

## 9. HETEROGENEITIES AT TWO LEVELS: STATES, NON-STATE ACTORS AND INTENTIONAL OIL POLLUTION

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### ABSTRACT

Heterogeneities among states, among non-state actors and between state and non-state actors explain the timing, process, form and effectiveness of international regulation of intentional oil pollution. Understanding the progressive movement toward rules that reduced intentional oil discharges depends on identifying different varieties of heterogeneity and their unique influences on the process and outcomes of cooperation. Success at reducing discharges by tanker operators, who had few incentives to provide the public good of a cleaner ocean, depended on rules that took advantage of existing heterogeneities in preferences and capacities to build a regulatory structure that coerced compliance by preventing most violations and deterring the rest.

**KEY WORDS** • environment • heterogeneity • international regimes • pollution • public goods

Heterogeneities among states, among non-state actors and between state and non-state actors explain the timing, process, form and effectiveness of international regulation of intentional oil pollution. General claims regarding the impact of heterogeneity on cooperation in this issue-area provide little useful insight. Rather, understanding the progressive movement toward rules that reduced intentional oil discharges depends on identifying different varieties of heterogeneity and their unique influences on the process and outcomes of cooperation. Success at reducing discharges by tanker operators, who had few incentives to provide the public good of a cleaner ocean, depended on rules that took advantage of existing heterogeneities in preferences and capacities to build a regulatory structure that coerced compliance by preventing most violations and deterring the rest.

Although the process is less dramatic, the traditional practice by tankers of discharging waste oil overboard has regularly accounted for far more of the oil that enters the ocean than have accidents. Analysts estimated in the 1970s that a million tons of oil entered the ocean each year from intentional

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discharges, while only one-third as much came from accidents (National Academy of Sciences, 1975; National Academy of Sciences and National Research Council, 1985). Since the 1920s international diplomats have sought to reduce the environmental impact of the oil transportation process. After a tanker delivers its cargo, a small fraction adheres to the tank walls. This clingage becomes mixed with water through two shipboard operations. First, the clingage mixes with the sea water that tankers place in their cargo tanks to ballast themselves on the return voyage. Second, tankers clean their tanks with sea water en route to prepare for their next cargo. For an average tanker these processes generate some 300 tons of oil/water mixtures per voyage.<sup>1</sup> The easiest, cheapest and customary method of disposal was to discharge these mixtures while at sea. With thousands of tanker voyages per year, however, this disposal method soon became more than a minor problem. While scientific uncertainty remains regarding the extent of damage to marine life caused by the low-concentration, chronic oiling from discharges, their visible impact as well as that of accidents on seabirds and resort beaches have provided the impetus for regular efforts at international regulation (National Academy of Sciences and National Research Council, 1985; GESAMP, 1990: 2; Hawkes and M'Gonigle, 1992: 178).

This paper begins by describing the dynamic history of attempts to control intentional oil pollution from tankers. It then argues that this history reflects a pattern of progressive cooperation from initial rules that had no hope of achieving the desired goal of reducing intentional oil pollution to rules with which actors were more likely to comply and compliance with which was more likely to produce real pollution reductions. The analysis then successively evaluates how four types of heterogeneity – of preferences and capabilities in producing the public good, among states, among non-state actors and between state and non-state actors – and learning account for particular elements of this process.

## History

### *The 1954 International Convention for the Prevention of Pollution of the Sea by Oil<sup>2</sup>*

Regulation of intentional oil pollution has been on the international agenda since the US convened an intergovernmental conference in 1926. The UK

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1. For comparison, the *Exxon Valdez* spilt 35,000 tons into Prince William Sound in 1989 and the *Braer* spilt 85,000 tons off the Shetland Islands in 1993.

2. This section relies heavily on Pritchard (1987) and M'Gonigle and Zacher (1979).

prompted a similar effort in 1935 under the auspices of a League of Nations Committee of Experts. Both conferences produced draft conventions. While major oil companies agreed to 'voluntarily comply' with the limits these agreements put on discharges near shore, neither convention ever took legal effect. After World War II, growing demand in Western countries for Middle East crude oil produced growing complaints of spoiled beach resorts and large numbers of dead sea birds in the UK and in Europe (Ministry of Transport, 1953: 1). In the UK, bird protection societies, hotel and tourist organizations and local governments formed the Advisory Committee on Oil Pollution of the Sea (ACOPS) and pressed for international action.

In response to such pressures, the British government set up a committee to study oil pollution. The Faulkner Committee recommended a unilateral ban for all British ships of discharges over 100 parts per million (ppm) 'within a wide zone around the United Kingdom' until an international ban on such discharges could be established (Ministry of Transport, 1953: 1, 33). The British – believing that even a large prohibition zone around the UK was inadequate, facing pressures from ACOPS and not wanting to encumber their domestic shipping and oil interests – hosted an intergovernmental conference in London in 1954. They proposed an ocean-wide ban on discharges, rather than merely discharging farther from shore as required by the prewar agreements (M'Gonigle and Zacher, 1979: 90). Tankers, it was contended, could eliminate oil pollution if they 'refrained from cleaning their cargo tanks and mixed oily ballast residues with new cargo oil' or retained slops on board for discharge in port (Pritchard, 1987: 95).

At the time the US viewed its pollution problems as having been solved by its own national legislation and voluntary restraints by industry and had lost interest in international regulation (International Conference, 1954a: 4). Denmark, France, Japan, Norway, Sweden and most developing states – lacking domestic concern over coastal pollution, believing oil evaporated and biodegraded if discharged far from shore, or seeking to protect their maritime interests – saw any regulation as unnecessary (United Nations Secretariat, 1956; Pritchard, 1987: 98–9).<sup>3</sup> Oil and shipping companies objected to an ocean-wide ban because discharging slops in port, rather than at sea, involved lengthy delays. Governments resisted the complementary requirement to provide reception facilities for these slops as too expensive.

The final 1954 International Convention for the Prevention of Pollution

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3. For example, the British commission found no evidence that fish or shellfish beds were harmed by oil pollution (Ministry of Transport, 1953: 2–3). The French argued that their research had 'produced no proof that its effects upon marine life were harmful' (International Conference, 1954b: 5).

of the Sea by Oil (OILPOL) failed to limit discharges throughout the ocean, reflecting 'the fact that most governments were still not willing to accept any important control costs themselves or even to impose such costs on their industries' (M'Gonigle and Zacher, 1979: 89). Instead, the British garnered Commonwealth and Soviet bloc support to adopt a convention that prohibited discharges above 100 ppm within 50 miles from shore.<sup>4</sup> Discharge rates outside these zones and total oil discharged were unrestricted, relying on redistribution of discharges to mitigate coastal pollution. The final agreement required states to 'ensure provision' of reception facilities but only to meet the needs of non-tankers, leaving tankers with few real alternatives to discharging at sea (Pritchard, 1987: 108). However, even these weak reception facility clauses led several countries, including the US, to lodge objections.

Enforcement was based on requiring ship masters to record all ballasting, cleaning and discharge operations in an oil record book. Port states could inspect these books but, in most cases, had to turn over evidence to flag states for prosecution (Pritchard, 1987: 112). All states had to report to the Secretariat on reception facilities installed and flag states had to report on actions taken on violations referred for prosecution, although the Convention established no schedule or format for these reports. The Convention entered into force in 1958.

