

Implications of new economic policy instruments for tuna management in the Western and Central Pacific

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ABSTRACT

Tuna management in the Western and Central Pacific is complicated by the conflicting interests of countries and agents exploiting tuna resources in the region. Historically, regulatory attempts by Pacific Island Countries to control fishing effort within their Exclusive Economic Zones (EEZs) have met with limited success. The introduction of new economic policy instruments by the Parties to the Nauru Agreement (PNA), such as the Vessel Day Scheme (VDS) and Marine Stewardship Council (MSC) certification, has supported and complemented existing conservation and management measures. By bringing in new incentives for the PNA states, greater control over fishing effort and the formulation of perceptibly new sustainable fishing practices have emerged. Using a new institutional economic framework, this paper analyses the shift from regulatory policy to new economic policy instruments through the lens of New Institutional Economics. The results show how the adoption of the VDS and MSC certification program has brought new changes and improvements to tuna negotiations, to agreements, and to outcomes amongst parties. Investing in these new instruments has elucidated ways in which new economic institutions strengthen de jure political control over transboundary fish resources and fishing fleets.

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1. Introduction

The impact of the skipjack tuna purse seine fishery on the more vulnerable yellowfin and bigeye tuna stocks in the Western and Central Pacific Ocean (WCPO) has become increasingly controversial in recent years [1]. Stock assessments from the WCPO consistently report that bigeye is overfished while yellowfin remains fully exploited [2,3]. The impetus to continue (over)exploiting these more vulnerable stocks comes from the economic importance of skipjack to coastal states—who rely on revenues from licensing arrangements with mixed fishing vessels ranging from distant water fishing nations to locally owned and joint-venture fishing vessels. Pacific coastal states' revenue from licensing arrangements ranges from 2% to almost 60% of their GDP [4–6]. Developing management arrangements that balance the ongoing exploitation of skipjack tuna stocks, while reducing pressure on yellowfin and bigeye tuna, is therefore largely dependent on cooperation for balancing conservation and economic goals between the 16 coastal states of the Pacific including the eight

Parties to the Nauru Agreement (PNA) states.

Despite continued recognition of the conservation and economic benefits that can be derived from improved cooperation around tuna management in the region [7], examples of effective cooperative international regimes remain scarce [8–12]. It is also apparent that past access arrangements governing the WCPO tuna fisheries have not led to significant increases in economic returns to coastal states, until the recent implementation of the Vessel Day Scheme in 2012 [4,12]. Inappropriate incentives, inadequate knowledge, a high demand for limited resources, and ineffective governance are noted among the main contributing factors that undermine cooperation [13,14]. As Hanich and colleagues [15,16] noted, cooperative measures that deliver on both effective management and equitable distribution of wealth from these resources have therefore remained a central development policy objective for the region.

Contrary to this trend, the Parties to the Nauru Agreement (PNA), a sub-regional group of eight tuna rich countries, have strengthened the coordination of tuna fishery management across their joint jurisdictions. The PNA members have adopted two new economic policy instruments—the Vessel Day Scheme (VDS) in 2005 and the Marine Stewardship Council (MSC) certification program in 2011—in an attempt to strengthen and complement existing regulatory conservation and management measures for

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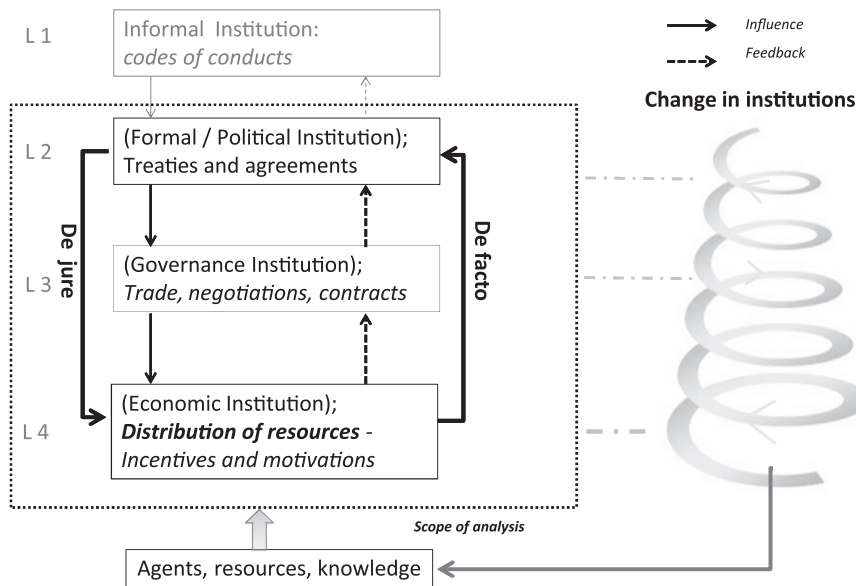


