

Vessel Day Scheme and Tuna Catch in the Pacific Island Region

Research Team

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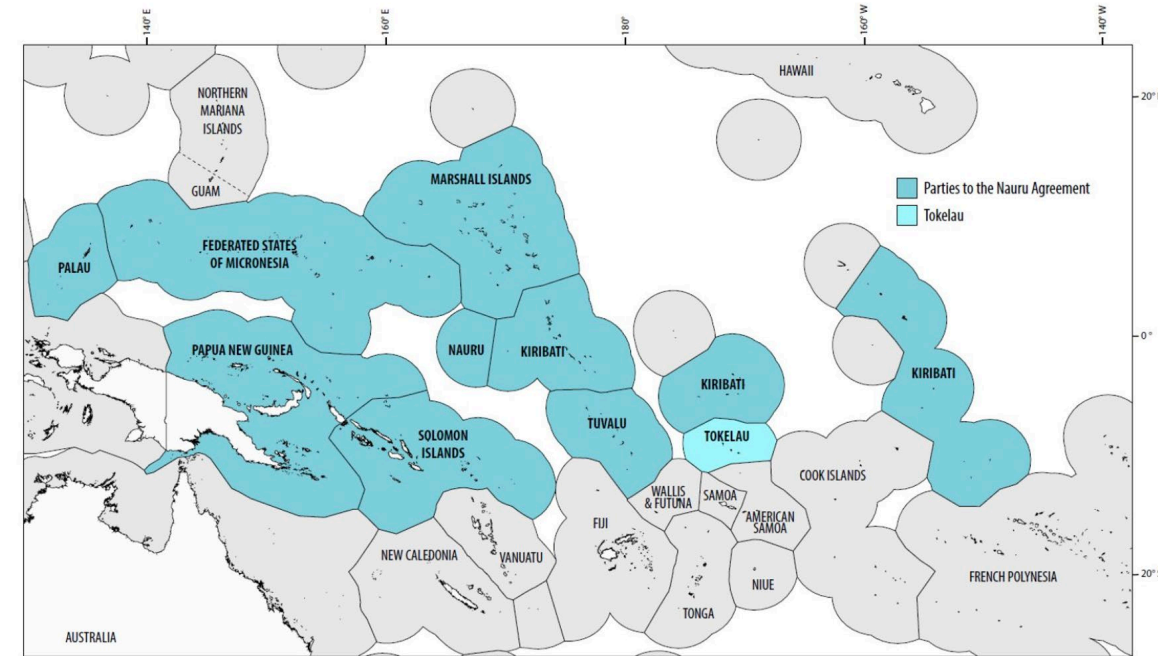


Background





- About **57% of world's tuna** comes from fisheries in the Western and Central Pacific Ocean (**WCPO**) (WEF, 2022).
- Management of tuna fisheries includes the **Exclusive Economic Zones (EEZs)** of the Pacific countries that share the resource.
- Tuna catch increased by **more than double** in last two decades.
- **Overfishing and destructive fishing practices** by the distant water fishing nations causes concerns in the management of tuna.
- In 2007, Parties to Nauru Agreement (PNA) introduced **Vessel Day Scheme (VDS)**.

Vessel Day Scheme (VDS)

