Examining Fuel Subsidy Effects on Fishing Activity in the East China Sea

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Abstract

Input subsidies reduce marginal costs, driving overexploitation and raising concerns about marine ecosystem sustainability—particularly in regions with high levels of Illegal, Unreported, and Unregulated (IUU) fishing. We examine the impact of the fuel subsidies provision on fishing activity and unauthorized fishing following a reform of the fuel subsidy program introduced in 2016 by the Chinese government. The Chinese government has been known for providing a wide variety of subsidies within its economy to strengthen its economic position relative to other world economies. In 2016, China introduced a reform to its fuel subsidy program for fishing fleets due to high levels of subsidy expenditure, fuel consumption, and overfishing. Using the discontinuities introduced by the reform, we find that after the reform, the hours of unauthorized fishing increased, particularly in Taiwan and in disputed areas. Vessels that receive a greater amount of subsidies reduce their activity within national waters and increase their operations in foreign waters, potentially leading to overexploitation of fish stocks in international waters and conflicts with neighboring countries over disputed fishing grounds. The results suggest that subsidies decrease the level of compliance among fishers and encourage IUU fishing.

Key words: Commercial Fishing, Fisheries Management, Fuel Subsidies, Unauthorized Fishing.
JEL Classification: H23,O13,Q22,Q28.

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1 Introduction

Input subsidies have been widely used as an instrument for capacity-enhancement across various sectors of the economy (Reyes-García et al., 2025). In the fisheries sector, in particular, there has been considerable debate about the implications of subsidies in contributing to the overexploitation of marine resources and the depletion of natural products (Sumaila et al., 2021, Shen and Chen, 2022, Finley, 2017), especially in common-pool setting (Munro and Sumaila, 2002). In 2018, approximately 35.4 billion dollars were distributed in subsidies to global fisheries, of which capacity-enhancing subsidies are USD 22.2 billion (Sumaila et al., 2019). This has generated overcapacity leading to overexploitation problems (Sumaila et al., 2010a), especially in scenarios with low controls (Wang et al., 2023).

According to FAO (2024), the fraction of fishery stocks outside biologically sustainable levels increased to 37.7 percent in 2021, that is 2.3 percent higher than in 2019, raising alarm over the accelerating degradation of marine ecosystems and the sustainability of global fisheries. Thus, the World Trade Organization (WTO) has been promoting negotiations to eliminate input subsidies in fisheries to ensure the reduction of overfishing levels (Cisneros-Montemayor et al., 2022), in order to achieve Sustainable Development Goal (SDG) 14.6 (Shen and Chen, 2022, Skerritt and Sumaila, 2021, Yang et al., 2017). The provision of subsidies is particularly concerning because it enables vessels to fish outside their own countries, venturing into the high seas or the waters of other nations (Englander et al., 2025), generating rents that would not have been possible without the subsidies (Sumaila et al., 2019, Sakai et al., 2019, Sumaila and Pauly, 2013). Moreover, this creates distortions in national budgets, complicating the management of other fiscal objectives and increasing the opportunity cost for governments and society (Davis, 2014).

Changes in subsidy provision can lead to a directly proportional response in fishing activity, driven by change in cost structure, or to an inversely proportional one, as vessels attempt to compensate for change in competitiveness (Sakai et al., 2019), especially when the direction of the subsidy change is negative, which can influence decisions related to IUU fishing. This raises concerns about IUU fishing because it not only impacts fish stock levels (Khan et al., 2024), but also affects international relations between countries (Spijkers et al., 2019, Chen et al., 2023). The hypothesis to be evaluated in this paper is linked to the role of access to subsidies as an incentive for increased development of fishing activity, greater capacity to fish in foreign waters, and, in turn, increased development of unauthorized fishing activity.

Although recent literature has presented causal evidence on the implications of subsidy provision on fishing capacity (Wang et al., 2023, Shen and Chen, 2022) and overfishing (Englander et al., 2025), there is a lack of causal empirical evidence on the incentives that access to subsidies can generate for unauthorized fishing activity. This study adds a new dimension to the debate on how subsidies affect the sustainability of marine ecosystems by focusing specifically on their relationship with IUU fishing. Unauthorized fishing is understood as fishing activity conducted by a vessel in foreign waters where it does not have an access agreement. Such practices fall under the concept of environmental injustice, where the provision of subsidies reduces marginal costs and increases the benefits of national fishing fleets at the expense of exploiting the natural resources of other nations. This has been shown to contribute to other social problems such as piracy (Phayal et al., 2024, Mitchell and Schmidt, 2024, Denton and Harris, 2021).

This paper studies this relationship by evaluating the impact of fuel subsidies provided to Chinese fishing fleets in Zheijuang province on fishing activities in the East China Sea, including operations in the waters of Taiwan and Japan. China leads the group of countries providing the highest amount of subsidies. In 2018, it allocated USD 7.2 billion, representing 21% of global subsidies, 81% of which are categorized as capacity-enhancing subsidies (Sumaila et al., 2019). Chinese fishing activity has become a global concern due to its immense fishing capacity, which poses a threat to the sustainability of global ecosystems (Englander et al., 2025). Additionally, China's significant involvement in IUU fishing contributes to generating tensions among nations (Tseng and Ou, 2010, Zhang, 2016, Kim, 2019, Watson and Woodill, 2022).

In this paper, we present a theoretical and empirical model in which we use a newly released dataset containing individual-level information on trawler fishing vessels compiled by Wang et al. (2023) from the Marine Fishing Vessel Dynamic Management System of Zhejiang province, which has the largest fishing fleet in the East China Sea. Additionally, we use information from Global Fishing Watch to measure real-time fishing activity. To characterize the type of fishing according to authorization status, we use data from the Fishing Access Agreements database provided by the Sea Around Us platform. The objective of this paper is to evaluate the effect of the subsidy program reform implemented in China in 2016 on unauthorized fishing activity.

The reform introduced multiple discontinuities in subsidy allocation: a general one based on gross tonnage and engine power (Englander et al., 2025), applicable to all vessel operations, and a more specific one based on vessel size for operations classified as harmful (e.g., trawlers) (Wang et al., 2023). In our analysis, we focus on the discontinuity related to vessel size, primarily due to the composition of our dataset and the policy targeting around that specific threshold for trawlers. Moreover, the second discontinuity does not allow us to clearly distinguish between binding and non-binding vessels within our data.

The redesign of China's subsidy allocation program motivates the implementation of a regression discontinuity model, notably, vessels just over 30 meters in length received approximately 19% more in subsidy payments than those just under 30 meters. However, the reform affected not only the margin around the cut-off, but also the continuum of vessels. For some, the subsidy reduction compared to the previous year was much greater, but it decreased for all. Thus, a difference-in-differences (DiD) estimation can capture more information than a regression discontinuity (RD) model, given that RD estimates are local and concentrated around the cutoff point. Considering these factors, we use a DiD model to obtain more generalizable estimates, differentiating the vessel population by size in accordance with the program's design.

Our results suggest that following the reform, vessels receiving higher subsidies, compared to those receiving lesser amounts, increased their fishing efforts in foreign waters while reducing their total fishing hours within Chinese territory. Furthermore, we find that although compliance levels are high in comparison to the global average—95.1% versus 61%, respectively—vessels that receive a greater amount of subsidies report a higher incidence of unauthorized fishing activities, particularly in Taiwanese waters and disputed areas. The design of the reform, which excludes fishers who do not comply with national and international regulations from accessing the subsidy program, along with the implementation of the Vessel Buyback Program (VBP), may help explain the relatively higher levels of compliance observed in the Chinese context. In contrast, we would expect the effect of subsidy provision on IUU fishing to be more pronounced in settings with weaker enforcement. As demonstrated in the theoretical model, subsidies can influence either the actual cost structure or fishers' expectations about costs, thereby generating sufficient incentives to engage in unauthorized fishing.

This paper contributes to the literature by quantifying the relation between fuel subsidy and unauthorized fishing activity. The results highlight the complex interplay between subsidy allocation and fishing behavior, revealing that changes in the cost structure could incentivize illegal practices. The significant increase in fishing efforts in foreign waters may indicate a strategic shift among subsidized vessels seeking to maximize their operational efficiency and profit margins. Despite relatively high compliance rates, the correlation between subsidy levels and unauthorized fishing underscores the need for enhanced regulatory frameworks and monitoring mechanisms to ensure that financial incentives do not undermine sustainable fishing practices.

The remainder of the paper is structured as follows. Section 2 provides a description of the study case, including the background and institutional framework about the fuel subsidy program reform and other details. Section 3 presents the theoretical model and Section 4 describes the data collection and the empirical strategy. Section 5 presents the results of the effects of the fuel subsidy program reform, and Sections 6 and 7 discuss the findings and conclude the paper, respectively.

2 Study Case

2.1 Background

The East China Sea has long been a region of historical disputes between neighboring countries over sovereignty and the rights to exploit marine resources (Midford and Østhagen, 2024, Valencia, 2014). Chinese fishers have increasingly become central figures in maritime conflicts within these contentious regional waters. China's governmental policies and strategies have directly or indirectly influenced the presence of Chinese vessels in disputed territories, thereby contributing to the escalation of tensions between the countries involved (Zhang, 2016). In many instances, China's maritime territorial claims diverge from those recognized under international law (Radio Free Asia, 2024), which partly explains the persistent presence of Chinese vessels in these contested areas.