Fig. 1. Theoretical framework of political and economic institutions (Source: Adapted and modified from Williamson [26] and Acemoglu et al. [29]).

tuna fisheries. The new policy instruments have been adopted by the PNA group to ensure both the ecological objectives of the Western and Central Pacific Fisheries Commission (WCPFC) and the economic goals of its member countries are achieved. These new approaches are intended to influence individual countries' choices around securing collective welfare in the fishery, thereby improving not only cooperation and tuna governance in the Pacific [12], but also to meet Pacific island countries' aspirations of gaining greater benefits from tuna [17].

This paper examines the design and implementation of these new economic policy instruments through the lens of New Institutional Economics (NIE); an approach designed to integrate approaches from economics, law and social and political sciences to explain and address complex societal (and fisheries environmental) problems [18]. The paper describes the reasons for the shift to these new economic instruments and analyses how they influence the political (de jure) and economic (de facto) control over fishing resources in the waters of the PNA. In doing so we analyse how this shift has come about and the institutional changes that have been implemented by the PNA as a result. The paper begins by introducing the NIE framework before providing an overview of regional tuna treaties and regimes and the conditions under which the PNA has shifted from a regulatory approach to new economic policy framework. Finally, we examine how these policy instruments affect the de jure and de facto power over fishing resources in the PNA.

Data and information were gathered through literature and document review, as well as interviews and observations at regional and sub-regional tuna management meetings from December 2013 to December 2014. These meetings included the 10th and 11th regular meeting of the WCPFC, 19th meeting of the Parties to the Palau Agreement, 19th meeting of the Parties to the Federated States of Micronesia (FSM) Arrangement, and 33rd annual meeting of the PNA. In addition, 14 in depth interviews were conducted with senior officials and delegations from each of the PNA countries, officials and consultants from the regional organisations in particular Fisheries Forum Agency and PNA Office, and fishers or vessels operators, observers and NGO representatives.

2. New Institutional Economic (NIE) framework

The complexity of balancing the interests of multiple

conflicting states, has led to the emergence of international regimes that seek to combine both regulatory and market logics into finding solutions for global environmental problems through international cooperation [19,21]. As a result, the perceived ineffectiveness of command and control approaches have led to questions about how states and other actors try to achieve desired outcomes. Creating the right incentives then becomes central to the effectiveness of institutions. As regimes evolve in response to the emergence of new issues, they reframe old issues, allow for the entrance of new agents, and/or the changing interests of existing agents, leading to new knowledge and/or a redistribution of power [22]. Understanding such a dynamic institutional environment is essential in determining the conditions under which public and private interests can enable rather than constrain effective resource management and allocation.

A conceptual understanding of this evolving process can be derived from New Institutional Economics (NIE). NIE is relevant for understanding how dynamic political interests influence decisions over the (environmental) governance of trans-boundary and common resources, by focusing on the processes that lead to inefficient policy outcomes and the design of innovative policy solutions. To this end, NIE offers an interdisciplinary approach to analyse the form and function of institutions in allocating rights and responsibilities for efficient resource use and stewardship [18,23–25].

Williamson [26] provides a hierarchical NIE framework consisting of four institutional levels, each with a different pace of change (see Fig. 1). The first two levels refer to informal and formal institutions. Informal or social institutions include socially embedded norms customs, traditions and codes that often hold slow change but pervasive influence over societal conduct. Formal or political institutions constitute the institutional environment within which “executive, legislative, judicial, and bureaucratic functions of government, as well as the distribution of powers across different levels of government” are located (p. 598). Level three of Williamson's hierarchy refers to institutions of governance, constituted by rules for mitigating conflict and creating mutual gains by ‘crafting order’ through contracts and enforcement mechanisms. Finally, level four refers to economic institutions that structure incentives and motivations for ‘day-to-day’ transactions and decisions making. The dynamic nature of agents, resources and knowledge encompassed by economic institutions

are subject to continuous review, with greater frequencies of change compared to governance and political institutions [27]. This also means that experimentation and iterative improvement are also likely in these economic institutions compared to the other institutional levels [28].

