



Rational choice, Round Robin, and rebellion: An institutional solution to the problems of revolution

Peter T. Leeson

Department of Economics, George Mason University, MSN 3G4, Fairfax, VA 22030, United States

ARTICLE INFO

Article history:

Received 29 April 2009
Received in revised form 8 October 2009
Accepted 30 December 2009
Available online 11 January 2010

JEL classification:

D70
D74
K42
N43

Keywords:

Round Robin
Revolution
Rational choice

ABSTRACT

Two collective action problems plague successful revolution. On the one hand, would-be revolutionaries confront a “participation problem,” whereby no rationally self-interested individual has an incentive to participate in rebellion. On the other hand, individuals face a “first-mover problem” whereby no rationally self-interested individual has an incentive to lead rebellion. This paper argues that 18th-century merchant sailors who confronted these problems devised a novel institution to facilitate maritime revolution and assist them in overthrowing abusive captains. This institution was called a “Round Robin.” Round Robins helped overcome both the participation and first-mover problems by aligning the interests of individual sailors desiring mutiny and restructuring the payoffs of leading versus following maritime rebellion.

© 2010 Elsevier B.V. All rights reserved.

1. Introduction

Successful revolution must overcome two collective action problems. The first is a “participation problem.” To be successful, a sufficient number of individuals must participate in revolution to depose the existing authority. Although individuals maximize social welfare when they jointly revolt, since everyone enjoys the benefits of revolutionary success but each person bears the cost of his participation privately, if no person's participation has an appreciable effect on the revolt's success, no individual has an incentive to participate in the revolution.

Individuals can avoid this strict free-riding outcome if the number of potential revolutionaries is small enough that each person's decision to participate significantly affects the probability of the revolt's success. But even in this case a considerable participation problem remains. Since revolutionary success requires joint participation, each individual is best off when he participates in the revolution and his comrades do as well. However, he's harmed if he revolts and his comrades abstain. Uncertain that others will revolt with him, each individual is led to abstain from revolting himself, again preventing successful revolution.

The second obstacle revolution confronts is a “first-mover problem.” Even if individuals can overcome the participation problem and everyone is willing to participate in the revolution, no individual has an incentive to be its leader. If rebellion fails, the leader bears the brunt of the punishment. In contrast, following rebellion largely secures one against this possibility. Thus, among those desiring to revolt, everyone wishes to follow instead of lead. Without someone to initiate it, the rebellion doesn't happen.

These collective action problems mean we shouldn't observe revolutions. Nevertheless, we do. Sparked by the initial insights of Olson (1965) and Ireland (1967), later elaborated by Tullock (1971; see also 1974) in his seminal paper “The

E-mail address: pleeson@gmu.edu.

Paradox of Revolution,” a voluminous literature analyzes the collective action problems of revolution and considers potential solutions (see, for example, Taylor, 1988; Lichbach, 1994, 1995, 1996; DeNardo, 1985; Popkin, 1979, 1988; Calhoun, 1988; Goldstone, 1991, 1994; Elster, 1988; Kurrild-Klitgaard, 1997; Muller and Opp, 1986, 1987; Finkel et al., 1989; Opp, 1989, 1994; Chong, 1991; Coleman, 1990; Frohlich and Oppenheimer, 1970; Frohlich et al., 1971; Mason, 1984; Tilly, 1978; Silver, 1974; Kuran, 1989, 1991; Moore, 1995).

For rational choice theorists the core concern has been two-fold. First, to identify mechanisms that could enable desiring rebels to overcome both the participation and first-mover problems, and second, to do so in a way consistent with rationally self-interested individual behavior. Lichbach's (1994, 1995) important work identifies no fewer than two dozen “solutions” researchers have offered in this endeavor and presents a useful schemata for categorizing them. Among these are what Lichbach calls “market,” “contractual,” “community,” and “hierarchical” solutions to the collective actions problems of revolution.