In recent years, the expansion of Chinese fishing fleets has emerged as one of the primary threats to overexploitation and unauthorized fishing in the waters of the Sea of Japan. Between 2018 and 2020, Chinese vessels were detected, on average, approximately 4,341 times within Japanese territorial waters, with a significant concentration of incidents occurring in the disputed areas around the Diaoyu/Senkaku Islands activities in contested maritime regions (Sato and Chadha, 2022, Reuters, 2024). One of the main explanations for this trend is that these vessels are often en route to North Korean waters, where fishing agreements and authorizations are in place. This situation underscores the complex geopolitical and environmental challenges posed by the increasing presence of Chinese fishing. Another focal point of tension has been the presence of fishing activities in Taiwanese territory, particularly in the territorial waters around Kinmen, which extend approximately halfway to the Chinese coast, or roughly 4 km (2.5 miles) to the north and northwest (Radio Free Asia, 2024). Figure 1 shows the territorial waters of each country.

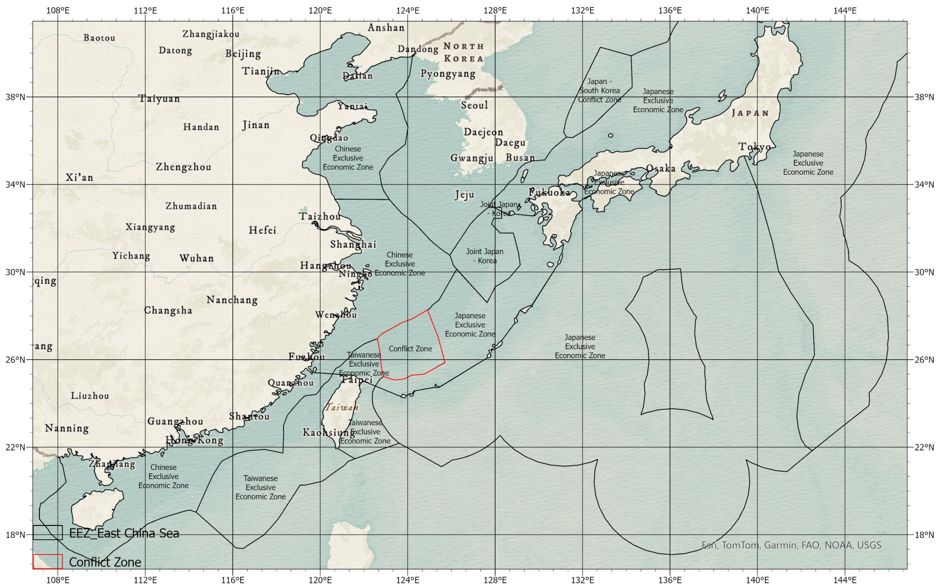


Figure 1. The East China Sea Map. Source: Authors, using information from Marine Regions Repository. Note: The black solid line represents the EEZ boundaries of each country in the East China Sea, while the red solid line marks the disputed zone between Japan and China.

Regarding the fishing access relationships between China, Taiwan, and Japan, there are currently no formal agreements in place between China and Taiwan or Japan. This absence of agreements can be attributed to the concerns expressed by the Japanese and Taiwanese governments regarding the sustainability of their territorial waters. Moreover, the historical context of diplomatic relations among these countries, combined with China's fisheries policies, has further complicated efforts to establish formal access agreements (Chen et al., 2024).

The lack of formal fishing access agreements is significant, particularly considering the ongoing territorial disputes in the East China Sea, where Taiwan and Japan have established a bilateral fisheries agreement. This agreement, signed on April 10, 2013, allows for reciprocal fishing rights in overlapping exclusive economic zones, thereby isolating China in the context of these maritime disputes. The agreement reflects a strategic approach by Taiwan and Japan to manage their fishing interests while setting aside sovereignty issues to foster cooperation and reduce tensions in the region (The Diplomat, 2018).

The presence of Chinese vessels in these territories is largely explained by their significant overcapacity (Wang et al., 2023) and the policies aimed at strengthening China's food security (Zhang, 2016). These factors have incentivized the expansion and increased prevalence of Chinese fishing activities in many foreign waters. Coupled with the provision of subsidies, this has stimulated greater fishing activity and heightened tensions between countries, particularly when such activities occur outside the framework of international agreements.

2.2 Institutional and Policy Overview

Due to the scale of its fishing operations—driven by rising domestic demand for seafood and the expansion of distant-water fishing—China significantly influences marine ecosystems and global fishery dynamics. Its extensive fishing history has positioned China as the nation with the highest fishing capacity in the world (Shen and Heino, 2014). China's fishing capacity has steadily grown since 1949 and began to be regulated in 1979 in response to growing concerns over the overexploitation of marine resources (Su et al., 2020). Today, most fish stocks in China's seas are either fully exploited or already depleted (Yu and Yu, 2008).

Despite policy efforts to curb fishing capacity, it continues to increase. Between 2012 and 2014 alone, a 149% rise in capacity was recorded (Yang et al., 2017). One of the main challenges faced by the Chinese government is underreporting, primarily driven by the fact that nearly all taxes, fees, and fines imposed on fishing vessels are calculated based on engine horsepower. As a result, fishers tend to underreport their vessels' horsepower, contributing to the growth of a "hidden" fishing capacity (Su et al., 2020).

Another issue associated with the growth of fishing capacity in China is linked to input subsidy programs (Yang et al., 2017). The Chinese government has long implemented policies aimed at enhancing its fishing capacity (Mallory, 2016). Beginning in the 1980s, the state insulated its economy from international fuel price volatility by subsidizing fuel—purchasing it at high global prices and reselling it domestically at lower rates. However, fiscal deficits in the early 2000s prompted a policy shift in 2006, re-exposing the economy to global fuel prices. In response, the government introduced targeted subsidies for vulnerable sectors such as fisheries, with allocations based on factors such as fuel consumption, gear type, engine power, and vessel size (Englander et al., 2025).

In 2016, facing international pressure to address the ecological harm linked to fisheries subsidies, and in alignment with its "Ecological Civilization" agenda, the Chinese Communist Party (CCP) reformed the program (Su et al., 2020). The previous design had fueled high expenditures, increased fuel use, and exacerbated overfishing (Cao et al., 2017). The reform introduced a classification system for vessels over 12 meters in length, dividing them into 12 groups by size. Each vessel was then assigned a subsidy coefficient based on gear type, with less environmentally friendly gear receiving lower subsidy weights. Furthermore, the baseline fuel price standard was reduced by 18% per year (Wang et al., 2023).

The reform introduced multiple discontinuities in subsidy allocation: a general one based on gross tonnage and engine power (Englander et al., 2025), applicable to all vessel operations, and a more specific one based on vessel size for operations classified as harmful (e.g., trawlers) (Wang et al., 2023). In this study, we focus on trawler vessels. Accordingly, in terms of vessel size, fuel subsidy provisions decreased across all vessels; however, the reduction was more pronounced for vessels under 30 meters in length compared to those over 30 meters. Smaller vessels experienced an approximately 15.8% reduction in fuel subsidy payments, despite there being no pre-reform differences between the two groups (Figure 2). This discontinuity, in particular, provides the methodological foundation necessary for our analysis.

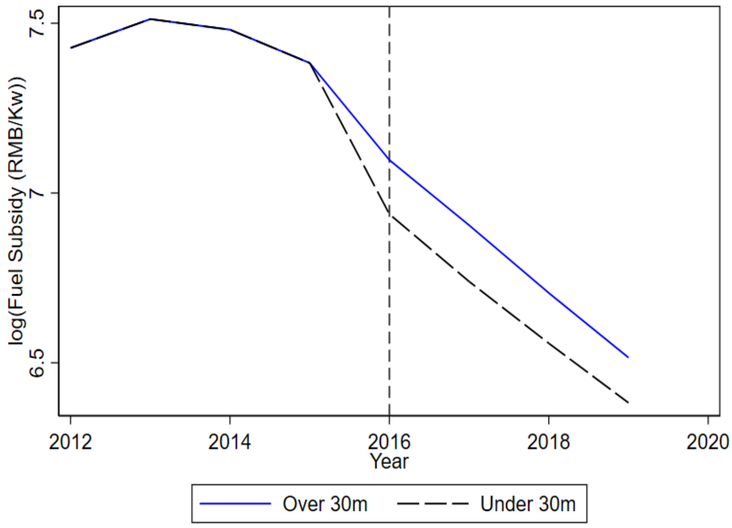


Figure 2. Fuel subsidy payments. Authors, using information from Global Fishing Watch and Wang et al. (2023) database. The size of the vessels is measured in meters.

The management context of the fishing sector in China is complex, involving the integration of various programs aimed at reconciling economic growth with sustainable sector development. Alongside the subsidy program, since 2002, the Vessel Buyback Program (VBP) has been implemented. This program provides funds to fishers willing to exit the fishing market and transition to non-fishing activities, coupled with the relinquishment of the power quota granted for vessel operation (Graff Zivin and Mullins, 2015).