The four levels are ordered to the extent that 'higher' levels have a direct influence over those below. So that social institutions direct the formation of political institutions which craft the conditions under which everyday economic practice occurs. But while Williamson recognised that feedbacks between levels are possible, he did not elaborate what these feedbacks would be, nor what consequence they might have. Recognising this gap, Acemoglu et al. [29] argue that the interactions between these institutional levels are fundamentally based on feedbacks which determine the distribution of two types of decision making power. First, *de jure* power derived from the political institutions that underscore state representation, and second *de facto* political power derived from economic institutions that determine the allocation of economic resources. They argue that the control over resources, such as transboundary fish stocks, at any given time is determined by a process of co-production between political (level two) and economic (level four) institutions [26,30].

Following Acemoglu et al. [29] economic institutions are therefore not a function of political institutions, but instead constitutive of political decisions to capture the benefits associated with economic outcomes [31]. Likewise, it opens up the possibility for political institutions to directly structure economic institutions, and in doing so internalise incentives for improved resource stewardship [29]. But returning to Williamson, this process of co-production is not a binary process. It is instead mediated by 'level three' governance institutions. Recognising this mediating role therefore opens up questions about the design of these governance institutions, how they are negotiated, what incentives they 'craft', and ultimately how they influence the balance between political *de jure* and economic *de facto* power. As illustrated in Fig. 1, this combination of both political, governance and economic institutions can be described as the prevailing 'governance' framework, reflecting the incentives of decision makers to choose certain policies, the inclusion of actions, and ultimately how a decision making process leads to different choices, each with their own economic outcomes [31].

3. PNA's shifting focus to incentive driven strategies

The introduction of the VDS and MSC certification of free school purse seine fisheries demonstrates a clear shift in strategy from using political to economic institutions to govern transboundary fisheries by the PNA. In this section we outline the challenges faced by political institutions and the corresponding emergence of these two economic policy instruments, as well as the relationship of these instruments to contemporary fisheries management in the Western and Central Pacific Ocean.

3.1. Palau Agreement and Federated States of Micronesian Arrangement

Under the 1982 United Nations Convention on the Law of the Sea (UNCLOS, 1982), tuna fisheries are governed at different geographic and jurisdictional levels and scales from subnational to national and regional [32]. In the Pacific access to sovereign resources have been governed through a combination of bilateral access and joint venture arrangements, both of which also aim to provide economic development opportunities and lower transaction cost for coastal states. However, despite the goal of managing regionally shared resources, the outcome of these arrangements

have often favoured the interests of the fishing industry dominated by foreign owned, but locally flagged and joint venture vessels. These industry interests have then in turn, been expressed as national interests at the regional level [4,17,33,34]. As a result access arrangements for tuna fisheries in the WCPO have failed to provide significant increases in economic returns to coastal states [4,13]. While most bilateral agreements are rather driven by national political aspirations, weak governance and a lack of political will related to multiple competing interests, have led to a continued overexploitation and inefficient allocation of tuna resources.

The first shift towards new economic policy instruments was initiated through the Palau Arrangement in 1992 and the Federated States of Micronesia Arrangement (FSMA) in 1994. The Palau Arrangement restricted the number of purse seine vessels in PNA waters to 205 [35,36] and the FSMA provides preferential access to vessels engaged in domestic development and offering discounted fishing licences and reciprocal access between PNA member countries [4,36]. Reflecting a wider shift to inter-state investment in fishery resources, the FSMA also marked a fundamental shift in the design of access agreements by offering incentives for economic development opportunities through domestic initiatives [4,12,37]. For example, while giving coastal flagged state vessels preferences, both the Palau Agreement and the FSMA required the development of domestic fisheries, ports and infrastructure, as well as the provision of employment opportunities for PNA nationals.

Despite the conditions set out by both arrangements, it became clear by 2000 that these goals have not been reached [36]. The FSMA failed to promote investment in domestic development largely due to the lack of transparency and limited development opportunities provided by joint venture partners, despite having been in operation in the region for the past 20 years. As argued by national officials, distant water nations offered limited development opportunities that were also not conducive to national aspirations, and offered very limited employment opportunities for nationals. Furthermore, as argued by interview respondents, the Palau Agreement failed to create a competitive environment for vessels given the lack of support from distant water fishing nations (DWFNs). Vessel numbers were fixed at 205 leaving no room for competition, and allocation rights were given to vessels instead of PNA members [10,36]. The result was a stagnation of access fees charged by the PNA at 5% to 6% of catch values [37], jeopardising hopes that foreign investment would increase.

