (m). Standard errors are clustered at the interview-location level. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table B17: Robustness: The Effect of Piracy in Somalia on Fresh Fish Consumption

Dep. Var.	Cons. (dummy)						std Cons. (dummy)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Fishing Hours	-0.004***	-0.003***	-0.003***	-0.003***	-0.003***	-0.003***	-0.007***	
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	
Piracy ($\leq$ 500 km)	0.073**	0.046	0.038	0.078**		0.071*	0.160*	0.160*
	(0.034)	(0.032)	(0.032)	(0.038)		(0.037)	(0.084)	(0.084)
sd Fishing Hours								-0.403***
								(0.109)
Obs.	2,036	2,036	2,036	2,036	2,036	2,036	2,036	2,036
FEs	w	y	r, y	y, m	r, m, y	r, m, y	r, m, y	r, m, y
F	5.43	5.65	5.31	6.93	13.15	6.94	6.94	6.94
Kleib.-Paap F	14.07	15.12	15.11	17.87	17.56	17.83	17.83	17.83
Clusters	446	446	446	446	446	446	446	446
Mean Dep. Var.	0.73	0.73	0.73	0.73	0.73	0.73	-0.00	-0.00

Note: The dataset is a cross-section. The dependent variable is any fresh-fish consumption in the previous 7 days. Columns (1)–(6) report the outcome in levels, while Columns (7) and (8) use its standardized counterpart. Fishing hours are instrumented using the standardized instrument in all specifications except Column (6), which uses the instrument in levels. Column (1) includes LSMS-wave fixed effects; Column (2) year fixed effects; Column (3) year and rural-status fixed effects; and Column (4) year and month fixed effects. Column (5) includes rural-status, month, and year fixed effects but omits the control for nearby piracy. Column (6) adds the nearby-piracy control to the same fixed-effect specification and uses the instrument in levels rather than in standardized units. Column (7) retains the preferred specification and standardizes only the dependent variable, while Column (8) standardizes both the dependent variable and fishing hours. Except in Column (5), all specifications control for the number of piracy incidents within 500 km of the coast. FE notation is LSMS wave (w), rural status (r), year (y), and month (m). Standard errors are clustered at the interview-location level. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

B.4 Nutritional Pathways

Table B18: IV: The Effect of Distant Water Fishing on Total Macronutrient Intake

	(1) Calories	(2) Protein	(3) Fat	(4) Fiber	(5) Carbs
Fishing Hours	22.0503	0.0571	-0.5322	1.1600***	14.1777***
	(45.5127)	(0.4581)	(0.6112)	(0.3361)	(3.5707)
Piracy ($\leq$ 500 km)	-5178.8192**	-26.5412	17.9427	-31.8494**	-303.4568**
	(2373.9574)	(19.7279)	(30.2487)	(13.2301)	(133.2784)
Obs.	2,036	2,036	2,036	2,036	2,036
FEs	r, y, m	r, y, m	r, y, m	r, y, m	r, y, m
First-stage coef.	20.28	20.28	20.28	20.28	20.28
First-stage s.e.	4.80	4.80	4.80	4.80	4.80
Kleib.-Paap F	17.83	17.83	17.83	17.83	17.83
Clusters	446	446	446	446	446
Mean Dep. Var.	57,862.25	570.74	635.78	349.17	3,599.57

Note: The table reports IV estimates for macronutrient intake measured in original units. Fishing Hours is measured within 36 nautical miles of the closest coastal point to the household interview location and is instrumented with the standardized interaction between piracy shocks in the Gulf of Aden and predetermined local marine productivity. Fishing and piracy exposures are measured over the preceding 60 days, while household food consumption is measured over the preceding seven days. All specifications include rural-status, month, and year fixed effects. Standard errors are clustered at the interview-location level. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table B19: IV: The Effect of Distant Water Fishing on Total Micronutrient Intake

	(1) Iron	(2) Zinc	(3) A – RAE	(4) B12	(5) D – IU	(6) Selenium
Fishing Hours	0.5937***	0.1541	13.8101	-0.0868*	-19.4642***	-1.9946***
	(0.1491)	(0.1489)	(12.0501)	(0.0487)	(4.0597)	(0.5850)
Piracy ($\leq$ 500 km)	-4.3044	-7.0014	-899.8977*	-2.6962	377.3452*	35.6354
	(5.8730)	(5.7922)	(545.2815)	(2.2580)	(202.3888)	(27.6332)
Obs.	2,036	2,036	2,036	2,036	2,036	2,036
FEs	r, y, m	r, y, m	r, y, m	r, y, m	r, y, m	r, y, m
First-stage coef.	20.28	20.28	20.28	20.28	20.28	20.28
First-stage s.e.	4.80	4.80	4.80	4.80	4.80	4.80
Kleib.-Paap F	17.83	17.83	17.83	17.83	17.83	17.83
Clusters	446	446	446	446	446	446
Mean Dep. Var.	121.21	143.57	2,884.19	19.94	1,990.99	463.81

Note: The table reports IV estimates for micronutrient intake measured in original units. Fishing Hours is measured within 36 nautical miles of the closest coastal point to the household interview location and is instrumented with the standardized interaction between piracy shocks in the Gulf of Aden and predetermined local marine productivity. Fishing and piracy exposures are measured over the preceding 60 days, while household food consumption is measured over the preceding seven days. All specifications include rural-status, month, and year fixed effects. Standard errors are clustered at the interview-location level. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table B20: IV: The Effect of Distant Water Fishing on Total PUFA Intake