The purpose of the VBP is to remove from the fishing industry those vessels that have a greater impact on the ecosystem, such as trawlers. Entre 2002 y 2014, permitio la reducción en un 31% de the number of commercial fishing vessels (Cao et al., 2017). This program is grounded in the Quota Management Program for fishing power, which operates in conjunction with the Licensing System. Under this system, each vessel must annually undergo registration, inspection, and management with the Ministry of Agriculture to obtain a fishing license (Wang et al., 2023). The Licensing System was introduced as a regulatory mechanism to curb the disproportionate growth in the number of fishing vessels by requiring that new vessels be constructed only through the acquisition of licenses from decommissioned ones, thereby creating a market for licenses and, together with related policy instruments, aiming to achieve what has been termed "negative growth" in fleet capacity (Su et al., 2020).

Despite the CCP's efforts to control the environmental impacts of the fishing fleet size, these measures had limited effects due to the coexistence and poor design of the subsidy program, which encouraged fishers to remain in the market (Cao et al., 2017). This situation changed with the 2016 reform. Savings from the redesign of the subsidy program allowed for an increase in the bonuses granted through the VBP, this increase was more significant in the province of Zhejiang as part of its own objective to reduce the size of its fishing fleet, contributing to the reduction of the fishing fleet's capacity through subsidy reductions (Wang et al., 2023).

Given the structure and combination of the programs, trawler-type vessels were immediately affected, as they were the primary target due to their environmentally harmful nature (Graff Zivin and Mullins, 2015). Moreover, the interaction between the subsidy reform and the vessel buyback program provides a unique opportunity to analyze how changes in cost structure may reduce incentives to engage in certain IUU fishing activities. Figure 3 illustrates the exit rates from the fishing sector under the buyback program, comparing vessels smaller than 30 meters with those larger than 30 meters. A higher exit rate is observed among smaller vessels, which experienced greater reductions in subsidies following the reform. This suggests that fishers considered their cost structures and expected benefits when deciding whether or not to remain in the sector.

The Chinese case presents a valuable opportunity to examine how fishing incentives and decision-making are shaped by changes in subsidy provision and opportunity costs, the latter captured by the offer of exit bonuses from the fishing sector. This context also allows for an assessment of how unauthorized fishing dynamics are influenced, especially in the geopolitically contested waters of the East China Sea.

Removing financial incentives, such as fuel subsidies, is expected to contribute to reductions in both fishing overcapacity (Wang et al., 2023) and resource overexploitation (Englander et al., 2025). However, the relationship between subsidy reform and IUU fishing is not straightforward. It is therefore essential to understand how vessels respond to changes in their cost structures. Specifically, we seek to understand how fishers react to reductions in subsidy levels, how they internalize the unequal allocation of subsidies across vessel types, and whether these changes alter their incentives to engage in IUU fishing.

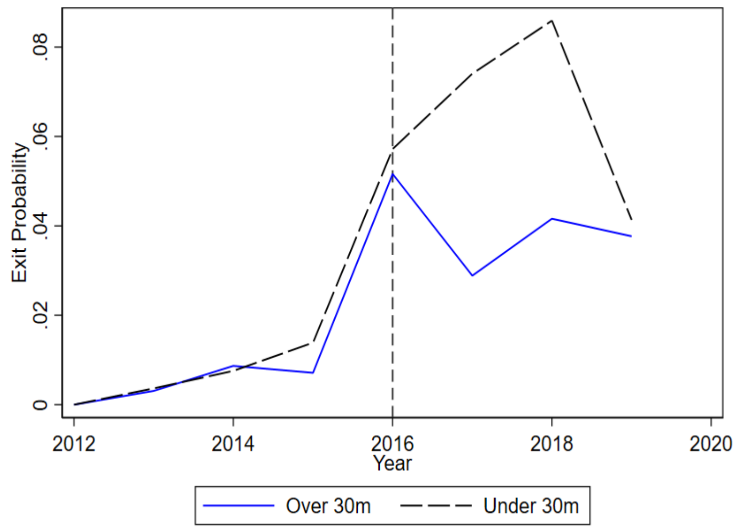


Figure 3. Exit probability. Authors, using information from Global Fishing Watch and Wang et al. (2023) database. The size of the vessels is measured in meters.

3 The Model

One might assume that the expected effect of reducing subsidy provision would simply be a decrease in fishing effort due to higher marginal costs. In the Chinese context, an increase in opportunity costs could create incentives to reduce installed capacity in the sector. However, changes in costs could also generate incentives to intensify fishing efforts in areas where the activity is more profitable or where the probability of catch is higher—either due to greater fish stock availability or the presence of higher-value species—even if these areas are unauthorized. In such cases, fishers may seek to offset rising costs through higher revenues, ultimately maximizing profits. This behavior could explain a potential increase in IUU fishing.

The Chinese case allows us to examine the effect of subsidy provision on IUU fishing, particularly due to the unequal change across vessel types and the fact that the cost structure changes for all vessels. In order to understand how vessels respond in terms of authorized and unauthorized fishing efforts, we present a theoretical model where we take into account the unequal changes in subsidy allocation introduced by a reform.

We define a subsidy $S_i \in \mathbb{R}_+$ for a vessel, whether small (s) or large (l), given that $i \in \{s, l\}$. A reform r reduces the subsidy received by vessels in an unequal manner, such that:

$$S_s^r = (1 - \lambda_s) S_s \tag{1}$$

$$S_l^r = (1 - \lambda_l) S_l \tag{2}$$

where $0 < \lambda_l < \lambda_s < 1$.

Vessels exert effort $e_i \in \mathbb{R}_+$, which can be either authorized (a_i) or unauthorized (na_i), to maximize their payoff, defined as:

$$\pi_i(e_{a_i}, e_{na_i}) = b_i(e_{a_i} + e_{na_i}) - (c_{a_i} - S_i)e_{a_i} - c_{na_i}e_{na_i} \tag{3}$$

where $\frac{\partial b_i}{\partial e_i} > 0$ and $\frac{\partial^2 b_i}{\partial e_i^2} < 0$, meaning that the benefit function is concave. Marginal costs are assumed to be constant. Additionally, we assume that $e_{a_i} \succ e_{na_i}$, which means that vessels will always prefer to engage in authorized fishing. Note that $c_{a_i} - S_i < c_{na_i}$ ensures that only authorized effort e_{a_i} is undertaken.

Now, we define the first-order conditions to determine the optimal effort level. For e_{a_i}:

$$\frac{\partial \pi_i}{\partial e_{a_i}} = b'(e_{a_i} + e_{na_i}) - (c_{a_i} - S_i) = 0 \tag{4}$$

Thus:

$$b'(e_{a_i} + e_{na_i}) = (c_{a_i} - S_i) \tag{5}$$

For e_{na_i}:

$$\frac{\partial \pi_i}{\partial e_{na_i}} = b'(e_{a_i} + e_{na_i}) - c_{na_i} = 0 \tag{6}$$

Thus:

$$b'(e_{a_i} + e_{na_i}) = c_{na_i} \tag{7}$$

The effect of the reform on equation (5) is:

$$b'(e_{a_i} + e_{na_i}) = (c_{a_i} - S_i^r) \tag{8}$$

Since $S_i^r < S_i$, then $b_r'(.) > b'(.)$, implying that, due to concavity, higher $b'(.)$ leads to lower effort. Thus:

$$e_{a_i}^r < e_{a_i} \tag{9}$$

The effect of the reform on equation (7) is:

$$b'(e_{a_i}^r + e_{na_i}) = c_{na_i} \tag{10}$$

Since $e_{a_i}^r < e_{a_i}$, then $e_{na_i}^r$ can be larger than e_{na_i} if the condition $c_{na_i} < c_{a_i} - S_i^r$ holds.

Now, evaluating the cost structure:

$$c_{a_i} - S_i < c_{na_i} < c_{a_i} - S_i^r < c_{a_i} \tag{11}$$

It is important to highlight that the condition $c_{na_i} < c_{a_i} - S_i^r$ may correspond to an actual cost structure or merely reflect vessels' behavioral responses to the reform, that is, a shift in expectations under imperfect information. This condition is necessary to ensure that $e_{na_i} > 0$.

The cost structure (11) allows us to demonstrate that total effort decreases after the reform:

$$E_T = \sum_{i=1}^{n} e_i > E_T^r = \sum_{i=1}^{n} e_i^r \tag{12}$$

since $c_{a_i} - S_i < c_{a_i} - S_i^r$ holds. However, in equation (11), we also observe that the effort-to-subsidy ratio (η_i) may increase:

$$\eta_i = \frac{e_i}{S_i} < \eta_i^r = \frac{e_i^r}{S_i^r} \tag{13}$$

If $e_i^r = e_{a_i}^r + e_{na_i}^r$ and $S_i > S_i^r$, then $\eta_i < \eta_i^r$ occurs if and only if $c_{na_i} < c_{a_i} - S_i^r$, as effort does not decline proportionally to S_i^r due to $e_{na_i}^r > e_{na_i}$.

In summary, based on the model's predictions, we argue that introducing a reform that reallocates subsidies unequally across vessel types leads to: (i) a rise in the effort- to-subsidy ratio as a response to the loss of competitiveness due to the unequal subsidy allocation; (ii) a reduction in total subsidies, increasing marginal costs and decreasing authorized fishing efforts; and (iii) an increased incentive for unauthorized fishing activities, as vessels seek to at least maintain pre-reform profit levels despite overall subsidy reductions.