Over time it also became apparent that the measures put in place by the Palau Agreement and FSMA were ineffective in mitigating negative effects of purse seining on yellowfin and bigeye tuna. The fishery faced a continued expansion of 'effort creep' associated with the entry of larger more efficient vessels and the expanded use of georeferenced floating fish aggregating devices (FADs) [36,38,39]. As a result, catches have been consistently increasing over the years, albeit at a reduced rate [40,41]. The latest record indicates that the 2014 WCPFC statistical catch record was slightly higher than in previous years, but relatively stable compared to the average over the past five years [40,42]. The provisional 2014 purse seine catch was estimated at 2,020,627 mt, was the highest on record. Skipjack catches accounted for 1,957,693 mt – 68% of the total catch, yellowfin catch is the second largest at 608,807 mt – 21% of the total catch, and bigeye and albacore are around 161,299 mt and 132,849 mt – 6% and 5% of the total catch respectively [42].

By 2010 bigeye tuna was overfished and overfishing still continues. To remediate this situation, the scientific committee of the WCPFC has called for a reduction of at least 32% in fishing mortality from the average 2006–2009 levels, signalling a need for new mechanisms to address overfishing, and provide a long-term

solution to stock decline [43,44].

3.2. Shift to new economic policy instruments

In response to lower returns from access arrangements and the perceived erosion of sovereign control over resources by distant water nations represented by the WCPFC, the PNA called for a review of the Palau Agreement in 2000 with assistance of the Forum Fisheries Agency (FFA). At the conclusion of this review in 2007, it was decided to move from capacity limits to effort control. The outcome was the adoption of the VDS in 2005 to replace the limit of 205 purse seine vessels under the Palau Agreement. In doing so, the PNA increased control over the level of fishing effort with limited fishing days in an effort to support both ecological goals set by the WCPFC and economic goals of the PNA member states.

The goal of the VDS is to improve economic benefits to resource-owning states by generating a real limit on fishing days, thereby creating demand and competition between vessel operators. The scheme does not put restrictions on the number of vessels, but rather provides flexibility for new entrants that may offer higher fees. Economic gains with VDS are measured and dependent on the price charged per fishing day. Fishing days allocated to coastal states were limited and fixed, so coastal states were given more flexibility to either use the benchmark price or independently increase the price of their days [45]. By tightening effort and limiting the number of days, the PNA has aimed to further increase competition for licences while also improving fishing efficiency by eliminating inefficient vessels [34]. Although alternative systems were proposed, the VDS was adopted because it was seen as technically feasible, with real time monitoring through a mandatory vessel monitoring scheme [37]. However, full adoption of the scheme was delayed until 2012 because of diverse political interests undermining the necessary consensus by PNA members to move to full implementation. The current allocation of days is based on the 2010 effort levels [43,44]. The recommended PNA Total Allowable Effort (TAE) in which Parties allocated effort for 2015 is 44,623 days [46].

In parallel with the implementation of the VDS, the PNA also initiated steps to move towards MSC certification – widely seen as the ‘gold standard’ for fisheries management [47]. This was not the first consideration to have the tuna fishery certified. However, earlier proposals were never taken forward, largely because of bycatch issues associated with FAD-based purse seine fisheries, and because of the perceived weakness of sustainability claims around pole and line fisheries [48]. The goal of the new initiative was to certify skipjack tuna in PNA waters that employ ‘free school’ or non-FAD purse seining, thereby reducing effort on vulnerable non-target yellowfin and bigeye tuna with purse seining associated with FADs [49]. In doing so the PNA sought certification of potential landings equivalent to approximately 60% of the WCPO fishery, and help create a new market for sustainably certified purse seine tuna. The hope is that this market would lead to greater overall recognition and credibility for the PNA implementing arrangements and (again reinforcing the Palau and FSM Arrangements) ensure higher control, economic returns and commercial opportunities for member countries.

The PNA also saw MSC certification as a means of capturing more market control over the tuna traded from their waters. In 2010, the PNA secretariat entered into a 50/50 joint venture with the Dutch based company Pacific BV to promote and market MSC certified skipjack [49]. Fishers changing their practices to comply with the MSC non-FAD requirement are rewarded with a 10% price premium, with canneries receiving a further 3%, and the PNA/Pacific receiving a further 7% [48]. Having gone through both pre-assessment (independent third party assessment) and full

assessment (stakeholder's input) processes, PNA was granted MSC certification in 2011 and a chain of custody (COC) certification in 2013. The first Pacific MSC tuna products were on European supermarket shelves in November 2013.