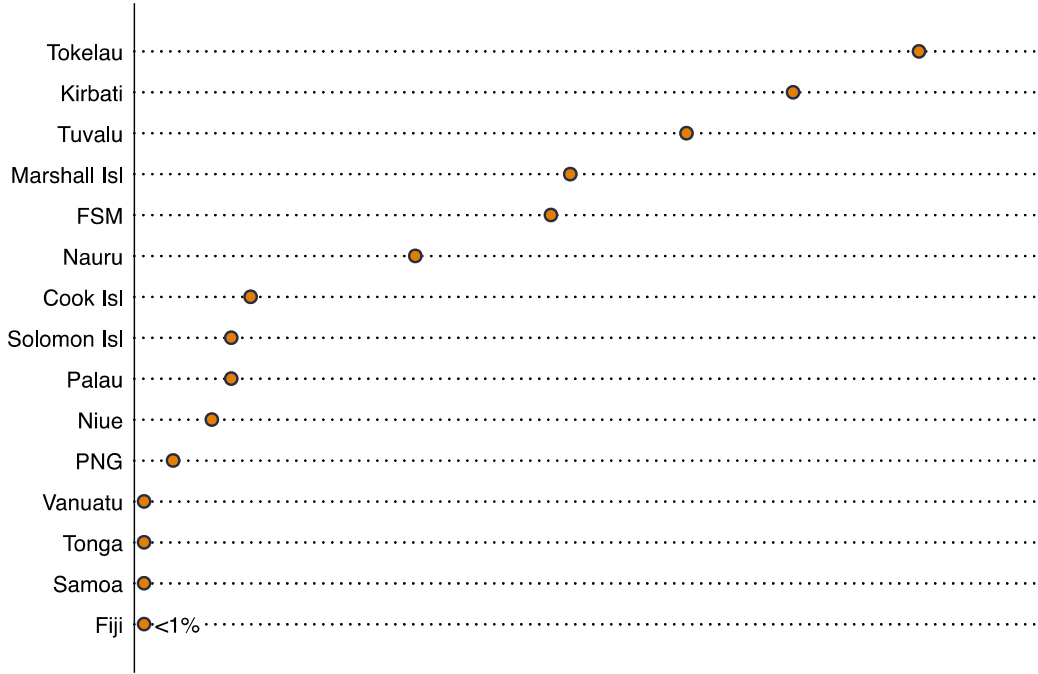
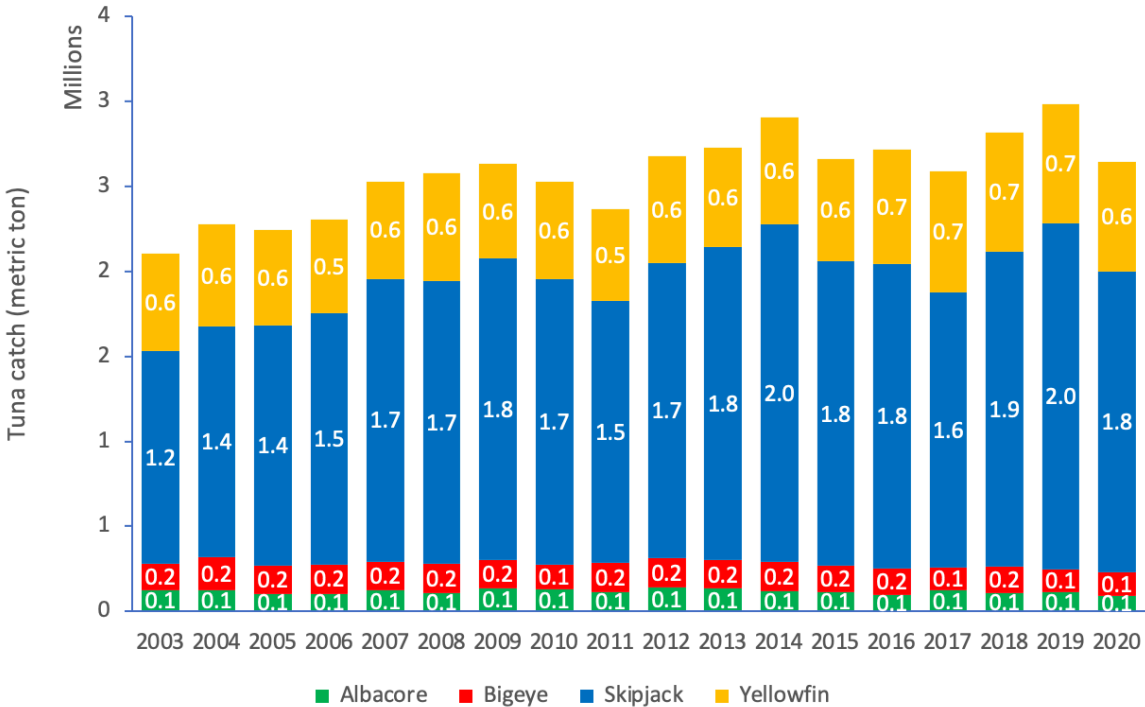
- VDS aims to increase **economic returns to resource-owning PNA countries** by increasing licensing revenues.
- System of **tradable fishing effort (days)** allocated to the 8 Parties
- Puts **limit on Total Allowable Effort (TAE)**, ~ 45,000 days in 2020-2023.
- TAE is allocated to Parties based on zonal biomass and historical effort as **PAEs** (Party Allowable Effort)
- **Fishing days are sold to fleets** for fishing in each EEZ



