# Pay Thy Fisher; Beggar Thy Neighbor? China's Fishing Subsidies in the 21st Century

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**Abstract**

Countries facing over-exploitation of domestic waters may find it politically and economically advantageous to offer subsidies as a way of "decongesting" their domestic fisheries. Fuel subsidies, the most significant form of fisheries subsidies, may play such a role if they induce distant water fishing. We characterize the conditions under which fuel subsidies are decongesting, and then estimate their empirical effects using a triple-difference design exploiting a change in Chinese subsidy policy. We show that China's fuel subsidy *increased* fishing in its domestic waters, by suppressing a 1.24% elasticity of domestic fishing with respect to the oil price. Meanwhile, it *decreased* distant water fishing. Consistent with our model, we find that the total number of fishing trips increased but their distance from port of departure decreased. We also show that non-Chinese vessels in spatial competition with China decreased their fishing in response to China's subsidies. However, we show that the evolution of China's subsidy policy away from fuel subsidies and towards spatially specific subsidies *did* promote domestic decongestion: Had China not changed it subsidy policy, vessels in our sample would have fished 39% more in the Chinese EEZ and 33% less outside of it. The change reduced total fishing on net, implying a trade-off between the environmental and global distributional consequences of disciplining fisheries subsidies.

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# 1 Introduction

Policies in the national interest need not be in the international interest. When faced with a localized negative externality, governments can attempt to alter production so that the externality falls disproportionately on other localities. We study these beggar-thy-neighbor policies in the global fishing industry. Countries around the world provide large subsidies for the extraction of common-pool resources, including fisheries. In order to continue catching fish without exacerbating overfishing in domestic waters, individual countries may choose to subsidize "distant water" fishing outside of their Exclusive Economic Zone (EEZ). Although coastal countries have jurisdiction over marine resources within their EEZ, all countries have the freedom to fish in waters beyond that limit (the high seas). Approximately 12% of the catch and 15% of the value of marine fisheries comes from the high seas, which contains many fish stocks that straddle the borders of EEZs (Sumaila et al., 2015).

We study how China has used strategic subsidies to decongest domestic waters while promoting distant water fishing. Our core empirical exercise studies the effects of China's fuel subsidy policy that existed from 2006 to 2015. Many academics, policymakers, and stakeholders believe that fuel subsidies, the most significant form of fishing subsidy, are a major contributor to distant water fishing (Skerritt et al., 2023). We present a simple theoretical model that shows that the spatial effects of fuel subsidies are ambiguous: fuel subsidies may encourage vessels to take a few more long trips or many more short trips, depending on which fishing strategy is relatively more fuel intensive. However, if a government can condition its subsidies on the location of fishing, then it can achieve its decongestion motives more effectively.

First, we present quasi-experimental evidence of the effect of fuel subsidies on the behavior of subsidized fishing vessels, and estimate spill-overs onto their spatial competitors. We exploit a 2016 change in Chinese subsidy policy to identify the effect of Chinese subsidies on the behavior of both Chinese and non-Chinese fishing vessels. Before 2016, China's fuel subsidies for fishing were tied to vessels' fuel consumption and designed to depress fluctuations in fuel prices above a (low) price threshold. After 2016, China greatly reduced its subsidies and completely decoupled them from actual fuel consumption or fuel prices. In effect, the post 2016 subsidy regime created a level shift in fishing effort, whereas the pre 2016 subsidy changed the elasticity of fishing with respect to the fuel price. This policy change motivates a triple-difference design that compares the fuel price elasticity of Chinese and unexposed non-Chinese vessels before and after 2016. We use rich vessel-level data on fishing location, duration, and travel distance, combined with weekly global oil prices, to construct a vessel-week panel and estimate changes in the elasticity of fishing duration and travel distances with respect to the global fuel price.

We estimate that fuel subsidies increase the aggregate fishing effort, but also shift the fishing effort toward *domestic* waters. Specifically, we find that China's pre-2016 subsidy policy suppressed a fuel price elasticity for total fishing hours of 0.89%. This is a combination of suppressing a 1.24% elasticity for domestic fishing and adding a -0.57% elasticity for distant water fishing. In fact, we find that the subsidy increased the number and duration of domestic fishing trips while reducing distant water trips and the distance of fishing from port of departure. These results contradict the common view that fuel subsidies primarily increase distant water fishing but are reconcilable with our theoretical model, which shows that the response of the location of fishing to fuel subsidies depends on the fuel intensity of fishing relative to travel and the gradient of productivity with respect to distance.

We replicate this strategy on non-Chinese vessels that target the same ocean regions as the Chinese fleet, dubbing these vessels "China-Exposed." For these vessels, our triple-differences design identifies the indirect effect of fuel subsidies through the change in Chinese competition. We find that non-Chinese vessels exposed to China had *larger* oil price elasticities in the pre-period, indicating that the increased Chinese fishing effort led to a partially offsetting decrease in non-Chinese fishing effort. Specifically, we find that the fuel subsidy increased the elasticity of China-Exposed fishing with respect to the fuel price by .56%, driven by equivalent reductions in domestic and distant water fishing. We further establish that China's fuel subsidy had dynamic effects on non-Chinese vessels, as past oil prices have a significant negative effect on the fishing duration of China-exposed vessels, consistent with stock depletion. However, the dynamic effects are significantly smaller than the contemporaneous crowding effects.

Our results suggest that China's pre-2016 policy did *not* achieve the goal of decongesting domestic waters. However, that result helps rationalize the change in Chinese subsidy policy. After 2016, China targeted its subsidies specifically at distant water fishing, a policy made possible due to the advent of vessel positioning data. We calculate that if China had not changed it's subsidy policy, vessels in our sample would have spent 39% more hours fishing in Chinese waters and 33% less hours distant water fishing. Therefore we interpret the change in Chinese subsidy policy as an effective decongestion strategy, with significant spillovers on neighboring countries.

This paper builds on an existing multidisciplinary literature studying fisheries subsidies. Prior theoretical work has identified strategic rationales for offering subsidies: Ruseski (1998) and Quinn and Ruseski (2001) demonstrate how effort expanding subsidies can work as entry deterrents in international fisheries. Several papers have examined the theoretical consequences of various subsidies, such as employment and output subsidies Jinji (2012), vessel buy-back programs (Clark et al., 2005, 2007), and generic effort subsidies (Sumaila et al., 2008). Bayramoglu et al. (2018) models the international political economy of fisheries subsidies and finds that these subsidies are uniquely difficult to discipline by international agreement because they do not impose the same negative terms-of-trade effects as a typical production subsidy.

There exists relatively little credible empirical evidence on the effects of fisheries subsidies. Nearly all existing empirical papers in this literature tackle this question by comparing fisheries outcomes to lagged subsidies (Sakai et al., 2019), an approach subject to various concerns about omitted variables bias. For example, Chai et al. (2021) find catch declines following increases in China's subsidies, but cannot distinguish between lower effort or lower stock as the driving mechanism. Kroodsma et al. (2018) include an estimate of the elasticity of fishing hours with respect to fuel costs, but do not isolate changes in fuel costs from contemporaneous changes in aggregate demand conditions. Wang et al. (2023) study the effect of Chinese fuel subsidies and buyback programs on entry and exit from the domestic fishery. As in our paper, they exploits 2016 changes in China's fuel subsidy policy for identification, but do not examine the policy's effects on fishing behavior.

The most closely related paper to ours is that of Englander et al. (2023), who use discontinuities in the post-2016 Chinese subsidy policy to estimate the effect of fishing subsidies on aggregate fishing effort and travel. Our paper builds on this work and provides several additional contributions: first, we evaluate the effect of China's earlier, more substantial fuel subsidy, which affected the fuel price elasticity of fishing behavior rather than adding a level shift in the incentive to fish, and we leverage high-frequency temporal variation in the aggregate size of the subsidy based on global fluctuations in world oil prices. As a result our identification comes from changes in the fuel subsidy faced within vessel, rather that differences in subsidy rates across vessels that partially reflect endogenous policy decisions. Second, our triple-differences design uses non-Chinese vessels to form a counterfactual, giving us a much larger sample of vessels and more precise estimates as well as the ability to sweep out changes in aggregate demand that may otherwise confound empirical estimates. Third, we study a wider range of outcomes, in particular studying the spatial distortions in the global pattern of fishing activity that fuel subsidies may induce. Since the post-2016 subsidy only applied to distant water vessels, only our strategy can characterize the effect of fuel subsidies on the choice between domestic and distant water fishing. Finally, the time variation in the subsidy we study allows us to identify the effects of Chinese fuel subsidies on non-Chinese vessels, which is essential for characterizing the aggregate effects of subsidies in common pool resources.

We also contribute to wider literatures on adversarial environmental policy (e.g. Lipscomb and Mobarak (2017); Coria et al. (2021); Li (2025)), global commons regulation (e.g.

Stavins (2011); Noack and Costello (2022); Barrett (2024)), and Chinese industrial policy (e.g. Kalouptsidi (2018); Wang and Yang (2021); Barwick et al. (2024); Gortmaker (2025)). Finally, we contribute some empirical evidence that is relevant to active negotiations over fisheries subsidies at the World Trade Organization. The current agreement on fisheries subsidies does not prohibit fuel subsidies, but there are concerted efforts to include fuel subsidies in a follow-on agreement currently under discussion (see, for example, the proposals in Cisneros-Montemayor et al. (2022); Sumaila et al. (2024)). Our estimates inform whether fuel subsidies drive WTO prohibited outcomes or fishing on the high seas (no) and whether reducing fuel subsidies can reduce fishing overall (yes).

The remainder of the paper proceeds as follows. Section 2 presents our theoretical model of fuel subsidies. Section 3 presents a short background and history of China's fisheries subsidies with an emphasis on the policy design that generates our empirical strategy. Section 4 describes our data and Section 5 describes our empirical strategy. Section 7 presents and discusses our results. Section 7 considers the counterfactual scenario if China had not changed in fuel subsidy in 2016. Section 8 concludes.

# 2 Theory

While existing research and policy has assumed fuel subsidies are particularly egregious drivers of distant-water fishing activity, the effects of fuel subsidies on fishing location decisions are theoretically ambiguous. Here we present a simple model to illustrate that ambiguity. The key mechanism is that both travel and fishing have time and fuel costs. Since vessels must decide how to spend their operating time, a fuel subsidy will encourage them to pursue fishing trips where the relatively more fuel intensive factor is a larger share of time.

Specifically, suppose a vessel decides how far ($l$) and how much ($e$) to fish based on productivity ($p(l)$), effort costs $c(e, s)$, travel costs ($f(l, s)$) and subsidies ($s$). The vessel faces a time budget $T$ and time costs for travel and fishing effort of $\tau l$ and $h$, respectively.

That is, the vessel solves

$$\max_{e,l} \quad p(l)e - c(e,s) - f(l,s)e \quad \text{s.t.} \quad (\tau l + h)e = T \tag{1}$$

Which gives the optimal fishing distance:

$$l^* = \frac{p(l^*) - f(l^*, s) - c_e(e(l^*), s)}{f_l(l^*, s) - p_l(l^*)} \tag{2}$$

The effect of subsidies on the optimal fishing decision then depends on the productivity gradient $p_l(l)$:

$$\frac{\partial l^*}{\partial s} = \frac{-(f_l - p_l)(f_s - c_{es}) - (p(l) - f(l,s) - c_e)f_{ls}}{(f_l - p_l)^2} \tag{3}$$

If $p_l(l) > 0$, so marginal product is increasing in distance, then $\frac{\partial l^*}{\partial s}$ is ambiguous, and fuel subsidies could increase or decrease the distance of fishing from shore. While nearshore fisheries are more productive overall, the marginal product of fishing effort further from shore may be higher if, for example, nearshore fisheries are relatively more exploited or congested.

The main mechanism driving this result is the possibility that vessels spend longer fishing as a share of a trip when they fish further away from shore. In the appendix, Figure 3 shows that weekly fishing hours increase with average fishing distance from post.[1]

# 3 Background

Massive industrial subsides have been a feature of the global fishing industry since at least the early 2000s. Despite declining fish stocks and catch in recent years, even in the presence of expanded fishing area and effort, many countries still offer substantial subsidies to their fishing fleets (Tickler et al., 2018; Sumaila et al., 2010). Sumaila et al. (2019) estimates that

[1] One potential alternate explanation is that vessels face a binding capacity constraint, and so cannot increase fishing time in response to productivity. In this case, the same forces would operate but fishing time would respond negatively to productivity. This would cause the sign of the productivity effect to flip, but would leave the underlying ambiguity of the effects of fuel subsidies. However, we believe the best available evidence suggests capacity constraints do not typically bind Abe and Anderson (2022).

a total of 22.2 billion USD in capacity-enhancing subsidies were provided worldwide in 2018 alone, despite the theorized inefficiency of capacity-enhancing subsidies in even well managed fisheries (Clark et al., 2005; Sumaila et al., 2008; Martini and Innes, 2018; Skerritt et al., 2020). Figure 1 shows a breakdown of all fisheries subsidies provided in 2018. Fuel subsidies are the single largest form of subsidy offered globally (amounting to over 7.5 billion USD in 2018), and are believed to be a major driver of distant water fishing. Globally, subsidies make up 54% of revenues for the high seas (Sumaila et al., 2019; Sala et al., 2018). Fishing subsidies are generally offered by high-income countries, yet they are thought to deplete global commons to the detriment of fishermen in low-income countries (Schuhbauer et al., 2017, 2020). In fact, there is a strong positive correlation between subsidies offered and fishing outside of a country's Exclusize Economic Zone (EEZ) Skerritt and Sumaila (2021); Skerritt et al. (2023). The international community is concerned about the effects of these subsidies, and has made their removal a Sustainable Development Goal and the subject of a recent WTO agreement (Cisneros-Montemayor et al., 2022).

China is by far the largest provider of harmful fishing subsidies and has the largest distant water fishing fleet. Figure 2 shows total fuel subsidies in 2018 by country: China is responsible for almost half of all fuel subsidies at approximately 3.5 billion dollars (Sumaila et al., 2019). Meanwhile, China's distant water fishing fleet is well known for overfishing at the expense of the coastal fishermen of less developed countries (Mallory, 2013; Skerritt and Sumaila, 2021). This motivates our focus on China's historic fuel subsidies.

Since the 1980s the Chinese government has promoted the expansion of its distant water fishing fleet, largely due to the over-exploitation of its domestic fisheries. When it became clear that China's domestic fisheries were highly depleted, and later when the UN Convention on the Law of the Sea entered into force, Chinese authorities realized that the only hope on preserving employment in the fisheries sector was promoting the distant water industry (Mallory, 2016). A congressional report concluded: "Overfishing and depleted coastal fish stocks appear to have led the Chinese fishing industry to develop its DWF and to operate in more distant waters" (Vaughn and Dolven, 2022). The support for distant water fishing is not primarily motivated by food security: China has a massive aquaculture industry to meet domestic needs, and exports around half of its wild caught fish. Instead, China's motivation for growing its distant water fishing industry is generally understood to be increasing employment and exerting geopolitical influence (Mallory, 2013).