A point of sharp contention in this literature exists between researchers, such as Tullock (1971), who argue that “selective incentives” – private benefits bestowed on individuals who lead and participate in successful rebellion – motivate individuals’ leadership of and participation in revolution, and researchers, such as Muller and Opp (1986, 1987), who contend that “it is implausible a priori to postulate that most participants in rebellious collective action are either mercenaries or are taking part in the hope of personal gain from pillage and plunder” (Muller and Opp, 1986, p. 473). In place of “selective incentives,” members of this latter camp propose a public goods model of revolution “stipulating that the value of rebellion in terms of public goods can be a relevant incentive for participation” (1986, p. 471). This argument substitutes the “hard” rational choice assumption of individual rationality and decision making with a “softer” approach that permits “collective rationality” and “group decision making” (see, for instance, Finkel et al., 1989), and substitutes the strict rational choice assumption of self-interest with a weaker version that allows individuals to also attach value to the public good *per se*.

This paper argues that the collective action problems of revolution can be, and have been, overcome through private institutional innovation even under “strong” rational choice assumptions.¹ This mechanism retains the strict and narrowly defined rational self-interest assumption economists use to analyze human behavior, but does so without invoking the “selective incentive” argument some critics have taken issue with. In examining a private institutional mechanism individuals have used to help overcome the collective action problems of revolution, my analysis fits most comfortably in the “contractual solutions” category that Lichbach (1994, 1995) identifies. This is significant, since, unlike several of the other categories of solutions Lichbach describes, researchers have devoted little attention to contractual mechanisms for surmounting the collective action problems of revolution.

A brief but illuminating, and hitherto undiscussed, historical episode involving mutiny on British merchant ships in the first half of the 18th century demonstrates how individuals overcame the collective action problems that plague revolution without selective incentives or altruism. Merchant sailors who confronted these problems devised an institution called a “Round Robin” to facilitate maritime revolution and overthrow abusive captains. Round Robins helped overcome both the participation and first-mover problems by aligning the interests of individual sailors desiring mutiny and restructuring the payoffs of leading versus following maritime rebellion.

2. A reason for rebellion: predatory merchant ship captains

As Earle (1998) points out, modern commentators have tended to be overly critical in assessing 18th-century merchant sailor life.² This may be so. But while it's important to avoid painting overly gloomy portraits of existence aboard early 18th-century merchant vessels, it's equally important to avoid romanticizing this existence. Descriptions of the harshness and difficulty of merchant sailors' living and working conditions have strong foundations in the historical record (to see this, simply peruse the London Public Record Office's High Court of Admiralty papers). Rediker's (1987) important work documents these foundations and points to the regular, if not commonplace, abuses early 18th-century merchant sailors suffered at the hands of predatory merchant ship officers and captains in particular. Predatory officers cut sailor rations to save costs or leave more for them to consume; they fraudulently docked sailors' pay to save money or paid sailors in debased currency; and they physically abused their sailors to reinforce their authority, punish insolent crewmembers, and settle personal scores (see, for instance, Gifford, 1993; Rediker, 1987; Morris, 1965).

English Admiralty law permitted “reasonable” corporal punishment to keep merchant sailors in line. But predatory officers far exceeded this limit, in some cases killing their sailors. In 1724 one merchant ship captain dealt two of his sailors “above a hundred Blows with a Cane upon and about their Heads, Necks & Shoulders with great force and violence in a very cruel and barbarous manner.” A few days later the sailors died (Information of Benjamin Bush 1724, High Court of Admiralty Papers, 1/55, fol. 92). Another abusive captain, “without any provocation, came . . . and knock'd” one of his men “down and then stamped upon him twice with all the violence he could.” Shortly thereafter the sailor expired (Deposition of William Bennett 1729/1730, High Court of Admiralty Papers, 1/55). Other predatory captains physically abused their sailors in more heinous ways. Captain Samuel Norman ordered one of his ship's boys “to fetch a Pail of Water . . . to wash his Leggs, Thighs, & privy Parts.” The boy resisted, but Norman compelled him “& whilst he was washing the same, he the said Samuel let down the

¹ In addition to the research discussed above, this paper is thus also connected to the growing literature that examines private institutions of social order. See, for instance, Friedman (1979), Benson (1989), Leeson (2005, 2007b,c, 2008), and Leeson and Boettke (2009).