	(1) PUFA 18:4	(2) PUFA 18:3	(3) PUFA 20:4	(4) EPA (20:5 n-3)	(5) DPA (22:5 n-3)	(6) DHA (22:6 n-3)	(7) PUFA 18:2
Fishing Hours	-0.0004***	-0.0021***	-0.0019***	-0.0022***	-0.0029***	-0.0107***	-0.1503**
	(0.0001)	(0.0008)	(0.0005)	(0.0005)	(0.0006)	(0.0024)	(0.0677)
Piracy ($\leq$ 500 km)	0.0076*	0.0100	0.0083	0.0404*	0.0525*	0.1763	0.5481
	(0.0043)	(0.0375)	(0.0218)	(0.0235)	(0.0305)	(0.1162)	(3.5273)
Obs.	2,036	2,036	2,036	2,036	2,036	2,036	2,036
FEs	r, y, m	r, y, m	r, y, m	r, y, m	r, y, m	r, y, m	r, y, m
First-stage coef.	20.28	20.28	20.28	20.28	20.28	20.28	20.28
First-stage s.e.	4.80	4.80	4.80	4.80	4.80	4.80	4.80
Kleib.-Paap F	17.83	17.83	17.83	17.83	17.83	17.83	17.83
Clusters	446	446	446	446	446	446	446
Mean Dep. Var.	0.04	0.65	0.28	0.26	0.31	1.30	46.07

Note: The table reports IV estimates for polyunsaturated fatty-acid intake measured in original units. Fishing Hours is measured within 36 nautical miles of the closest coastal point to the household interview location and is instrumented with the standardized interaction between piracy shocks in the Gulf of Aden and predetermined local marine productivity. Fishing and piracy exposures are measured over the preceding 60 days, while household food consumption is measured over the preceding seven days. All specifications include rural-status, month, and year fixed effects. Standard errors are clustered at the interview-location level. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

B.5 Short-Run Consequences: Food Insecurity

Table B21: OLS: The Effect of Fishing Hours on Food Insecurity

	(1) Food Insec.	(2) Less Pref. Food	(3) Limited Variety	(4) Portion Size	(5) N. of Meals	(6) Restrict Child	(7) Borrow Food	(8) No Food at Home	(9) No Food Full Day
Fishing Hours	0.001***	0.004***	0.001*	0.002***	0.004***	0.000	0.001**	0.000*	0.000
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.000)	(0.000)
Piracy ($\leq$ 500 km)	-0.067**	-0.257**	-0.207***	-0.131**	-0.305***	-0.044**	-0.038	-0.040*	-0.031**
	(0.026)	(0.108)	(0.079)	(0.055)	(0.108)	(0.023)	(0.046)	(0.024)	(0.012)
Obs.	2,036	2,036	2,036	2,036	2,036	2,036	2,036	2,036	2,035
FEs	r, y, m	r, y, m	r, y, m	r, y, m	r, y, m	r, y, m	r, y, m	r, y, m	r, y, m
F	7.33	6.43	4.36	7.30	6.32	1.96	4.08	3.40	3.20
R^2	0.04	0.04	0.03	0.02	0.04	0.01	0.02	0.01	0.01
Num c	446	446	446	446	446	446	446	446	446
Avg Dep Var	0.25	0.69	0.39	0.32	0.70	0.08	0.25	0.08	0.04

Note: The dataset is a cross-section. The dependent variables are food-insecurity outcomes measured over the previous 7 days. The variable Piracy ($\leq$ 500 km) counts the number of piracy incidents within 500 km from the coast. FE notation is rural (r), year (y), and month (m). Standard errors are clustered at the interview-location level. *, **, *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table B22: PPML: The Effect of Piracy on Food Insecurity

	(1) Food Insec.	(2) Less Pref. Food	(3) Limited Variety	(4) Portion Size	(5) N. of Meals	(6) Restrict Child	(7) Borrow Food	(8) No Food at Home	(9) No Food Full Day
sd Z	0.158***	0.267***	0.178**	0.179***	0.199***	0.305***	0.216***	0.372***	0.324***
	(0.043)	(0.050)	(0.074)	(0.054)	(0.043)	(0.062)	(0.061)	(0.065)	(0.100)
Piracy ($\leq$ 500 km)	-0.236*	-0.268	-0.480*	-0.417*	-0.417**	-0.651*	-0.026	-0.410	-0.810*
	(0.132)	(0.183)	(0.253)	(0.224)	(0.181)	(0.387)	(0.183)	(0.359)	(0.451)
Obs.	2,036	2,036	2,023	2,023	2,023	2,023	2,036	1,857	1,723
FEs	r, y, m	r, y, m	r, y, m	r, y, m	r, y, m	r, y, m	r, y, m	r, y, m	r, y, m
Wald χ^2	15.38	32.36	9.87	14.89	25.41	26.58	13.48	43.84	12.60
Pseudo R^2	0.03	0.06	0.06	0.04	0.06	0.06	0.05	0.08	0.06
Num c	446	446	442	442	442	442	446	407	395
Avg Dep Var	0.25	0.69	0.39	0.32	0.71	0.09	0.25	0.09	0.04

Note: The dataset is a cross-section. The dependent variables are food-insecurity outcomes measured over the previous 7 days. The variable Piracy ($\leq$ 500 km) counts the number of piracy incidents within 500 km from the coast. FE notation is rural (r), year (y), and month (m). Standard errors are clustered at the interview-location level. *, **, *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table B23: Including Urban Dar es Salaam: The Effect of Fishing Hours on Food Insecurity