We identify "decongestion" as a theoretically distinct motivation for offering a fuel subsidy in particular. While we are the first to do so formally, the intuition has been grasped by observers of Chinese policy and is consistent with the fact that China's expansion of distant water fishing originated in response to depleted local fisheries. He (2015) writes of Chinese fisheries reforms in the 1980s that "the other outlet that Chinese policy-makers envisaged to reduce fishery resource pressure was to move fishing capacity progressively from near-sea to offshore and even open sea waters." Yu and Wang (2021) analyzes Chinese distant water fisheries policy documents to chart the evolution in priorities from 1985 to the present: it states "the development of distant water fisheries is conducive to alleviating the contradiction between the limited regeneration capacity of domestic traditional fishery resources and the excessive increase in fishing capacity." These statements make clear that the distant water fishing industry is valuable not only as a source of employment or geopolitical strength, but also as a means of diverting fishing effort away from overexploited domestic stocks, consistent with our theory.

Fisheries subsidies have been crucial to China's development as a distant water fishing nation. In its early history, China expanded its fishing footprint primarily by making fisheries access agreements with other developing countries to allow its fleet to target their resources (He, 2015). By 2000, however, China had built a significant industrial fishing fleet that now targeted many regions and the high seas, supported by subsidies for vessel construction and modernization (Yu and Wang, 2021). From 2000-2011 China's distant water fishing fleet was already the largest in the world, with around 3400 vessels by the end of that period. Its largest catch footprint was off the coast of Africa, but it catches large quantities of fish in Asia, Oceania, Central and South America, and Antarctica (Pauly et al., 2014). The 12th Five Year Plan for National Fisheries Development (2011-2015) sought to continue the trend, by extending DWF while restricting insure capture (He, 2015). Only in 2016 did Chinese fisheries policy change tenor, with a stated goal of promoting conservation even of distant water fisheries while continuing to emphasize vessel modernization (Yu and Wang, 2021). While this coincided with changes to subsidy structure, it also involved devolution of subsidies to the regional level and an end to transparent subsidy reporting (Mallory et al., 2021a). China's distant water fishing fleet continues to be the largest of any nation, and it is also the largest high seas fishing fleet (Carmine et al., 2020). In nearly every FAO region of the high seas, Chinese vessels have the most detected fishing hours in our data.

China has offered some kind of fuel subsidy to its fishing vessels since 2006. That year it offered diesel subsidies to motorized fishing vessels in Chinese domestic waters and the subsequent year it expanded its subsidies to the distant water fishing industry. This program was part of a wider package of fuel subsidies to many Chinese industries to help alleviate the pain of a change to national policy that allowed the price of refined oil in the Chinese market to rise (Mallory, 2013; Mallory et al., 2021b). Fuel also tends to be the costliest input for the fishing industry, and thus a natural candidate for effort expanding subsidies (Sumaila et al., 2008; Parker and Tyedmers, 2015). Finally, fuel subsidies change the relative cost of fishing further away from shore, and thus help promote distant water fishing over of nearshore, domestic fishing.

In 2009 the Chinese government announced its plan for the provision of fuel subsidies to the fishing industry which would extend through the 12th Five-Year Plan (2011-2015): All fishing vessels, domestic or distant water, were eligible for a fuel subsidy which kicked in when the price of oil reached CNY 4400/ton and when the price of diesel reached CNY 3870/ton. The subsidy was directly tied to fuel consumption and was designed to blunt changes in the price of fuel above the threshold (Greenpeace, 2016; Mallory et al., 2021b). Wei (2022) writes: "the subsidy was designed to kick in when oil prices were over a 2006 baseline, and then fluctuate in line with fuel prices." Theoretically, this kind of fuel policy should have operated on the elasticity of fishing with respect to the fuel price, rather than having a constant effect of fishing behaviors. This is the era of fuel subsidies which we evaluate in our paper, exploiting the change in form after 2015.

In 2016, Chinese policy changed substantially. Following concerns that the fuel subsidy had grown too large and incentivized too much fishing capacity, the 13th Five-Year Plan committed to reducing domestic fuel subsidies to 40% of their 2014 level by 2019. These subsidies would no longer be tied to the amount of fuel consumed and would not change the market price of fuel. Domestic subsidies were also largely devolved to the local level. Fuel subsidies to the distant water fishing industry were also separated from fuel consumption and the fuel price, reduced over time, and absorbed into other general subsidy programs (Mallory et al., 2021b). The new subsidy for distant water vessels gave a fixed payout for every vessel hour spent fishing, calculated based on gear-type specific subsidy parameters. Such subsidy targeting became possible due to the dissemination of the Vessel Monitoring System (VMS), which China could now use to give subsidies based on where a vessel fishes.[2] In effect, the Chinese policy changed from attempting to cap the price of fuel faced by its fishing vessels to a flat subsidy for fishing effort (which varied between the distant water fishery and various regions). We will exploit this change in the Chinese subsidy structure to identify the effects of the fuel subsidy on Chinese fishing behavior.

[2]China most recently updated its subsidy policy in 2021, completely eliminating domestic fuel subsidies and adding several "stewardship" conditions to its distant water effort subsidies, such as reporting more data through VMS (Wei, 2022). Observers have pointed out that the continuation of some kind of fuel subsidy for the distant water fleet is part of a strategy "where the country's government continues to present distant water fishing as a methods for conserving its domestic waters" (Godfrey, 2022). It is increasingly difficult to observe the full picture of China's current fisheries subsidies due to highly opaque data and policy reporting (Mallory et al., 2021b), but all evidence points to continued subsidization of the distant water fishery with decongestion as a plausible motivation. The widespread adoption of VMS now allows for location-contingent subsidies that replace fuel subsidies.

# 4 Data

Our primary dataset comes from Global Fishing Watch (GFW), a non-profit technology partnership dedicated to transparency and ocean governance. GFW collects data from vessels' Automatic Identification System (AIS), a navigational tool carried by nearly all industrial fishing vessels, and applies machine learning tools to identify fishing activity and port visits from the vessel position data transmitted over AIS. It also collects vessel information directly from AIS, such as flag state, and creates additional variables based on machine learning classification, such as gear type (Kroodsma et al., 2018). GFW data has high coverage of industrial fishing vessels, particularly on the high seas, as AIS is an important navigational device (Carmine et al., 2020). This data represents the most comprehensive picture of the global fishing industry that is identifiable at the vessel level, although recent evidence suggests a sizable portion of fishing effort may still be undetected by AIS (Sala et al., 2018; Paolo et al., 2024).

We compile a sample of 25,820,952 fishing events and 22,796,695 port events from 2014 to 2019, which we collapse to a vessel-week panel. We match this panel to weekly Brent oil price data obtained from Global Petrol Prices. Global Fishing Watch data has covered an increasing number of vessels over time. In order to maintain a constant composition of vessels in our estimation sample, we keep only observations for vessels that were active from 2014–2019. The resulting dataset has 7,032,543 observations on 23,982 unique fishing vessels (14.9% of the entire sample) over 312 weeks. This data is based on 11,301,114 fishing events (43.8% of the raw data). For 2015 vessels, the GFW data does not record flag state. In those cases, if a vessel exclusively fishes and visits port in a single EEZ, we assign it the flag of that EEZ. We classify 1538 vessels in this way and classify the remainder as having an unknown flag (counted at non-Chinese in our regression analysis). Figure 4 shows the spatial distribution of the fishing events included in our panel. In the appendix, figure 6 shows the distribution of vessels in our sample by flag state and gear type.

We construct several outcomes from the GFW data. We collapse fishing hours to the weekly level based on the start time of detected fishing events. We separately code fishing events as domestic or distant-water fishing based on the region of the fishing event and the flag state of the vessel. We measure time at port similarly based on port event data. Since we occasionally detect that the same vessel has simultaneous fishing and port events, we construct a two measures of port hours: a maximum, if all port events are included, and a minimum if we subtract the time with conflicting events. We construct fishing duration based only on those fishing events which do not occur during port events. We also construct two variables representing travel distances. First, we measure distance traveled as the sum of the geodesic distance between all detected vessel activities in a week. Second, we measure the weighted average distance of fishing from vessels' port of departure by assigning each fishing event to the preceding port event, calculating the geodesic distance, and then taking the average across all fishing events in a week, weighted by their duration. These give us two different notions of the distance a vessel travels to fish.

Chinese vessels account for 10601 (44.2%) of the vessels in our sample. While Chinese fishing effort was the largest of any country at 60% of all fishing hours in the raw data, the average Chinese vessel spent less time fishing than the average non-Chinese vessel. Appendix Figure 7 shows average fishing hours, domestic and distant water, before and after 2016, for each grouping of vessels in our analysis. Our analysis requires further differentiating between non-Chinese vessels who are exposed to Chinese fishing and those that are unexposed. We define this at the vessel level based on the location of fishing events. Specifically, we divide the ocean into 36 by 36 grid cell regions. In each region we calculate the Chinese share of fishing hours in our raw data.[3] Then for each vessel, we find the average Chinese share of hours for the regions we detect them fishing in, weighted by the duration of fishing, during the pre-2016 period. Finally, we categorize vessels as "Exposed" to Chinese fishing if their exposure variable is greater than 1%. While this is an economically low threshold, it is close to the 66th percentile of the continuous exposure variable for non-Chinese vessels and results

[3]Figures **??**, **??**, and **??** map the total fishing hours, Chinese fishing hours, and Chinese share of hours by grid cell, respectively.

in a sample of 3063 (12.8%) of China-Exposed vessels and 10318 (43%) unexposed vessels. Figure 5 plots the time series of the Brent oil price and average fishing effort by Chinese, China-Exposed and Unexposed vessels. Table 1 shows the summary statistics for Chinese, China-Exposed and Unexposed vessels.

# 5 Empirical Strategy

## 5.1 Triple-Differences Design

Our core design estimates the effect of China's pre-2016 fuel subsidy policy, which blunted fuel price increases for Chinese vessels, on the fishing behavior of Chinese and China-Exposed vessels. Theoretically, this policy should have reduced the Chinese elasticity of fishing with respect to the fuel price. While China continued to subsidize effort after 2016, the subsidy structure was no longer tied to the fuel price and therefore should not directly affect the fuel price elasticity. Put differently, while China's new policy was still intended to increase fishing effort, it should only have created a level shift in effort. In the pre-period, the policy was designed to dull the effect of fuel price increases and therefore should have affected the elasticity of fishing with respect to the fuel price.

Since the Chinese fuel price was above the threshold for the subsidy during the entire period of our data, we use a triple-differences design comparing the fuel price responsiveness of treated and untreated vessels, before and after the policy change in 2016. In this case we have two notions of treatment: Chinese vessels are directly treated, in that they are covered by the fuel subsidy policy, and therefore should have had a blunted elasticity of fishing with respect to the fuel price. Meanwhile, China-Exposed non-Chinese vessels are treated indirectly, as they are not covered by the subsidy policy but are affected by the change in Chinese fishing behavior. For both groups, we use the Unexposed non-Chinese vessels to form our counterfactual for the evolution of the elasticity of fishing with respect to the fuel price, before and after 2016.

We include vessel fixed effects in order to absorb differences in fishing activity due to vessel-level characteristics such as gear type, engine power, or tonnage. We also include time fixed effects (at the week level) to eliminate the effect of seasonal or idiosyncratic global shocks to fishing effort. As a result of including vessel fixed effects the "China" indicator variable becomes collinear and drops out. We also include week fixed effects, to remove temporal shocks that affect the entire fishing industry such as seasonality in fish availability or demand, and Lunar New Year and Chinese Moratorium -times-China fixed effects to account for patterns in Chinese fishing activity.[4] As a result of the fixed effects, several terms in our regression drop out. We use several outcomes, described below. Finally, we estimate a Poisson regression, in order to avoid the problem of using a log (or log-like) transformation on many of our outcomes that include zeros. Chen and Roth (2024) showed that log-like transformations including zeros cannot be interpreted as elasticities, but Poisson regressions can preserve the elasticity interpretation even in the presence of zeros. Our estimating equation is the following:

$$\begin{aligned} Log(E[Y_{it}|\text{Regressors}]) =& \beta_1[Log(\text{Oil Price}_t) \times \text{Treated}_i \times \text{Pre-2016}_t] \\ &+ \beta_2[Log(\text{Oil Price}_t) \times \text{Treated}_i] + \beta_3[\text{Treated}_i \times \text{Pre-2016}_t] \\ &+ \text{Vessel FE} + \text{Week FE} + \text{Moratorium-by-Treatment FE} + \varepsilon_{it} \end{aligned} \tag{4}$$

The coefficient of interest in our regression is $\beta_1$, which represents how the pre-2016 policy suppressed the relationship between fuel prices and the outcome variable for Chinese vessels. Specifically, $e^{\beta_1 - 1}$ represents the "suppressed elasticity" our regression is intended to estimate. The identifying assumption behind this design is that the responsiveness of the outcome variable to the fuel price would have evolved in parallel for Chinese and non-Chinese vessels from before 2016 to after 2016 if not for the change in fuel subsidy policy, conditional

[4]Chinese fishing activity drops dramatically during the Lunar New Year and during summer moratoria imposed on Chinese fisheries (Kroodsma, 2021)

on fixed effects. While the relationship between fuel prices and fishing effort might by itself not identify the effect of fuel costs, as it is confounded by global macroeconomic conditions and seasonal events which could also affect the demand for fish, our design leverages both the change in the Chinese subsidy policy and the counterfactual provided by Unexposed non-Chinese vessels to eliminate these confounds.

We examine several outcomes. Our most immediate outcome of interest is fishing time, but we also separately estimate the extensive margin using an indicator variable for whether a vessel fishes at all in a given week as the outcome of interest. We also repeat these estimates for fishing in domestic waters (inside the EEZ of the vessel's flag) and distant waters (outside the EEZ of the vessel's flag). In addition to fishing time outcomes, we also use total hours spent at port and the number of port entries and exits as outcomes to explore port and trip behavior. Finally, we include several distance measures: total geodesic distance traveled between all detected events in a week, the average geodesic distance of fishing events from the port of departure, and the average ocean distance (straightest line path) of fishing events from the port of departure.