This initial deterrence-based regulatory system did not look promising. Existing monitoring devices could not reliably measure the 100 ppm standard, so even conscientious captains could assure compliance only by making all discharges outside the zones. Many captains could have done this with little additional cost in time or fuel, since those plying the main Europe - Middle East route could deballast and clean their tanks in the still-legal discharge area in the central Mediterranean (Kirby, 1968: 203). Yet few incentives existed to incur even minimal costs of compliance, since successful detection of violations was highly unlikely. Likewise, the evidentiary and incentive-related obstacles posed by exclusive flag state jurisdiction made prosecution, let alone penalization, even less likely.<sup>5</sup>

### *The 1962 Amendments*

As tankers transported more oil by sea, increases in discharges prompted increased concern over pollution. Dissatisfied with OILPOL's results, ACOPS sponsored a conference in 1959 that recommended a global

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4. It established wider zones near Australia, the North Sea states and in the Atlantic off the European and UK coasts.

5. These problems had been noted as early as the 1926 Conference (Pritchard, 1987: 23).

discharge ban (Pritchard, 1987: 119). The Intergovernmental Maritime Consultative Organization (IMCO) itself prepared a conference in 1962 to amend the 1954 Convention. By then, French and German studies had prompted a new scientific consensus that crude oil persisted so long that zones would not prove environmentally effective (Pritchard, 1987: 130–1).

The British sought to reduce the immediate costs of, and hence resistance to, their proposal for an ocean-wide discharge ban by applying it only to *new* tankers over 20,000 tons. New tankers would need to retain slops on board and monitor all discharges, although oil content monitors and oily water separators were not explicitly required. The US opposed this proposal for reducing, rather than redistributing, discharges because reliable devices for a tanker to monitor its own compliance did not exist (Pritchard, 1987: 138). Japan, Norway and the Netherlands also opposed the proposal as expensive in itself and imposing competitive disadvantages for compliant states (M'Gonigle and Zacher, 1979: 95–6). The provision was adopted, however, with the support of the Commonwealth and Soviet bloc states that had supported Britain in 1954 (Pritchard, 1987: 139). Discharges below 100 ppm remained legal within somewhat expanded zones and all discharges by existing tankers remained legal outside them. Industry raised few objections: whether the zones were 50 or 100 miles, experience had shown that enforcement never extended beyond a country's 3-mile limit. Since compliance with the rules for new tankers required discharging slops into reception facilities, the parties replaced the 1954 language with broader but weaker requirements for governments to 'promote provision' of facilities in all ports, including tanker ports. The clear implication was that the oil industry should shoulder this burden (M'Gonigle and Zacher, 1979: 93–4).

Changes in enforcement and reporting were also considered. Parties adopted a clause that penalties be severe enough to discourage violations. They rejected proposals to increase the enforcement powers of coastal and port states. The Conference recommended, but did not require, that IMCO 'produce reports for which the Contracting Governments should contribute information' on oil pollution, Convention effectiveness, reception facilities, enforcement and violations (IMCO, 1962: Resolution 15). The 1962 Amendments entered into force in 1967, but only for those parties explicitly ratifying them. Future amendments could be made within the IMCO structure rather than requiring a conference (OILPOL, 1954/62: Article XVI). IMCO established the Subcommittee on Oil Pollution (SCOP) to evaluate existing rules, recommending amendments to governments through the Maritime Safety Committee, the IMCO Council and the IMCO Assembly.

Evidence soon showed enforcement of the 1954 and 1962 rules was exceedingly hard even for the two countries – the UK and Germany – seriously attempting it. Violations were commonplace (IMCO, 1964; Mitchell, 1994: ch. 7). As late as 1975 a British oil pollution expert did not think 'there was

a tanker over 20,000 [tons] in the world complying with the 1962 Amendments' (M'Gonigle and Zacher, 1979: 99). Few new reception facilities were built.

The 1962 Amendments did prompt considerable research into alternative oil control technologies: the US developed segregated ballast tanks and the Soviets developed chemical washing techniques (Pritchard, 1987: 145). Likewise, oil companies, which had been 'strangely silent' previously, recognized that explicit requirements for equipment were just around the corner (M'Gonigle and Zacher, 1979: 95). These pressures and a request from the British government led Shell researchers to develop and promote a technique called Load-on-Top (LOT). LOT involved reducing tank cleaning, consolidating all oil/water mixtures in a single tank, decanting the separated-out water from beneath the oil and loading subsequent cargo on top of these slops, allowing slops to be discharged with the next load of cargo. Oil companies liked LOT because it eliminated equipment requirements and reception facility discharge time while increasing 'outturn,' i.e. the amount of oil delivered compared to oil originally loaded, by several hundred tons per voyage.<sup>6</sup> Governments liked LOT because it reduced the amount of oil discharged at sea without requiring them to build expensive reception facilities.

Yet, to make LOT work without equipment required tanker operators to determine by sight when to stop discharging water from beneath oil slops. Oil companies admitted that this would frequently violate the existing discharge limit of 100 ppm by large amounts. Nonetheless, by 1964 Shell and Exxon had allegedly encouraged 60 percent of tankers to adopt LOT (Kirby, 1968; M'Gonigle and Zacher, 1979: 97).

### *The 1969 Amendments*

In a context in which it had become 'axiomatic that the less oil discharged into the sea, the better', the 1967 *Torrey Canyon* accident provided a major new impetus to oil pollution control (Sutton, 1964: 9; Kirby, 1968: 210). The accident raised public concern in many European countries, prompting negotiation of several agreements on tanker accidents and, coupled with growing environmental pressure, on all ocean pollution.

Conflicting pressures to modify the OILPOL Convention came to a head in IMCO's SCOP in the late 1960s. On one side Shell proposed scrapping OILPOL's zonal system altogether in favor of voluntary adoption of LOT (Kirby, 1968). The British government, now working more closely with its

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6. On the development of LOT, see Kirby (1965: 26; 1968), Ministry of Transport (1953), and Moss (1963: 42).

oil companies and supported by Norway, the Netherlands and France, more modestly proposed that governments promote LOT and revise OILPOL to legitimize its use while retracting the 1962 amendments' equipment costs (M'Gonigle and Zacher, 1979: 99). This required replacing discharge limits defined in oil content (ppm) terms with an equivalent rate metric, i.e. volume discharged over a given distance that tankers could monitor using existing on-board machinery.

On the other side, newly pro-environmental states were seeking to strengthen the discharge regulations. The American environmental movement had influenced the US government to take increasingly strong positions advocating international environmental protection, bringing with this stronger concern a greater capacity to influence international rules (M'Gonigle and Zacher, 1979: 100). The Americans wanted to tighten the 1962 regulations and, after much oil industry lobbying, they and other opponents of LOT agreed to legitimize LOT and eliminate the 1962 requirements on new tankers in exchange for more stringent standards. The final amendments constituted a compromise. The 50-mile zones were retained. Within the zones discharges could only involve 'clean ballast' – those leaving no visible trace. Therefore 'any sighting of a discharge from a tanker . . . would be much more likely to be evidence of a contravention' (IMCO, 1977: Annex, par. 5). Outside the zones, all tankers would need to keep discharges below the new rate limit of 60 liters per mile (60 l/m).<sup>7</sup> Finally, the US seized on the oil industry's claim that LOT could make the convention 'automatically enforced worldwide', forcing through a limit on total discharges of 1/15,000th of a tanker's cargo capacity. Under these rules port authorities in oil loading states could assume that any tanker with clean tanks had blatantly violated the agreement (Kirby, 1968: 200, 209; Burke et al., 1975: 129).<sup>8</sup>

The clean ballast, the rate metric and the total discharge limits all increased the ability, if not the incentives, of tanker operators to monitor their own compliance. The total discharge limits also made independent detection of violations possible in oil loading ports. However, international law still barred port states from the intrusive inspections necessary to verify compliance with the total discharge standards and no changes were made to exclusive flag state enforcement rights. The IMCO Assembly adopted these

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7. The 60 l/m rate posed few problems for tankers since it was 'a figure within which any responsibly run ship, no matter how big, could operate' (Kirby, 1968: 208).