² Rodger (1996) makes a similar point about life in the 18th-century Royal Navy.

[boy's] Trousers . . . & had the carnal use of him" (Information of Richard Mandewell 1722, High Court of Admiralty Papers, 1/55, fol. 22).

Like a minority of men in other employments, a minority of merchant ship captains were sadists. However, many other predatory captains were not, but were instead rationally responding to the incentives they faced in light of merchant ships' organizational structure. This structure was autocratic, headed by the captain. Below him were his fellow officers, and far below the officers were ordinary seamen. Autocratic authority enabled captain predation, empowering captains to use their authority for private gain at sailors' expense.³

Merchant ships' autocratic organization wasn't arbitrary, however. As Leeson (2007a, 2009c) points out, merchant ship autocracy reflected an efficient organizational response to the specific economic situation these ships confronted, and in particular merchant vessels' ownership structure. Absentee owners – landed merchants – owned most merchant ships. Groups of merchants pooled their resources to finance and outfit vessels for carrying their and other merchants' goods. In addition to providing the vessel, absentee merchant owners supplied their ship's provisions, in some cases advanced sailor wages, and provided the other wares required for an expedition's success. Merchant shipping's absentee ownership structure reflected specialization and comparative advantage. Merchants, who had ready capital and expertise in finance and investment but comparatively little knowledge of seafaring, remained on shore and focused on supplying the capital required to build and outfit vessels along with tending to the commercial aspects of merchant shipping. Seamen with expertise in sailing but comparatively little capital, financial know-how, or expertise in negotiating commercial matters went to sea as maritime labor working on absentee merchant owners' ships.

This division of labor was sensible and effective. However, it generated a principal-agent problem from absentee owners' perspective. Away at sea, sometimes for lengthy periods, merchant ships were outside their financiers' direct watch or control. This created latitude for sailor opportunism, such as negligence in caring for the ship, carelessness that damaged cargo, liberality with provisions, embezzlement of freight or advances required to finance the vessel's voyage, and outright theft of the vessel itself.

To solve this problem, absentee merchant owners appointed captains to their ships to monitor and control the sailors who worked on them. Captains often owned small shares in the ships they commanded and/or had familial connections to members of the merchant groups that hired them, aligning their interests with those of the absentee owners. To protect their interests and prevent sailor opportunism, absentee owners granted their captains extensive powers over their ship's sailors, creating the autocratic organization described above. These powers included directing sailors' tasks, distributing victuals, determining payment, and disciplining and punishing crewmembers. Admiralty law supported captains in this capacity by granting them the legal right to command and physically punish their crewmembers, as well as by prohibiting sailors from disobeying captain orders or interfering with captain punishments. The law also permitted captains to deduct sums from sailors' pay if they damaged cargo through carelessness or embezzled the ships' goods. Because of this organization, captains "had absolute authority over the mates, the carpenters and boatswain, and the seamen," giving them the power to "make life tolerable or unbearable as they wished" (Davis, 1962, pp. 131–132; see also, Betagh, 1728).

The law didn't permit predatory captain behaviors. But once a merchant ship left port, in most cases the law couldn't effectively prevent such predation. At sea there were few government authorities to ensure captains didn't abuse their authority or to punish captains who did. Merchant ship captains therefore had considerable latitude to take advantage of their crewmembers.

This latitude wasn't limitless. An overzealous captain who maimed or otherwise physically disabled too many of his sailors might have trouble finishing his trip. Reputation also prevented some captain abuse. Sailors weren't keen to sign on with merchant ship captains known for being abusive. Further, sailors could, and in many cases did, sue predatory captains on their ship's return for abuse or fraud. But merchant ships' distance from the authorities' prying eyes once they were at sea reduced the effectiveness of these checks on captain predation. There was often a paucity of disinterested witnesses who could verify a sailor's word against a predatory captain's. In the absence of such witnesses it could be unclear, for instance, whether a captain had legitimately docked sailors' wages for damaging cargo or had done so fraudulently instead. The law itself was also ambiguous, "reasonable" correction carrying different meanings for different authorities. Similarly, reputation's effectiveness was limited. Some sailor–captain interactions weren't repeated and information could move slowly in the early 18th century.