Tuna Fishing in the Pacific (1)

	Albacore	Bigeye	Skipjack	Yellowfin
				
Fishing method	Longline fishing	Purse seine Longline	Purse-seine Pole-and-line	Purse-seine Pole-and-line Longline
Demand	Use in canneries	High value in Japanese sashimi market	Sold fresh, frozen, canned, dried, salted, and smoked	Mature fish: high value in Japanese sashimi market. Juveniles: sold fresh, frozen, canned, dried, salted,
Harvest (2020)	92,129 metric ton	140,225 metric ton	1,767,117 metric ton	643,628 metric ton
Catch Value (2020)	323 US\$ million	576 US\$ million	2,536 US\$ million	1,498 US\$ million

Tuna Fishing in the Pacific (2)



as percentage of government revenue

Motivation

- VDS is an effort rights-based tool, which is different from pre-VDS fishing **quota based management**.
- Effort rights-based management systems encourage **maximizing revenue and catch** (Squires et al. (2017)).
- VDS creates an impetus to **expand input use and adopt new technology** to increase catch/productivity.
- VDS has strengthened the rights over tuna resources, but raises the **concerns of sustainability** of tuna fishery in the **WCPO** (Havice, 2013).

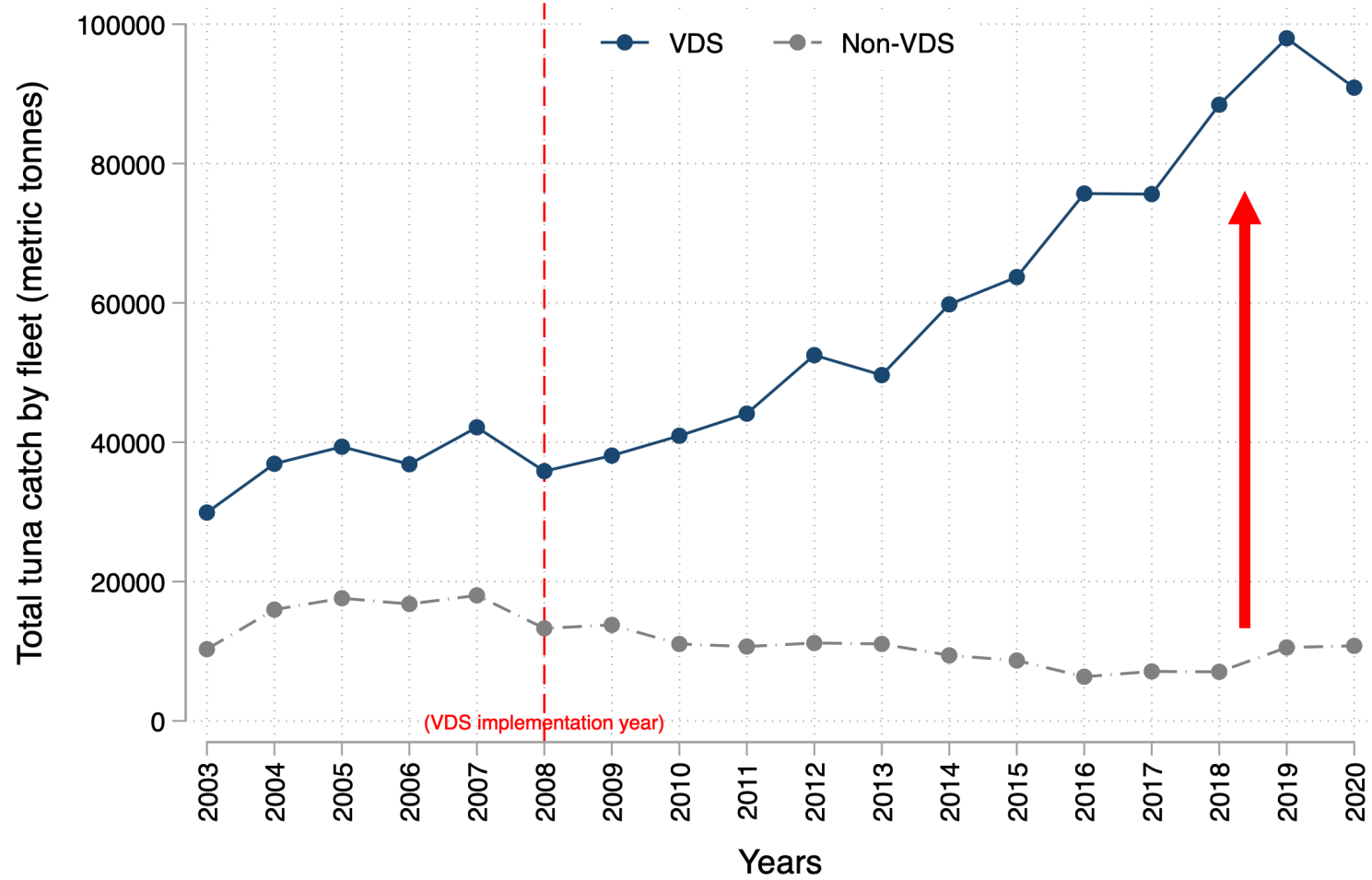
This Research

- Provides **causal evidence** on the connection between the VDS and the tuna catch levels.
- We found that **tuna catch has significantly increased** in VDS countries (treatment) compared to non-VDS (control) countries