8. A new tanker that loaded 150,000 tons of oil in Kuwait would deliver 149,400 tons in Rotterdam, 600 tons remaining as clingage. If it arrived in Kuwait with less than 590 tons of oil residues ('slops'), it would clearly have discharged more than 1/15,000th of its 150,000 tons. The more likely scenario would involve arrival in Kuwait with completely clean tanks or negligible slops.

amendments in October 1969, replacing the earlier principle of redistribution of discharges with one of reduction. Unfortunately, it would take nine years for these amendments to enter into force.

*The 1973 International Convention for the Prevention of Pollution from Ships*

Environmental interest continued to grow and led in the early 1970s to the UN Conference on the Human Environment. Concern over oil pollution also increased as sea-borne oil trade went from 264 million tons in 1954 to 1,695 million tons in 1973. Even if each tanker had discharged significantly less cargo than previously, total discharges would have increased. Countries previously opposing strict rules, including Greece and Italy, became supportive as they experienced more pollution and greater calls for environmentalism at home (M'Gonigle and Zacher, 1979: 118).

The US continued to push for stricter regulations. While oil companies had been promoting LOT's advantages since 1964, the US contended that history showed it to be far less effective than oil companies alleged. The US noted how easily tanker crews could violate the 1969 amendments and the massive resources and diligence needed to detect violations (M'Gonigle and Zacher, 1979: 108). Domestic pressures led Congress to pass the Ports and Waterways Safety Act of 1972. It required the Coast Guard to unilaterally adopt strict equipment standards by 1976 unless other countries agreed to international equipment requirements (United States Congress, 1972: Sec. 201[13]). In response, IMCO hosted a conference in 1973, which produced the International Convention for the Prevention of Pollution from Ships (MARPOL). At this conference the US proposed supplementing more stringent discharge standards with more enforceable requirements for new tankers over 70,000 tons to install segregated ballast tanks (SBT) and double bottoms. While double bottoms strictly addressed accidental pollution, SBT reduced the amount of slops generated by levels comparable to that required by the 1969 discharge standards by designating certain tanks exclusively for ballast, not cargo. Both proposals were very expensive and correspondingly controversial.

Developed states with long coastlines and small shipping industries supported the US SBT proposal. Motivated by both environmental and territorial concerns, Australia, Canada and New Zealand persuaded developing states to attend the 1973 Conference to lobby for coastal state environmental rights (Grolin, 1988: 32). Italy, lacking strong shipping interests but traditionally opposed to stringent requirements, joined the environmental ranks as coastal pollution increased. Developing states – such as Argentina, Egypt and India – supported SBT to reduce growing pollution from developed countries' ships without imposing large direct costs on their own small tanker



fleets. SBT tankers also generated fewer slops, which reduced pressures on them to build expensive reception facilities. In an era of detente Soviet bloc countries saw support as having low economic costs and both political and environmental benefits.<sup>9</sup> This diverse coalition was large enough to pass the SBT requirement.

Two factors converted initially strong oil company opposition into support for the SBT requirement. First, a recent construction boom and the proposal's definition of new tankers as those delivered after 1980 put costs far out in the future. Second, 'with the American submission, the handwriting was on the wall', and the major oil companies – five of which were American-based – realized that support for SBT requirements on all nations' tankers would avert the competitive disadvantages of US unilateralism while derailing pressures for the even more expensive double bottoms (M'Gonigle and Zacher, 1979: 109).

Opposition to mandatory SBT remained strong from countries with large independent shipowning interests – Denmark, Germany, Greece, Norway and Sweden – less able than oil company fleets to pass on the costs involved, and those with shipbuilding interests – France and Japan – concerned that new requirements would cause deferrals in ship orders (M'Gonigle and Zacher, 1979: 114). Independent shippers opposed SBT to the end, contending that entry into force and enforcement of the less costly and more economically efficient 1969 amendments would 'effectively eliminate oil pollution arising from operational discharge' (International Chamber of Shipping, 1972: 2, 1973).

Despite US pressures for wider prohibition zones and stricter discharge limits, the final agreement maintained the 1969 standards with the exception of limiting new tankers to total discharges below 1/30,000th of cargo capacity (M'Gonigle and Zacher, 1979: 113). The rules did seek to improve implementation, enforcement and compliance. The Conference agreed, for the first time, to require annual reporting on penalties and enforcement 'in a form standardized by the Organization' (MARPOL 1973/78: Article 11[f]). Continuing ratification delays were addressed through a tacit acceptance procedure that automatically brought amendments into effect in 16 months for all parties unless more than one-third explicitly objected. Construction standards applied to ships built after set dates, regardless of the number of ratifications. Within special areas states were to 'ensure provision' of reception facilities on a schedule independent of the treaty's date of entry into force.

Compliance with equipment standards relied on initial surveys by national

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9. For an insightful argument on the impact of detente on Soviet bloc positions in negotiations on acid rain, see Levy (1993).

governments and ship classification societies documented in an International Oil Pollution Prevention (IOPP) Certificate. Port states were given expanded rights to inspect this certificate and to verify that required equipment was on board and operating properly. To improve compliance the generally more-environmentalist port states were obligated to detain a ship caught violating until it no longer posed 'an unreasonable threat of harm to the marine environment' (MARPOL 1973/78: Article 5[2]). More drastic increases in port and coastal state enforcement were discussed but defeated by powerful flag states and the desire of many states to make these jurisdictional decisions in the Law of the Sea context (M'Gonigle and Zacher, 1979: 231-4). MARPOL did attack a wider range of issues than had OILPOL, addressing oil platforms as well as ships, including refined as well as crude oil and using five annexes (including Annex I for oil) to address liquid chemicals, harmful packaged substances, sewage and garbage discharged by ships. IMCO affirmed this broader perspective on pollution by establishing the Marine Environment Protection Committee as a full committee answering directly to the IMCO Assembly.

The 1973 Conference significantly changed the compliance system. The US interpreted enforcement difficulties and low compliance rates as evidence of inherent obstacles to an effective compliance system for discharge standards. SBT requirements created a fundamentally different regulatory structure, based on a coerced-compliance model that prevented, rather than deterred, violations (Reiss, 1994). Responsibility for compliance shifted from tanker captains to tanker owners. The site of potential violation shifted from the open ocean to the shipyard. Inspection provisions 'piggybacked' on the existing information infrastructures of classification societies and government inspections of tanker certificates and tankers' actual conditions. The greater ease of identifying violations and the international authority to detain tankers caught in violation did provide a strong deterrent. However, the equipment rules would prove especially successful because tankers would find it difficult to violate them in the first place. While a tanker captain faced no constraints in discharging illegally, a tanker buyer would have found it difficult to get cooperation from a builder, a classification society and an insurer in having a tanker built without the required equipment. While the inability to trade with an illegal tanker posed a credible threat if one could have bought a non-SBT tanker after 1980, MARPOL's regulatory system relied heavily on preventing the purchase of such ships.