In general, we expect our fishing outcomes should respond negatively to increases in the fuel price in the absence of the fuel subsidy, once controlling for macroeconomic conditions. If the fuel subsidy is suppressing these responses for Chinese vessels before 2016, we would expect to see a positive coefficient for $\beta_1$ when estimated for Chinese vessels. Similarly, we would expect higher prices to lead to less travel, so the coefficient for $\beta_1$ should be positive if the subsidy is suppressing this response for Chinese vessels. For China-Exposed vessels, we would expect a negative coefficient for $\beta_1$ on fishing hours outcomes, as we would anticipate that more competition from Chinese subsidy-induced fishing should weakly crowd out non-Chinese fishing. This argument is more ambiguous for travel distance outcomes. China-Exposed vessels may subsitute away from areas targeted by Chinese vessels, but this could be towards their domestic EEZs, reducing travel distances, or towards other, marginally less desirable areas which could be further away. Therefore the prediction for $\beta_1$ on travel distances by China-Exposed vessels is ambiguous.

If vessels spend less time fishing and traveling when fuel prices are high, we would expect hours spent at port to increase commensurately. This would lead us to expect a negative coefficient for $\beta_1$ for Chinese vessels. However, this prediction is more ambiguous, as vessels could potentially spend more time in transit if they travel slower, and the average distance of fishing could respond positively or negatively since vessels may change both where they fish and how many trips they take in respond to fuel prices. For China-Exposed vessels, we might expect more Chinese competition should induce less fishing and thus more time at port, and therefore expect a positive coefficient for $\beta_1$, but this too is subject to some uncertainty.

In Appendix B, we repeat this analysis on various subsets of vessels. First, we run this analysis on vessels that we have ever observed fishing outside their domestic EEZ. We do this to eliminate vessels that are are not capable of distant water fishing, which otherwise would attenuate the magnitude of our estimated coefficient. Second, we run this analysis omitting vessels which we never observe changing their fishing routes. Specifically, we identify whether a vessel always fishes in the same region and always lands at port within the same EEZ, and we drop those vessels. We do this to eliminate vessels which may be incapable of behavioral responses to input costs as well as to explore heterogeneity by vessel types. We also repeat our analysis on the complements of these two subsets: exclusively domestic fishing vessels, and fixed route fishing vessels. These results let us dig deeper into how our results differ across different vessel types.

In Appendix C we explore the robustness of our results to several other constructions of the oil price shock. Since in practice the Chinese fuel subsidy is paid out based on the average price of fuel throughout the year, past oil prices and expectations of future oil prices could enter a sophisticated vessel's subsidy expectations. Therefore, we repeat our analysis using several alternate measures of oil prices. First, we compute the average oil price year-to-date, and use that as a regressor instead of the contemporaneous price. This design recognizes that the fuel subsidy policy as carried out by the Chinese government not only blunts changes in the contemporaneous oil price, but also leads to higher expected subsidy payouts when past oil prices were higher within a calendar year. Therefore, we calculate the average price from the start of the year until period $t$, and use that in place of the contemporaneous oil price. Second, we compute the expected average oil price over the calendar year. This design recognizes the fact that the final fuel subsidy for the year will be based on the average price over the whole year, so a maximally sophisticated vessel would be basing its strategy over its expectation of that. In practice, we take the average of past prices in the calendar year and futures prices for contracts delivering later in the calendar year to form vessel's expectations of future prices. Figure 9 shows the time series of these various measures. Finally, we repeat our analysis of the Chinese vessel response using the residuals from an AR1 regression of log oil prices on past oil prices. This design is meant to capture totally unexpected fluctuations in the oil price in order to further eliminate any confounding due to serial correlation in the oil price or correlated macroeconomic conditions.

## 5.2 Dynamic Effects

Because the most significant externality involved in fishing is the externality imposed on other fishing vessels through the depletion of a common stock, detecting dynamic effects is highly important for understanding the general equilibrium effects of fuel subsidies. However, our empirical design has some limits on what dynamic effects we can consider. Specifically, the design of the Chinese subsidy introduces serial correlation in the size of the subsidy for Chinese vessels. Since the fuel subsidy is paid out at the end of the year based on the average price of fuel throughout the year, past oil prices and expectations of future oil prices should enter sophisticated vessels' subsidy expectations. Therefore we cannot cleanly decompose past subsidies and present subsidies for Chinese vessels when our identification is based on high frequency variation in oil prices. However, we do consider the effects of this subsidy structure in Appendix C, as described above.

While the subsidy structure does not allow us to consider the effect of past subsidies on present Chinese fishing, we can detect dynamic effects on the China-Exposed, non-Chinese fleet. Under the post period subsidy regime, when Chinese subsidies do not vary with the price of fuel, increases in the fuel price should, on the margin, discourage all vessels from fishing. This in turn should reduce fishing pressure and relatively increase the stock of fish available for target later in the year. Therefore, we expect past oil price increases to increase current fishing conditional on current oil prices. Under the pre-2016 subsidy regime, however, Chinese vessels should not have reduced their fishing effort as significantly in response to fuel price increases (as our results in Section 7 show). In that case, the non-Chinese vessels exposed to Chinese fishing should not increase their current fishing as much in response to higher past oil prices.

We implement two designs the study the dynamic effects of China's fuel subsidy on non-Chinese fishing. First, we repeat our triple-difference design with an alternate measure of oil prices. Rather than use only the contemporaneous oil price, we use the average oil price over a window of several weeks. Rather than interact the lagged average with an indicator for the pre period, we calculate the lagged average *subsidized* oil price as the average of the oil price in each lag period interacted with an indicator for whether that oil price was subject to the subsidy. That is, we define the following variables:

$$\overline{\text{Log Oil Price}}_{t,t-X} \equiv \frac{1}{X} \sum_{\tau=t-X}^{t} (\text{Log Oil Price}_\tau) \tag{5}$$

$$\overline{\text{Subsidized Log Oil Price}}_{t,t-X} \equiv \frac{1}{X} \sum_{\tau=t-X}^{t} (\text{Log Oil Price}_\tau \times \text{Pre-2016}_\tau) \tag{6}$$

Where $X$ represents the number of weeks lag. We run this design for X = 12, 16, 20, and 24 weeks. We also explore alternate transformations of the lagged oil prices, specifically the minimum, median, and maximum. Using these variables, we repeat our triple difference design substituting in these measures for the contemporaneous log oil price and the interaction of the log oil price and the pre period, respectively. Our resulting coefficient of interest is the interaction between Exposed and $\overline{\text{Subsidized Log Oil Price}}$.

In our second dynamic design, we repeat our simple triple difference but introduce X lag periods, each with its own triple difference coefficient. Once again we use X = 8, 12, 16, 20, and 24 weeks. We do this to test for the contribution of each individual lag period to the overall effect picked up by our first dynamic design, in order to rule out that the effect is driven entirely by the most recent periods and should instead by understood as a purely contemporaneous effect. In both designs our counterfactual is once again the unexposed, non-Chinese fleet. In both designs we could additionally control for the year-to-date average fuel price or the expected annual average fuel price, to ensure we are not picking up the contemporaneous effect of past oil prices due to current Chinese subsidy-induced fishing, but these are co-linear with the week fixed effects and are therefore unnecessary.

# 6 Results

## 6.1 Chinese Response to Subsidy

Table 2 shows the triple-differences coefficient in our regressions using total fishing hours—total, domestic, and distant water—as outcomes for Chinese vessels. For clarity of interpretation, it also includes a line showing the implied effect of a 1% increase in the fuel price as a percentage of the pre-2016 Chinese mean, which we interpret as the "suppressed elasticity." Column (1) of table 2 shows that in the suppressed a 0.89% elasticity of fishing with respect to the oil price overall. This implied elasticity is close in magnitude to existing estimates of the elasticity of fishing with respect to fuel prices (Kroodsma et al., 2018; Englander et al., 2023). However, this was the combination of two effects: Column (2) shows that the subsidy suppressed an elasticity of 1.24% for fishing in the domestic EEZ, whereas column (3) shows the subsidy *increased* the elasticity of distant water fishing by an additional 0.57%. We are unaware of other estimates that separately identify this elasticity by fishing location, and we therefore view this finding as a novel result about the spatially heterogeneous impacts of domestic fuel subsidies. Consistent with our model, we find that the fuel subsidy increased domestic fishing while decreasing distant water fishing.

Table 3 shows the triple-differences coefficient using an indicator for any fishing as an outcome for Chinese vessels. This represents the extensive margin. Column (1) shows that the policy suppressed an oil price elasticity of 0.24% of any fishing in a week in. Column (2) shows that this effect is driven by domestic fishing, as the policy suppressed a 0.31% elasticity of any fishing in domestic waters. Meanwhile column (3) shows the subsidy amplified the elasticity of fishing in distant waters by 0.29%.

Taking stock of our results on fishing duration, a few patterns emerge. Our regressions on the full sample clearly show that domestic fishing increases due to the fuel subsidy, while distant water fishing decreases. In Appendix B we break these results down by vessel subsets, and find that this pattern of results in composed of two different stories: Domestic-only vessels significantly increase their (domestic) fishing activity, whereas distant water fishing vessels substitute their fishing from distant waters to the domestic EEZ. These results can be seen in Tables 29 and 26, respectively.

Table 4 shows the triple-differences coefficient in our regressions using port hours measures as outcomes for Chinese vessels. Column one shows the subsidy suppressed a 0.13% elasticity of port hours with respect to the oil price. Due to the way port hours are measured in our data, this likely reflects time spent at port unloading catch or refueling, rather than true idle time. Columns (2) and (3) show suppressed elasticities of 0.28% for the number of port entries and exits. All together these results suggest vessels take slightly more trips due to the subsidy. This aligns with the prediction that fuel subsidies could induce a greater number of domestic trips rather than inducing (a smaller number of) distant water trips. We find the same pattern of results for domestic-only and distant water vessels in Tables 30 and 27, respectively.

Table 5 shows the triple-differences coefficient in our regressions using travel distance measures as outcomes for Chinese vessels. Column (1) shows the subsidy suppressed an elasticity of 0.195% for total travel distance in response to oil prices. Meanwhile, columns (2) and (3) show that the subsidy increased the elasticity of the average distance of fishing from port by 0.6% for the geodesic distance and 0.21% for the shortest ocean path distance. This suggests the subsidy induced vessels to travel more in total, but to do so by taking more shorter trips rather than longer trips. Therefore the robust finding is that vessels on average fish closer to their home ports in response to the subsidy. This is consistent with the fishing duration results that show an increase in domestic fishing activity and a decrease in distant water fishing. Splitting the results by vessel subset shows a more complex pattern: Table 31 shows domestic-only vessels increased their total travel distance, and may have reduced the average distance of fishing from port. Meanwhile table 31 shows distant water vessels reduced total travel distance along with their distance of fishing from port.

In Appendix B, table 26 shows the coefficients in our regressions with fishing hours as an outcome for the subset of Chinese vessels we detect ever fishing outside of their domestic waters (Distant Water Fishing vessels). Tables 27 and 28 show the coefficient of interest in our regressions using port hours and travel measures as outcomes for those Chinese DWF vessels, respectively. Tables 29, 30 and 31, repeat these outcomes for vessels which only ever fish the domestic EEZ. Breaking the results down by subset shows that our overall effects are really driven by two different sets of effects: For domestic-only vessels, the subsidy simply increased total fishing (in domestic waters by definition), with small and often statistically insignificant effects on the number of trips and on travel outcomes. Meanwhile, for vessels capable of distant water fishing, the subsidy led to a significant reduction in distant water activity and a substitution towards domestic waters, with a corresponding significant change in port and travel behavior. Table 32 shows the triple-differences coefficient and implied elasticity in our regressions with fishing hours as an outcome, for the subset of Chinese vessels we observe making flexible trips.[5] Tables 33 and 28 does the same for regressions using port hours and travel measures as outcomes for those Chinese flexible trip vessels.

[5]We define "flexible trip vessels" as those which do not always fish with the same EEZ of departure-fishing ground-EEZ of landing tuple.

Tables 35, 36 and 37, repeat these outcomes for vessels which only ever fish the domestic EEZ. For all subsets, the counterfactual is formed by the equivalent subset of Unexposed, non-Chinese vessels.

In Appendix C, we repeat our regressions using alternate oil price measures. Table 53 shows the coefficients in our regressions with fishing hours as an outcome and year-to-date average oil prices as a regressor. Tables 54 and 55 show the coefficients in our regressions with port hours and travel measures outcomes and year-to-date average oil prices as a regressor. Tables 56, 57, and 58 show the coefficients in our regressions with fishing hours, port hours, and travel distances (respectively) as outcomes and expected annual average oil prices as a regressor. Finally, Tables 59, 60, and 61 show the coefficients in our regressions with fishing hours, port hours, and travel distances (respectively) as outcomes when the residual of an AR1 regression is the regressor.

Altogether, our results present a cohesive picture that China's fuel subsidy policy altered fishing behavior by increasing domestic fishing effort while decreasing distant water fishing effort. The net effect was to reduce the average distance of fishing from port of departure while increasing total fishing effort, measured in both hours and number of fishing trips. This is consistent with the predictions of our model in Section 2 with an upward sloping productivity gradient with respect to distance, suggesting the marginal unit of fishing effort is more productive in more distant fisheries. This could be the result of greater historic extraction and congestion in nearshore Chinese fisheries.

## 6.2 Non-Chinese Response to Subsidy

Table 6 shows the triple-differences coefficient in our regressions using total fishing hours—total, domestic, and distant water—as outcomes for China-Exposed vessels. It also includes the implied effect of a 1% increase in the fuel price as a percentage of the pre-2016 mean. Column (1) of shows that in the absence of the policy, China-Exposed vessels would have increased total weekly fishing by .56% in response to a 1% increase in the fuel price. This suggests the subsidy policy reduced the fishing activity of non-subsidized vessels, presumably by inducing higher competition. Columns (2) and (3) show that these effects are similar for domestic and distant water fishing. Table 7 shows the extensive margin triple-differences coefficient for China-Exposed vessels. Columns (1) and (2) show statistically significant effects of the subsidy policy on whether China-Exposed vessels do any fishing or any domestic fishing, but Column (3) shows statistically insignificant effects for any distant water fishing.

Table 8 shows the triple-differences coefficient in our regressions using port hours measures as outcomes for China-Exposed vessels. All three columns show statistically insignificant effects, although columns (2) and (3) do show a negative relationship between the subsidy and the number of trips taken.

Table 9 shows the triple-differences coefficient in our regressions using travel distance measures as outcomes for China-Exposed vessels. Column (1) shows that China Exposed vessels had a -.16% greater response of total travel to oil prices during the subsidy, although only statistically significant at the 10% level. Columns (2) and (3) show statistically significant reductions in the average distance of fishing from port in response to the subsidy.