	(1) Food Insec.	(2) Less Pref. Food	(3) Limited Variety	(4) Portion Size	(5) N. of Meals	(6) Restrict Child	(7) Borrow Food	(8) No Food at Home	(9) No Food Full Day
Fishing Hours	0.004***	0.020***	0.007***	0.006**	0.015***	0.003**	0.004***	0.004***	0.001**
	(0.001)	(0.004)	(0.002)	(0.002)	(0.004)	(0.001)	(0.001)	(0.001)	(0.000)
Piracy ($\leq$ 500 km)	-0.095***	-0.374***	-0.216***	-0.140**	-0.338***	-0.054*	-0.060*	-0.065**	-0.014
	(0.026)	(0.111)	(0.073)	(0.059)	(0.099)	(0.031)	(0.032)	(0.027)	(0.014)
Obs.	3,334	3,335	3,335	3,335	3,335	3,335	3,335	3,335	3,334
FEs	r, y, m	r, y, m	r, y, m	r, y, m	r, y, m	r, y, m	r, y, m	r, y, m	r, y, m
Kleib.-Paap F	13.51	13.51	13.51	13.51	13.51	13.51	13.51	13.51	13.51
Clusters	803	803	803	803	803	803	803	803	803
Mean Dep. Var.	0.28	0.79	0.49	0.39	0.66	0.14	0.23	0.10	0.05

Note: The dataset is a cross-section. The dependent variables are food-insecurity outcomes measured over the previous 7 days. Fishing hours are instrumented using the standardized instrument. The variable Piracy ($\leq$ 500 km) counts the number of piracy incidents within 500 km from the coast. FE notation is rural (r), year (y), and month (m). Standard errors are clustered at the interview-location level. *, **, *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table B24: Robustness: The Effect of Piracy in Somalia on Food Insecurity

Dep. Var.	Food Insecurity						std Food Insecurity	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Fishing Hours	0.003***	0.002***	0.002***	0.002***	0.002***	0.002***	0.005***	
	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	
Piracy ($\leq$ 500 km)	-0.095***	-0.070**	-0.063**	-0.095***		-0.089***	-0.206***	-0.206***
	(0.029)	(0.029)	(0.027)	(0.029)		(0.027)	(0.062)	(0.062)
sd Fishing Hours								0.316***
								(0.070)
Obs.	2,036	2,036	2,036	2,036	2,036	2,036	2,036	2,036
FEs	w	y	r, y	y, m	r, m, y	r, m, y	r, m, y	r, m, y
F	11.26	10.97	9.91	12.34	19.05	11.59	11.59	11.59
Kleib.-Paap F	14.07	15.12	15.11	17.87	17.56	17.83	17.83	17.83
Clusters	446	446	446	446	446	446	446	446
Mean Dep. Var.	0.25	0.25	0.25	0.25	0.25	0.25	0.00	0.00

Note: The dataset is a cross-section. The dependent variable is an indicator equal to one whether the household worried that it would not have enough food during the previous seven days. Columns (1)–(6) report the outcome in levels, while Columns (7) and (8) use its standardized counterpart. Fishing hours are instrumented using the standardized instrument in all specifications except Column (6), which uses the instrument in levels. Column (1) includes LSMS-wave fixed effects; Column (2) year fixed effects; Column (3) year and rural-status fixed effects; and Column (4) year and month fixed effects. Column (5) includes rural-status, month, and year fixed effects but omits the control for nearby piracy. Column (6) adds the nearby-piracy control to the same fixed-effect specification and uses the instrument in levels rather than in standardized units. Column (7) retains the preferred specification and standardizes only the dependent variable, while Column (8) standardizes both the dependent variable and fishing hours. Except in Column (5), all specifications control for the number of piracy incidents within 500 km of the coast. FE notation is LSMS wave (w), rural status (r), year (y), and month (m). Standard errors are clustered at the interview-location level. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table B25: Robustness: The Effect of Piracy in Somalia on Food Insecurity

Dep. Var.	Less Pref.Food						std Less Pref.Food	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Fishing Hours	0.016***	0.014***	0.014***	0.013***	0.013***	0.013***	0.008***	
	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.001)	
Piracy ($\leq$ 500 km)	-0.360***	-0.280**	-0.258**	-0.419***		-0.399***	-0.233***	-0.233***
	(0.110)	(0.114)	(0.110)	(0.111)		(0.108)	(0.063)	(0.063)
sd Fishing Hours								0.463***
								(0.082)
Obs.	2,036	2,036	2,036	2,036	2,036	2,036	2,036	2,036
FEs	w	y	r, y	y, m	r, m, y	r, m, y	r, m, y	r, m, y
F	13.63	14.79	14.35	17.96	28.72	18.11	18.11	18.11
Kleib.-Paap F	14.07	15.12	15.11	17.87	17.56	17.83	17.83	17.83
Clusters	446	446	446	446	446	446	446	446
Mean Dep. Var.	0.69	0.69	0.69	0.69	0.69	0.69	0.00	0.00

Note: The dataset is a cross-section. The dependent variable counts the number of days the household relied on less preferred or less expensive foods in the previous seven days. Columns (1)–(6) report the outcome in levels, while Columns (7) and (8) use its standardized counterpart. Fishing hours are instrumented using the standardized instrument in all specifications except Column (6), which uses the instrument in levels. Column (1) includes LSMS-wave fixed effects; Column (2) year fixed effects; Column (3) year and rural-status fixed effects; and Column (4) year and month fixed effects. Column (5) includes rural-status, month, and year fixed effects but omits the control for nearby piracy. Column (6) adds the nearby-piracy control to the same fixed-effect specification and uses the instrument in levels rather than in standardized units. Column (7) retains the preferred specification and standardizes only the dependent variable, while Column (8) standardizes both the dependent variable and fishing hours. Except in Column (5), all specifications control for the number of piracy incidents within 500 km of the coast. FE notation is LSMS wave (w), rural status (r), year (y), and month (m). Standard errors are clustered at the interview-location level. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table B26: Robustness: The Effect of Piracy in Somalia on Food Insecurity