### *The 1978 Protocol to the 1973 Convention*

By 1978 only three states had ratified the 1973 MARPOL Convention. Besides the usual delays in ratification, resistance stemmed from the linkage of Annex I addressing oil pollution to the even more stringent and costlier

Annex II on chemical pollution. Then, just as the *Torrey Canyon* incident had motivated earlier agreements, a series of accidents in December 1976 and January 1977 combined with activist pressures to produce unilateral US action that put oil pollution back on the international agenda.

The 1977 Carter Initiatives expanded on the 1973 proposals, calling again for double bottoms to address accidental spills and SBT on all tankers to address intentional discharges. Under direct threats that 'if IMCO tailors its moves to suit and protect the US, we will accept; if not, we reserve the right to impose our own rules', IMCO called the Tanker Safety and Pollution Prevention Conference in 1978 (M'Gonigle and Zacher, 1979: 130). This Conference produced a Protocol that became integral to the 1973 MARPOL agreement, together known as MARPOL 1973/78.

At the Conference the US proposed to apply the 1973 SBT rule to new *and existing* tankers over 20,000 tons. A few states with heavy pollution supported the SBT retrofit proposal. Support also came from states with large independent fleets - Greece, Norway and Sweden - which had many tankers laid up during the tanker glut caused by the decreased demand for oil at post-1973 prices. For these states SBT retrofits promised to reduce the carrying capacity of all trading tankers, allowing their laid-up tankers to reenter the world market (M'Gonigle and Zacher, 1979: 123, 135). Most states, however, including Soviet bloc and developing ones, saw SBT as too costly even as they recognized the need to compromise, given US power and determination (M'Gonigle and Zacher, 1979: 138). Proposals to revert to performance standards only or to voluntary compliance were clearly non-starters, reflecting a fundamental shift from the debates of the late 1960s. As with the 1962 Amendments and LOT earlier, the 1973 rules had led the oil industry to reevaluate its technological options. Crude oil washing (COW), available since the late 1960s, became far more attractive in light of rising oil prices and US pressures for retrofitting SBT. COW reduced slops by spraying tanks with oil during cargo delivery rather than with water during the ballast voyage. Especially for those who owned the cargo, as oil companies did, COW was far more attractive than SBT because it had lower capital and operational costs. From an environmental perspective COW reduced discharges almost as much as SBT, but from an economic perspective COW was far superior since it recovered oil that was wasted under traditional transportation procedures. The oil industry and the UK proposed, as an alternative to retrofitting tankers with SBT, requiring existing tankers over 70,000 tons to install COW.

The 1978 Conference had to resolve three distinct issues in the conflict between SBT and COW. The first two involved whether to broaden the scope of MARPOL 1973's equipment rules that had applied only to large new tankers: would equipment requirements apply to small tankers and would they apply to existing tankers? Equipment rules for tankers above 20,000

(rather than 70,000) tons meant far more transporters would incur equipment costs. Equipment rules for existing tankers entailed far more immediate costs for existing oil transporters than rules that applied only to new tankers. The third issue was what equipment to require of tanker owners. While the Americans had proposed requiring double hulls, the real debate was between SBT and COW.<sup>10</sup> Most states opposed SBT requirements on all tankers as too costly; 40 states preferred COW while 11 favored SBT retrofits (M'Gonigle and Zacher, 1979: 136-7). Most states clearly had limits to the costs they would impose on their industries to achieve a cleaner marine environment. Yet the American threat of unilateralism could not be ignored. The final compromise greatly expanded the scope of the requirements to meet the American objective of essentially all ships having to install some form of pollution control equipment in the near future, while allowing existing tankers the industry-desired flexibility to fulfill these requirements in the cheaper manner: existing tankers could choose between SBT and COW while new tankers had to install both (MARPOL 1973/78: Annex I, Regulation 1). Existing tankers were sure to choose the cheaper COW option.

The requirements for COW and SBT have proved remarkably effective. Ninety-eight percent of all tankers have installed COW, SBT or both as required by the Convention (Mitchell, 1994; Clarkson Research Studies, 1991). This is especially remarkable in light of the significant costs involved in the case of SBT. Not surprisingly, of existing tankers that can legally install either of the technologies, 9 out of 10 installed the more economic COW while only one-third installed SBT. Along with states that supported equipment requirements, Japan and many European states that opposed equipment requirements in 1973 and 1978 have established extensive programs, including regional cooperation, to inspect equipment on board tankers entering their ports (Kasoulides, 1989; IMO, 1991, 1993: 24; Secretariat of the Memorandum of Understanding, 1992). Through these programs governments can directly sanction violating tankers, including those that are nationals of states whose governments have been reluctant to impose such sanctions themselves. Likewise, classification societies appear to issue accurate equipment certificates and conduct thorough and regular inspections as required by MARPOL.

The negotiators also took steps to reduce potential delays in the legal entry into force of the rules. First, the ratification of oil pollution requirements was delinked from that of the more controversial chemical pollution rules. Second, following the 1973 approach, the equipment requirements applied

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10. The American concern regarding protection against accidents was addressed by requiring new tankers to install SBT in 'protective locations'.

to new ships delivered after June 1982 regardless of whether enough ratifications had led to legal entry into force. This proved prescient, since the slowness of ratifications meant that MARPOL 1973/78 did not take legal effect until late 1983. MARPOL's procedures also have proved remarkably effective at promoting faster implementation of amendments. Seven sets of amendments adopted by the Marine Environment Protection Committee since 1983, including requirements for costly accident-prevention equipment in the wake of the *Exxon Valdez* accident, have entered into force automatically in 16 months under MARPOL's tacit acceptance procedure, vastly improving on previous experience in which new rules had never entered into force in less than 4 years.

### **Heterogeneity and the Provision of Public Goods**

International regulation of intentional oil pollution has produced rules progressively more capable of producing the public good that had been the nominal goal of cooperation since the outset. Requirements in OILPOL and MARPOL have been consistently more stringent than many states desired, often being adopted over the dissenting votes of states wielding considerable power in oil transportation markets. This success at putting in place rules that can remedy this environmental problem raises two questions in the context of this collection of papers. First, what factors explain why, in this case, the obstacles that generally inhibit creation of a public good in international affairs were successfully overcome? Second, did heterogeneity, in any of its various forms, contribute to this success?

The 1954 Convention sought 'to take action by common agreement to prevent pollution of the sea by oil discharged from ships' (OILPOL, 1954). That goal has not changed: MARPOL 1973/78 calls for 'the complete elimination of intentional pollution of the marine environment by oil and other harmful substances' (MARPOL 1973/78). What has changed over time is the likelihood that the international rules governing intentional oil discharges would actually achieve these goals. Even if tanker operators had complied, the limits and zones of the 1954 rules would only have redistributed, not reduced, the amount of oil entering the ocean. Numerous obstacles to detecting and prosecuting violations prevented achievement of even this modest objective. The 1962 amendments required new tankers to reduce total discharges, but did so via requirements with which even conscientious operators could not comply because of the absence of appropriate technology and the continuing dependence on a deterrence-based strategy of regulation. The 1969 amendments were the first rules which, had they been complied with, would have achieved significantly reduced total discharges. These reductions involved greater restraint and costs than previous rules, but

they averted additional capital costs and legitimized the oil companies' preferred method for reducing discharges. Improvements in enforcement that were hoped for did not materialize in practice, however, and compliance levels remained low. While none of the rules agreed to before 1973 had much prospect of producing the desired public good, progress had been made.