In Appendix B, table 38 shows the coefficients in our regressions with fishing hours as an outcome for the subset of China-Exposed vessels we detect ever fishing outside of their domestic waters (Distant Water Fishing vessels). Tables 39 and 40 show the coefficients of interest in our regressions using port hours and travel measures as outcomes for those China-Exposed DWF vessels. Tables 41, 42, and 43 show these results for exclusively domestic fishing vessels. Table 44 shows the triple-differences coefficient and implied elasticity in our regressions with fishing hours as an outcome, for the subset of China-Exposed vessels we observe making flexible trips. Tables 45 and 46 do the same for regressions using port hours and travel measures as outcomes for those China-Exposed flexible trip vessels. Tables 47, 48, and 49 show these results for China-Exposed, fixed-trip fishing vessels. For all subsets, the counterfactual is formed by the equivalent subset of Unexposed, non-Chinese vessels.

In Appendix B, we also repeat our triple difference design categorizing non-Chinese vessels that fish FAO region 61 (China's home region) as "treated". This is a slightly different notion of exposure to China that perhaps better captures exposure to the fuel subsidy specifically, given the subsidy increased fishing in China's EEZ. Table 50 shows that vessels from FAO 61 significantly reduced their *domestic* fishing hours in response to the subsidy, with no change to distant water activity. This was accompanied by a marginally significant decrease in the number of port visits, with no effect on travel distances or port hours.

Taken together our results show that the Chinese subsidy had a contemporaneous effect on China-Exposed non-Chinese vessels, making them slightly less likely to fish overall, and therefore have slightly less travel and a lower average distance from port.

### 6.2.1 Dynamic Effects

Table 17 shows the coefficients of interest for the regression specification using the lagged average subsidized oil price over the last 16 weeks as a regressor and fishing as outcomes. Columns (1) and (3) show statistically significant negative effects on total and distant water fishing hours, respectively. Like Table 6, we detect the effect of fishing subsidies on unsubsidized vessels. However this lagged design is meant to also capture the stock externality imposed on unsubsidized vessels by past subsidy-induced fishing. The effects are smaller relative to the contemporaneous effects from Table 6: a 1% increase in the average past subsidized oil price decreases fishing hours by .16%, domestic fishin hours by .14% and distant water fishing hours by .13%.

Since the 16 week benchmark is arbitrary, we repeat this exercise for 8, 12, 20, and 24 weeks. In the appendix, Tables 11, 14, 20 and 23 show the results for those regressions, respectively. Figure 8 plots the triple difference coefficient for each of these specifications. They all show statistically significant negative effects for fishing hours, although the effect sizes shrink slightly as the lag periods get longer, as expected.

In the appendix, Tables **??**, 15, 18, 21, 24 show the results for the specification using the lagged average subsidized oil price over the last 8, 12, 16, 20 and 24 months as regressors and port hours as outcomes. Tables ??, 16, 16, 16 and 16 show the results for the specification using the lagged average subsidized oil price over the last 8, 12, 16, 20, and 24 weeks as regressors and travel distances as outcomes. These generally show statistically insignificant effects, with the exception of port hours, which is usually positive, and average geodesic distance from port, which is usually negative.

# 7 Counterfactual

In this section, we consider the counterfactual if China had not changed its fuel subsidy structure in 2016. Primarily, we use our estimates for the suppressed elasticity from Section , and calculate the counterfactual fishing hours that would be predicted under the realized 2016-2019 fuel prices.

We use our prior results to compute the aggregate change in domestic and distant water fishing hours by Chinese vessels in our sample, under the counterfactual where China had not changed its subsidy policy. To compute the counterfactual fishing hours in each category, we first find the total response to oil prices by adding the number of domestic vessels times the domestic vessel triple difference coefficient (adjusted for the Poisson model) for that category from Table 29 plus the number of distant water vessels times the distant water vessel triple difference coefficient (adjusted for the Poisson model) for that category from Table 26. Since the Poisson model adjustment requires a baseline oil price to compute changes from, we use the lowest observed oil price in our sample. Finally, we multiply the weekly oil price response by the weekly oil price for every week 2016-2019.

We estimate that, had the policy not changed, Chinese vessels in our sample would have spent 3,125,985 more hours fishing in domestic waters and 486,615 fewer hours distant water fishing. In our data, these vessels spent 7,979,109 hours fishing in domestic waters and 1,474,545 hours distant water fishing. Therefore our estimates imply the change in subsidy policy reduced domestic fishing by 28.1% and increased distant water fishing by 49.2%, relative to the counterfactual with no change.

We interpret these findings as evidence that the change in Chinese policy aligns with the decongestion motive we have identified in this paper. The two subsidy regimes studied in this paper correspond closely to the subsidy strategies explored in our theoretical model in Section 2. Prior to the 13th Five Year plan, it was not technologically feasible for China to use a location-contingent subsidy strategy. Therefore, they adopted an input subsidy strategy, which we show did not accomplish decongestion goals. In 2016, however, the proliferation of the Vessel Monitoring System among the distant water fleet allowed China to monitor fishing locations and implement the location contingent approach. This change shifted significant fishing activity outside of China's EEZ, but imposed a greater environmental externality on other countries.[6] Notably, the shift in strategy on net reduced total fishing effort by Chinese vessels. This suggests that the decongestion strategy may reduce total extraction from the world's fisheries, at the cost of increasing extraction from globally shared fisheries. This implies an important trade-off for global subsidies agreements.

# 8 Conclusion

In this paper we have presented new estimates of the effects of Chinese fuel subsidies on Chinese fishing effort, as well as novel estimates of the effects of Chinese subsidies on non-Chinese fishing. Our results suggest that China's fuel subsidies had a significant effect on the amount and location of Chinese fishing, in particular increasing the amount and duration of domestic fishing trips, but also had a significant crowding out effect on non-Chinese fishing in regions targeted by both Chinese and non-Chinese vessels. We are the first to estimate the crowd-out response of unsubsidized vessels to a fisheries subsidy. These results demonstrate that the effects of subsidies for the extraction of global commons are not limited to the subsidizing country. On net, China's fuel subsidies increased total extraction from the world's fisheries, albeit by less than would be assumed from simply projecting the Chinese

[6] We have not yet estimated the response by non-Chinese vessels, but intend to do so in the future.

effects without accounting for the partially offsetting non-Chinese response. We also show that the increase in extraction is almost entirely driven by the Chinese domestic fishing, contradicting the popular narrative about the spatial impact of fuel subsidies. Our model explains that this is the result of domestic fishing trips being relatively more travel intensive once considering the trade-off between quantity and length of trips. Both major results have implications for optimal domestic and international fisheries subsidy policy.