4. Analysis of the VDS and MSC certification

From the perspective of new institutional economics both the VDS and MSC certification are designed to (re)allocate rights and responsibilities by packaging and delivering economic incentives for compliance with state defined conservation and management measures. The intended outcome of implementing these instruments by the PNA is to enhance the protection of member's common interest over state owned and controlled tuna stocks, as established under UNCLOS 1982, and create a competitive advantage as well as economies of scale within the region. The question remains, however, as to what extent have they been able to achieve this goal. Returning to our combined NIE framework (Fig. 1), we now examine how these new economic policy instruments have realigned the interaction between political, governance and economic institutions and in doing so influenced the de facto and de jure control over tuna resources in the region.

4.1. The Vessel Day Scheme

The VDS is based on vessel days held by the members of the PNA that are allocated through the Total Allowable Effort (TAEs) and the Parties Allowable Efforts (PAEs), both of which are determined at the annual meeting of the PNA. The WCPFC, which includes distant water fishing nations, agrees on conservation and management measures in a given year that will support or maintain maximum sustainable yield (MSY) based on the best available scientific information [44]. Subsequently, the PNA members determine TAEs and allocated PAEs (measured in vessel days) among members based on historical effort and biomass levels that will support ecological objectives of the WCPFC [46]. Additionally, the PNA governs the VDS by agreeing on the minimum benchmark price of fishing days or vessel days, and through a trading mechanism for transferrable days among members. The minimum benchmark price of a vessel day, give members the flexibility to sell their days for higher prices.

The implementation of the VDS can be broken into four phases. In the first phase, from 2007 to 2010, the design of the VDS progressed with some PNA members starting to sell vessel days to purse seine vessels. However, because the coverage of the scheme was partial and alternative access remained possible through non-participating members, the scheme was not successful [50]. The second phase saw the full implementation of the VDS in 2011 with hard limits on the PAEs. The third phase saw all member states agreeing to the establishment of a benchmark price through a signed Memorandum of Understanding (MOU) in 2012. With this MOU, the PNA members took the first step to form a cartel-like agreement to control fishing day price and increase revenue from purse seine fishing vessels [37]. At this time member states recognised the value that was being created by capping purse seine fishing effort leading to an increase in demand of fishing days, and increasing competition among fishing vessels. Their vision for the VDS at this point was that inefficient vessels would be removed from the fishery as prices would be driven up by more efficient vessels. The fourth phase saw a commitment by PNA members to also trade days among themselves, with the goal of creating greater flexibility to more efficiently allocated effort, and thereby create an incentive for members not to overshoot their collective TAE [33,34,46,51].

Although the VDS has been widely seen as a success, a number

of criticisms have been levelled at the scheme, focused on unresolved technical loopholes and the lack of evidence of improved fish stock health. For example, stock analysts claim that fishing mortality per day is expected to increase because vessels participating in VDS have become more efficient at catching fish via investment in human and physical capital and technology [52,53]. Also, while VDS places limit on purse seine effort, it has failed to place limits on the use of FADs, which is considered by some as key in addressing the decline in bigeye tuna stocks [54]. The inconsistent application of fishing and non-fishing days also remains a key challenge to effective monitoring and enforcement, leading to under reported fishing days and thus undermining the goal of restricting effort. For instance, in 2014, a record of non-fishing days has reached 8041 days, which is about 65% higher than the level it should be [41,46]. Finally, concern has been raised that the existence of non-VDS areas and participants within the WCPO will continue to put pressure on the conservation goal of the VDS given the free-rider effects of non-VDS participants are able to attract distant water fishing vessels to fish outside PNA waters. It is for these reasons that the VDS is reviewed annually to allow members to examine its effect, as well as improve the VDS.

Despite these concerns, the VDS has created clear economic returns. From 2010 to 2015 access fees have increased from 3–6% to 14% of the total value of tuna landed from PNA waters. These returns have led to further strengthening the PNA's commitment to support and improve the VDS. Indeed, part of VDS improvement is the continued review of the MOU on benchmark price every year, which has resulted in an increase in benchmark price from US\$5,000 in 2012 to US\$6,000 in 2014 and \$8,000 in 2015, and a further restriction on fishing effort [46]. At the regional level, the VDS is gaining recognition and acceptance by the WCPFC [34,54], which also appears to have increased the profile and overall bargaining power of the PNA with distant water fishing nations.