The 1973 MARPOL Conference retained earlier standards requiring all tankers to reduce discharges, but reinforced them with equipment requirements with which tankers were more likely to comply and which, once complied with, actually reduced the oil a tanker needed to discharge. Since the rules applied only to large new tankers, decades would have passed before enough tankers had installed SBT to produce significant reductions in discharges. Even then, all small tankers would have remained constrained only by the unenforceable operational requirements carried over from 1969. However, the equipment rules rested on a new, more sound regulatory basis of coerced compliance in which violations were minimized by prevention rather than deterrence. On this foundation the 1978 Protocol established rules that required some form of equipment on all tankers. These rules had the three virtues of applying to all potential producers of the public good, producing the public good if complied with and creating a regulatory structure likely to produce compliance.

A final element to this pattern of progressive cooperation that deserves attention is why actors who opposed adoption of increasingly stringent rules have not only remained within the regulatory regime but have actually enforced and complied with its demands. International law legally binds only those nations that consent to its constraints. Nations often opt out of international rules adopted over their opposition or withdraw from a convention altogether. The whaling treaty provides numerous examples of states opting out or withdrawing from the regime when its rules became too onerous (Mitchell, 1992). In contrast, powerful countries have opposed oil pollution regulation at every stage, but none have withdrawn or opted out. The rest of this article assesses different forms of heterogeneity and their ability to explain the difficulty, timing, direction, form and effectiveness of this consistent, if slow, pattern of progress toward production of a desired public good.

Explaining this pattern of cooperative arrangements moving progressively towards successful production of a desired public good requires evaluating (1) heterogeneities of preferences and capabilities in producing the public good, (2) heterogeneities among states, (3) heterogeneities among non-state actors, (4) heterogeneities between state and non-state actors and (5) institutional learning. All these factors help explain the fact, timing and form of the progressive convergence between means and goals.

### *Heterogeneities of Preferences and Capabilities in Producing the Public Good*

A focus on heterogeneity first helps us understand the difficulty of resolving the collective-action problem facing the international community. Most of the other contributions to this collection focus on resolution of common-pool resource (CPR) problems. In contrast, oil pollution, or rather an ocean free from intentional oil discharges, can be more accurately characterized as a public good exacerbated by a negative economic externality. Creating a clean ocean requires resolving a problem of underprovision or free riding, but not one of overappropriation or stealing (Keohane and Ostrom, 1994). The natural system allocates the good once provided and its non-rival character prevents overappropriation by any party.

While lacking an overappropriation aspect, oil pollution's underprovision problem is exacerbated because the actors involved are sharply differentiated into heterogeneous roles, involving both different preferences and capacities for producing the public good. Analysts of CPRs and of public goods often assume relatively homogenous actors: all relevant actors are capable of contributing to *and* benefitting from the CPR in varying degrees.<sup>11</sup> All contributors view themselves as better off with the public good, even though fears of free riding lead to underprovision (Keohane and Ostrom, 1994). As made clear in the contributions to this collection from Ostrom, Libecap and Hackett, Dudley and Walker, numerous obstacles to cooperation arise even when the problem involves getting potential beneficiaries to jointly provide benefits that are shared among them. However, many pollution problems exhibit characteristics that further confound resolution: actors perceptually and actually are either the contributors to, or the beneficiaries of, a clean environment, *but not both*.

This heterogeneity of preferences translates into a division across, rather than within, actors. The conflict becomes externalized between those who can provide the public good but do not benefit from it and the quite separate group who benefit from it but cannot provide it. Potential beneficiaries' fears of underprovision prove especially warranted. In many CPRs the harms of overappropriation are restricted to other appropriators. In pollution cases, however, the major costs are not reduced future rents to industry but the often non-economic, non-quantifiable costs of environmental harm frequently imposed on people who contribute little to the problem. A cleaner

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11. The Olsonian problems discussed in Oye and Maxwell's contribution to this collection highlight the obstacles to cooperation raised when potential users of a CPR will not benefit from its production, but they contend that the CPR will not be protected unless contributors receive side payments or other positive inducements. Even Olson assumes the privileged group of contributors benefits enough from the public good to provide it (Olson, 1965).

ocean does not benefit those who must provide it, but rather is only a 'good' in the social aggregate. Therefore, contributors lack the incentives to contribute that are traditionally assumed to provide the engine for solution of public good and CPR problems. In the two-level problems involving state and non-state actors that characterize many international environmental problems, resolution of such externality-plagued public goods requires an imposed order vis-a-vis the polluter, if not necessarily nation to nation (Young, 1983).

Regulation becomes more difficult if the ability to produce the public good correlates inversely with the preference for its production. When actors view themselves as either providers or beneficiaries of a public good, but not both, the public good becomes harder to provide. While it is difficult to assess whether oil pollution is 'harder' than an otherwise comparable public good with less heterogenous actors, the five decades between initial efforts and eventual regulatory success suggest it at least falls at the 'hard' end of the spectrum.

### *Heterogeneities Among States*

Heterogeneity among states helps us understand the timing and extent of cooperative efforts to reduce intentional oil pollution. Did heterogeneity among states foster or impede the progress from initial opposition to weak controls to far more support for far stricter controls? Every proposal to deepen cooperation from 1954 to 1978 faced major opposition. Surmounting that opposition required an activist state, either the UK or US, pushing the reluctant majority of states to consider measures more likely to reduce oil pollution. Obviously, perfect homogeneity of state preferences for pollution control would have greatly eased cooperation; perfect homogeneity of state preferences against pollution control would have made it impossible. The oil pollution experience highlights that, when most states do not value a public good but some do, a heterogeneity of power must be overlaid on this heterogeneity of preferences for progress toward the public good to be made. British proposals drove other nations from no controls to zones and from zones to new tanker prohibitions; American proposals drove other nations to accept total limits on all tankers, equipment on large new tankers and then equipment on all tankers.

The higher value that the UK and then the US put on production of the public good produced progress only because these states could credibly threaten unilateral regulation if international action was not taken. Their threats prompted conferences that pressed states to consider new regulations, set the conference agenda and anchored the debate with proposals far more stringent than other countries would otherwise have considered because these states wielded power over the major oil companies. French or



Japanese proposals could not have prompted such conferences and, indeed, these powerful countries had their preferences overridden by adoption of the 1973 SBT requirements.

While the exogenous factors of tanker accidents and growing environmental consciousness in the 1960s and 1970s helped narrow the range of preferences among states, the timing and magnitude of increases in regulatory stringency owes more to proposals from powerful states that channeled concern in specific directions and on learning from existing regulatory experience, discussed below. Most other governments were not experiencing or responding to the domestic political forces prompting activism in the US and UK. Other states would not have sought international environmental regulations on their own. Only UK and US activism prevented a generally low level of environmental concern among most states from producing far slower resolution of the problem. It is not heterogeneity or homogeneity of preferences within an issue-area so much as the power of the actors valuing the public good that determines how far and how fast the international community moves toward producing that good.