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# 9 Figures

Figure 1: Fishing Subsidies by Type

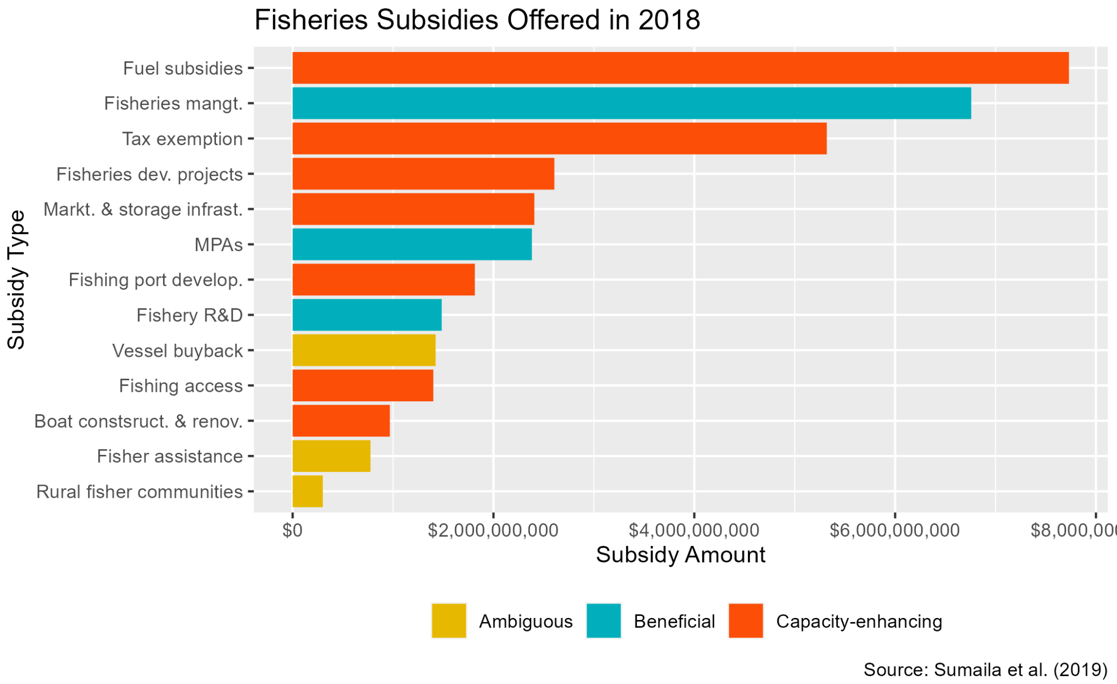



Figure 2: Fuel Subsidies by Country

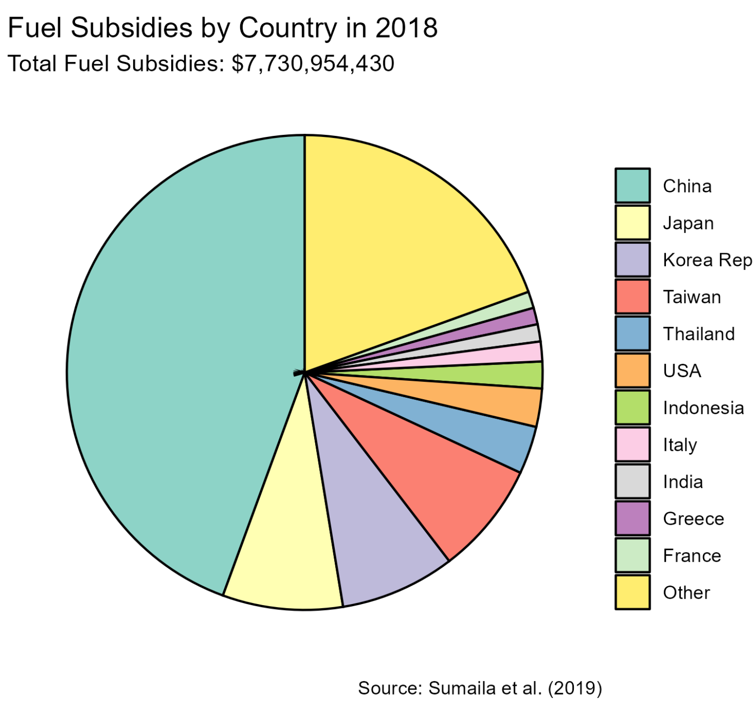


Figure 3: Fishing Time Vs Distance from Port Binscatter

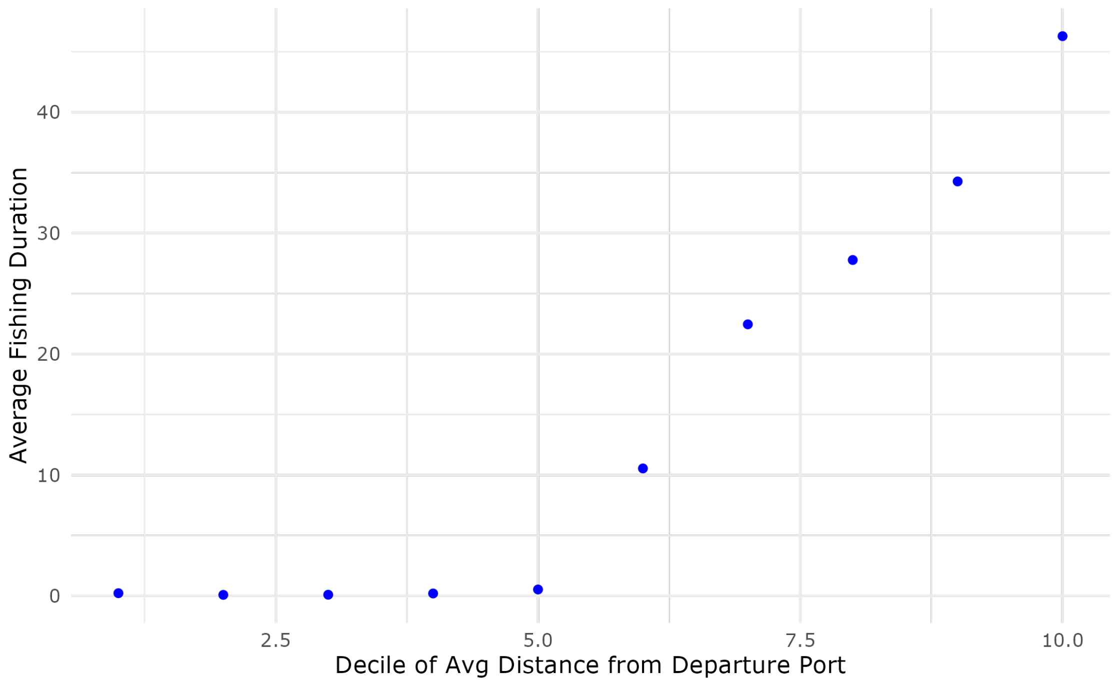



Figure 4: Fishing Events by Panel Vessels

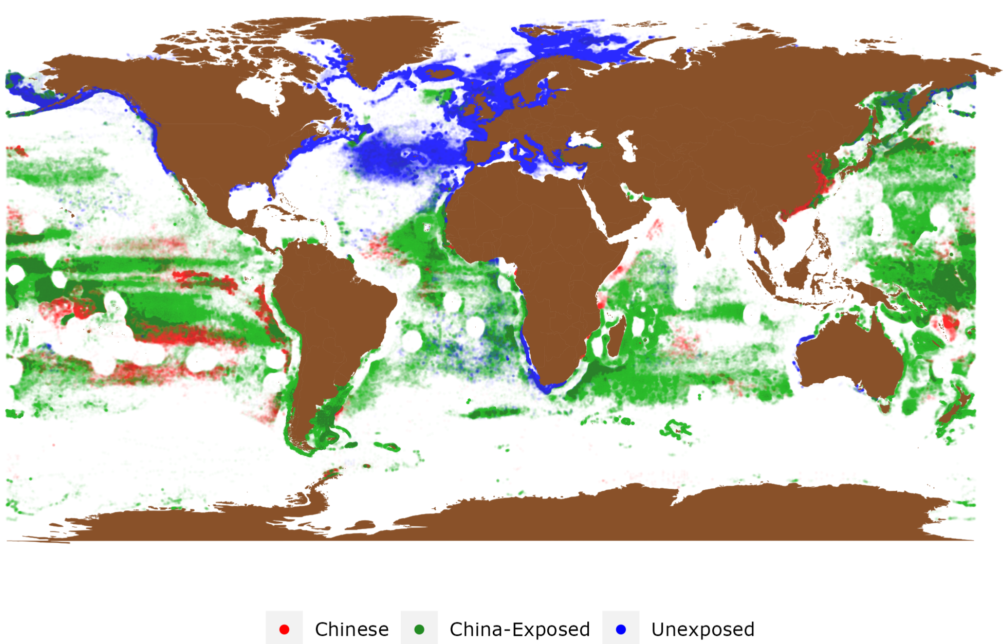


Figure 5: Fuel Price and Fishing Over Time

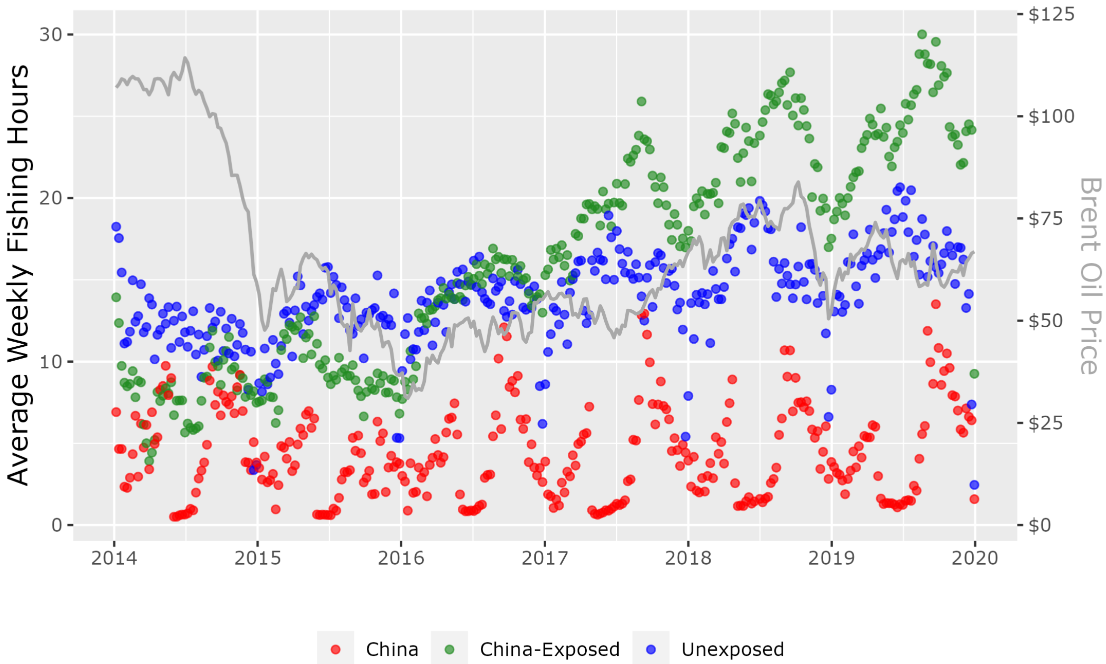



Figure 6: Sample Vessels

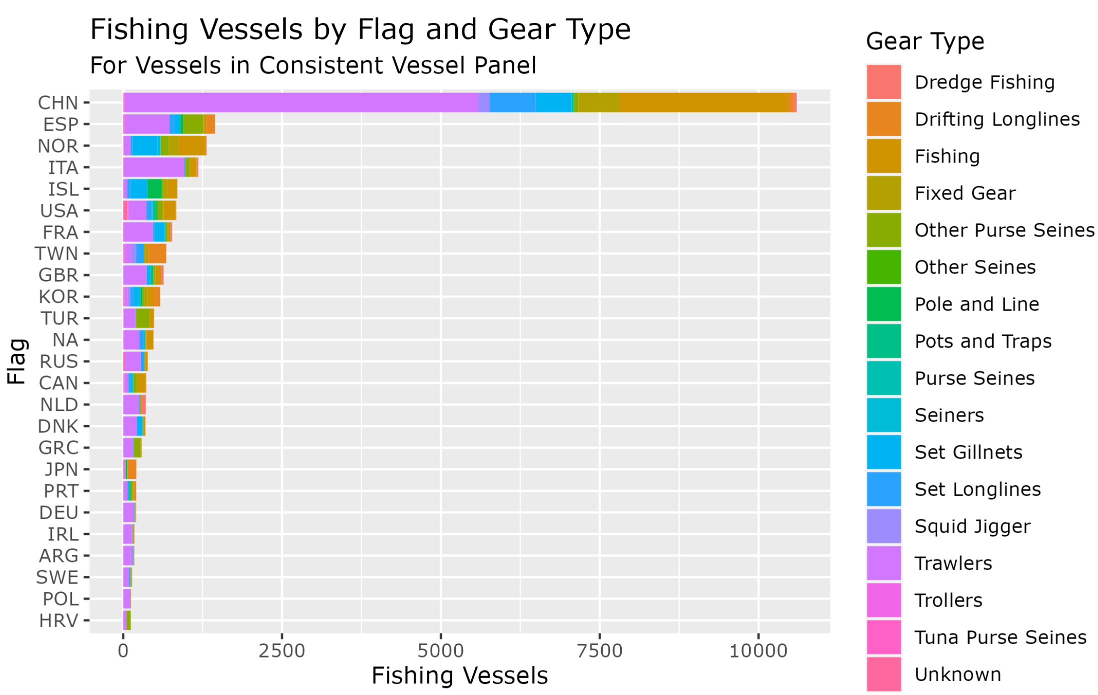
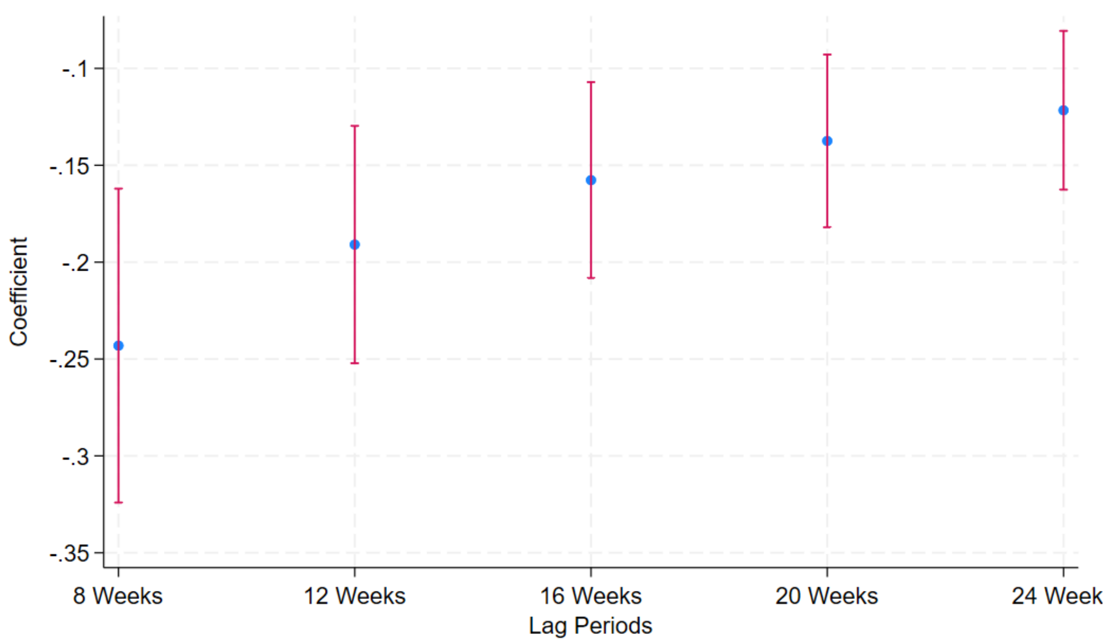


Figure 7: Average Vessel Effort


Figure 8: Fishing Hours Coefficient By Lag Period



# 10 Tables

Table 1: Summary Statistics

| | China | China-Exposed | Unexposed |
|---|---|---|---|
| N | 3,079,373 (43.4%) | 904,513 (12.7%) | 3,111,279 (43.9%) |
| Distant Water Vessel | | | |
| 0 | 2,445,463 (79.4%) | 260,454 (28.8%) | 1,685,876 (54.2%) |
| 1 | 633,910 (20.6%) | 644,059 (71.2%) | 1,425,403 (45.8%) |
| Fishing Hrs. | 4.37 | 16.47 | 13.91 |
| Fishing Hrs. (EEZ) | 3.81 | 6.55 | 10.99 |
| Fishing Hrs. (DWF) | 0.57 | 9.93 | 2.92 |
| Any Fishing | 0.20 | 0.40 | 0.45 |
| Any Fishing (EEZ)) | 0.18 | 0.18 | 0.39 |
| Any Fishing (DWF) | 0.02 | 0.22 | 0.08 |
| Port Hrs. | 82.03 | 55.26 | 90.25 |
| Port Entries | 0.46 | 0.43 | 1.18 |
| Port Exits | 0.41 | 0.39 | 1.08 |
| Travel Dist. (km) | 24.40 | 206.39 | 63.14 |
| Avg. Geo Dist. from Port (km) | 122.67 | 869.76 | 66.70 |
| Avg. Ocean Dist. from Port (km) | 394.11 | 1586.78 | 141.35 |

Table 2: Fishing Hours Regressions (Coefficients of Interest)

| | (1) Fishing hrs. (Any) | (2) Fishing hrs. (Home EEZ) | (3) Fishing hrs. (DWF) |
|---|---|---|---|
| China × Pre | -2.590*** | -3.211*** | 2.881*** |
| | (0.420) | (0.396) | (0.860) |
| China × Log Price | 0.090 | -0.008 | 0.605*** |
| | (0.088) | (0.089) | (0.132) |
| China × Log Price × Pre | 0.637*** | 0.806*** | -0.842*** |
| | (0.111) | (0.105) | (0.220) |
| Observations | 6187859 | 6055554 | 2059313 |
| Implied Elasticity | 0.891 | 1.238 | -0.569 |
| Vessel FE | Yes | Yes | Yes |
| Week FE | Yes | Yes | Yes |

Table 3: Fishing Extensive Margin Regressions (Coefficients of Interest)

| | (1) Any Fishing | (2) Any Fishing (Home EEZ) | (3) Any Fishing (DWF) |
|---|---|---|---|
| China × Pre | -0.953*** | -1.165*** | 1.133** |
| | (0.195) | (0.226) | (0.446) |
| China × Log Price | 0.321*** | 0.294*** | 0.474*** |
| | (0.038) | (0.045) | (0.095) |
| China × Log Price × Pre | 0.212*** | 0.268*** | -0.351*** |
| | (0.048) | (0.056) | (0.115) |
| Observations | 6187859 | 6055554 | 2059313 |
| $R^2$ | | | |
| Implied Elasticity | 0.236 | 0.308 | -0.296 |
| Vessel FE | Yes | Yes | Yes |
| Week FE | Yes | Yes | Yes |

Table 4: Port Duration Regressions (Coefficients of Interest)

| | (1) Port Hrs. | (2) Port Entries | (3) Port Exits |
|---|---|---|---|
| China × Pre | -0.609*** | -1.164*** | -1.138*** |
| | (0.088) | (0.396) | (0.364) |
| China × Log Price | 0.126*** | 0.404*** | 0.386*** |
| | (0.021) | (0.055) | (0.051) |
| China × Log Price × Pre | 0.124*** | 0.248*** | 0.244*** |
| | (0.022) | (0.095) | (0.087) |
| Observations | 6180907 | 6180907 | 6179756 |
| Implied Elasticity | 0.132 | 0.281 | 0.277 |
| Vessel FE | Yes | Yes | Yes |
| Week FE | Yes | Yes | Yes |

Table 5: Travel Distance Regressions (Coefficients of Interest)

| | (1)<br>Travel Dist. (km) | (2)<br>Avg. Geo Dist. (km) | (3)<br>Avg. Ocean Dist. (km) |
|---|---|---|---|
| China × Pre | -0.812*** | 3.485*** | 0.884*** |
| | (0.209) | (0.228) | (0.115) |
| China × Log Price | 0.268*** | 0.323*** | 0.205*** |
| | (0.044) | (0.044) | (0.025) |
| China × Log Price × Pre | 0.178*** | -0.920*** | -0.240*** |
| | (0.056) | (0.057) | (0.032) |
| Observations | 6187580 | 4392181 | 2044297 |
| Implied Elasticity | 0.195 | -0.602 | -0.213 |
| Vessel FE | Yes | Yes | Yes |
| Week FE | Yes | Yes | Yes |

Table 6: Fishing Regressions (Coefficients of Interest)

| | (1)<br>Fishing hrs. | (2)<br>Fishing hrs. (Home EEZ) | (3)<br>Fishing hrs. (DWF) |
|---|---|---|---|
| Exposed × Pre | 2.727*** | 2.836*** | 2.282** |
| | (0.481) | (0.658) | (1.069) |
| Exposed × Log Price | 0.601*** | 0.606*** | 0.534* |
| | (0.189) | (0.131) | (0.310) |
| Exposed × Log Price × Pre | -0.811*** | -0.826*** | -0.698** |
| | (0.131) | (0.189) | (0.283) |
| Observations | 4014107 | 3607583 | 2069462 |
| Implied Elasticity | -0.556 | -0.562 | -0.503 |
| Vessel FE | Yes | Yes | Yes |
| Week FE | Yes | Yes | Yes |

Table 7: Fishing Extensive Margin Regressions (Coefficients of Interest)

| | (1) Any Fishing | (2) Any Fishing (Home EEZ) | (3) Any Fishing (DWF) |
|---|---|---|---|
| Exposed × Pre | 1.115*** | 1.562*** | 0.652 |
| | (0.299) | (0.598) | (0.542) |
| Exposed × Log Price | 0.237*** | 0.318* | 0.164 |
| | (0.090) | (0.172) | (0.157) |
| Exposed × Log Price × Pre | -0.305*** | -0.422*** | -0.180 |
| | (0.077) | (0.147) | (0.145) |
| Observations | 4014107 | 3607583 | 2069462 |
| Implied Elasticity | -0.263 | -0.344 | -0.165 |
| Vessel FE | Yes | Yes | Yes |
| Week FE | Yes | Yes | Yes |

Table 8: Port Hours Regressions (Coefficients of Interest)

| | (1) Port Hrs. | (2) Port Entries | (3) Port Exits |
|---|---|---|---|
| Exposed × Pre | 0.029 | 0.823 | 0.827 |
| | (0.180) | (0.637) | (0.632) |
| Exposed × Log Price | -0.018 | 0.216 | 0.206 |
| | (0.038) | (0.148) | (0.149) |
| Exposed × Log Price × Pre | 0.002 | -0.200 | -0.201 |
| | (0.044) | (0.151) | (0.150) |
| Observations | 4009097 | 4009097 | 4006994 |
| Implied Elasticity | 0.002 | -0.181 | -0.182 |
| Vessel FE | Yes | Yes | Yes |
| Week FE | Yes | Yes | Yes |