As illustrated in Fig. 2, the economic incentives created through the VDS have also fed back into strengthening de jure political control over sovereign resources in three ways. First, the VDS has created a mechanism through which the PNA members are able to collectively and directly renegotiate fishing access with DWFNs, instead of at the WCPFC and through often divisive bi-lateral agreements. The VDS therefore appears to have empowered PNA members to take ownership and exercise rights and control over the allocation of their sovereign waters through a regionally coordinated and standardized negotiation structure [33,34]. It has also enabled PNA states to incentivise binding conservation measures through regional monitoring and enforcement, given allocation is determined by biomass and average actual vessel days in their respective EEZs. Third, the VDS provides member states with

further leverage to expand control over purse seine vessels under the two multilateral agreements in the region including: (1) the Federated States of Micronesia Arrangement (FSMA) and (2) the United States Treaty (UST). In both cases, vessels have to incorporate VDS in their agreements with the eight PNA members indicating a significant shift in both de jure and de facto control over tuna resources.

4.2. MSC certification

The MSC certification of free school or non-FAD purse seining complements the VDS by changing the catchability of a portion of purse seine fishing. By having the fishery certified, the PNA members' intend to generate added value from tuna through greater domestic participation in the tuna supply, set conditions for access to high value markets for fishing vessels and generate greater control over the activities of the purse seine fleet.

There are three key incentives provided by the MSC certification program. First, Pacific BV (of which the PNA Secretariat is a 50% shareholder) set an initial price premium for MSC compliant tuna at 14%, which is expected to be distributed among fishers, processors and retailers [55]. The price premium is intended to be paid to reward agents and partners taking part in the value chain of the MSC eligible tuna products. At the harvesting level, it is expected to motivate fishers to invest in non-FAD fishing, which will assist the PNA and WCPFC reach conservation goals for bigeye tuna [48]. Second, certified skipjack will have preferential market access to EU and US retailers who have committed to selling MSC certified fish by 2018 or 2020 [49]. In Europe, supermarkets dominate global canned tuna sales, with an increasing volume under direct contract to retailers selling the fish under their private labels [49]. Despite the certified volume being limited to approximately 0.2% of the potential MSC eligible catches in 2014, PNA is hopeful that between 50–60% of the PNA tuna catches can eventually be MSC labelled [48]. Finally, by also certifying the chain of custody PNA members also hope to 'push' processing companies to invest in domestic processing plants and in doing so support the original FSMA goals for increasing domestic economic benefits.

Since obtaining the chain of custody certification in May 2013, it took the PNA two years to deliver its first supply to the market, largely due to an ongoing conflict between 'Pacifical' and EII Dolphin safe label [49], limited supply of certified tuna, and delays in delivering processed tuna to the EU supermarkets [56]. It is premature to determine the economic outcome of MSC certification, given that progress has been limited due to the voluntary nature of the programme. Nevertheless, the annual net wholesale value of MSC certified products up to September 2014 has reached US\$4.5 billion [57]. Having MSC representing an increase on the same amount of landed product it is thought that PNA could earn up to 5% of MSC's net wholesale value, an estimated annual revenue PNA can get from participating in the value added tuna products besides revenue only from access fees every year [48].

As illustrated in Fig. 3, the MSC has provided the PNA with a means of developing new incentives to shape everyday fishing practices. Just like the VDS, the MSC certification has enabled the PNA to increase their de jure control over the tuna industry in two directions. First, MSC compliance provides a reinforcement of existing state-based monitoring and enforcement measures, such as 100% observer coverage and the separation of FAD and free-school catches. In this way the investment in the MSC certification program is expected to support the enforcement and protection of property rights through the VDS. Second, and extending beyond the VDS, the MSC chain of custody certification provides greater transparency on where, when and how the fish is being caught and processed, which adds economic data that was previously not