Heterogeneous state preferences within the issue-area also contribute to understanding MARPOL's improved effectiveness. MARPOL did considerably better than OILPOL in mapping governments' legal authority and practical ability to enforce its rules onto the distribution of government preferences for pollution control. Violations of the 1954 and 1962 rules were hard for any state to detect and could be prosecuted and penalized almost exclusively by flag states. The 1969 total discharge limits made violations easier to detect, but only in oil loading ports. Unfortunately, the flag states and oil exporting states that could conduct inspections there had shown even less interest than most in enforcement. MARPOL's equipment requirements and detention provisions, however, expanded the practical ability and legal authority to identify and sanction violations to a group of states that included some likely to use it, namely developed port states. This matching of authority and ability to the heterogeneous interests in monitoring and enforcement proved crucial to MARPOL's effectiveness.<sup>12</sup>

Heterogeneous state preferences across issues help explain both the support of other governments for activist proposals and why governments chose not to opt out of rules they had opposed. Activist states consistently cobbled together support from the ranks of otherwise indifferent states that derived linked, non-environmental benefits for their support. In the sort of cross-issue linkages discussed by Martin (paper 4 in this collection), diplomatic concerns drove Commonwealth and Soviet bloc support in 1954 and 1962, jurisdictional concerns played a major role in Australian, Canadian, New

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12. Elsewhere I have called this the strategic triangle of compliance (Mitchell, 1994).

Zealand and developing country support in 1973 and economic concerns accounted for Greek, Norwegian and Swedish support of US proposals in 1978.

States have consistently seen rules agreed to in IMCO, renamed the International Maritime Organization (IMO) in 1981, as the only legitimate forum for international regulation of shipping. Many shipping issues such as navigation, communication and safety rules require international coordination to avoid suboptimal outcomes; others, like oil pollution, are collaboration problems in which defection remains attractive (Stein, 1983). While opting out on oil pollution issues has never been explicitly linked to other issues, retaining a say on the dense network of shipping issues negotiated at IMO undoubtedly presses states to express their discontent with specific rules through loyalty and voice rather than exit (Hirschman, 1970; Martin, paper 4 in this collection).

Even without linkage as a threat against opting out, governments would have few incentives to do so. Governments opt out or withdraw from treaties to legitimately make a rule non-applicable and thereby avoid sanctions for non-compliance. Yet, in OILPOL and MARPOL, governments have never been sanctioned for failing to fulfill their commitments. For years IMO received no reports on monitoring and enforcement and even today less than a quarter of the parties regularly report (Dempsey, 1984; Peet, 1992; Mitchell, 1994: ch. 4). Government failure to rigorously detect and prosecute OILPOL and MARPOL violations has never been sanctioned and rarely even shamed. IMO has used neither inducements nor sanctions to improve the admitted lack of reception facilities. In this context governments incurred fewer costs by simply ignoring provisions they opposed than by highlighting their non-compliance through withdrawal or opting out.<sup>13</sup>

The oil pollution experience confirms the importance of issue-specific hegemonic power as a determinant of the type of international rules adopted. Rephrased in heterogeneity terms, given heterogeneous preferences for a public good, a heterogeneous distribution of power enhances the prospects for cooperation if those valuing the public good have greater power. Rules proved more effective that accounted for heterogeneous preferences for pollution control in designing provisions influencing the legal authority and practical ability to monitor and enforce. The recognition of heterogeneous preferences across issues explains the adoption of rules more stringent than general environmental concern would have predicted and the unwillingness of governments opposing regulations to opt out.

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13. Such a context did not exist in the whaling case where other whaling countries would quickly have become aware of any significant illegal whaling and hence a country intent on whaling could at least maintain legal legitimacy by opting out (Mitchell, 1992).

*Heterogeneities Among Non-state Actors*

While international relations scholars generally focus on states in evaluating the prospects and process for cooperation, the crucial role played by non-state actors has been noted by numerous scholars (Keohane and Nye, 1972). In international environmental affairs they often prove especially important as the targets of regulation and as monitors and enforcers (Mitchell, 1994). In oil pollution heterogeneity among non-state actors as well as between non-state and state actors influences which actors make inputs to regulation, what methods of regulation are adopted and the effectiveness of regulation.

Two groups transport oil: oil companies and independent tanker owners. These groups differ in their preferences for oil conservation because the costs of recovery fall on tanker operators, the value of oil recovered accrues to cargo owners and independents generally do not own the cargo they carry. Since oil companies are tanker owner-operators as well as cargo owners, they have private economic incentives to reduce discharges (even absent environmental concerns) whenever oil prices are high enough to offset recovery costs. By contrast, the chartering arrangements under which most independents work generally involve payment for oil loaded rather than oil delivered, passing through few incentives to conserve oil. Major oil companies directly control one-third of the world's oil tankers and are based in the US or UK, while a far larger number of independents based elsewhere control the other two-thirds. Being fewer in number, oil companies have organized and influenced international rules more readily than independents. They have been more motivated to do so because UK and US unilateralism constrained their alternatives to regulation. Together, these factors explain oil companies' greater involvement in regulation, their proposed methods of regulation and their greater influence over regulation.

Three examples illustrate this. Pushed by the British government in the 1960s, Shell energetically developed and promoted LOT to derail pressures to establish international equipment requirements. Oil companies liked LOT's ability to recover most waste oil without new equipment but also wanted to avoid its mandated use. Indeed, for a period in the 1960s, oil companies promoted LOT by compensating independents for the additional expense it imposed on tanker operators (Kirby, 1968). Not surprisingly, however, data from the 1970s show that independents rarely used LOT efficiently or effectively and discharged far more oil at sea than did oil company tankers (Mitchell, 1994: ch. 7).

In 1973 MARPOL adopted SBT requirements for new tankers with the support of oil companies and over the opposition of independents. However, Stiglerian benefits from regulation do not explain oil company support (Oye and Maxwell, paper 8 in this collection). Unlike LOT, SBT involves large equipment costs, reduces tanker capacity and – because it reduces, rather

than recovers, the slops a tanker generates – has no offsetting economic benefits. Oil companies had opposed SBT requirements as recently as 1971 and have since opposed SBT retrofit proposals in 1978 and 1991 (International Chamber of Shipping, OCIMF, and INTERTANKO, 1991). If requiring SBT on new tankers had raised barriers to market entry, then independents as well as oil companies should have supported it. Indeed, both should have pressed for its immediate application to all new tankers, not just those over 70,000 tons built after 1980. No such lobbying took place. Rather, oil company support stemmed from their vulnerability to even more stringent, unilateral American rules and because a recent building boom and the requirement's application to tankers built after 1980 meant costs were far in the future.

By 1978 stricter proposals and exogenous changes to the incentives of independent tanker owners created quite different positions. The US proposal to require all existing tankers to retrofit with SBT evoked the support of independent tanker owners in Greece, Norway and Sweden and the strong opposition of oil companies. The mid-1970s tanker glut reversed earlier positions vis-a-vis these more ambitious regulations. To deal with excess tanker supply oil companies chartered fewer independent tankers, retrenching to greater use of their own tankers. This concentrated laid-up tankers among independents, who now saw SBT retrofits as a means to reduce the capacity of working tankers and put their own ships back to work. Such regulations would have cost oil companies millions in the relatively short term and they developed and successfully pressed crude oil washing equipment as an alternative to, if not a replacement for, SBT requirements, over the objections of both the US and states representing independent tankers.