Table 9: Distances Traveled Regressions (Coefficients of Interest)

| | (1)<br>Travel Dist. (km) | (2)<br>Avg. Geo Dist. (km) | (3)<br>Avg. Ocean Dist. (km) |
|---|---|---|---|
| Exposed × Pre | 0.658* | 2.652*** | 0.797*** |
| | (0.360) | (0.484) | (0.243) |
| Exposed × Log Price | 0.028 | -0.053 | -0.039 |
| | (0.101) | (0.078) | (0.052) |
| Exposed × Log Price × Pre | -0.177* | -0.672*** | -0.193*** |
| | (0.101) | (0.130) | (0.067) |
| Observations | 4014107 | 3151462 | 1772652 |
| Implied Elasticity | -0.163 | -0.490 | -0.176 |
| Vessel FE | Yes | Yes | Yes |
| Week FE | Yes | Yes | Yes |

Table 10: Fishing Hours on 16 Week Avg Subsidized Oil Prices (Coefficients of Interest)

| | (1)<br>Fishing hrs. | (2)<br>Fishing hrs. (Home EEZ) | (3)<br>Fishing hrs. (DWF) |
|---|---|---|---|
| Exposed × Pre | -0.004 | 0.030 | -0.069 |
| | (0.089) | (0.172) | (0.154) |
| Exposed × Lag Avg Price | 0.371** | 0.293** | 0.430* |
| | (0.162) | (0.123) | (0.233) |
| Exposed × Subs. Lag Avg Price | -0.158*** | -0.154*** | -0.136** |
| | (0.026) | (0.035) | (0.053) |
| Observations | 3880863 | 3481991 | 1990805 |
| Implied Elasticity | -0.146 | -0.143 | -0.127 |
| Vessel FE | Yes | Yes | Yes |
| Week FE | Yes | Yes | Yes |

# A Appendix: More Tables

Table 11: Fishing Hours on 8 Week Avg Subsidized Oil Prices

| | (1)<br>Fishing hrs. | (2)<br>Fishing hrs. (Home EEZ) | (3)<br>Fishing hrs. (DWF) |
|---|---|---|---|
| Exposed × Pre | 0.348** | 0.444** | 0.189 |
| | (0.136) | (0.223) | (0.197) |
| Exposed × Lag Avg Price | 0.347** | 0.304*** | 0.352 |
| | (0.165) | (0.113) | (0.244) |
| Exposed × Subs. Lag Avg Price | -0.243*** | -0.254*** | -0.200*** |
| | (0.041) | (0.052) | (0.072) |
| Observations | 3957000 | 3552589 | 2036011 |
| Implied Elasticity | -0.216 | -0.224 | -0.181 |
| Vessel FE | Yes | Yes | Yes |
| Week FE | Yes | Yes | Yes |

Table 12: Port Hours on 8 Week Avg Subsidized Oil Prices

| | (1)<br>Port Hrs. | (2)<br>Port Entries | (3)<br>Port Exits |
|---|---|---|---|
| Exposed × Pre | -0.082** | 0.059 | 0.074 |
| | (0.035) | (0.191) | (0.199) |
| Exposed × Lag Avg Price | -0.007 | 0.174 | 0.170 |
| | (0.027) | (0.124) | (0.124) |
| Exposed × Subs. Lag Avg Price | 0.028*** | -0.019 | -0.023 |
| | (0.011) | (0.050) | (0.052) |
| Observations | 3951731 | 3951427 | 3949642 |
| Implied Elasticity | 0.029 | -0.019 | -0.022 |
| Vessel FE | Yes | Yes | Yes |
| Week FE | Yes | Yes | Yes |

Table 13: Travel Distances on 8 Week Avg Subsidized Oil Prices

| | (1)<br>Travel Dist. (km) | (2)<br>Avg. Geo Dist. (km) | (3)<br>Avg. Ocean Dist. (km) |
|---|---|---|---|
| Exposed × Pre | 0.054 | 0.195*** | 0.044 |
| | (0.088) | (0.068) | (0.040) |
| Exposed × Lag Avg Price | -0.036 | -0.269*** | -0.096*** |
| | (0.071) | (0.079) | (0.035) |
| Exposed × Subs. Lag Avg Price | -0.032 | -0.074*** | -0.011 |
| | (0.026) | (0.026) | (0.011) |
| Observations | 3957000 | 3103357 | 1748050 |
| Implied Elasticity | -0.031 | -0.071 | -0.011 |
| Vessel FE | Yes | Yes | Yes |
| Week FE | Yes | Yes | Yes |

Table 14: Fishing Hours on 12 Week Avg Subsidized Oil Prices

| | (1)<br>Fishing hrs. | (2)<br>Fishing hrs. (Home EEZ) | (3)<br>Fishing hrs. (DWF) |
|---|---|---|---|
| Exposed × Pre | 0.131 | 0.195 | 0.021 |
| | (0.103) | (0.189) | (0.157) |
| Exposed × Lag Avg Price | 0.346** | 0.278** | 0.384 |
| | (0.163) | (0.119) | (0.235) |
| Exposed × Subs. Lag Avg Price | -0.191*** | -0.195*** | -0.159*** |
| | (0.031) | (0.041) | (0.059) |
| Observations | 3920789 | 3518958 | 2015056 |
| Implied Elasticity | -0.174 | -0.177 | -0.147 |
| Vessel FE | Yes | Yes | Yes |
| Week FE | Yes | Yes | Yes |

Table 15: Port Hours on 12 Week Avg Subsidized Oil Prices

| | (1) Port Hrs. | (2) Port Entries | (3) Port Exits |
|---|---|---|---|
| Exposed × Pre | -0.090*** | 0.054 | 0.051 |
| | (0.030) | (0.187) | (0.188) |
| Exposed × Lag Avg Price | 0.008 | 0.202 | 0.200 |
| | (0.028) | (0.123) | (0.123) |
| Exposed × Subs. Lag Avg Price | 0.030*** | -0.019 | -0.018 |
| | (0.009) | (0.048) | (0.049) |
| Observations | 3915540 | 3915240 | 3913469 |
| Implied Elasticity | 0.030 | -0.019 | -0.018 |
| Vessel FE | Yes | Yes | Yes |
| Week FE | Yes | Yes | Yes |

Table 16: Travel Distances on 12 Week Avg Subsidized Oil Prices

| | (1) Travel Dist. (km) | (2) Avg. Geo Dist. (km) | (3) Avg. Ocean Dist. (km) |
|---|---|---|---|
| Exposed × Pre | -0.004 | 0.127** | 0.036 |
| | (0.080) | (0.058) | (0.041) |
| Exposed × Lag Avg Price | -0.012 | -0.223*** | -0.074** |
| | (0.073) | (0.069) | (0.035) |
| Exposed × Subs. Lag Avg Price | -0.017 | -0.054** | -0.009 |
| | (0.022) | (0.022) | (0.010) |
| Observations | 3920789 | 3075006 | 1732387 |
| Implied Elasticity | -0.017 | -0.053 | -0.009 |
| Vessel FE | Yes | Yes | Yes |
| Week FE | Yes | Yes | Yes |

Table 17: Fishing Hours on 16 Week Avg Subsidized Oil Prices

| | (1)<br>Fishing hrs. | (2)<br>Fishing hrs. (Home EEZ) | (3)<br>Fishing hrs. (DWF) |
|---|---|---|---|
| Exposed × Pre | -0.004 | 0.030 | -0.069 |
| | (0.089) | (0.172) | (0.154) |
| Exposed × Lag Avg Price | 0.371** | 0.293** | 0.430* |
| | (0.162) | (0.123) | (0.233) |
| Exposed × Subs. Lag Avg Price | -0.158*** | -0.154*** | -0.136** |
| | (0.026) | (0.035) | (0.053) |
| Observations | 3880863 | 3481991 | 1990805 |
| Implied Elasticity | -0.146 | -0.143 | -0.127 |
| Vessel FE | Yes | Yes | Yes |
| Week FE | Yes | Yes | Yes |

Table 18: Port Hours on 16 Week Avg Subsidized Oil Prices

| | (1)<br>Port Hrs. | (2)<br>Port Entries | (3)<br>Port Exits |
|---|---|---|---|
| Exposed × Pre | -0.085*** | 0.063 | 0.056 |
| | (0.027) | (0.180) | (0.179) |
| Exposed × Lag Avg Price | 0.019 | 0.220* | 0.221* |
| | (0.028) | (0.120) | (0.122) |
| Exposed × Subs. Lag Avg Price | 0.028*** | -0.022 | -0.020 |
| | (0.008) | (0.047) | (0.046) |
| Observations | 3875940 | 3875644 | 3873889 |
| Implied Elasticity | 0.029 | -0.022 | -0.020 |
| Vessel FE | Yes | Yes | Yes |
| Week FE | Yes | Yes | Yes |

Table 19: Travel Distances on 16 Week Avg Subsidized Oil Prices

| | (1) Travel Dist. (km) | (2) Avg. Geo Dist. (km) | (3) Avg. Ocean Dist. (km) |
|---|---|---|---|
| Exposed × Pre | -0.031 | 0.118** | 0.058 |
| | (0.074) | (0.055) | (0.039) |
| Exposed × Lag Avg Price | 0.011 | -0.191*** | -0.066* |
| | (0.073) | (0.062) | (0.036) |
| Exposed × Subs. Lag Avg Price | -0.009 | -0.049** | -0.013 |
| | (0.021) | (0.020) | (0.009) |
| Observations | 3880863 | 3044943 | 1716358 |
| Implied Elasticity | -0.009 | -0.048 | -0.013 |
| Vessel FE | Yes | Yes | Yes |
| Week FE | Yes | Yes | Yes |

Table 20: Fishing Hours on 20 Week Avg Subsidized Oil Prices

| | (1) Fishing hrs. | (2) Fishing hrs. (Home EEZ) | (3) Fishing hrs. (DWF) |
|---|---|---|---|
| Exposed × Pre | -0.090 | -0.087 | -0.095 |
| | (0.080) | (0.158) | (0.160) |
| Exposed × Lag Avg Price | 0.381** | 0.312** | 0.430* |
| | (0.161) | (0.125) | (0.232) |
| Exposed × Subs. Lag Avg Price | -0.137*** | -0.127*** | -0.129** |
| | (0.023) | (0.031) | (0.051) |
| Observations | 3838095 | 3441694 | 1965715 |
| Implied Elasticity | -0.128 | -0.119 | -0.121 |
| Vessel FE | Yes | Yes | Yes |
| Week FE | Yes | Yes | Yes |

Table 21: Port Hours on 20 Week Avg Subsidized Oil Prices

| | (1)<br>Port Hrs. | (2)<br>Port Entries | (3)<br>Port Exits |
|---|---|---|---|
| Exposed × Pre | -0.075*** | 0.087 | 0.079 |
| | (0.026) | (0.165) | (0.162) |
| Exposed × Lag Avg Price | 0.028 | 0.212* | 0.212* |
| | (0.029) | (0.123) | (0.126) |
| Exposed × Subs. Lag Avg Price | 0.026*** | -0.029 | -0.027 |
| | (0.006) | (0.043) | (0.042) |
| Observations | 3833221 | 3832929 | 3831192 |
| Implied Elasticity | 0.026 | -0.028 | -0.026 |
| Vessel FE | Yes | Yes | Yes |
| Week FE | Yes | Yes | Yes |

Table 22: Travel Distances on 20 Week Avg Subsidized Oil Prices

| | (1)<br>Travel Dist. (km) | (2)<br>Avg. Geo Dist. (km) | (3)<br>Avg. Ocean Dist. (km) |
|---|---|---|---|
| Exposed × Pre | -0.035 | 0.122** | 0.072* |
| | (0.066) | (0.057) | (0.041) |
| Exposed × Lag Avg Price | 0.004 | -0.185*** | -0.062 |
| | (0.070) | (0.058) | (0.039) |
| Exposed × Subs. Lag Avg Price | -0.008 | -0.047** | -0.015* |
| | (0.021) | (0.019) | (0.009) |
| Observations | 3838095 | 3012035 | 1698135 |
| Implied Elasticity | -0.008 | -0.046 | -0.015 |
| Vessel FE | Yes | Yes | Yes |
| Week FE | Yes | Yes | Yes |

Table 23: Fishing Hours on 24 Week Avg Subsidized Oil Prices

| | (1) Fishing hrs. | (2) Fishing hrs. (Home EEZ) | (3) Fishing hrs. (DWF) |
|---|---|---|---|
| Exposed × Pre | -0.157** | -0.170 | -0.126 |
| | (0.077) | (0.152) | (0.160) |
| Exposed × Lag Avg Price | 0.397** | 0.334*** | 0.435* |
| | (0.162) | (0.128) | (0.234) |
| Exposed × Subs. Lag Avg Price | -0.122*** | -0.108*** | -0.122** |
| | (0.021) | (0.029) | (0.049) |
| Observations | 3792387 | 3399902 | 1938180 |
| Implied Elasticity | -0.115 | -0.103 | -0.115 |
| Vessel FE | Yes | Yes | Yes |
| Week FE | Yes | Yes | Yes |

Table 24: Port Hours on 24 Week Avg Subsidized Oil Prices

| | (1) Port Hrs. | (2) Port Entries | (3) Port Exits |
|---|---|---|---|
| Exposed × Pre | -0.069*** | 0.092 | 0.085 |
| | (0.026) | (0.149) | (0.146) |
| Exposed × Lag Avg Price | 0.039 | 0.201 | 0.203 |
| | (0.031) | (0.127) | (0.130) |
| Exposed × Subs. Lag Avg Price | 0.024*** | -0.032 | -0.030 |
| | (0.006) | (0.038) | (0.038) |
| Observations | 3787564 | 3787276 | 3785559 |
| Implied Elasticity | 0.025 | -0.031 | -0.029 |
| Vessel FE | Yes | Yes | Yes |
| Week FE | Yes | Yes | Yes |

Table 25: Travel Distances on 24 Week Avg Subsidized Oil Prices

| | (1) Travel Dist. (km) | (2) Avg. Geo Dist. (km) | (3) Avg. Ocean Dist. (km) |
|---|---|---|---|
| Exposed × Pre | -0.056 | 0.118** | 0.085** |
| | (0.063) | (0.055) | (0.040) |
| Exposed × Lag Avg Price | 0.015 | -0.174*** | -0.063 |
| | (0.070) | (0.054) | (0.040) |
| Exposed × Subs. Lag Avg Price | -0.003 | -0.044** | -0.017** |
| | (0.021) | (0.018) | (0.008) |
| Observations | 3792387 | 2977946 | 1679446 |
| Implied Elasticity | -0.003 | -0.043 | -0.017 |
| Vessel FE | Yes | Yes | Yes |
| Week FE | Yes | Yes | Yes |