Data and Variables (1)

PERIOD	2003-2020 (18 YEARS)
COUNTRIES	18
CONTROL	Australia, Cook Islands, Fiji, New Zealand, Niue, Samoa, Tokelau, Tonga, and Vanuatu (9 countries)
TREATMENT	Federated States of Micronesia, Kiribati, Marshall Islands, Nauru, Palau, Papua New Guinea, Solomon Islands, Tuvalu and Tokalau (9 countries)
Data Source	<ul style="list-style-type: none">• Western & Central Pacific Fisheries Commission (WCPFC-CA) Tuna Fisheries 2021 Database, Pacific Islands Forum Fisheries Agency (FFA)• World Development Indicators, World Bank

Trends of pacific tuna catch between control and treatment group



Data and Variables (2)

Category	Variables	Description
Dependent Variable	$\ln(\text{Catch})_{it}$	Log of total tuna catch in fleet
Treatment	$VDS \times TC$	DID Variable
	VDS	1 if country i is exposed to the VDS in 2008, 0 otherwise
	TC	1 = treatment country if country i is exposed to VDS and 0 = control country who are still in quota system.
Control Variables	$GDPPC_{it}$	GDP per capita in US\$
	$AlbacorePrice$	Import price of fresh albacore in Japan (US\$/mt)
	$BigeyePrice$	Import price of fresh bigeye in Japan (US\$/mt)
	$SkipjackPrice$	Import price of skipjack in Japan (US\$/mt)
	$YellowfinPrice$	Import price of fresh yellowfin in Japan (US\$/mt)
	$Diseloil_{it}$	Price of marine diesel oil
	$Elniño$	1 = yes, 0 = otherwise