4 Methodology

4.1 Data Collection

To examine the relationship between access to fuel subsidies for industrial fishing vessels and fishing activity, we utilize data from two primary sources: (i) a newly released database compiled by Wang et al. (2023) that contains individual-level administrative data on fishing vessels registered in the Marine Fishing Vessel Dynamic Management System of the Zhejiang provincial government. This administrative platform comprises five modules corresponding to each section of the vessel management activities: engine power quota, vessel name, vessel inspection, vessel registration, and fishing license; and (ii) data from Global Fishing Watch (GFW), which provides information on the number of fishing hours conducted by each vessel at a resolution of 0.01 degrees per pixel on a daily basis.

The database from Wang et al. (2023) contains reports from 7,592 vessels constructed between 1988 and 2011. A total of 3,354 vessels, representing 44% of the sample, were successfully matched with GFW data.

Table 1: *Summary Statistics of the main outcome variables*

	Min	**25%**	**50%**	**Mean**	**75%**	**Max**	**Obs**
Total fishing hours	0	0	0	1.25	1.03	45.39	5,074.669
Total fishing hours (Without 0)	0.00	0.93	2.07	3.63	4.57	45.39	1,752,117
Authorized fishing hours	0	0	0	1.31	1.15	45.39	4,827.774
Authorized fishing hours (without 0)	0.00	0.93	2.07	3.63	4.57	45.39	1,737,173
Unauthorized fishing hours	0	0	0	0.25	0	39.06	246,895
Unauthorized fishing hours (without 0)	0.00	0.70	2.03	4.16	5.30	39.06	14,944
Fuel subsidies (RMB/Kw)	331	958.75	1608.48	1375.27	1774.08	1830.72	5,074,669
Authorization status	0	-	-	95.1%	-	1	5,074,669
Exit Probability	0	-	-	2.25%	-	1	5,074.669

Source: Authors, using information from Global Fishing Watch, Sea Around Us and Wang et al. (2023) database. Note: Fishing hours are presented as total hours per pixel/day. Each pixel has a resolution of 0.01 degrees, approximately 1km x 1km. Fuel subsidies are expressed as the annual payment in Chinese Yuan (RMB) per Power (Kw). Authorization status takes the value of 1 if the detected fishing activity carried out by a Chinese vessel occurs in the waters of countries where there is a fishing access agreement, in national waters, or in high sea. Exit probability indicates whether the vessel participates in the buyback program.

The resulting database comprises fishing activity in hours per day/pixel for 3,354 trawler vessels from Zhejiang province in China for the period 2012-2019. The database also includes the characteristics of the vessels, records of the fuel subsidy payments received, and records of exits through the vessel buyback program.

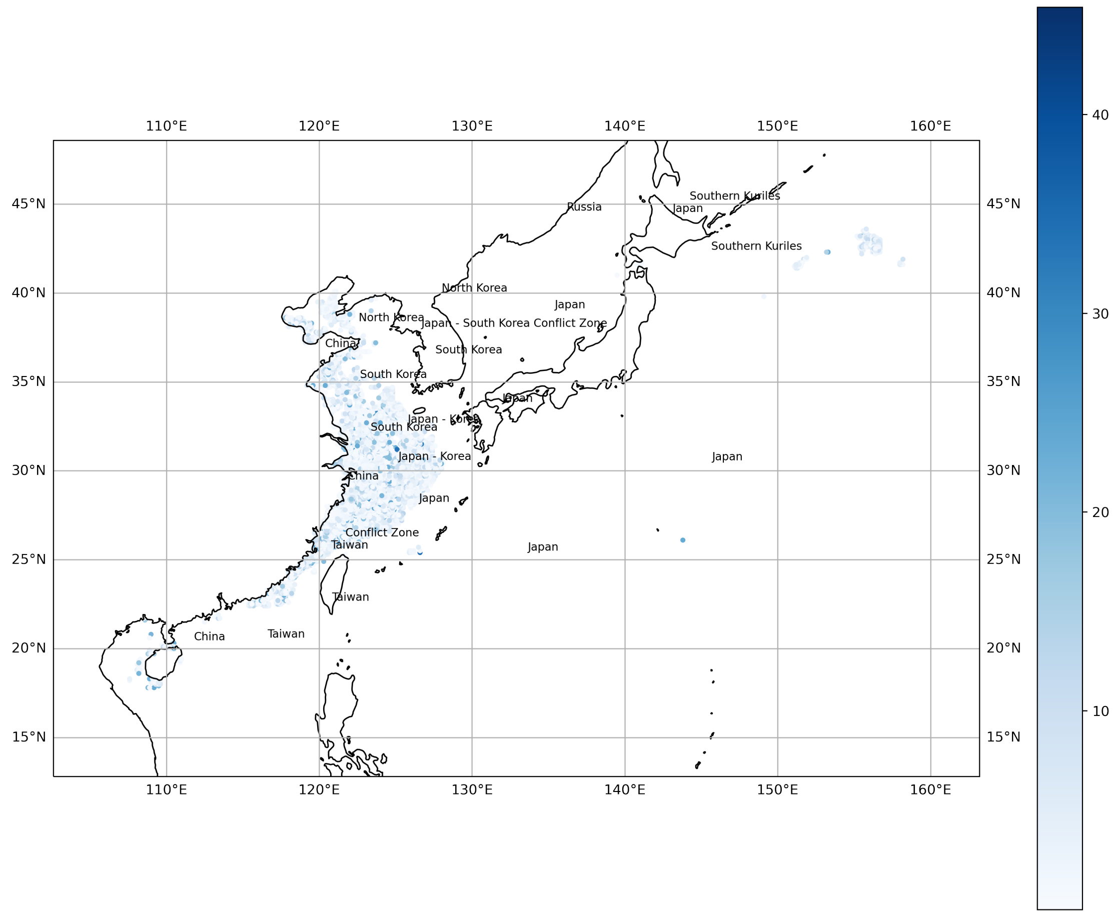


Figure 4. Coverage of Chinese Trawler Vessel's Fishing activity. Authors, using information from Global Fishing Watch and Wang et al. (2023) database. Each pixel has a resolution of 0.01 degrees, approximately 1km x 1km.

The descriptive statistics for the outcome variables are presented in Table 1. On average, vessels spend 1.25 hours/day/pixel on fishing activities (3.63 hours/day/pixel for positive fishing hours). In terms of authorization status, vessels average 1.31 hours/day/pixel in authorized fishing and 0.25 hours/day/pixel in unauthorized fishing. For positive fishing hours, the averages are 3.63 and 4.16 hours/day/pixel, respectively. No-positive fishing hours refers to the pixels where fishing vessels passed through but did not engage in any fishing activity. This indicates the transit from one fishing location to another.

Figure 4 illustrates the extent of the fishing activity of the vessels in the database, along the eastern coast of China. For positive fishing hours, vessels fished an average of 3.67 hours/day/pixel in national territory, 4.90 hours/day/pixel in Taiwanese territory, 4.57 hours in the joint regime area between Japan and Korea, 3.70 hours in disputed zones, and 3.67 hours in Japanese territory (Table 2). Figure A2 shows the distribution of vessel length.

Table 2: *Chinese Fishing Activity by Countries and Sovereign*

Country	Sovereign	Agreements	Fishing Hours		
			Obs	**Mean**	**SD**
China	China	-	1.466.579	3.67	4.28
South Korea	South Korea	Yes	1.107	3.95	4.87
Taiwan	Taiwan	No	2.872	4.90	5.46
Conflict Zone	Disputed	No	2.111	3.70	4.60
Japan - Korea	Joint Regime	No	1.198	4.57	5.87
Japan	Japan	No	525	3.97	4.63

Source: Authors, using information from Global Fishing Watch, Sea Around Us, and Wang et al. (2023) database. Note: The agreements were defined according to the internal fishing access agreements dataset from Sea Around Us. The existence of an agreement is determined by whether a formal agreement was signed between the parties for the years under analysis.

Regarding the authorization status of fishing activity we use the Sea Around Us (SAU) fishing access agreements database. Fishing activity will be considered authorized if there is a formal fishing agreement between the parties. This is because the SAU database contains vessel detection information based on Global Fishing Watch data, necessitating a distinction between the types of access contained in the database used. Table A2 shows the fishing agreements that China had during the analysis period[1].

4.2 Empirical Strategy

Based on the theoretical model, we found that introducing a reform that reallocates subsidies unequally across vessel types leads to (i) a rise in the effort- to-subsidy ratio as a response to the loss of competitiveness due to the unequal subsidy allocation; (ii) a reduction in total subsidies, increasing marginal costs and decreasing authorized fishing efforts; and (iii) an increased incentive for unauthorized fishing activities, as vessels seek to at least maintain pre-reform profit levels despite overall subsidy reductions.

We test the first predictions through descriptive data analysis, while to evaluate the (ii)-(iii) theoretical predictions, we propose a Difference-in-Differences (DiD) model to estimate the effect of subsidy allocation on fishing activity and the number of unauthorized fishing hours, using the following specification:

$$y_{izt} = \alpha_1 D_i + \alpha_2 Post_{t_y} + \beta D_i \times Post_{t_y} + \gamma_i + \phi_z + \rho_t + \epsilon_{izt} \tag{14}$$

[1]For agreements with unspecified end year, we assume that the agreement is still valid, which biases the authorization status towards authorized rather than unauthorized, therefore, the results obtained could be interpreted as a lower bound.