These incidents highlight several points. First, oil company positions consistently differed from those of independents, reflecting their divergent economic incentives as cargo owners. Their greater resources and technical expertise allowed them to develop alternatives that promoted these interests. Second, these preferences, by themselves, have not caused oil companies to support regulation; their development of the LOT and COW alternatives and their support for regulation have been direct responses to threats posed by existing or proposed regulations. Their support for regulation responded to, rather than being exogenous of, international and unilateral US pressures. Third, support or opposition to international regulation depended on the costs of proposed regulations relative to likely future alternatives rather than to the status quo ante. Over time oil company positions diverged less from those of activist governments – as evident in the absence of calls for voluntary guidelines in the 1970s – not because of a convergence of underlying preferences but because the history of regulation made earlier positions untenable. Fourth, international regulations have incorporated oil company preferences more than independents', largely because the former

could more readily organize and lobby for their positions. As MARPOL's rejection of requirements in the 1972 Port and Waterways Safety Act and the 1977 Carter initiatives demonstrates, often international rules reflected oil company preferences more than domestic rules. The distribution of power and preferences at the international level let oil companies block costly rules that they failed to block at the domestic level.

MARPOL's rules also took advantage of a different heterogeneity between non-state actors, namely between the preferences of oil transporters and others involved in the oil trade. Discharge rules could be violated by any tanker operator with incentives to do so. Reducing violations depended on reducing those incentives via deterrence. MARPOL's equipment rules could only be violated by those tanker owners able to elicit cooperation from a builder, classification society and insurer in building an admittedly illegal tanker. These actors had reputational incentives not to cooperate and could effectively prevent violations. Building on heterogeneous incentives across actors, the regime delegated monitoring authority to classification societies in an example of what Martin (paper 4 in this collection) calls 'functional differentiation', thereby facilitating cooperation. The coerced-compliance regulatory strategy proved very effective and was reinforced by the deterrence stemming from the willingness of some important markets, especially the US, to link the ability to trade to compliance. A market structure involving non-state actors with divergent interests allowed creation of a regulatory strategy that prevented, rather than merely deterring, violations.<sup>14</sup>

### *Heterogeneities Between State and Non-state Actors*

The fact that states, as a group, differ in capacities and incentives from non-state actors gives us further leverage in understanding the dynamics of efforts to reduce oil pollution. As Young notes (paper 3 in this collection), international environmental problems often involve a two-level implementation game that follows Putnam's two-level negotiation game (Putnam, 1988; Chayes and Chayes, 1993). While being the ultimate targets of regulation, non-state actors lack certain abilities that constrain their options relative to governments. Given rules they dislike, governments can choose to comply, violate or opt out. Non-state actors can choose only between the first two of these. While states can legitimately express their preferences by opting out, non-state actors cannot. If a government does not opt out, its corporate nationals can oppose this position only through non-compliance.

Indeed, available evidence suggests that many tanker operators chose not

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14. On the difference between incentive-based, deterrence-based and coerced-compliance models of regulation, see Reiss (1984).

to comply with discharge standards. In contrast, even though MARPOL's SBT requirements were more widely opposed and owners had ongoing incentives to violate them, almost all have subsequently complied. This contrast is partly due to a two-level implementation problem that allowed hierarchical enforcement and coerced compliance regulatory strategies in an international context (Keohane and Ostrom, 1994). While the heterogeneity of roles and preferences described above determines the need for an imposed order, it does not determine its form. Internationally, regulatory options are assumed to include positive incentives like sidepayments (Oye and Maxwell, paper 8 in this collection), negative sanctions or their combination as linkage. Hierarchical enforcement, possible at the domestic level, is generally assumed to be unavailable to international regulators (Martin, paper 4 in this collection). However, these traditional incentive-manipulating alternatives ignore regulatory strategies that constrain actors' abilities to engage in undesirable activities, known as coerced-compliance strategies (Reiss, 1984). The oil pollution problem shows both hierarchical enforcement and coerced-compliance strategies being used at the international level.

MARPOL altered the definition of compliance and the rules regarding enforcement to provide governments with the practical ability and legal authority to easily identify and sanction violations committed by the nationals of other countries. MARPOL took advantage of the divergent preferences for enforcement among states by establishing sanctions that addressed governments' aversions to sanctioning other governments. Detaining a foreign national's tanker is far less likely to evoke retaliatory sanctions than an economic boycott or other government-to-government sanction. International authorization of transnational hierarchical enforcement, i.e. by one government against another's nationals, made sanctioning more likely by isolating intergovernmental relations from pollution enforcement. Without hierarchical enforcement, e.g. if all tankers had been government-owned, adoption of SBT would likely have been considerably less prevalent because of either opting out or unsanctioned non-compliance. Obviously, the practical possibility of such enforcement depended on international trade as part of the environmental problem's structure. While common to international regulation of endangered species, ozone protection and hazardous waste, trade is not common to many other environmental problems, limiting the use of such techniques.

While governmental enforcement can increase compliance by non-state actors, the latter lack equivalent enforcement powers to alter the behavior of governments. Ongoing non-compliance by many governments in ensuring provision of reception facilities has been a frequent complaint of tanker operators and has delayed implementation of more stringent discharge restrictions in several MARPOL special areas for over a decade (Andren and Liu, 1990; INTERTANKO, 1989, 1993). Even when tanker owners have

brought the absence and inadequacy of countries' reception facilities to IMO's attention, no responses have been forthcoming (International Chamber of Shipping, 1983, 1985, 1990). Thus, differences in enforcement powers between states and non-state actors manifested themselves in different compliance levels.

MARPOL's equipment standards also enhanced effectiveness by recognizing that non-state actors may prove more able and likely than governments to monitor and enforce international regulations. While environmental non-governmental organization (NGO) involvement is frequently cited as crucial to implementation of international accords, non-environmental NGOs also can play a role. MARPOL built on the fact that classification societies, insurers and shipbuilders had abilities and incentives to monitor and enforce that exceeded those of many governments. Classification societies had greater access to information about a tanker than governments did, but had to build reputations for high standards to recruit new business. Given MARPOL's inspection and certification rules and the benefits of classifying with a reputable classification society, it became worth the costs of complying with equipment rules. Insurance depended on classification that depended, in turn, on compliance with equipment regulations. Even ordering a tanker without SBT became difficult when a prospective buyer had to identify a builder, classification society and insurer willing to cooperate in facilitating an admittedly illegal act. Tanker owners complied with MARPOL's equipment rules because private transactions prevented them from doing otherwise. While even governments found it difficult to enforce discharge standards, equipment standards gave a new role to private actors with existing capacities and incentives that were different from those of many governments, thereby facilitating provision of the public good of reduced oil pollution. The structure of the environmental problem and the heterogeneity of the capabilities, authority and incentives between state and non-state actors explain the greater effectiveness of MARPOL's equipment rules, showing up in more government enforcement, prevention of violations by non-state actors and a resultant greater overall compliance level by tankers.