# B Appendix: Results by Subset

Table 26: Fishing Hours Regressions (DWF Vessels)

| | (1)<br>Fishing hrs. (Any) | (2)<br>Fishing hrs. (Home EEZ) | (3)<br>Fishing hrs. (DWF) |
|---|---|---|---|
| China × Pre | -0.415 | -2.773*** | 2.881*** |
| | (0.639) | (0.608) | (0.860) |
| China × Log Price | 0.370*** | 0.040 | 0.605*** |
| | (0.122) | (0.129) | (0.132) |
| China × Log Price × Pre | 0.046 | 0.697*** | -0.842*** |
| | (0.168) | (0.162) | (0.220) |
| Observations | 2059313 | 1927008 | 2059313 |
| Implied Elasticity | 0.047 | 1.007 | -0.569 |
| Vessel FE | Yes | Yes | Yes |
| Week FE | Yes | Yes | Yes |

Table 27: Port Hours Regressions (DWF Vessels)

| | (1)<br>Port Hrs. | (2)<br>Port Entries | (3)<br>Port Exits |
|---|---|---|---|
| China × Pre | -0.841*** | -0.581*** | -0.715*** |
| | (0.135) | (0.208) | (0.184) |
| China × Log Price | 0.262*** | 0.332*** | 0.261*** |
| | (0.040) | (0.051) | (0.054) |
| China × Log Price × Pre | 0.180*** | 0.119** | 0.159*** |
| | (0.037) | (0.051) | (0.045) |
| Observations | 2058181 | 2058181 | 2057907 |
| Implied Elasticity | 0.197 | 0.126 | 0.172 |
| Vessel FE | Yes | Yes | Yes |
| Week FE | Yes | Yes | Yes |

Table 28: Travel Distance Regressions (DWF Vessels)

| | (1)<br>Travel Dist. (km) | (2)<br>Avg. Geo Dist. (km) | (3)<br>Avg. Ocean Dist. (km) |
|---|---|---|---|
| China × Pre | 0.413 | 4.094*** | 1.008*** |
| | (0.280) | (0.270) | (0.138) |
| China × Log Price | 0.309*** | 0.330*** | 0.234*** |
| | (0.052) | (0.050) | (0.030) |
| China × Log Price × Pre | -0.135* | -1.076*** | -0.270*** |
| | (0.074) | (0.067) | (0.038) |
| Observations | 2059034 | 1535290 | 864066 |
| Implied Elasticity | -0.127 | -0.659 | -0.237 |
| Vessel FE | Yes | Yes | Yes |
| Week FE | Yes | Yes | Yes |

Table 29: Fishing Hours Regressions (Domestic Vessels)

| | (1)<br>Fishing hrs. (Any) | (2)<br>Fishing hrs. (Home EEZ) |
|---|---|---|
| China × Pre | -3.051*** | -3.051*** |
| | (0.350) | (0.350) |
| China × Log Price | 0.048 | 0.048 |
| | (0.070) | (0.070) |
| China × Log Price × Pre | 0.765*** | 0.765*** |
| | (0.087) | (0.087) |
| Observations | 4128546 | 4128546 |
| Implied Elasticity | 1.150 | 1.150 |
| Vessel FE | Yes | Yes |
| Week FE | Yes | Yes |

Table 30: Port Hours Regressions (Domestic Vessels)

| | (1)<br>Port Hrs. | (2)<br>Port Entries | (3)<br>Port Exits |
|---|---|---|---|
| China × Pre | -0.538*** | -1.175** | -1.151** |
| | (0.077) | (0.573) | (0.533) |
| China × Log Price | 0.100*** | 0.423*** | 0.411*** |
| | (0.025) | (0.069) | (0.061) |
| China × Log Price × Pre | 0.111*** | 0.251* | 0.247* |
| | (0.019) | (0.137) | (0.128) |
| Observations | 4122726 | 4122726 | 4121849 |
| Implied Elasticity | 0.118 | 0.285 | 0.280 |
| Vessel FE | Yes | Yes | Yes |
| Week FE | Yes | Yes | Yes |

Table 31: Travel Distance Regressions (Domestic Vessels)

| | (1)<br>Travel Dist. (km) | (2)<br>Avg. Geo Dist. (km) | (3)<br>Avg. Ocean Dist. (km) |
|---|---|---|---|
| China × Pre | -2.280*** | -0.179 | 0.167 |
| | (0.365) | (0.297) | (0.130) |
| China × Log Price | 0.222*** | 0.075 | 0.012 |
| | (0.074) | (0.077) | (0.026) |
| China × Log Price × Pre | 0.554*** | 0.044 | -0.062* |
| | (0.093) | (0.081) | (0.033) |
| Observations | 4128546 | 2856891 | 1180231 |
| Implied Elasticity | 0.739 | 0.045 | -0.060 |
| Vessel FE | Yes | Yes | Yes |
| Week FE | Yes | Yes | Yes |

Table 32: Fishing Hours Regressions (Flexible Trip Vessels)

| | (1) Fishing hrs. (Any) | (2) Fishing hrs. (Home EEZ) | (3) Fishing hrs. (DWF) |
|---|---|---|---|
| China × Pre | -2.486*** | -3.345*** | 2.886*** |
| | (0.468) | (0.437) | (0.861) |
| China × Log Price | 0.164* | 0.036 | 0.606*** |
| | (0.095) | (0.097) | (0.132) |
| China × Log Price × Pre | 0.602*** | 0.835*** | -0.843*** |
| | (0.124) | (0.117) | (0.220) |
| Observations | 4209855 | 4085798 | 2051065 |
| Implied Elasticity | 0.826 | 1.305 | -0.570 |
| Vessel FE | Yes | Yes | Yes |
| Week FE | Yes | Yes | Yes |

Table 33: Port Hours Regressions (Flexible Trip Vessels)

| | (1) Port Hrs. | (2) Port Entries | (3) Port Exits |
|---|---|---|---|
| China × Pre | -0.603*** | -1.304*** | -1.279*** |
| | (0.116) | (0.299) | (0.276) |
| China × Log Price | 0.142*** | 0.353*** | 0.337*** |
| | (0.028) | (0.050) | (0.049) |
| China × Log Price × Pre | 0.116*** | 0.289*** | 0.285*** |
| | (0.030) | (0.074) | (0.068) |
| Observations | 4209006 | 4209006 | 4207855 |
| Implied Elasticity | 0.123 | 0.335 | 0.330 |
| Vessel FE | Yes | Yes | Yes |
| Week FE | Yes | Yes | Yes |

Table 34: Travel Distance Regressions (Flexible Trip Vessels)

| | (1)<br>Travel Dist. (km) | (2)<br>Avg. Geo Dist. (km) | (3)<br>Avg. Ocean Dist. (km) |
|---|---|---|---|
| China × Pre | -0.527** | 3.701*** | 0.934*** |
| | (0.225) | (0.242) | (0.124) |
| China × Log Price | 0.302*** | 0.333*** | 0.213*** |
| | (0.046) | (0.046) | (0.028) |
| China × Log Price × Pre | 0.104* | -0.977*** | -0.253*** |
| | (0.060) | (0.061) | (0.034) |
| Observations | 4209855 | 3015862 | 1564508 |
| Implied Elasticity | 0.110 | -0.623 | -0.223 |
| Vessel FE | Yes | Yes | Yes |
| Week FE | Yes | Yes | Yes |

Table 35: Fishing Hours Regressions (Fixed Trip Vessels)

| | (1)<br>Fishing hrs. (Any) | (2)<br>Fishing hrs. (Home EEZ) | (3)<br>Fishing hrs. (DWF) |
|---|---|---|---|
| China × Pre | -2.948*** | -2.942*** | -13.893*** |
| | (0.537) | (0.538) | (5.074) |
| China × Log Price | -0.117 | -0.115 | -0.724 |
| | (0.077) | (0.078) | (0.503) |
| China × Log Price × Pre | 0.755*** | 0.754*** | 3.236*** |
| | (0.130) | (0.130) | (1.229) |
| Observations | 1978004 | 1969756 | 6509 |
| Implied Elasticity | 1.129 | 1.125 | 24.424 |
| Vessel FE | Yes | Yes | Yes |
| Week FE | Yes | Yes | Yes |

Table 36: Port Hours Regressions (Fixed Trip Vessels)

| | (1) Port Hrs. | (2) Port Entries | (3) Port Exits |
|---|---|---|---|
| China × Pre | -0.629*** | -0.756 | -0.762 |
| | (0.096) | (0.649) | (0.613) |
| China × Log Price | 0.100*** | 0.487*** | 0.463*** |
| | (0.028) | (0.073) | (0.062) |
| China × Log Price × Pre | 0.143*** | 0.143 | 0.147 |
| | (0.029) | (0.153) | (0.145) |
| Observations | 1969108 | 1969108 | 1969108 |
| Implied Elasticity | 0.153 | 0.154 | 0.158 |
| Vessel FE | Yes | Yes | Yes |
| Week FE | Yes | Yes | Yes |

Table 37: Travel Distance Regressions (Fixed Trip Vessels)

| | (1) Travel Dist. (km) | (2) Avg. Geo Dist. (km) | (3) Avg. Ocean Dist. (km) |
|---|---|---|---|
| China × Pre | -2.406*** | -0.438 | -0.043 |
| | (0.501) | (0.371) | (0.140) |
| China × Log Price | 0.077 | -0.077 | -0.011 |
| | (0.080) | (0.072) | (0.028) |
| China × Log Price × Pre | 0.592*** | 0.125 | 0.001 |
| | (0.124) | (0.099) | (0.035) |
| Observations | 1977725 | 1376319 | 479769 |
| Implied Elasticity | 0.808 | 0.133 | 0.001 |
| Vessel FE | Yes | Yes | Yes |
| Week FE | Yes | Yes | Yes |

Table 38: Fishing Hours Regressions (DWF Vessels)

| | (1) Fishing hrs. | (2) Fishing hrs. (Home EEZ) | (3) Fishing hrs. (DWF) |
|---|---|---|---|
| Exposed × Pre | 2.387*** | 2.336** | 2.282** |
| | (0.661) | (1.043) | (1.069) |
| Exposed × Log Price | 0.522** | 0.485*** | 0.534* |
| | (0.226) | (0.153) | (0.310) |
| Exposed × Log Price × Pre | -0.735*** | -0.729** | -0.698** |
| | (0.179) | (0.294) | (0.283) |
| Observations | 2069462 | 1662938 | 2069462 |
| Implied Elasticity | -0.520 | -0.517 | -0.503 |
| Vessel FE | Yes | Yes | Yes |
| Week FE | Yes | Yes | Yes |

Table 39: Port Hours Regressions (DWF Vessels)

| | (1) Port Hrs. | (2) Port Entries | (3) Port Exits |
|---|---|---|---|
| Exposed × Pre | -0.087 | -0.060 | 0.010 |
| | (0.248) | (0.382) | (0.382) |
| Exposed × Log Price | -0.022 | 0.148 | 0.129 |
| | (0.049) | (0.154) | (0.156) |
| Exposed × Log Price × Pre | 0.019 | 0.001 | -0.016 |
| | (0.066) | (0.095) | (0.095) |
| Observations | 2065711 | 2065711 | 2063918 |
| Implied Elasticity | 0.020 | 0.001 | -0.016 |
| Vessel FE | Yes | Yes | Yes |
| Week FE | Yes | Yes | Yes |

Table 40: Travel Distance Regressions (DWF Vessels)

Table 41: Fishing Hours Regressions (Domestic Vessels)

| | (1) Fishing hrs. | (2) Fishing hrs. (Home EEZ) |
|---|---|---|
| Exposed × Pre | 3.454*** | 3.454*** |
| | (0.745) | (0.745) |
| Exposed × Log Price | 0.759*** | 0.759*** |
| | (0.210) | (0.210) |
| Exposed × Log Price × Pre | -0.941*** | -0.941*** |
| | (0.204) | (0.204) |
| Observations | 1944645 | 1944645 |
| Implied Elasticity | -0.610 | -0.610 |
| Vessel FE | Yes | Yes |
| Week FE | Yes | Yes |

Table 42: Port Hours Regressions (Domestic Vessels)

| | (1) Port Hrs. | (2) Port Entries | (3) Port Exits |
|---|---|---|---|
| Exposed × Pre | 0.211 | 1.551** | 1.503** |
| | (0.307) | (0.776) | (0.761) |
| Exposed × Log Price | -0.008 | 0.267 | 0.269 |
| | (0.070) | (0.191) | (0.193) |
| Exposed × Log Price × Pre | -0.036 | -0.365** | -0.354* |
| | (0.079) | (0.184) | (0.181) |
| Observations | 1943386 | 1943386 | 1943076 |
| Implied Elasticity | -0.036 | -0.306 | -0.298 |
| Vessel FE | Yes | Yes | Yes |
| Week FE | Yes | Yes | Yes |

Table 43: Travel Distance Regressions (Domestic Vessels)

| | (1)<br>Travel Dist. (km) | (2)<br>Avg. Geo Dist. (km) | (3)<br>Avg. Ocean Dist. (km) |
|---|---|---|---|
| Exposed × Pre | 2.114*** | 1.022** | -0.139 |
| | (0.653) | (0.417) | (0.223) |
| Exposed × Log Price | 0.346* | 0.065 | -0.130* |
| | (0.180) | (0.140) | (0.072) |
| Exposed × Log Price × Pre | -0.564*** | -0.288*** | 0.029 |
| | (0.162) | (0.107) | (0.055) |
| Observations | 1944645 | 1534061 | 767605 |
| Implied Elasticity | -0.431 | -0.250 | 0.029 |
| Vessel FE | Yes | Yes | Yes |
| Week FE | Yes | Yes | Yes |

Table 44: Fishing Hours Regressions (Flexible Trip Vessels)

| | (1)<br>Fishing hrs. | (2)<br>Fishing hrs. (Home EEZ) | (3)<br>Fishing hrs. (DWF) |
|---|---|---|---|
| Exposed × Pre | 2.578*** | 2.500*** | 2.289** |
| | (0.493) | (0.744) | (1.068) |
| Exposed × Log Price | 0.585*** | 0.566*** | 0.537* |
| | (0.196) | (0.128) | (0.310) |
| Exposed × Log Price × Pre | -0.778*** | -0.749*** | -0.701** |
| | (0.134) | (0.215) | (0.283) |
| Observations | 3052556 | 2671196 | 2044298 |
| Implied Elasticity | -0.541 | -0.527 | -0.504 |
| Vessel FE | Yes | Yes | Yes |
| Week FE | Yes | Yes | Yes |