The imperfection of these constraints on captain predation created significant scope for captain abuse, which some captains seized. And if a sailor was unlucky enough to find himself under the control of such a captain, he might consider the extralegal options available to him to remedy this situation.

3. Round Robin: an institutional solution to the problems of revolution

Confronted with captain predation and unwilling to wait for the chance to reproach their abusive commander in court, seamen who refused to acquiesce to mistreatment had but a few options available to them. Desertion was one possibility; and 18th-century merchant sailors sometimes did this. In fact, predatory merchant captains sometimes surreptitiously arranged for their men's "desertion" since deserters forfeited their pay. "Often this desertion was accomplished with the help of

³ For a more detailed discussion of merchant captain predation, merchant ship organization, and the relationship between them, see Leeson (2007a).

a dockside crimp. Instead of a whore's bed or the diggings, the hapless and penniless sailor found himself next morning comatose, hung-over and 'shanghaied' aboard another outward-bound ship, without proper cloathes and heading for Cape Horn" (Woodman, 2005, p. 9). Unfortunately for sailors, deserting one abusive captain often meant finding employment on another merchant vessel, which might have its own unscrupulous commander.

Piracy was another option for merchant sailors who suffered captain abuse. Although entering piracy meant becoming an outlaw, because of seamen's superior treatment aboard pirate ships where a system of constitutional democracy and separated powers that prevented captain abuse prevailed, and because of the prospect of much higher pay, in many cases piracy remained an attractive alternative despite its criminality (Leeson, 2007a, 2009a,b,c). For these reasons, turning pirate was a popular response to the abusive atmosphere on merchant vessels, and merchant captain predation was one of the major causes of piracy.

The final option available to dissatisfied seamen was mutiny.⁴ Although mutiny was perhaps the riskiest response to captain abuse, provided it could be carried off successfully, mutiny was in some ways also the most attractive option. The obstacle to mutiny was the same one confronted by all forms of revolution. How could crewmembers secure participation in the desired rebellion?

3.1. Overcoming the participation problem

The average early 18th-century merchant ship of 200 tons carried only 13–17 crewmembers, including the captain and his officers (Rediker, 1987, p. 107). Ships that transported slaves could be larger, carrying around 20 crewmembers (Mincinton, 1989). However, with the exception of 450+-ton East Indiamen, which at their largest carried about 90 sailors, relatively few merchant ships had crews that were substantially larger than this.

The smallness of most merchant crews influenced the nature of the collective action problem that sailors confronted in securing participation in mutiny. Unlike cases of revolution encompassing large populations for which the individual's probabilistic influence on the revolt's success is close to zero, the small populations aboard merchant ships meant an individual's decision to participate in or abstain from rebellion appreciably affected the potential for mutinous success or failure.⁵ This isn't to say that in all cases every person aboard a merchant ship was the "decisive sailor." The number of individuals required to successfully stage a mutiny depended on the strength of the would-be mutineers relative to the strength of the captain and any of his officers who would support him, among other factors. However, given the small size of merchant crews, which meant that an individual sailor's decision to participate in mutiny could significantly affect the rebellion's outcome, if his fellow sailors intended to mutiny, it was often in his interest to mutiny as well.