Dep. Var.	Variety						std Variety	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Fishing Hours	0.005***	0.004***	0.004***	0.003**	0.003**	0.003**	0.002**	
	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	
Piracy ($\leq$ 500 km)	-0.218***	-0.191**	-0.182**	-0.253***		-0.244***	-0.172***	-0.172***
	(0.072)	(0.075)	(0.073)	(0.081)		(0.079)	(0.055)	(0.055)
sd Fishing Hours								0.135**
								(0.057)
Obs.	2,036	2,036	2,036	2,036	2,036	2,036	2,036	2,036
FEs	w	y	r, y	y, m	r, m, y	r, m, y	r, m, y	r, m, y
F	6.72	7.00	6.60	6.59	4.81	6.36	6.36	6.36
Kleib.-Paap F	14.07	15.12	15.11	17.87	17.56	17.83	17.83	17.83
Clusters	446	446	446	446	446	446	446	446
Mean Dep. Var.	0.39	0.39	0.39	0.39	0.39	0.39	-0.00	-0.00

Note: The dataset is a cross-section. The dependent variable counts the number of days the household limited the variety of foods eaten in the previous seven days. Columns (1)–(6) report the outcome in levels, while Columns (7) and (8) use its standardized counterpart. Fishing hours are instrumented using the standardized instrument in all specifications except Column (6), which uses the instrument in levels. Column (1) includes LSMS-wave fixed effects; Column (2) year fixed effects; Column (3) year and rural-status fixed effects; and Column (4) year and month fixed effects. Column (5) includes rural-status, month, and year fixed effects but omits the control for nearby piracy. Column (6) adds the nearby-piracy control to the same fixed-effect specification and uses the instrument in levels rather than in standardized units. Column (7) retains the preferred specification and standardizes only the dependent variable, while Column (8) standardizes both the dependent variable and fishing hours. Except in Column (5), all specifications control for the number of piracy incidents within 500 km of the coast. FE notation is LSMS wave (w), rural status (r), year (y), and month (m). Standard errors are clustered at the interview-location level. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table B27: Robustness: The Effect of Piracy in Somalia on Food Insecurity

Dep. Var.	Portion Size						std Portion Size	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Fishing Hours	0.005***	0.004**	0.004**	0.004**	0.004**	0.004**	0.003**	
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	
Piracy ($\leq$ 500 km)	-0.165***	-0.139**	-0.126**	-0.176***		-0.165***	-0.142***	-0.142***
	(0.060)	(0.056)	(0.055)	(0.066)		(0.064)	(0.055)	(0.055)
sd Fishing Hours								0.198**
								(0.083)
Obs.	2,036	2,036	2,036	2,036	2,036	2,036	2,036	2,036
FEs	w	y	r, y	y, m	r, m, y	r, m, y	r, m, y	r, m, y
F	4.79	4.68	4.29	4.31	5.15	4.21	4.21	4.21
Kleib.-Paap F	14.07	15.12	15.11	17.87	17.56	17.83	17.83	17.83
Clusters	446	446	446	446	446	446	446	446
Mean Dep. Var.	0.32	0.32	0.32	0.32	0.32	0.32	-0.00	-0.00

Note: The dataset is a cross-section. The dependent variable counts the number of days the household reduced portion sizes at meals in the previous seven days. Columns (1)–(6) report the outcome in levels, while Columns (7) and (8) use its standardized counterpart. Fishing hours are instrumented using the standardized instrument in all specifications except Column (6), which uses the instrument in levels. Column (1) includes LSMS-wave fixed effects; Column (2) year fixed effects; Column (3) year and rural-status fixed effects; and Column (4) year and month fixed effects. Column (5) includes rural-status, month, and year fixed effects but omits the control for nearby piracy. Column (6) adds the nearby-piracy control to the same fixed-effect specification and uses the instrument in levels rather than in standardized units. Column (7) retains the preferred specification and standardizes only the dependent variable, while Column (8) standardizes both the dependent variable and fishing hours. Except in Column (5), all specifications control for the number of piracy incidents within 500 km of the coast. FE notation is LSMS wave (w), rural status (r), year (y), and month (m). Standard errors are clustered at the interview-location level. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table B28: Robustness: The Effect of Piracy in Somalia on Food Insecurity

Dep. Var.	N of Meals						std N of Meals	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Fishing Hours	0.013***	0.011***	0.011***	0.010***	0.009***	0.009***	0.005***	
	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.001)	
Piracy ($\leq$ 500 km)	-0.363***	-0.291**	-0.253**	-0.430***		-0.399***	-0.218***	-0.218***
	(0.118)	(0.117)	(0.110)	(0.119)		(0.111)	(0.061)	(0.061)
sd Fishing Hours								0.310***
								(0.068)
Obs.	2,036	2,036	2,036	2,036	2,036	2,036	2,036	2,036
FEs	w	y	r, y	y, m	r, m, y	r, m, y	r, m, y	r, m, y
F	9.98	10.31	9.78	12.16	17.74	12.72	12.72	12.72
Kleib.-Paap F	14.07	15.12	15.11	17.87	17.56	17.83	17.83	17.83
Clusters	446	446	446	446	446	446	446	446
Mean Dep. Var.	0.70	0.70	0.70	0.70	0.70	0.70	0.00	0.00