Table 45: Port Hours Regressions (Flexible Trip Vessels)

| | (1) Port Hrs. | (2) Port Entries | (3) Port Exits |
|---|---|---|---|
| Exposed × Pre | 0.028 | 0.523 | 0.558 |
| | (0.225) | (0.581) | (0.581) |
| Exposed × Log Price | -0.010 | 0.183 | 0.173 |
| | (0.039) | (0.155) | (0.156) |
| Exposed × Log Price × Pre | -0.003 | -0.126 | -0.135 |
| | (0.057) | (0.138) | (0.137) |
| Observations | 3050222 | 3050222 | 3048119 |
| Implied Elasticity | -0.003 | -0.118 | -0.126 |
| Vessel FE | Yes | Yes | Yes |
| Week FE | Yes | Yes | Yes |

Table 46: Travel Distance Regressions (Flexible Trip Vessels)

| | (1) Travel Dist. (km) | (2) Avg. Geo Dist. (km) | (3) Avg. Ocean Dist. (km) |
|---|---|---|---|
| Exposed × Pre | $0.612^{*}$ | $2.654^{***}$ | $0.815^{***}$ |
| | (0.371) | (0.483) | (0.250) |
| Exposed × Log Price | 0.015 | -0.057 | -0.040 |
| | (0.103) | (0.080) | (0.053) |
| Exposed × Log Price × Pre | -0.165 | $-0.672^{***}$ | $-0.198^{***}$ |
| | (0.104) | (0.130) | (0.069) |
| Observations | 3052556 | 2396658 | 1459191 |
| Implied Elasticity | -0.152 | -0.490 | -0.179 |
| Vessel FE | Yes | Yes | Yes |
| Week FE | Yes | Yes | Yes |

Table 47: Fishing Hours Regressions (Fixed Trip Vessels)

| | (1)<br>Fishing hrs. | (2)<br>Fishing hrs. (Home EEZ) | (3)<br>Fishing hrs. (DWF) |
|---|---|---|---|
| Exposed × Pre | 4.967*** | 5.311*** | -7.414* |
| | (0.979) | (0.934) | (4.232) |
| Exposed × Log Price | 0.850*** | 0.894*** | -1.552* |
| | (0.218) | (0.231) | (0.855) |
| Exposed × Log Price × Pre | -1.309*** | -1.403*** | 2.182** |
| | (0.248) | (0.233) | (1.057) |
| Observations | 961551 | 936387 | 25128 |
| Implied Elasticity | -0.730 | -0.754 | 7.865 |
| Vessel FE | Yes | Yes | Yes |
| Week FE | Yes | Yes | Yes |

Table 48: Port Hours Regressions (Fixed Trip Vessels)

| | (1)<br>Port Hrs. | (2)<br>Port Entries | (3)<br>Port Exits |
|---|---|---|---|
| Exposed × Pre | 0.003 | 1.627** | 1.537* |
| | (0.440) | (0.816) | (0.814) |
| Exposed × Log Price | -0.038 | 0.298* | 0.289* |
| | (0.089) | (0.159) | (0.161) |
| Exposed × Log Price × Pre | 0.016 | -0.398** | -0.376* |
| | (0.110) | (0.193) | (0.194) |
| Observations | 957190 | 957190 | 957190 |
| Implied Elasticity | 0.017 | -0.328 | -0.313 |
| Vessel FE | Yes | Yes | Yes |
| Week FE | Yes | Yes | Yes |

Table 49: Travel Distance Regressions (Fixed Trip Vessels)

| | (1) Travel Dist. (km) | (2) Avg. Geo Dist. (km) | (3) Avg. Ocean Dist. (km) |
|---|---|---|---|
| Exposed × Pre | 2.424*** | 1.612*** | -0.028 |
| | (0.700) | (0.519) | (0.275) |
| Exposed × Log Price | 0.402** | 0.176 | -0.026 |
| | (0.197) | (0.182) | (0.098) |
| Exposed × Log Price × Pre | -0.656*** | -0.446*** | -0.005 |
| | (0.162) | (0.125) | (0.068) |
| Observations | 961551 | 754804 | 313443 |
| Implied Elasticity | -0.481 | -0.360 | -0.005 |
| Vessel FE | Yes | Yes | Yes |
| Week FE | Yes | Yes | Yes |

Table 50: Fishing Hours Regressions (FAO 61)

| | (1) Fishing hrs. | (2) Fishing hrs. (Home EEZ) | (3) Fishing hrs. (DWF) |
|---|---|---|---|
| FAO 61 Fisher × Pre | 2.407*** | 3.572*** | 0.315 |
| | (0.794) | (0.969) | (0.820) |
| FAO 61 Fisher × Log Price | 0.553*** | 0.669*** | 0.307* |
| | (0.162) | (0.238) | (0.173) |
| FAO 61 Fisher × Log Price × Pre | -0.719*** | -1.029*** | -0.150 |
| | (0.231) | (0.296) | (0.221) |
| Observations | 4014107 | 3607583 | 2069462 |
| Implied Elasticity | -0.513 | -0.643 | -0.139 |
| Vessel FE | Yes | Yes | Yes |
| Week FE | Yes | Yes | Yes |

Table 51: Port Hours Regressions (FAO 61)

| | (1) Port Hrs. | (2) Port Entries | (3) Port Exits |
|---|---|---|---|
| FAO 61 Fisher × Pre | -0.047 | 1.289* | 1.280* |
| | (0.186) | (0.735) | (0.728) |
| FAO 61 Fisher × Log Price | 0.018 | 0.406*** | 0.398*** |
| | (0.040) | (0.141) | (0.149) |
| FAO 61 Fisher × Log Price × Pre | 0.012 | -0.328* | -0.325* |
| | (0.047) | (0.169) | (0.167) |
| Observations | 4009097 | 4009097 | 4006994 |
| Implied Elasticity | 0.012 | -0.279 | -0.277 |
| Vessel FE | Yes | Yes | Yes |
| Week FE | Yes | Yes | Yes |

Table 52: Travel Distance Regressions (FAO 61)

| | (1) Travel Dist. (km) | (2) Avg. Geo Dist. (km) | (3) Avg. Ocean Dist. (km) |
|---|---|---|---|
| FAO 61 Fisher × Pre | 0.901 | 0.539 | -0.051 |
| | (0.623) | (0.541) | (0.418) |
| FAO 61 Fisher × Log Price | 0.166 | -0.025 | -0.081*** |
| | (0.120) | (0.040) | (0.024) |
| FAO 61 Fisher × Log Price × Pre | -0.264 | -0.143 | 0.021 |
| | (0.176) | (0.147) | (0.108) |
| Observations | 4014107 | 3151462 | 1772652 |
| Implied Elasticity | -0.232 | -0.133 | 0.021 |
| Vessel FE | Yes | Yes | Yes |
| Week FE | Yes | Yes | Yes |

# C Appendix: Alternate Oil Price Results

Figure 9: Oil Price Measures over Time


Table 53: Fishing Hours Regressions: Year to Date Average Price

| | (1)<br>Fishing hrs. (Any) | (2)<br>Fishing hrs. (Home EEZ) | (3)<br>Fishing hrs. (DWF) |
|---|---|---|---|
| China × Pre | -3.418*** | -4.025*** | 2.616*** |
| | (0.423) | (0.363) | (0.781) |
| China × Log Price (YTD) | -0.040 | -0.165* | 0.630*** |
| | (0.082) | (0.087) | (0.105) |
| China × Log Price (YTD) × Pre | 0.823*** | 0.989*** | -0.781*** |
| | (0.112) | (0.099) | (0.199) |
| Observations | 6076256 | 5945104 | 2021197 |
| Implied Elasticity | 1.277 | 1.689 | -0.542 |
| Vessel FE | Yes | Yes | Yes |
| Week FE | Yes | Yes | Yes |

Table 54: Port Hours Regressions: Year to Date Average Price

| | (1) Port Hrs. | (2) Port Entries | (3) Port Exits |
|---|---|---|---|
| China × Pre | -0.293*** | -2.258*** | -2.287*** |
| | (0.112) | (0.232) | (0.213) |
| China × Log Price (YTD) | 0.132*** | 0.205*** | 0.196*** |
| | (0.022) | (0.046) | (0.042) |
| China × Log Price (YTD) × Pre | 0.045 | 0.498*** | 0.507*** |
| | (0.028) | (0.058) | (0.053) |
| Observations | 6069436 | 6069436 | 6068049 |
| Implied Elasticity | 0.046 | 0.646 | 0.660 |
| Vessel FE | Yes | Yes | Yes |
| Week FE | Yes | Yes | Yes |

Table 55: Distance Traveled Regressions: Year to Date Average Price

| | (1) Travel Dist. (km) | (2) Avg. Geo Dist. (km) | (3) Avg. Ocean Dist. (km) |
|---|---|---|---|
| China × Pre | -1.419*** | 3.272*** | 0.958*** |
| | (0.218) | (0.199) | (0.167) |
| China × Log Price (YTD) | 0.196*** | 0.363*** | 0.229*** |
| | (0.043) | (0.044) | (0.027) |
| China × Log Price (YTD) × Pre | 0.315*** | -0.865*** | -0.260*** |
| | (0.058) | (0.050) | (0.044) |
| Observations | 6075982 | 4314767 | 2014028 |
| Implied Elasticity | 0.370 | -0.579 | -0.229 |
| Vessel FE | Yes | Yes | Yes |
| Week FE | Yes | Yes | Yes |

Table 56: Fishing Hours Regressions: Expected Annual Average Price

| | (1)<br>Fishing hrs. (Any) | (2)<br>Fishing hrs. (Home EEZ) | (3)<br>Fishing hrs. (DWF) |
|---|---|---|---|
| China × Pre | -4.144*** | -4.856*** | 2.743*** |
| | (0.460) | (0.395) | (0.896) |
| China × Log Exp. Price | -0.043 | -0.172* | 0.662*** |
| | (0.093) | (0.096) | (0.130) |
| China × Log Exp. Price × Pre | 0.988*** | 1.178*** | -0.810*** |
| | (0.121) | (0.107) | (0.227) |
| Observations | 5584238 | 5459630 | 1847010 |
| Implied Elasticity | 1.687 | 2.249 | -0.555 |
| Vessel FE | Yes | Yes | Yes |
| Week FE | Yes | Yes | Yes |

Table 57: Port Hours Regressions: Expected Annual Average Price

| | (1)<br>Port Hrs. | (2)<br>Port Entries | (3)<br>Port Exits |
|---|---|---|---|
| China × Pre | -0.410*** | -2.447*** | -2.484*** |
| | (0.127) | (0.265) | (0.244) |
| China × Log Exp. Price | 0.129*** | 0.222*** | 0.215*** |
| | (0.025) | (0.049) | (0.045) |
| China × Log Exp. Price × Pre | 0.073** | 0.547*** | 0.555*** |
| | (0.031) | (0.065) | (0.060) |
| Observations | 5578944 | 5577692 | 5577667 |
| Implied Elasticity | 0.076 | 0.727 | 0.742 |
| Vessel FE | Yes | Yes | Yes |
| Week FE | Yes | Yes | Yes |

Table 58: Travel Distance Regressions: Expected Annual Average Price

| | (1)<br>Travel Dist. (km) | (2)<br>Avg. Geo Dist. (km) | (3)<br>Avg. Ocean Dist. (km) |
|---|---|---|---|
| China × Pre | -1.784$^{***}$ | 3.412$^{***}$ | 0.964$^{***}$ |
| | (0.236) | (0.234) | (0.174) |
| China × Log Exp. Price | 0.186$^{***}$ | 0.352$^{***}$ | 0.230$^{***}$ |
| | (0.048) | (0.049) | (0.030) |
| China × Log Exp. Price × Pre | 0.400$^{***}$ | -0.898$^{***}$ | -0.261$^{***}$ |
| | (0.062) | (0.058) | (0.045) |
| Observations | 5583988 | 3957248 | 1872142 |
| $R^2$ | | | |
| Implied Elasticity | 0.492 | -0.593 | -0.230 |
| Vessel FE | Yes | Yes | Yes |
| Week FE | Yes | Yes | Yes |

Table 59: Fishing Hours Regressions: AR1 Residual Log Price

| | (1)<br>Fishing hrs. (Any) | (2)<br>Fishing hrs. (Home EEZ) | (3)<br>Fishing hrs. (DWF |
|---|---|---|---|
| China × Pre | 0.142$^{***}$ | 0.225$^{***}$ | -0.599$^{***}$ |
| | (0.043) | (0.050) | (0.075) |
| China × Log Price (AR(1)) | 0.133 | 0.243 | -0.118 |
| | (0.125) | (0.158) | (0.164) |
| China × Log Price (AR(1)) × Pre | 0.854$^{***}$ | 1.085$^{***}$ | -1.517$^{***}$ |
| | (0.185) | (0.227) | (0.211) |
| Observations | 6187859 | 6055554 | 2059313 |
| Implied Elasticity | 1.350 | 1.961 | -0.781 |
| Vessel FE | Yes | Yes | Yes |
| Week FE | Yes | Yes | Yes |

Table 60: Port Hours Regressions: AR1 Residual Log Price

| | (1) Port Hrs. | (2) Port Entries | (3) Port Exits |
|---|---|---|---|
| China × Pre | -0.054*** | -0.020 | -0.014 |
| | (0.016) | (0.025) | (0.023) |
| China × Log Price (AR(1)) | 0.102*** | 0.320*** | 0.348*** |
| | (0.029) | (0.118) | (0.128) |
| China × Log Price (AR(1)) × Pre | 0.426*** | 0.412* | 0.320 |
| | (0.075) | (0.215) | (0.224) |
| Observations | 6180907 | 6180907 | 6179756 |
| Implied Elasticity | 0.531 | 0.510 | 0.377 |
| Vessel FE | Yes | Yes | Yes |
| Week FE | Yes | Yes | Yes |

Table 61: Travel Distance Regressions: AR1 Residual Log Price

| | (1) Travel Dist. (km) | (2) Avg. Geo Dist. (km) | (3) Avg. Ocean Dist. (km) |
|---|---|---|---|
| China × Pre | -0.006 | -0.352*** | -0.098*** |
| | (0.027) | (0.018) | (0.017) |
| China × Log Price (AR(1)) | 0.283*** | 0.058 | 0.100*** |
| | (0.107) | (0.079) | (0.038) |
| China × Log Price (AR(1)) × Pre | 0.144 | -1.386*** | -0.314*** |
| | (0.198) | (0.162) | (0.072) |
| Observations | 6187580 | 4392181 | 2044297 |
| Implied Elasticity | 0.154 | -0.750 | -0.270 |
| Vessel FE | Yes | Yes | Yes |
| Week FE | Yes | Yes | Yes |