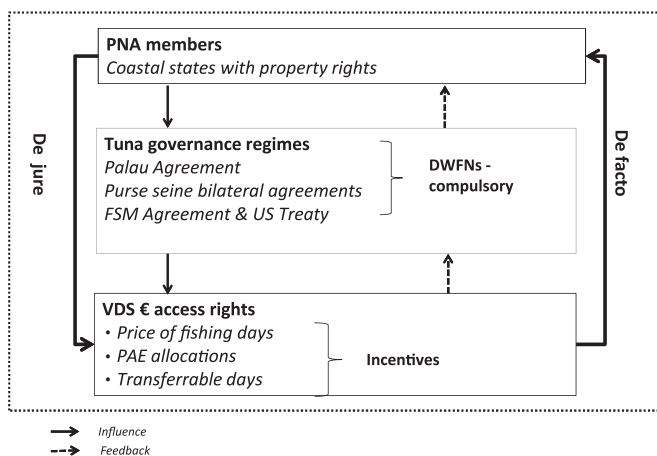


Fig. 2. VDS dynamics and implications.

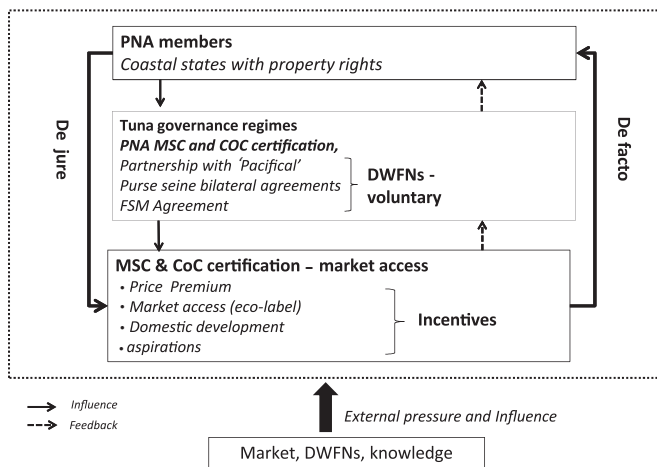


Fig. 3. MSC certification dynamics and implications.

included in the wider governance of the fishery [58]. By directly engaging in the tuna value chain, where global supply remains lower than demand, the PNA have used the MSC to reinforce the original aspirations of the FSMA. PNA countries such as PNG and the Solomon Islands are responding by establishing new contracts with processing and fishing companies to invest in improving domestic processing plants [48]. Building on this, the PNA members are now discussing landing quotas, whereby fishing vessels could offload the catches in their domestic plants for processing [33]. In doing so, the PNA countries are able to again further contribute to domestic economic growth and employment opportunities for PNA members. The PNA can eventually compete with Thailand, their main processing competitor; 1) by supplying their catches to their domestic plants and 2) by exercising greater control over the tuna supply through VDS, by putting further restrictions on fishing effort.

5. Discussion

Seen through the lens of NIE, our analysis demonstrates a clear interplay between de facto control of the PNA states and the de jure control of firms and distant water fishing nations, driven by the iterative feedback between political and economic institutions. Furthermore, our analysis indicates that the PNA has been able to strengthen their control over the tuna resources within their collective EEZs by extending what has proven to be relatively weak de jure power under regional treaties through the introduction of the VDS and MSC certification. In doing so, the PNA has developed greater control over the de facto power of everyday fishing practices, and consequently, extended sovereign control over transnational fish stocks and fishing fleets.

Our analysis also demonstrates, following Acemoglu et al. [29,30], the reinforcing role of continual feedback between political and economic institutions in the PNA. The results show that the VDS and MSC program change the incentive structure of resource and market access for distant water fishing nations and in doing so directly reinforce the formal political institutions associated with tuna conservation and wealth generation. In the case of the VDS, the benchmark price and trading mechanism has transformed access rights away from the distant water fishing country to the distant water fishing vessel level. In doing so, the scheme creates leverage for the PNA states to counter the normative and economic power of member states represented at the WCPFC level [49]. But it is the fourfold increase in revenues to PNA states that appears to have been most influential in reinforcing

state power beyond what the Palau Agreement alone was able to accomplish in the previous 14 years that has reinforced political support for the scheme.

The MSC certification is similar to the VDS in that both are economic institutions which allows the PNA to exercise greater control over everyday fishing practices. In doing so, it also shifts attention from the country to vessel level. But instead of regulating resource access, the MSC certification regulates market access by stipulating what changes need to be complied with to land and sell MSC labelled fish to export markets. The feedback from MSC regulation of fishing practices and market access is seen in the partnership of the PNA with Pacific BV, delivering a direct economic return for every tonne of MSC fish landed and sold. As such, the PNA receives a direct incentive to continue investing in harvest control rules that underlie both associated and un-associated FAD fishing. Like the VDS, the MSC certification therefore enables greater de jure power through the use and feedback from economic institutions which in turn enables greater de facto control over tuna resources.