Note: The dataset is a cross-section. The dependent variable counts the number of days the household reduced the number of meals eaten in a day in the previous seven days. Columns (1)–(6) report the outcome in levels, while Columns (7) and (8) use its standardized counterpart. Fishing hours are instrumented using the standardized instrument in all specifications except Column (6), which uses the instrument in levels. Column (1) includes LSMS-wave fixed effects; Column (2) year fixed effects; Column (3) year and rural-status fixed effects; and Column (4) year and month fixed effects. Column (5) includes rural-status, month, and year fixed effects but omits the control for nearby piracy. Column (6) adds the nearby-piracy control to the same fixed-effect specification and uses the instrument in levels rather than in standardized units. Column (7) retains the preferred specification and standardizes only the dependent variable, while Column (8) standardizes both the dependent variable and fishing hours. Except in Column (5), all specifications control for the number of piracy incidents within 500 km of the coast. FE notation is LSMS wave (w), rural status (r), year (y), and month (m). Standard errors are clustered at the interview-location level. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table B29: Robustness: The Effect of Piracy in Somalia on Food Insecurity

Dep. Var.	Restrict for Child						std Restrict Child	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Fishing Hours	0.002**	0.001*	0.001*	0.001*	0.001*	0.001*	0.003*	
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	
Piracy ($\leq$ 500 km)	-0.075***	-0.057**	-0.055**	-0.067**		-0.066**	-0.119**	-0.119**
	(0.027)	(0.024)	(0.025)	(0.030)		(0.029)	(0.053)	(0.053)
sd Fishing Hours								0.161*
								(0.083)
Obs.	2,036	2,036	2,036	2,036	2,036	2,036	2,036	2,036
FEs	w	y	r, y	y, m	r, m, y	r, m, y	r, m, y	r, m, y
F	4.21	3.06	2.90	2.81	3.41	2.75	2.75	2.75
Kleib.-Paap F	14.07	15.12	15.11	17.87	17.56	17.83	17.83	17.83
Clusters	446	446	446	446	446	446	446	446
Mean Dep. Var.	0.08	0.08	0.08	0.08	0.08	0.08	-0.00	-0.00

Note: The dataset is a cross-section. The dependent variable counts the number of days the household restricted food consumption by adults in order for children to eat in the previous seven days. Columns (1)–(6) report the outcome in levels, while Columns (7) and (8) use its standardized counterpart. Fishing hours are instrumented using the standardized instrument in all specifications except Column (6), which uses the instrument in levels. Column (1) includes LSMS-wave fixed effects; Column (2) year fixed effects; Column (3) year and rural-status fixed effects; and Column (4) year and month fixed effects. Column (5) includes rural-status, month, and year fixed effects but omits the control for nearby piracy. Column (6) adds the nearby-piracy control to the same fixed-effect specification and uses the instrument in levels rather than in standardized units. Column (7) retains the preferred specification and standardizes only the dependent variable, while Column (8) standardizes both the dependent variable and fishing hours. Except in Column (5), all specifications control for the number of piracy incidents within 500 km of the coast. FE notation is LSMS wave (w), rural status (r), year (y), and month (m). Standard errors are clustered at the interview-location level. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table B30: Robustness: The Effect of Piracy in Somalia on Food Insecurity

Dep. Var.	Borrow Food						std Borrow Food	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Fishing Hours	0.004***	0.004***	0.004***	0.003***	0.003***	0.003***	0.003***	
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	
Piracy ($\leq$ 500 km)	-0.034	-0.005	-0.002	-0.074		-0.071	-0.071	-0.071
	(0.045)	(0.052)	(0.051)	(0.045)		(0.045)	(0.046)	(0.046)
sd Fishing Hours								0.204***
								(0.070)
Obs.	2,036	2,036	2,036	2,036	2,036	2,036	2,036	2,036
FEs	w	y	r, y	y, m	r, m, y	r, m, y	r, m, y	r, m, y
F	5.10	3.96	3.72	5.18	8.47	4.84	4.84	4.84
Kleib.-Paap F	14.07	15.12	15.11	17.87	17.56	17.83	17.83	17.83
Clusters	446	446	446	446	446	446	446	446
Mean Dep. Var.	0.25	0.25	0.25	0.25	0.25	0.25	0.00	0.00

Note: The dataset is a cross-section. The dependent variable counts the number of days the household borrowed food or relied on help from relatives or friends in the previous seven days. Columns (1)–(6) report the outcome in levels, while Columns (7) and (8) use its standardized counterpart. Fishing hours are instrumented using the standardized instrument in all specifications except Column (6), which uses the instrument in levels. Column (1) includes LSMS-wave fixed effects; Column (2) year fixed effects; Column (3) year and rural-status fixed effects; and Column (4) year and month fixed effects. Column (5) includes rural-status, month, and year fixed effects but omits the control for nearby piracy. Column (6) adds the nearby-piracy control to the same fixed-effect specification and uses the instrument in levels rather than in standardized units. Column (7) retains the preferred specification and standardizes only the dependent variable, while Column (8) standardizes both the dependent variable and fishing hours. Except in Column (5), all specifications control for the number of piracy incidents within 500 km of the coast. FE notation is LSMS wave (w), rural status (r), year (y), and month (m). Standard errors are clustered at the interview-location level. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table B31: Robustness: The Effect of Piracy in Somalia on Food Insecurity

Dep. Var.	No Food at Home						std No Food Home	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Fishing Hours	0.003***	0.003***	0.003***	0.003***	0.003***	0.003***	0.005***	
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	
Piracy ($\leq$ 500 km)	-0.057**	-0.023	-0.027	-0.072**		-0.075**	-0.138**	-0.138**
	(0.028)	(0.026)	(0.026)	(0.031)		(0.032)	(0.059)	(0.059)
sd Fishing Hours								0.297***
								(0.090)
Obs.	2,036	2,036	2,036	2,036	2,036	2,036	2,036	2,036
FEs	w	y	r, y	y, m	r, m, y	r, m, y	r, m, y	r, m, y
F	6.43	4.74	4.70	5.83	10.75	5.75	5.75	5.75
Kleib.-Paap F	14.07	15.12	15.11	17.87	17.56	17.83	17.83	17.83
Clusters	446	446	446	446	446	446	446	446
Mean Dep. Var.	0.08	0.08	0.08	0.08	0.08	0.08	-0.00	-0.00