To see this explicitly consider the following equations, which model an individual crewmember's expected payoff of participating in or abstaining from mutiny.⁶ Eq. (1) expresses his expected payoff of mutinying along with his fellow crewmembers. Eq. (2) expresses his expected payoff of not mutinying when his fellow crewmembers do.

$$E(M) = \rho\alpha - (1 - \rho)\varphi \quad (1)$$

$$E(A) = (\rho - \rho_i)\alpha \quad (2)$$

ρ is the probability the mutiny is successful when all crewmembers, including this individual, participate, where $\rho \in [0, 1]$. α is the agent's private payoff of removing a predatory captain, where $\alpha > 0$. If mutiny fails, the captain punishes the mutineer by holding back additional pay, imprisoning him, physically punishing him, or in some other way adding to the abuse the predatory captain normally inflicts on crewmembers discussed above. φ captures the private cost the individual incurs in this event, where $\varphi > 0$. In Eq. (2) the cost term from (1) is absent since this equation considers the individual's expected payoff of abstaining from mutiny. Since he doesn't participate in mutiny, here he incurs no cost if it fails. However, the probability of mutinous success is lower by his expected contribution to the mutiny, ρ_i , since he abstains, where $\rho_i \in [0, 1]$ and $\rho \geq \rho_i$.

Using Eqs. (1) and (2) it is straightforward to establish when the individual will mutiny if his fellow crewmembers do as well: $\rho_i \geq \varphi(1 - \rho)/\alpha$. When the sailor's expected contribution to the probability of mutiny's success satisfies this inequality, he finds it in his interest to mutiny if his fellow crewmembers mutiny as well. If his expected contribution to the probability of the mutiny's success fails to satisfy this inequality, his interest is better served by abstaining from the mutiny and free riding on the hopeful success of his rebelling comrades. As the number of crewmembers falls, ρ_i rises, meaning that when the population is small, as it was on most early 18th-century merchant ships, it's easier to satisfy this inequality and sailors find it in their interest to join the revolt.

⁴ Piracy and mutiny weren't necessarily mutually exclusive alternatives. Several pirate ships got their start in merchant ship mutinies. The crew would mutiny and then "go on the account."

⁵ Incidentally, the traditional focus on large-scale revolts is rather strange. Most rebellions are small-scale, much closer to the case considered here with mutiny aboard merchant ships. Children considering rebellion against their parents, for example, confront the same collective action problems that the American colonists confronted in considering rebellion against England. Further, it's safe to say that the former occur with much greater frequency than the latter. Several notable exceptions to the tendency to focus exclusively on large-scale revolts include Kurrild-Klitgaard (1997), Gunning (1972), and Chalmers and Shelton (1975).

⁶ My model is based on the traditional rational choice model of rebellious participation presented in Muller and Opp (1986).

		Crewmember A	
		Mutiny	Abstain
Crewmember B	Mutiny	α	σ
	Abstain	ω	σ

Fig. 1. The mutineers' assurance game.

This important difference in the revolutionary environment merchant crews confronted means the collective action problem sailors faced is one described better by an “assurance game” than a standard prisoners' dilemma scenario.⁷ Instead of “defection” (which here refers to not participating in the mutiny) unilaterally constituting seamen's payoff-maximizing strategy, participating in the mutiny constitutes each sailor's payoff-maximizing strategy *as long as his fellow crewmembers participate as well*. The collective action problem crewmembers confronted in staging mutiny was thus one of creating assurance that, if they rebelled, their fellow crewmembers would too.

In this environment each crewmember's decision to participate in the mutiny depends critically on his expectation about whether or not his fellow crewmembers will do so as well. If crewmembers expect their comrades to join them in revolting against the predatory captain, the probability of successful mutiny is sufficiently high that each individual will want to participate himself. On the other hand, if crewmembers expect their comrades to “chicken out” when the time for mutiny comes, they know the mutiny is likely to fail and therefore will want to back out of participating in it themselves.⁸

To see this problem explicitly consider a merchant ship of complete but imperfect information. This ship has a captain and two ordinary crewmembers. Given the small number of crewmembers aboard this ship (and merchant ships more generally), let $\rho_i \geq \varphi(1 - \rho)/\alpha$, which is to say that conditional on the participation of his comrades, each sailor finds it profitable to participate in the mutiny. Crewmembers have two choices: mutiny or abstain from mutiny. If both crewmembers revolt, mutiny is successful and the predatory captain loses power. In this case both crewmembers earn their highest private payoff, α . If neither, or only one, crewmember revolts, the mutiny fails and the captain retains power. When neither crewmember revolts both earn a lower payoff, σ , their payoff of sailing under a predatory captain. When only one crewmember revolts he incurs the punishment cost of (unsuccessfully) challenging the captain, yielding him the lowest payoff possible, ω , where $\alpha > \sigma > 0 > \omega$. Fig. 1 depicts this game.