Both cases also demonstrate the importance of governance institutions [26] in mediating the feedback between political and economic institutions. Williamson's observation of the 'third level' governance institutions appear to be fundamental to these feedbacks. The extension of de jure power of the PNA states and the erosion of de facto power of distant water fishing vessels is facilitated through the VDS and MSC as economic institutions, but neither of these economic institutions are directly related to the formal state institutions of the PNA members. Instead, governance institutions such as the benchmark price and trading mechanism of the VDS, and the harvest control rules required for MSC certification, have enabled a translation of the multi-lateral treaties such as UNCLOS, the Palau and FSM Arrangements into terms that directly regulate economic practices.

The greater cooperation between PNA states that both economic institutions have fostered also appears to be influencing the negotiation of major international treaties of PNA members. For instance, the PNA member states appear to be pressuring Kiribati to review their fisheries partnership agreement with the EU to comply with the VDS and other purse seine management regimes in the PNA [51]. As the EU increases its market power over the region, the PNA countries are consolidating not only resource access, but also market access [48]. In addition, the recognition and popularity of VDS has led to greater interest by non-PNA members, such as Tokelau joining the Palau Agreement, allowing for an expansion of VDS application to non-PNA waters [54]. A similar integration of MSC compliance between member states is more problematic, however ideas of tabling compulsory landings have been discussed [33] with the wider goal of standardisation and integration of the PNA management for all purse seine vessels in the region and ensuring more participation in the value chain of the tuna products.

Despite the apparent successes of applying economic institutions for gaining greater political control over transboundary fish stocks, the future trend and success of such a strategy remains unclear. Following a new public management line of thinking [e.g. 60], this paper might be seeing the gradual merging of political and economic institutions, and as such an extension of de jure over de facto power. But this extension appears to be only possible at scales above the nation state—akin to so called 'new fisheries regionalism' [60]. At the centre of this upscaling of control are the governance institutions of the PNA, implementing incentives and cooperation that provide an alternative 'region' to the WCPFC that incorporates the interests of distant water fishing nations [see also 16]. Without effective governance institutions setting incentives for cooperation between states and the inclusion of vessels, both interplay between the Palau and FSM Arrangements and the VDS

and MSC are likely to be less effective.

It also remains unclear how these instruments can contribute to conservation objectives of state-based conservation measures over the long term. Although WCPO stocks of skipjack and yellowfin have been reported to be in a healthy state in 2014, overfishing continues, catch rates continue to increase [43]. At the same time the market indicates excess supply of tuna resulting in declining tuna prices [56]. It is worth noting, that technology also evolve with new instruments, contributing to the ongoing power struggles between coastal and fishing states, requiring new and additional instruments. While the VDS and MSC certification may provide PNA members incentive to extract better economic gains, it also provides firms and fishing companies, incentive to invest in larger efficient vessels. Efficiency in fishing could improve tuna market prices in the long run, but with greater possibility leading to overcapitalisation and overfishing. Solving such issues may require yet a new balance between political, economic and governance institutions.

6. Conclusion

Our analysis highlights the significant institutional shift from a regulatory based regime to new economic policy based incentives for tuna management in the waters of the PNA aimed at both improving the conservation outcomes and domestic wealth generation. The experience with the VDS and MSC certification demonstrates that these new economic tools can contribute to these goals because they provide means of realigning de facto economic with de jure political power. In doing so the instruments appear to have strengthened existing international treaties, provided a strategy to counter the influence of distant water fishing nations over the PNA member states under the WCPFC, and established greater credibility to the PNA's own conservation and management measures.

The results also demonstrate that the success of new economic policy instruments in aligning political and economic institutions is dependent on the effectiveness of meso-level governance institutions. The cooperation of the PNA members in maintaining these governance institutions has contributed to the apparent success of these economic tools in strengthening de jure control over tuna resources. Whether these arrangements can be maintained, will in large part be determined by the strength of continued PNA cooperation and the delivery of incentives for ongoing investment in the institutions such as the VDS and MSC certification by PNA states. By internalising the economic externalities associated with overfishing into these political institutions, durable long-term improvements in the PNA tuna management may well be possible. But to ensure success, both regional and sub-regional institutions need to also continue to provide effective governance institutions that will enable both political and economic actors to realise the incentives available.

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