Note: The dataset is a cross-section. The dependent variable counts the number of days the household had no food of any kind in the household in the previous seven days. Columns (1)–(6) report the outcome in levels, while Columns (7) and (8) use its standardized counterpart. Fishing hours are instrumented using the standardized instrument in all specifications except Column (6), which uses the instrument in levels. Column (1) includes LSMS-wave fixed effects; Column (2) year fixed effects; Column (3) year and rural-status fixed effects; and Column (4) year and month fixed effects. Column (5) includes rural-status, month, and year fixed effects but omits the control for nearby piracy. Column (6) adds the nearby-piracy control to the same fixed-effect specification and uses the instrument in levels rather than in standardized units. Column (7) retains the preferred specification and standardizes only the dependent variable, while Column (8) standardizes both the dependent variable and fishing hours. Except in Column (5), all specifications control for the number of piracy incidents within 500 km of the coast. FE notation is LSMS wave (w), rural status (r), year (y), and month (m). Standard errors are clustered at the interview-location level. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table B32: Robustness: The Effect of Piracy in Somalia on Food Insecurity

Dep. Var.	No Food Full Day						std Full Day	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Fishing Hours	0.001***	0.001***	0.001***	0.001**	0.001**	0.001**	0.002**	
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	
Piracy ($\leq$ 500 km)	-0.029***	-0.019*	-0.021**	-0.035***		-0.036***	-0.119***	-0.119***
	(0.010)	(0.010)	(0.010)	(0.012)		(0.013)	(0.041)	(0.041)
sd Fishing Hours								0.116**
								(0.045)
Obs.	2,035	2,035	2,035	2,035	2,035	2,035	2,035	2,035
FEs	w	y	r, y	y, m	r, m, y	r, m, y	r, m, y	r, m, y
F	5.74	4.52	4.79	5.01	6.41	5.19	5.19	5.19
Kleib.-Paap F	14.07	15.12	15.11	17.87	17.56	17.83	17.83	17.83
Clusters	446	446	446	446	446	446	446	446
Mean Dep. Var.	0.04	0.04	0.04	0.04	0.04	0.04	0.00	0.00

Note: The dataset is a cross-section. The dependent variable counts the number of days a household member went an entire day and night without eating because there was not enough food in the previous seven days. Columns (1)–(6) report the outcome in levels, while Columns (7) and (8) use its standardized counterpart. Fishing hours are instrumented using the standardized instrument in all specifications except Column (6), which uses the instrument in levels. Column (1) includes LSMS-wave fixed effects; Column (2) year fixed effects; Column (3) year and rural-status fixed effects; and Column (4) year and month fixed effects. Column (5) includes rural-status, month, and year fixed effects but omits the control for nearby piracy. Column (6) adds the nearby-piracy control to the same fixed-effect specification and uses the instrument in levels rather than in standardized units. Column (7) retains the preferred specification and standardizes only the dependent variable, while Column (8) standardizes both the dependent variable and fishing hours. Except in Column (5), all specifications control for the number of piracy incidents within 500 km of the coast. FE notation is LSMS wave (w), rural status (r), year (y), and month (m). Standard errors are clustered at the interview-location level. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

B.6 Longer-Run Consequences: Mortality, Fertility, and Household Composition

Table B33: The Effect of Piracy in Somalia on Total Mortality in Tanzania

	(1) Events	(2) Fem	(3) Male	(4) Tot ≤ 1	(5) Tot (1-15]	(6) Tot (15-64]	(7) Tot > 64
sd Z	0.0360*	0.0219*	0.0142	0.0225	0.0038*	0.0054	0.0043
	(0.0189)	(0.0118)	(0.0134)	(0.0150)	(0.0022)	(0.0086)	(0.0046)
Piracy ($\leq$ 500 km)	-0.0006	-0.0004	-0.0002	0.0068***	-0.0014	-0.0042*	-0.0017
	(0.0045)	(0.0035)	(0.0022)	(0.0026)	(0.0009)	(0.0022)	(0.0013)
Obs.	2,190	2,190	2,190	2,190	2,190	2,190	2,190
FEs	i, m, w	i, m, w	i, m, w	i, m, w	i, m, w	i, m, w	i, m, w
F	1.91	1.71	0.59	5.04	1.94	2.05	1.12
R^2	0.52	0.51	0.51	0.52	0.51	0.51	0.52
Clusters	350	350	350	350	350	350	350
Mean Dep. Var.	0.078	0.040	0.038	0.053	0.003	0.012	0.009

Note: In the specification, the dataset is a panel at the househol-interview date level. The variable "sd Z" is the instrument standardized, while, the variable "Piracy ($\leq$ 500 km)" counts the number of piracy incidents within 500km from the coast. The outcome is measured over the previous 2 years. FE notation is LSMS wave (w), household(i) and month (m). Standard errors are clustered at the interview location level. *, **, *** denote statistical significance at the 10%, 5%, 1% level respectively.