This assurance game has two pure-strategy Nash equilibria: the mutual mutiny equilibrium in which the crewmembers fare the best, and the mutual abstention from mutiny equilibrium in which the crewmembers fare the worst. Which equilibrium prevails depends on the probability each crewmember places on how the other crewmember will behave. Where θ is the probability each sailor places on the other sailor rebelling, the mutual mutiny equilibrium that maximizes social welfare results if and only if: $\theta > (\sigma - \omega)/(\alpha - \omega)$.⁹

In the absence of some assurance mechanism that creates a reason for crewmembers to believe otherwise, crewmembers' expectations about each others' commitment to rebellion doesn't satisfy this inequality. In this case both crewmembers abstain from mutiny and the predatory captain continues to prey on them, resulting in the socially suboptimal outcome.

To assist them in overcoming this problem, 18th-century merchant sailors developed a novel institution called a “Round Robin.” Under this institution crewmembers who desired to challenge their abusive captain would document their complaints in writing. Sailors could use Round Robins as petitions to show captains the extent of crew support for policy changes and what these changes were – backed by the threat of violent overthrow – or as clandestine documents, which they used internally to plot and establish support for overturning a predatory captain. By creating a written contract to revolt among crewmembers, a Round Robin facilitated assurance between sailors about their comrades' participation and committed those who wanted to challenge their captain to follow through on their mutinous desire.

Round Robins achieved this in three closely connected ways. First, in explicitly documenting the names of individuals who had mutinous desires, Round Robins informed other crewmembers that they weren't alone in desiring rebellion and, further, informed them how many other seamen, and specifically which ones, supported their cause. This was important because it removed some uncertainty among crewmembers about the likelihood that if they decided to challenge the captain, who,

⁷ Chong (1991) was among the first to point to the assurance game nature, rather than prisoners' dilemma game nature, of the collective action problem that many rebellions confront.

⁸ For an excellent discussion of the social dilemma more generally characterized in terms of the assurance game, see Skyrms (2004). For an application of this game in a different historical context, see Leeson (2009d).

⁹ By construction of the game, “social welfare” here refers exclusively to the sailors' welfare. Including the captain's welfare, the mutual mutiny equilibrium remains social welfare maximizing as long as an abusive captain's payoff of predation, λ , plus sailors' payoff of being preyed upon by an abusive captain, 2σ , is less than an abusive captain's payoff when he's removed from power, $\xi < \lambda$, plus sailors' payoff when they don't suffer under an abusive captain, 2α ; i.e., as long as: $\lambda + 2\sigma < \xi + 2\alpha$.

and how many others, would aid them. For example, in attempting to persuade merchant sailor John Bicknor to join their plot to mutiny on the *Abington* in 1719, merchant crewmen John Whitcomb and Robert Sparkes appealed to the Round Robin to alleviate Bicknor's fear about whether if he agreed to participate in the revolt the ship's cooper would as well. Whitcomb and Sparkes told the reluctant sailor "that if he . . . was afraid, of the Fidelity of the Cooper and the rest" that he should "draw the Contents of a Round-Robbin, and they would all sign it" (*The Tryals of Captain Jack Rackam, and other Pirates, 1721*, p. 41).

Second, in informing seamen about their number of potential allies and whether these supporters were weaker or stronger members of the crew, a Round Robin generated data about the strength of the mutinous coalition, which sailors could use to improve the probability of their mutiny's success. A Round Robin was particularly useful in this regard since it provided information specifically about the strength of signing sailors' commitment, or dedication, to the proposed rebellion. Signatories risked the prospect of captain punishment if the captain prematurely discovered the mutiny or it failed. Signing the Round Robin was therefore a costly signal for merchant sailors that evidenced the level of their dedication to the proposed revolt. The Round Robin added to the strength of mere oral promises to revolt and allowed mutiny desiring sailors not only to measure their numbers and the strength of these numbers, but also to ensure that those who agreed to join them were staunchly committed to the cause. It allowed desiring mutineers "to try ye Strength of their party" (quoted in Rediker, 1987, p. 234). They knew before openly rebelling whether they needed to wait and gather additional support, or if now was superior timing to maximize the likelihood of achieving their ends.