Where y is the outcome variable of fishing efforts for vessel i at pixel z on the day t. The outcome variables presented are total industrial fishing activity, activity in national waters, that is, within China, as well as activity in foreign waters and unauthorized activity. The variable $D_i = \mathbb{1}\{\text{Vessel Length} \geq 30\}$ indicates whether the vessel has a length greater than 30 meters. This is a threshold chosen based on the evaluation of subsidy access distribution by vessel size (Figure 2). $Post_{t_y}$ takes the value of 1 from year $t_y = 2016$,when the subsidy program reform was implemented, and 0 otherwise. The variables γ_i, ϕ_z y ρ_t represent vessel fixed effects, pixel fixed effects, and time fixed effects, respectively. The idiosyncratic error is represented by ϵ_{izt}. The coefficient of interest is β which captures the effect of the reform to the fuel subsidy program by large vessels.

To avoid potential bias from manipulation of the treatment assignment rule, the database consists of vessels built before 2012. Given this, and considering that D_i is a characteristic that does not vary over time in the analysis period, there is no reason to believe that D_i is correlated with unobserved factors that determine the outcome variable. Therefore, it is not necessary to include additional covariates.

Taking into account the distribution of vessels by size, the regressions are estimated for vessels around the 30-meter threshold. As the main estimation, the regressions are conducted for vessels between 25 and 35 meters. After the reform, vessels larger than 30 meters received approximately 19% more subsidy payments compared to vessels smaller than 30 meters.

Building on equation (14), we made the following change: similar to Wang et al. (2023), we replaced $\beta D_i \times Post_{t_y}$ with $\beta_j D_i \times Post^j_{t_y}$ for $j = 2012, ..., 2019$, where $Post^j_{t_y} = \mathbb{1}\{t = j\}$. This allows us to obtain the treatment effect over the years, thus conducting an event study that shows the effect of the subsidy program reform over time. Equation would be expressed as:

$$y_{izt} = \alpha_1 D_i + \alpha_2 Post_{t_y} + \sum_{j=2013}^{2019} \beta_j D_i \times Post^j_{t_y} + \gamma_i + \phi_z + \rho_t + \epsilon_{izt} \tag{15}$$

To ensure the correct estimation of the causal effect of the change in subsidy access on unauthorized fishing activity using the DiD method, it is necessary to satisfy the following assumptions: (i) *No anticipation.* This refers to the assumption that fishers did not have the opportunity to adjust vessel characteristics to take advantage of the treatment assignment rule. To prevent any bias, only vessels built before 2012 are considered. (ii) *Parallel trends.* This assumption presupposes that the fishing behavior of vessels that had access to more subsidies and those that had access to fewer subsidies follows parallel trends before the reform. Graphical representations of this assumption are presented in Figure A.2.

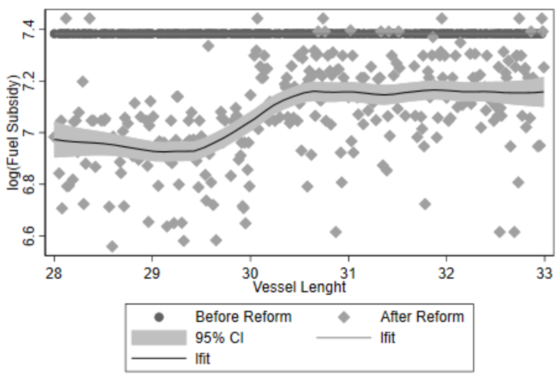
5 Results

In this section, we present the results about the effects of the fuel subsidy program reform on the fuel subsidy payments among vessels, and on fishing activity according to theoretical predictions.

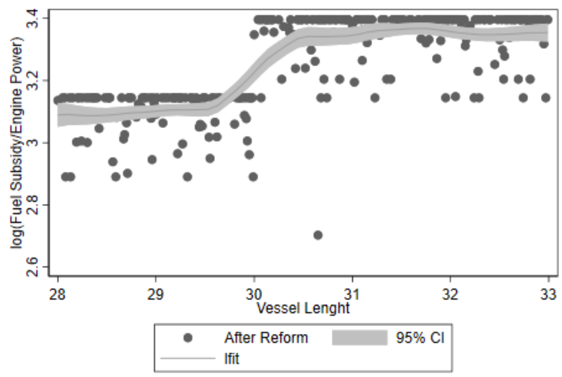
5.1 Effects of fuel subsidy program reform on fuel subsidy payments

The key factor explaining the findings is access to fuel subsidies, which contributes to vessels conducting a greater number of fishing hours and also incentives them to engage in unauthorized fishing activity due to lower opportunity costs.

Figure 5 depicts the payments for fuel subsidies made before and after the reform. In panel (a), it is observed that before the reform, vessels received the same payments regardless of size, whereas after the reform was introduced, the total subsidies decreased, more pronounced for vessels smaller than 30 meters (panel b).



***(a)** Fuel Subsidy Access in 2015-2016*



***(b)** Fuel Subsidy Access in 2016*

Figure 5. The relationship of Fuel subsidy payments per Kw and vessel length in 2015 and 2016. Source: Authors, using information from Global Fishing Watch and Wang et al. (2023) database. Note: Panel (a) shows the total fuel subsidy payments before and after reform, and panel (b) shows the total fuel subsidy payments per Kw of engine power after reform.

Table 3 displays the effect of the reform on subsidy access and the probability of exiting the fishing market. It is observed that after the reform, vessels larger than 30 meters received 15.8% more subsidies than vessels below 30 meters, and furthermore, larger vessels had a 2.5% lower probability of exiting the market. This is consistent with the results presented by Wang et al. (2023).

Table 3: *Average treatment effect of fuel subsidy program reform on fuel subsidy access and exit probability*

	Fuel subsidy (*log*)		Exit Probability	
	(1)	(2)	(3)	(4)
1.Treated*1.Post	0.141***	0.158***	-0.018***	-0.025***
	(0.0004)	(0.0003)	(0.0003)	(0.0004)
FE	No	Yes	No	Yes
$\text{Mean}_{<2016}$ $\text{Log}(y_{izt})$	7.45	7.45	0.009	0.009
N Treated	598.302	598.302	598.302	598.302
N Control	470.168	470.168	470.168	470.168
Observations	4,300,681	4,300.602	4,300,681	4,300.602

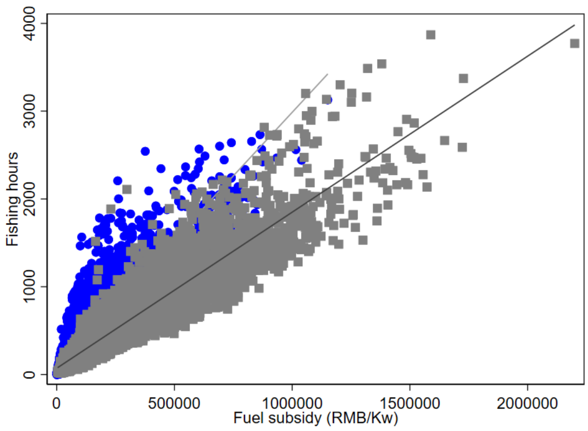
Source: Authors, using information from Global Fishing Watch and Wang et al. (2023) database. Note: * p<.10, * p<.05, ** p<.01. The outcome variables in columns (1)-(2) are expressed in log. Vessel, year, month and pixel controls are included.

5.2 Effects of fuel subsidy program reform on fishing activity according to theoretical predictions

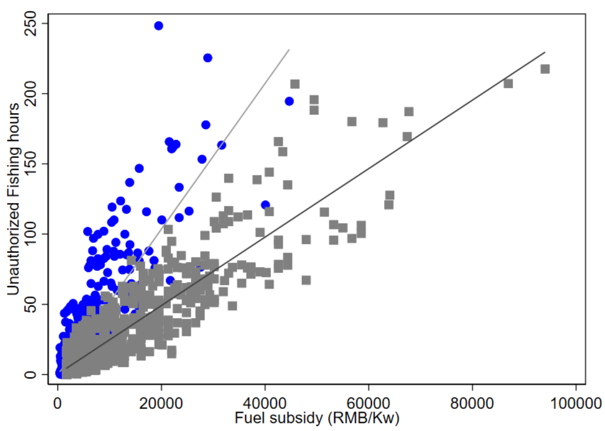
In the previous section, we showed that, due to greater access to subsidies compared to smaller vessels, larger vessels faced lower marginal fishing costs, enabling them to operate over longer distances. Consequently, fishing hours in foreign waters increased, consistent with the findings of Englander et al. (2025). In addition, unauthorized fishing activity increased as a result of lower relative opportunity costs.

5.2.1 Prediction 1: *a rise in the effort- to-subsidy ratio as a response to the loss of competitiveness due to the unequal subsidy allocation*

Figure 6 shows the relationship between the number of fishing hours and the payments of fuel subsidies before and after the reform. It is observed that after the reform, for each RMB/Kw received as part of the subsidy, vessels engaged in a greater number of fishing hours compared to activity levels before the reform, with the same trend observed for unauthorized fishing hours. This result is explained by the lower access, in general, to subsidies for all vessels after the reform compared to the records before the reform, as we presented earlier.