Estimation Strategy

Difference-in-Difference (DID) model is used to evaluate the impact of the VDS on the total tuna catch.

$$\ln(\text{Catch})_{it} = (\text{VDS} \times \text{TC})'_{it}\beta + X'_{it}\delta + \mu_i + \eta_t + \varepsilon_{it}$$

Event Study is employed to observe the differences between VDS and non-VDS period by including observed controls X .

$$\ln(\text{Catch})_{it} = \beta_0 + \sum_{\tau}^T \beta_{\tau} d\tau_t + X'_{it}\delta + \varepsilon_{it}$$

Empirical Results

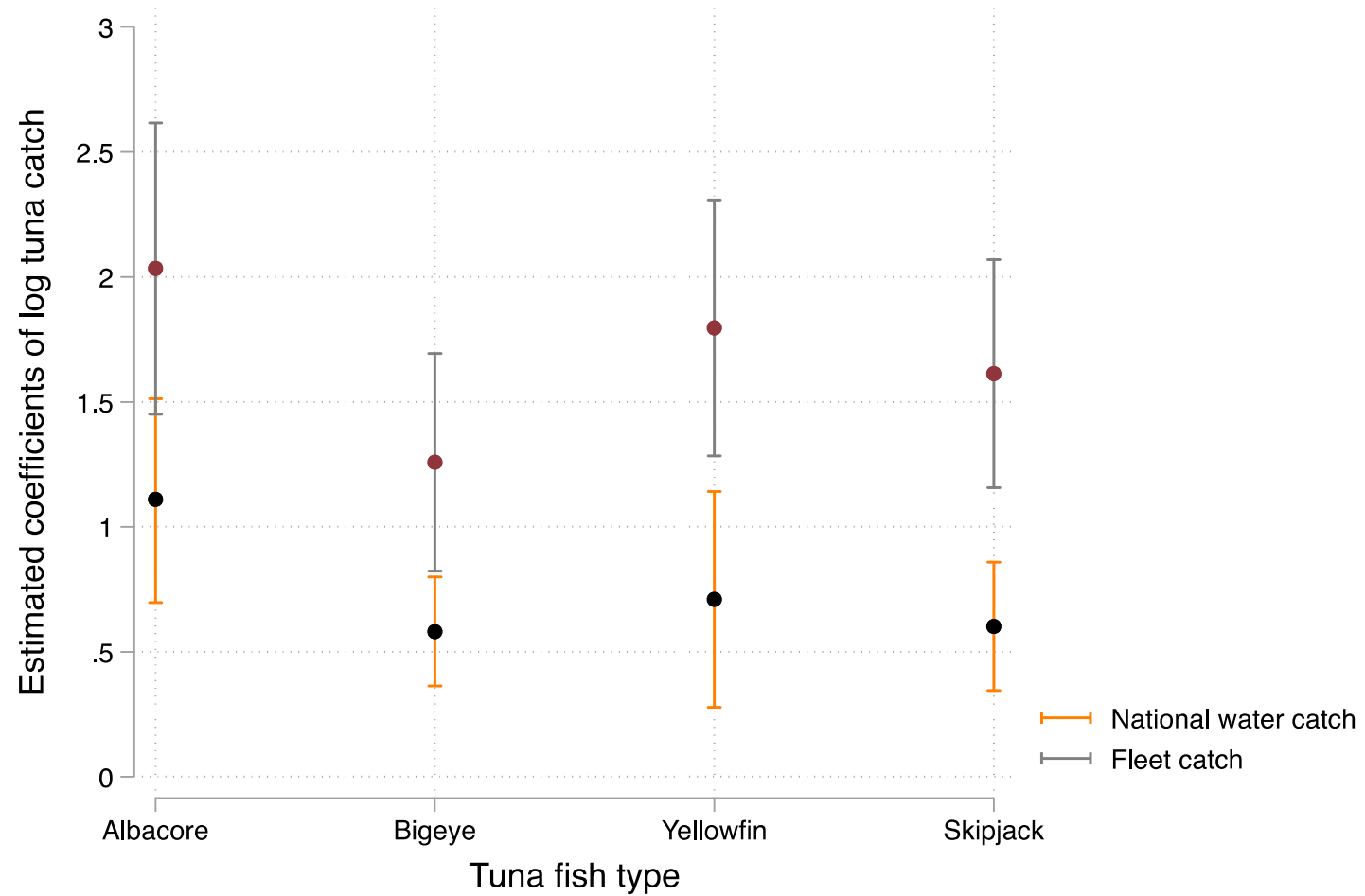
Table 5: Impact of VDS on Pacific Tuna Fleet Catch (in metric tones)