### *Learning*

Besides heterogeneity, the progressive movement toward reduction of the intentional oil pollution problem owes much to a process of learning that undercut certain positions while reinforcing others. Learning narrowed the range of positions that actors could reasonably take on alternative regulatory strategies, thus fostering cooperation. Existing strategies shown to have failed were excluded from consideration in subsequent regulation while successful strategies were built upon.

At the 1954 Conference countries unconcerned with oil pollution rebuffed British proposals for a global ban on discharges, contending that even coastal prohibition zones were unwarranted. By 1962 the increase in the amount of oil transported on and discharged into the sea, coupled with scientific findings that crude oil could persist over long distances, undercut arguments that no problem existed and allowed adoption of rules that essentially prohibited discharges for new tankers. While the 1962 requirements for new tankers had low immediate costs, they established the principle that discharges should be reduced. The 1969 amendments then expanded this principle, through total discharge limits, to all tankers, the 1962 precedent having made oil company arguments for voluntary guidelines untenable. Their arguments that effective use of LOT had already eliminated most discharges did, however, convince negotiators to legitimize LOT and not require pollution-reduction equipment. By 1973, however, evidence falsifying those claims and inherent difficulties in enforcing discharge rules removed voluntary guidelines and exclusive reliance on discharge standards from the menu of negotiable options.

The adoption of equipment standards in 1973 and their broadening in 1978 continued to build on the OILPOL experience. Similar to the 1962 events, the low immediate costs of the 1973 equipment rules allowed establishment of the principle of equipment regulations, which was then expanded to all tankers in 1978. The value attached to the enforcement benefits of equipment requirements grew directly from the obstacles to detecting and prosecuting OILPOL's discharge standards. To answer the counterfactual, without almost 20 years of history with OILPOL, MARPOL would not have adopted expensive equipment requirements as the initial approach to oil pollution reduction. Experience taught the US what regulatory strategies would better foster the environmental goal, while discrediting laggard state arguments to continue existing strategies.

The institution also prompted the more focused learning by industry reflected in the development of LOT and COW. While motivated by a desire to avoid regulatory costs, it produced information on lower cost means to achieving environmental goals. Industry promotion of these strategies signified a growing acceptance of environmental goals as the state of the world, even if it did not signify an internalization of those goals. Oil companies promoted LOT throughout the 1960s not because it conserved oil, which would not increase in value until 1973, but because it averted international equipment requirements. Oil companies supported COW retrofits in 1978 not only because they reduced oil lost during transport but because they averted the more expensive SBT retrofits. Previous regulatory decisions constrained the positions industry could expect to be acceptable to the activist state.

MARPOL's success also owes much to OILPOL's failures. OILPOL's



amendments had confirmed Ostrom's view that 'the initial rules established in some systems are likely to be ill-matched to the problems they face' (paper 6 in this collection). OILPOL took four years to enter into force, the 1962 amendments took five years and by 1973 the 1969 amendments had not yet taken effect. With little opposition MARPOL incorporated decision-making procedures that shortened the delay between adoption and implementation of new rules. First, many provisions set specific dates to take effect, whether or not the agreement had entered into force. The 1973 requirements for SBT installations and for reception facilities in special areas applied after January 1980 and January 1977, respectively and the 1978 equipment requirements for new tankers applied after June 1982. Second, via tacit acceptance, amendments enter into force automatically after 16 months unless one-third of the parties object. Both tactics have succeeded. As late as 1977 oil company representatives claimed that large discharges were not illegal because the 1969 restrictions on total discharges had not yet taken effect (Gray, 1978). In contrast, tankers installed required equipment on MARPOL schedules, even though waiting for entry into force would have delayed the requirements by up to three and a half years. Likewise, while slow ratifications delayed the 1969 Amendments for nine years and plagued entry into force of MARPOL itself, all MARPOL amendments have entered into force in 16 months, including controversial 1991 requirements for expensive double hulls.

Within the context of this collection, learning can be seen as a process that promoted effective regulation of oil pollution by reducing the heterogeneity of viable positions that actors could take, even while often leaving the heterogeneity of their underlying preferences unaffected. In line with Snidal's argument (paper 3 in this collection), positions were influenced by, as much as influencing, the efforts to provide the public good of a cleaner ocean. Learning within the regime created an endogenous bias toward certain goals and means and away from others, in ways different from those that would have occurred in the regime's absence.

### **Conclusions and Lessons**

How did heterogeneity contribute to or detract from the pattern of progressive cooperation that has characterized the international regulation of intentional oil pollution? As made clear throughout this collection, heterogeneity comes in various flavors, with corresponding variations in its impact on the ability of actors to resolve collective-action problems. This article has identified the different effects of different types of heterogeneity in a single international case. Problems in which actors have heterogeneous roles, as either producers or beneficiaries, make public goods harder to

produce by introducing externalities. If the oil industry had been more homogeneously distributed among countries, then no country could have credibly threatened unilateral action. Hegemony, involving a coincidence of state heterogeneity in power and state heterogeneity in preferences, consistently provided the engine that put intentional oil pollution on the international agenda and framed the ensuing debate. The heterogeneity of preferences and of the capacity to organize between sectors in the oil transportation industry determined the content and influence of proposals made by oil companies. It was the happy coincidence, from an environmental perspective, of the concentration of oil companies in states with environmental movements capable of getting their governments to threaten unilateral action that led those companies to support international regulation of any form.

Equipment requirements proved more effective than discharge standards by creating regulations that took advantage of several types of heterogeneity. First, because oil transporters faced different legal norms from states, they could choose only to comply with or violate rules they opposed, but could not opt out. Second, certain non-state actors had greater capacities than governments to prevent, rather than merely deter, equipment violations and had interests sufficiently different from those of oil transporters to use these capacities. Third, because the problem involved international trade and two-level enforcement, MARPOL enhanced the ability for hierarchical enforcement by one government against nationals of another, greatly increasing its likelihood.

The progressive cooperation toward reducing intentional oil pollution also illustrates institutional learning. Exogenous forces have consistently influenced positions and through them the oil pollution regulations adopted. However, after adoption of initial rules, experience with and future expectations of international regulations and institutions shaped preferences and capabilities toward amendments and revisions that enhanced the likelihood of pollution control, and away from those that decreased that likelihood. By reducing the gap between opposing positions, experience with previous regulations increased the ability to move toward regulations that facilitated provision of the public good of reduced pollution.

What does this experience teach us for solving other environmental collective-action problems? First, it provides optimism that even when those required to contribute to an international public good have no exogenous incentives to do so, nations can negotiate rules that progressively and successfully lead them to provide it. Second, it suggests that rules can succeed by identifying heterogeneities in the capacities and authority needed to effectively implement a regulatory strategy and selecting that strategy which best matches the heterogeneities in preferences among states, among non-state actors and between the two groups. Different preferences and capacities can provide 'natural' monitors and enforcers whose incentives independently

lead them to undertake those activities. The rules need only to give them the authority and to define compliance in ways that provide the practical ability to monitor and sanction. Third, it highlights that a strategy that alters incentives by deterring violations may prove less effective than a strategy that alters opportunities by preventing violations. For analysis of heterogeneity to improve our understanding of existing international environmental agreements and negotiation of future ones, much more research is needed to examine many more cases to identify the most important types of heterogeneity and their impact on the timing, shape and effectiveness of regulatory efforts.

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