(a) Total Fishing Efforts

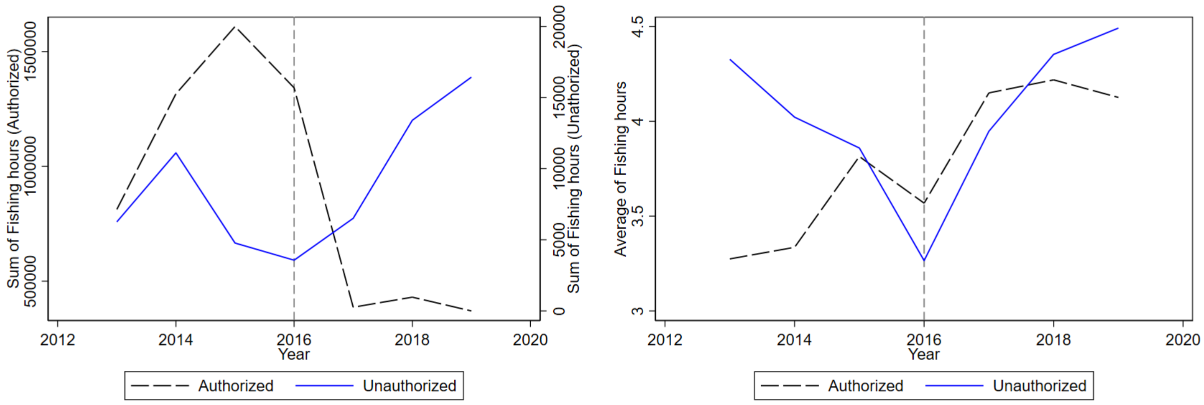


(b) Unauthorized Fishing Efforts

Figure 6. The relationship between fishing efforts and fuel subsidy payments before and after reform. Source: Authors, using information from Global Fishing Watch and Wang et al. (2023) database. Note: The figure show in blue the total and unauthorized fishing efforts after reform; and the results before reform are displayed in gray. Each point represents a vessel.

5.2.2 Prediction 2: *a reduction in total subsidies, increasing marginal costs and decreasing authorized fishing efforts*

Figure 7 shows the evolution of fishing according to its type of authorization for the years 2012-2019. Panel (a) displays the total sum of fishing hours/day/pixel, indicating that vessels engaged in more authorized fishing hours before the subsidy program reform in 2016, but this trend reversed post-reform. Similarly, panel (b) presents the average fishing hours/day/pixel, showing similar pattern.



(a) Total Fishing Efforts *(b) Average Fishing Efforts*

Figure 7: Fishing Efforts by authorization status. Source: Authors, using information from Global Fishing Watch and Wang et al. (2023) database. Note: Panel (a) shows the total fishing efforts for authorized and unauthorized fishing, and panel (b) shows the average total fishing efforts.

Table 4 presents the results of the impact of the reform of the fuel subsidy program on fishing activity variables. It is observed that on average, after the reform, vessels larger than 30 meters experienced a decrease of 1.3% in the total number of fishing hours compared to fishing conducted before the reform and by smaller vessels. Similarly, it is observed that these vessels decreased the total hours of fishing in national waters by 1.4% and increased fishing activity in foreign waters and high seas by 0.5%.

Table 4: *Average treatment effect of fuel subsidy program reform on fishing activity*

	Total fishing hours		National fishing hours		Fishing hours in foreign waters	
	(1)	(2)	(3)	(4)	(5)	(6)
1.Treated*1.Post	-0.034***	-0.013***	-0.0363***	-0.014***	0.036***	0.005**
	(0.001)	(0.001)	(0.002)	(0.002)	(0.003)	(0.003)
FE	No	Yes	No	Yes	No	Yes
$\text{Mean}_{<2016}$ $\text{Log}(y_{izt})$	0.48	0.48	0.49	0.49	0.07	0.07
N Treated	598.302	598.302	546.096	546.096	52.206	52.206
N Control	470.168	470.168	433.061	433.061	37.107	37.107
Observations	4,300,681	4,300.602	4,092,151	4,092,146	208.530	208.348

Source: Authors, using information from Global Fishing Watch and Wang et al. (2023) database. Note: * p<.10, * p<.05, ** p<.01. The outcome variables are expressed in log. Vessel, year, month and pixel FE are included.

5.2.3 Prediction 3: *an increased incentive for unauthorized fishing activities*

Finally, we observed that the difference in unauthorized fishing hours between vessels smaller than and larger than 30 meters increases in favor of larger vessels after the reform (Figure 8). Figure 9 shows unauthorized fishing hours by countries. In particular in Taiwan, smaller vessels exhibited higher levels of activity before the reform. However, following the reform, this relationship reversed, with the gap becoming more pronounced. This fact suggests the need to evaluate this relationship in greater detail.

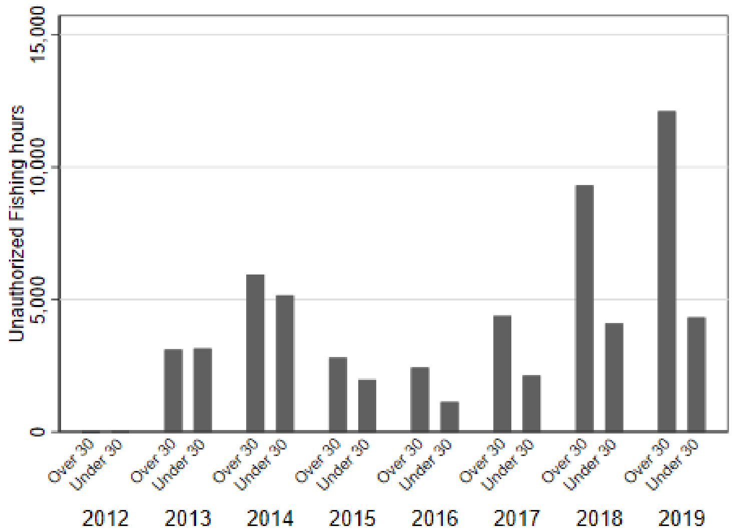
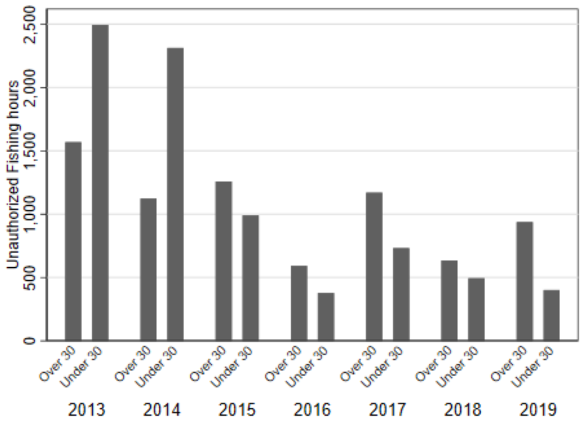
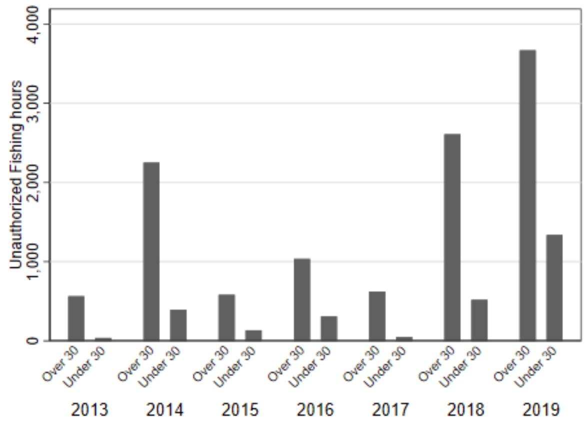


Figure 8. Total Unauthorized Fishing Efforts by vessel length over years. Authors, using information from Global Fishing Watch and Wang et al. (2023) database.

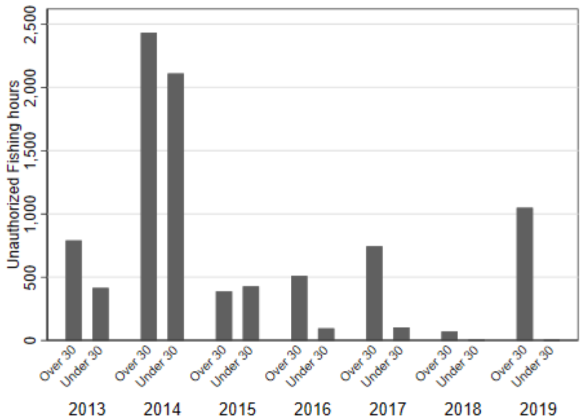
When looking at where these increases in fishing in foreign waters occurred, it is observed that fishing hours in countries without a fishing access agreement increased by 12.8% (Table 5). Following the reform, fishing activity by larger vessels began to migrate from national territory to foreign territory, explained by lower relative marginal costs due to access to subsidies. This increased foreign activity manifested in a significant increase in unauthorized fishing activity. Table A1 presents the results of the placebo test for periods prior to the reform. No significant effects are observed, with the exception of the post-2013 period; however, this effect disappears once fixed effects are included, suggesting that the results presented in Table 5 may be biased by factors preceding the subsidy program reform.