VARIABLES	log of total fleet catch					
	(1)	(2)	(3)	(4)	(5)	(6)
VDS × TC	0.924** (0.432)	1.891*** (0.266)	2.514*** (0.384)	0.661* (0.312)	2.282*** (0.359)	2.480*** (0.389)
Observations	306	306	306	306	306	306
R-squared	0.015	0.841	0.853	0.023	0.847	0.854
No. of Countries	17	17	17	17	17	17
Country FE	NO	YES	YES	NO	YES	YES
Year FE	NO	NO	YES	NO	NO	YES
Covariates	NO	NO	NO	YES	YES	YES
F	4.568	50.39	42.83	2.988	8.850	21.51

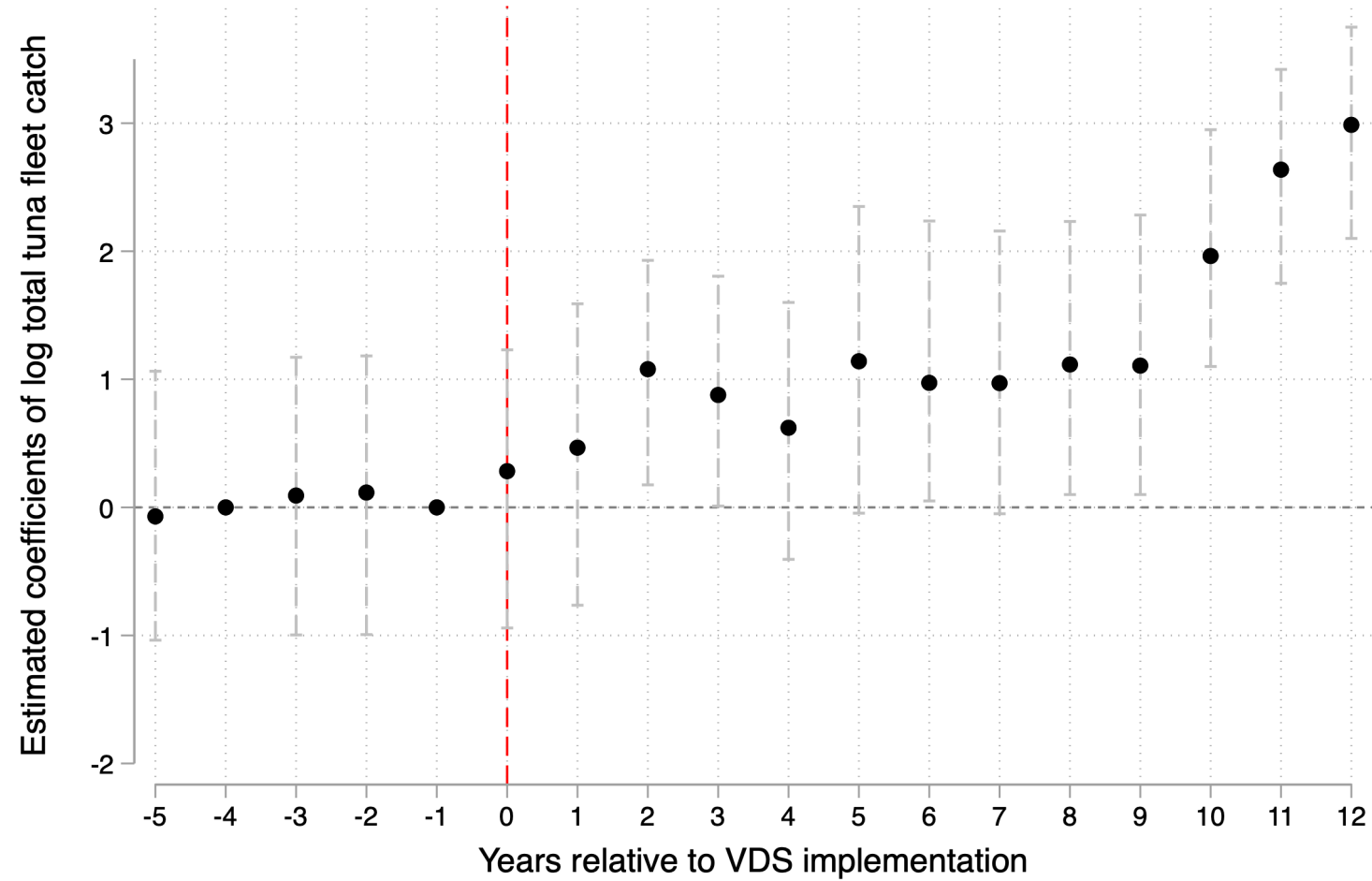
Note: Robust Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Covariates include: $GDPPC_{it}$, $Diseloil_{it}$, $Elniño$, $AlbacorePrice$, $BigeyePrice$, $SkipjackPrice$, $YellowfinPrice$