Table B34: Robustness: The Effect of Piracy in Somalia on Mortality (dummy) in Tanzania

Dep. Var.	(dummy)			Fem			(1-15]		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
sd Z	0.0242*	0.0249*	0.0276*	0.0176*	0.0180*	0.0189*	0.0014	0.0019	0.0029
	(0.0135)	(0.0138)	(0.0147)	(0.0097)	(0.0100)	(0.0104)	(0.0014)	(0.0017)	(0.0019)
Piracy ($\leq$ 500 km)	0.0031***	0.0013	0.0035***	0.0019**	0.0007	0.0025**	0.0003	-0.0012*	0.0003
	(0.0010)	(0.0034)	(0.0013)	(0.0008)	(0.0029)	(0.0011)	(0.0002)	(0.0007)	(0.0002)
Obs.	2,190	2,190	2,190	2,190	2,190	2,190	2,190	2,190	2,190
FEs	i	i, w	i, m	i	i, w	i, m	i	i, w	i, m
F	5.18	1.82	3.88	3.33	1.74	2.72	1.15	1.51	1.28
R^2	0.51	0.51	0.52	0.51	0.51	0.52	0.50	0.50	0.50
Clusters	350	350	350	350	350	350	350	350	350
Mean Dep. Var.	0.069	0.069	0.069	0.037	0.037	0.037	0.003	0.003	0.003

Note: In the specification, the dataset is a panel at the househol-interview date level. The variable "sd Z" is the instrument standardized, while, the variable "Piracy ($\leq$ 500 km)" counts the number of piracy incidents within 500km from the coast. The outcome is measured over the previous 2 years. FE notation is LSMS wave (w), household(i) and month (m). Standard errors are clustered at the interview location level. *, **, *** denote statistical significance at the 10%, 5%, 1% level respectively.

Table B35: Robustness: The Effect of Piracy in Somalia on Mortality (dummy) in Tanzania

Dep. Var.	(dummy)		Fem		(1-15]		sd (dummy)	sd Fem	sd (1-15]
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Z	0.0017*		0.0012*		0.0002*				
	(0.0009)		(0.0006)		(0.0001)				
sd Z		0.0294*		0.0203*		0.0035	0.1152*	0.1066*	0.0690*
		(0.0152)		(0.0109)		(0.0022)	(0.0599)	(0.0577)	(0.0407)
Piracy ($\leq$ 500 km)	-0.0003		-0.0006		-0.0014		-0.0010	-0.0032	-0.0262
	(0.0037)		(0.0032)		(0.0009)		(0.0143)	(0.0168)	(0.0160)
Obs.	2,190	2,190	2,190	2,190	2,190	2,190	2,190	2,190	2,190
FEs	i, m, w	i, m, w	i, m, w	i, m, w	i, m, w	i, m, w	i, m, w	i, m, w	i, m, w
F	1.93	3.76	1.71	3.45	1.94	2.70	1.93	1.71	1.94
R^2	0.52	0.52	0.52	0.52	0.51	0.51	0.52	0.52	0.51
Clusters	350	350	350	350	350	350	350	350	350
Mean Dep. Var.	0.069	0.069	0.037	0.037	0.003	0.003	-0.004	-0.006	0.004

Note: In the specification, the dataset is a panel at the househol-interview date level. The variable "sd Z" is the instrument standardized, while, the variable "Piracy ($\leq$ 500 km)" counts the number of piracy incidents within 500km from the coast. The outcome is measured over the previous 2 years. FE notation is LSMS wave (w), household(i) and month (m). Standard errors are clustered at the interview location level. *, **, *** denote statistical significance at the 10%, 5%, 1% level respectively.

Table B36: Including Urban Dar es Salaam: The Effect of Piracy in Somalia on Mortality in Tanzania

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	(dummy)	Fem	Male	$\leq$ 1	(1-15]	(15-64]	$>$ 64
sd Z	0.0117	0.0133*	-0.0013	0.0056	0.0020*	0.0026	0.0004
	(0.0099)	(0.0068)	(0.0086)	(0.0098)	(0.0012)	(0.0032)	(0.0020)
Piracy ($\leq$ 500 km)	0.0009	0.0001	0.0003	0.0041**	-0.0009*	-0.0023*	-0.0008
	(0.0026)	(0.0022)	(0.0016)	(0.0018)	(0.0006)	(0.0014)	(0.0009)
Obs.	3,336	3,336	3,336	3,336	3,336	3,336	3,336
FEs	i, m, w	i, m, w	i, m, w	i, m, w	i, m, w	i, m, w	i, m, w
F	0.83	1.89	0.03	2.83	2.10	1.51	0.34
R^2	0.51	0.51	0.50	0.50	0.50	0.51	0.51
Clusters	621	621	621	621	621	621	621
Mean Dep. Var.	0.072	0.039	0.037	0.052	0.003	0.011	0.007

Note: In the specification, the dataset is a panel at the househol-interview date level. The variable "sd Z" is the instrument standardized, while, the variable "Piracy ($\leq$ 500 km)" counts the number of piracy incidents within 500km from the coast. The outcome is measured over the previous 2 years. FE notation is LSMS wave (w), household(i) and month (m). Standard errors are clustered at the interview location level. *, **, *** denote statistical significance at the 10%, 5%, 1% level respectively.