(a) Taiwan



(b) Japan



(c) Conflict Zone

Figure 9. Total unauthorized fishing hours by vessel length over years. Source: Authors, using information from Global Fishing Watch and Wang et al. (2023) database. Note: Panel (a) shows the total chinese unauthorized fishing efforts in Taiwan, panel (b) shows the unauthorized fishing hours in Japan, and panel (c) shows the activity in Conflict zones.

Table 5: *Average treatment effect of fuel subsidy program reform on unauthorized fishing activity*

	Unauthorized fishing hours (*log*)			
	(1)	(2)	(3)	(4)
1.Treated*1.Post	-0.005	0.189**	0.156**	0.128**
	(0.04)	(0.06)	(0.06)	(0.07)
FE	No	i	i,t	i,t,z
$\text{Mean}_{<2016}$ Log(y_{izt})	0.99	0.99	0.99	0.99
N Treated	1.842	1.842	1.842	1.842
N Control	983	983	983	983
Observations	8.812	8.725	8.725	8.681

Source: Authors, using information from Global Fishing Watch and Wang et al. (2023) database. Note: * p<.10, * p<.05, ** p<.01. The outcome variables are expressed in log. Vessel, year, month and pixel FE are included.

The effect of the reform on unauthorized fishing activity was consistent over time and intensified as the years passed. Figure 10 presents the estimates from equation (15) relative to the year of the reform (event study). It can be observed that the number of unauthorized fishing hours increased from the first year, but it became significant from the year 2017 onwards, remaining so in the year 2019, before the pandemic. Figure A3 presents event study results for Taiwan, Japan and Disputed zones. It is observed that the increase in unauthorized fishing activity occurs primarily in disputed zones and in Taiwan.

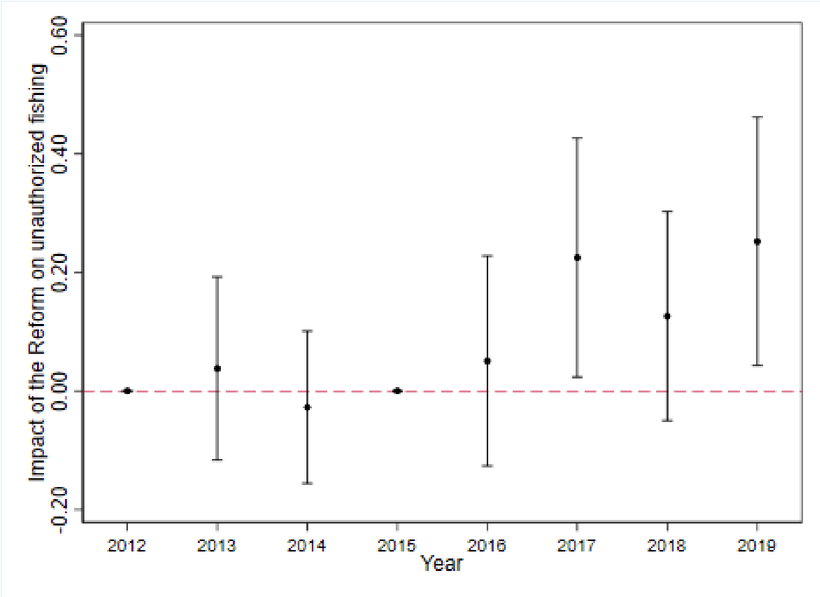


Figure 10: Event study of fuel subsidy program reform effect on unauthorized fishing hours. Source: Authors, using information from Global Fishing Watch and Wang et al. (2023) database. Note: The vertical bars indicate the confidence intervals at 10%. The figure presents the results of the estimates based on equation (2).

6 Discussion

This paper examines how state-provided economic incentives, specifically fuel subsidies, shape unauthorized fishing practices by Chinese industrial vessels. By exploiting the 2016 reform of China's fuel subsidy program, which introduced eligibility thresholds based on vessel size and temporal phasing, we identify the causal effect of change in subsidy access on fishing behavior in foreign waters. A distinguishing aspect of this study is its focus on unauthorized fishing as defined by the FAO (2024), namely, fishing activities carried out in countries without formal access agreements. By separating these from legal operations, we offer a more precise assessment of how subsidies affect compliance with international norms.

Our results suggest that vessels receiving larger subsidies, compared to those receiving smaller amounts, increase their fishing efforts in foreign waters while reducing their activities within national territory. This outcome is associated with the finding that access to subsidies enables vessels to undertake longer fishing expeditions and travel greater distances (Englander et al., 2025), and to take advantage of fish stocks in foreign zones. After the reform, vessels that received larger subsidies increased their unauthorized fishing activities, particularly in Taiwanese waters and disputed areas, which may have escalated tensions between the involved countries, as evidenced by recent news reports.[2]

[2]See: https://www.rfa.org/english/news/southchinasea/china-kinmen-intrusion-05102024034553.html and

Despite these shifts in spatial allocation, the estimated elasticity of unauthorized fishing effort with respect to fuel subsidies appears to be relatively inelastic. This suggests that while subsidies do reduce the cost of distant-water operations, other factors—such as perceived enforcement risks, penalties, and institutional deterrents—play a substantial role in shaping decision-making. Additionally, the VBP may have provided an alternative for fishers, encouraging them to view exiting the fishing sector as more economically attractive than engaging in IUU fishing. This finding aligns with economic theories of compliance and enforcement (Becker, 1968, Agnew et al., 2009) and highlights the limited efficacy of price-based incentives in isolation when attempting to influence illicit behavior.

This paper suggests that fishers, in one way or another, exploit favorable cost conditions to maximize their benefits. In this case, we observe that they take advantage of their increased fishing capacity, granted by access to subsidies, to engage in more extensive fishing activities, including unauthorized fishing. This finding contributes to the discussion on the implications of providing subsidies for inputs, which has been shown to threaten the sustainability of ecosystems by increasing fishing efforts, traveling greater distances, and now, increasing IUU fishing.

This study has several limitations. First, the main outcome variable, fishing effort, relies on Automatic Identification System (AIS) data as processed by GFW. While this dataset enables consistent global monitoring, it only captures vessels that broadcast AIS signals, potentially excluding those that deliberately disable transmitters to avoid detection. Although GFW applies cross-referencing techniques to mitigate manipulation of location data (Paolo et al., 2024), unobserved activity remains a concern. Second, the dataset from Wang et al. (2023) is based on official subsidy recipients, which by design excludes vessels not formally compliant with Chinese regulations. Consequently, our estimates likely understate the full extent of unauthorized activity, and may not capture behaviour by habitual violators.

Further research could strengthen these findings along several lines. Integrating non-AIS satellite imagery or port inspection data could help identify vessels operating without digital traceability. Survey evidence from fishing communities may also provide insight into fishers' perceptions of enforcement and how these shape risk tolerance. Finally, comparative studies involving other major distant-water fishing nations would help assess whether subsidy-induced reallocation of effort is a broader phenomenon, and could inform international negotiations on subsidy discipline and fisheries governance.

7 Conclusions

This paper examines the impact of subsidies provided to Chinese fishing vessels on unauthorized fishing activities, specifically assessing the level of compliance among Zheijuang fishers

https://www.spf.org/iina/en/articles/furuya_02.html with international fishing regulations. We analyze the effects of the 2016 reform of China's fuel subsidy program and distinguish between vessels operating in domestic waters and those operating in foreign waters. Furthermore, we differentiate between vessels fishing in countries with fishing access agreements and those without, with the latter considered unauthorized fishing activities, as defined by the FAO (2023) as illegal fishing. In this paper, we propose a theoretical model together with a causal inference model, which allows us to understand and estimate the impact of differential access to subsidies on the decisions of industrial fishers to engage in fishing activities in international waters of countries where the Chinese government lacks a fishing access agreement.

Our findings contribute to literature in several ways. First, they provide empirical support for the argument that public subsidies can facilitate activities inconsistent with international sustainability goals, especially when they reduce the private cost of long-distance fishing. While previous work has shown that subsidies can distort incentives (Sumaila et al., 2010b, Mallory, 2013), our contribution lies in documenting the geographic reallocation of fishing effort—from domestic to foreign waters—and linking this behavior to unauthorized activities. Second, we provide quantitative evidence that vessels receiving greater subsidies increase their presence in foreign waters where China lacks fishing access agreements, with marked increases in contested areas, including Taiwanese waters. This raises concerns about the geopolitical consequences of domestic support programs.

By documenting the link between national subsidy policies and transboundary fishing behaviour, this paper contributes to a deeper understanding of how domestic instruments can produce externalities beyond national jurisdiction. These results underscore the importance of aligning subsidy reforms not only with domestic objectives, but also with broader international commitments aimed at ensuring equitable and sustainable marine resource use.

It is necessary to expand this type of analysis to contexts with weaker enforcement in order to evaluate how the willingness of fishers to engage in unauthorized fishing activities changes as enforcement decreases. Broadening the scope to include varying institutional and regulatory settings could offer valuable insights into the interplay between enforcement intensity, cost structures, and IUU fishing behavior.