Estimated Results by Tuna Types



Event Study



Robustness

VARIABLES	(1) log of total fleet catch value	(2) log of total fleet catch value	(3) log of total catch value in national water	(4) log of total catch value in national water
vds_tc	1.121*** (0.155)	1.234*** (0.164)	0.553*** (0.112)	0.590*** (0.119)
Observations	306	306	306	306
R-squared	0.892	0.902	0.927	0.934
No. of				
Countries	17	17	17	17
Country FE	YES	YES	YES	YES
Year FE	NO	YES	NO	YES
Covariates	YES	YES	YES	YES
F	18.74	28.80	35.74	30.77

Note: Robust Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Covariates include: $GDPPC_{it}$, $Diseloil_{it}$, $Elniño$, $AlbacorePrice$, $BigeyePrice$, $SkipjackPrice$, $YellowfinPrice$

Findings

- Tuna catch has **increased more than two-fold** in VDS countries compared to the Non-VDS countries.
- Significant increase in catch levels for every species of tuna.

Policy Implication (1)

- VDS is strikingly **successful in terms of economic return** (raising government revenue and providing sizable profits) to the PNA countries.
- However, research (World Bank, 2012) predicts that, fuelled by increase in sea surface temperature and climate change, in 20 years **tuna stocks may begin to migrate out of the WCPO** EEZs towards the Central and Eastern Pacific ocean.
- About **13% of key commercial species** may move out of the EEZ of the 10 pacific states into the high seas by 2050 (Bell et al., 2021).

Policy Implication (2)

- As evidenced by our findings of two-fold increase in tuna catch by VDS countries, and if it continues, it potentially **threatens the sustainability of tuna stocks** in the EEZs of the affected pacific states.
- A threat to **fall in licence fee revenue** by up to 13% (Bell et al. 2021) as foreign vessels will be able to take advantage of fishing freely in international waters.
- Concern for sustainability of tuna species specially **Bigeye** as it has higher demand in Japanese market while the **spawning is the most depleted** of the four main species in WCPO (World Bank, 2012)

Thank you!

Comments & Questions