Table B37: The Effect of Piracy in Somalia on Household Composition in Tanzania

	(1) Mean Age	(2) Median Age	(3) HH Size	(4) Number of Consumers	(5) Number of Infants	(6) Adult-Equiv. HH Size	(7) Individuals 15–64	(8) Females 15–64	(9) Males 15–64
sd Z	-0.1716	0.2344	-0.2619	-0.3009**	0.0389	-0.2032*	-0.1405	-0.0994	-0.0411
	(0.5390)	(0.7065)	(0.1614)	(0.1482)	(0.0302)	(0.1130)	(0.0922)	(0.0606)	(0.0553)
Piracy (≤ 500 km)	0.1583**	0.0726	-0.0163	-0.0058	-0.0106	0.0001	0.0137	0.0063	0.0075
	(0.0790)	(0.0973)	(0.0414)	(0.0412)	(0.0070)	(0.0321)	(0.0288)	(0.0144)	(0.0172)
Obs.	2,190	2,190	2,190	2,190	2,190	2,190	2,190	2,190	2,190
FEs	i, m, w	i, m, w	i, m, w	i, m, w	i, m, w	i, m, w	i, m, w	i, m, w	i, m, w
F	2.02	0.37	1.56	2.19	1.77	1.66	1.21	1.37	0.33
R^2	0.88	0.86	0.76	0.75	0.57	0.76	0.75	0.73	0.76
Clusters	350	350	350	350	350	350	350	350	350
Mean Dep. Var.	27.389	24.174	5.582	5.289	0.294	4.105	3.043	1.605	1.437

Note: In the specification, the dataset is a panel at the househol-interview date level. The variable "sd Z" is the instrument standardized, while, the variable "Piracy (≤ 500 km)" counts the number of piracy incidents within 500km from the coast. The outcome is measured over the previous 2 years. FE notation is LSMS wave (w), household(i) and month (m). Standard errors are clustered at the interview location level. *, **, *** denote statistical significance at the 10%, 5%, 1% level respectively.

Table B38: Robustness: The Effect of Piracy in Somalia on Fertility Choice in Tanzania

Dep. Var.	Pregnancy (dummy)					sd Pregnancy (dummy)
	(1)	(2)	(3)	(4)	(5)	(6)
sd Z	0.0583	0.0619*	0.0609*		0.0652*	0.1390*
	(0.0355)	(0.0348)	(0.0353)		(0.0352)	(0.0731)
Piracy (≤ 500 km)	0.0017	-0.0085	0.0023	-0.0094		-0.0197
	(0.0018)	(0.0057)	(0.0021)	(0.0069)		(0.0143)
Z				0.0039*		
				(0.0020)		
Obs.	2,190	2,190	2,190	2,190	2,190	2,190
FEs	i	i, w	i, m	i, m, w	i, m, w	i, m, w
F	1.48	2.46	1.76	2.45	3.44	2.45
R^2	0.58	0.58	0.58	0.59	0.58	0.59
Clusters	350	350	350	350	350	350
Mean Dep. Var.	0.310	0.310	0.310	0.310	0.310	-0.108

Note: In the specification, the dataset is a panel at the househol-interview date level. The variable "sd Z" is the instrument standardized, while, the variable "Piracy (≤ 500 km)" counts the number of piracy incidents within 500km from the coast. The outcome is measured over the previous 2 years. FE notation is LSMS wave (w), household(i) and month (m). Standard errors are clustered at the interview location level. *, **, *** denote statistical significance at the 10%, 5%, 1% level respectively.

Table B39: Including Urban Dar es Salaam: The Effect of Piracy in Somalia on Fertility Choice in Tanzania

	(1) Pregnancy (dummy)	(2) Tot Pregnancy	(3) Number of Fem [15-49]
sd Z	0.0437*	0.0388	-0.0355
	(0.0236)	(0.0251)	(0.0481)
Piracy ($\leq$ 500 km)	-0.0083*	-0.0094	0.0041
	(0.0050)	(0.0057)	(0.0145)
Obs.	3,336	3,336	3,336
FEs	i, m, w	i, m, w	i, m, w
F	2.93	2.39	0.29
R^2	0.58	0.60	0.72
Clusters	621	621	621
Mean Dep. Var.	0.296	0.311	1.435

Note: In the specification, the dataset is a panel at the househol-interview date level. The variable "sd Z" is the instrument standardized, while, the variable "Piracy ($\leq$ 500 km)" counts the number of piracy incidents within 500km from the coast. The outcome is measured over the previous 2 years. FE notation is LSMS wave (w), household(i) and month (m). Standard errors are clustered at the interview location level. *, **, *** denote statistical significance at the 10%, 5%, 1% level respectively.

Table B40: The Effect of Piracy in Somalia on Fishermen and Fishing Ability in Tanzania

	(1) Fisherman in HH	(2) Total Fishermen	(3) Able to Fish in HH	(4) Total Able to Fish	(5) Any Fisherman Death	(6) Number of Fisherman Deaths
sd Z	-0.0054	-0.0008	-0.0089	-0.0156	-0.0046	-0.0046
	(0.0096)	(0.0196)	(0.0124)	(0.0286)	(0.0039)	(0.0039)
Piracy ($\leq$ 500 km)	-0.0003	-0.0036	-0.0007	0.0027	0.0012	0.0012
	(0.0018)	(0.0068)	(0.0016)	(0.0026)	(0.0008)	(0.0008)
Obs.	2,190	2,190	2,190	2,190	2,190	2,190
FEs	i, m, w	i, m, w	i, m, w	i, m, w	i, m, w	i, m, w
F	0.19	0.14	0.52	0.56	1.10	1.10
R^2	0.76	0.76	0.90	0.88	0.51	0.51
Clusters	350	350	350	350	350	350
Mean Dep. Var.	0.070	0.099	0.106	0.167	0.004	0.004

Note: The dataset is a cross-section. The dependent variables capture whether the household includes fishermen, whether members are able to fish, and fisherman mortality. The variable *sd Z* is the standardized instrument, while Piracy ($\leq$ 500 km) counts the number of piracy incidents within 500 km from the the interview-location in the previous 60 days. FE notation is interview location (i), month (m), and LSMS wave (w). Standard errors are clustered at the interview-location level. *, **, *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.