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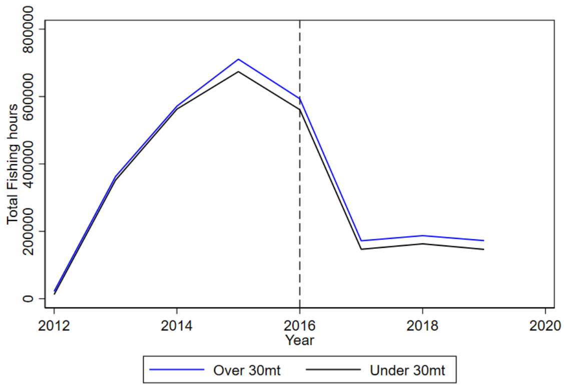
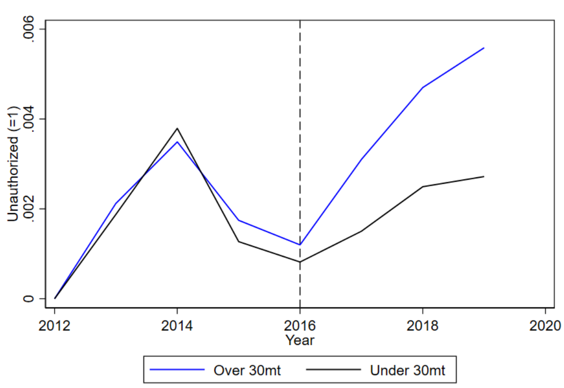
Appendix

A Additional Figures and Tables



(a) Total Fishing Efforts



(b) Unauthorized Fishing Status

Figure A1: Parallel Trend. Note: Source: Authors, using information from Global Fishing Watch and Wang et al. (2023) database. Note: Panel (a) shows the total fishing efforts by treatment, and panel (b) shows the unauthorized probability.

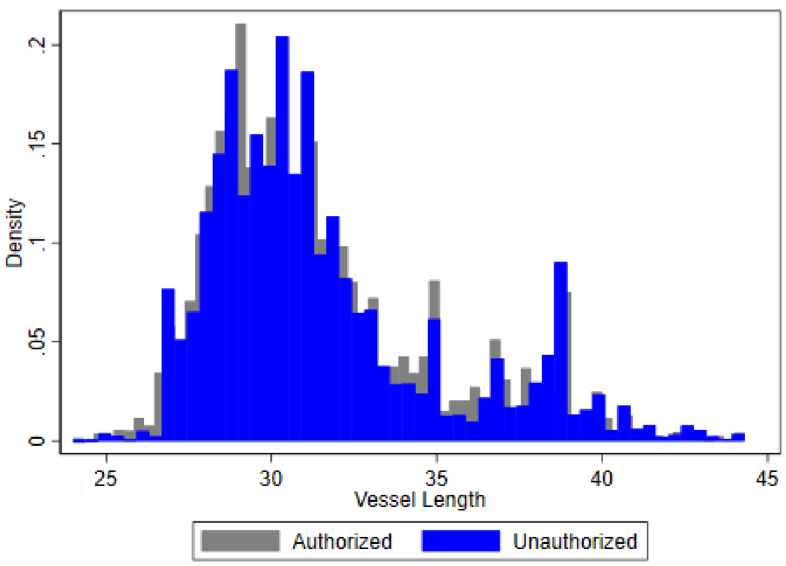
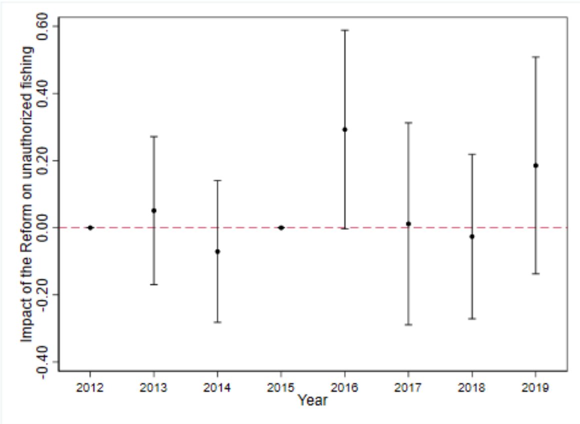
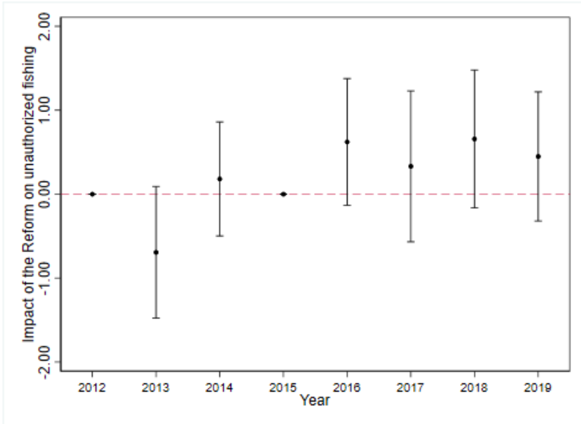


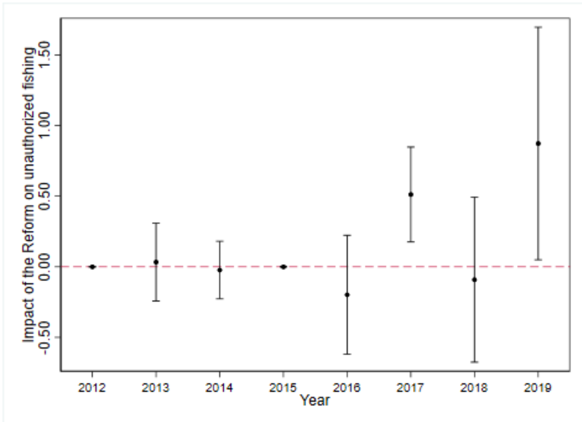
Figure A2: Distribution of Vessel Length. Source: Authors, using information from Global Fishing Watch, Sea Around Us and Wang et al. (2023) database.



(a) *Taiwan*



(b) *Japan*



(c) *Conflict Zone*

Figure A3: Event study of fuel subsidy program reform effect on unauthorized fishing hours by countries. Source: Authors, using information from Global Fishing Watch and Wang et al. (2023) database. Note: Note: Panel (a) shows the effects in Taiwan, panel (b) shows the effect in Japan, and panel (c) shows the effects in Conflict zones. The vertical bars indicate the confidence intervals at 10%. The figure presents the results of the estimates based on equation (3.2) for each country.

Table A1: *Pre-Period Placebo Test*

	Unauthorized fishing hours (*log*)					
	Post > 2014		Post > 2015		Post > 2013	
	(1)	(2)	(3)	(4)	(5)	(6)
1.Treated*1.Post	0.031	-0.077	0.092	0.092	-0.010*	0.017
	(0.049)	(0.070)	(0.059)	(0.086)	(0.058)	(0.083)
FE	No	Yes	No	Yes	No	Yes
N Treated	2.931	2.931	2.302	2.302	4.204	4.204
N Control	1.799	1.799	1.245	1.245	3.200	3.200
Observations	5.265	5.162	5.265	5.162	5.543	5.162

Source: Authors, using information from Global Fishing Watch and Wang et al. (2023) database. Note: * p<.10, * p<.05, ** p<.01. The outcome variables are expressed in log. Vessel, year, month and pixel FE are included. The estimators are calculated by replacing the value of *post* with the years 2013, 2014, and 2015, excluding the values after 2016, which are the actual treatment years.

Table A2: *Chinese Internal Fishing Access Agreements*

Country Owned	Start year	End year
Angola	2016	9999
Argentina	2020	2020
Benin	2015	9999
Cameroon	2018	9999
Côte d'Ivoire	2015	9999
Equatorial Guinea	2018	9999
Fiji	2018	2021
French Polynesia	2014	2019
Ghana	2019	9999
Guinea	2018	9999
Guinea-Bissau	2017	9999
Guyana	1996	9999
Liberia	2018	9999
Madagascar	2019	2021
Micronesia (Federated States of)	2020	2020
Mozambique	2018	2019
Nauru	2020	2020
Nigeria	2018	9999
Oman	2018	2019
Palau	2018	2019
Papua New Guinea	2016	2019
Peru	2010	2018
Senegal	2017	9999
Seychelles	2017	9999
Sierra Leone	2018	9999
Singapore	2017	2019
Somalia	2015	2019
Suriname	2018	2019
South Korea	2001	2019
Togo	2013	9999
Tuvalu	2020	2020
Uruguay	2018	2019
Vanuatu	2020	2020
Viet Nam	2017	2019
Angola	2016	9999
Argentina	2020	2020
Benin	2015	9999
Cameroon	2018	9999
Côte d'Ivoire	2015	9999
Equatorial Guinea	2018	9999
Fiji	2018	2021
Ghana	2019	9999
Guinea	2018	9999
Guinea-Bissau	2017	9999
Guyana	1996	9999
Liberia	2018	9999
Madagascar	2019	2021
Micronesia (Federated States of)	2020	2020
Nauru	2020	2020
Nigeria	2018	9999
Peru	2016	9999
Senegal	2017	9999
Seychelles	2017	9999
Sierra Leone	2018	9999
Togo	2013	9999
Tuvalu	2020	2020
Vanuatu	2020	2020

Source: Internal Fishing Access Agreements - Sea Around Us. Note: Country owned relates the countries with which China has had fishing access agreements. Values of 9999 in End year indicate that there is no specified termination date for the agreement.