Third, the Round Robin enhanced participatory assurance on the part of each sailor by making promises to support the mutiny explicit among those plotting to revolt. Under a Round Robin, if an individual signed the document, denying he promised his support wasn't an option if he later "chickened out." Once he signed the document he had to either follow through or explicitly break his commitment to his fellow crewmembers. Reneging on an explicit commitment to support his seagoing companions could damage this individual's reputation among the only people he could rely on in a difficult life at sea and therefore wasn't something he wanted to do.

In these ways Round Robins helped merchant crews overcome the collective action problem in Fig. 1 by increasing sailors' confidence in the probability that their fellow sailors would mutiny against an abusive captain along with them. If a Round Robin was effective, it would increase θ , enabling coordinated rebellion. As 18th-century merchant ship captain Nathaniel Uring described it, the purpose of the Round Robin was "I believe to be contrived to keep 'em all firm to their Purpose, when once they have signed it; and if discovered, no one can be excused, by saying, he was the last that signed it, and he had not done it without great Persuasion" (1726, p. 178).

The second part of Uring's statement is especially interesting and highlights another feature of Round Robins that helped commit mutinous sailors to joint rebellion. The reason "no [seaman] can be excused, by saying, he was the last that signed it, and he had not done it without great Persuasion" was that the Round Robin "contract" was, quite literally, round (Uring, 1726, p. 178). It therefore had no "bottom" and consequently no bottom signatories. This format bound signatories in a "one-for-all and all-for-one" type fashion whereby the last signatories, whose names would appear at the bottom of a rectangular mutinous agreement, couldn't, if the plan were discovered, turn on their comrades and claim coercion from the foregoing signatories to cheat their way out of being grouped with their fellow mutineers.¹⁰

The Round Robin's roundness wasn't only important in helping sailors overcome the participation problem that plagues rebellion. It also played an important role in helping sailors overcome the first-mover problem. I consider this role below.

3.2. Overcoming the first-mover problem

Although the Round Robin helped create the assurance crewmembers required to jointly participate in mutiny, a second collection problem that threatened to undermine rebellion remained. Who would lead the rebellion? Someone had to be willing to initiate the Round Robin and be the first to sign the mutinous document.

Crewmembers were reluctant to do this because of the fear of provoking captain retaliation. If a crewmember was the mutiny's first mover and the rebellion failed or was prematurely derailed, the captain would single him out as the mutinous ringleader and punish him more harshly. This could involve withholding additional pay, additional abuse, or even execution. Captains applied this enhanced punishment to disabuse the ringleader of future rebellious inklings (if he were allowed to live), to set an example to others who might be harboring mutinous ambitions, and as simple retaliation against individuals who dared to challenge their power.

While the cost of a failed or discovered mutiny fell disproportionately on the first mover of the rebellion, crewmembers shared the benefit of a successful mutiny equally, or nearly equally. An effective mutiny that succeeded in removing or reigning in an abusive captain relieved all seamen of his predation, whether a crewmember initiated it or not. These simple

¹⁰ Of course, the Round Robin institution wasn't bullet-proof insurance that certain mutinous "Conspirators" wouldn't receive more favorable treatment from their captain. If, for instance, a captain thought fondly of certain crewmembers, even in the presence of the Round Robin he may still, to assuage his priors, conclude that certain signatories had been forced. For example, when Captain Uring discovered a mutinous plot aboard his vessel coordinated by a nascent Round Robin, he was surprised to find that "Some . . . whom I looked upon to be the honestest Men I had . . . had signed it also." However, because Uring "believed they were persuaded into it against their Inclinations" he spared them more stringent punishment (1726, p. 177). There is no indication, however, that the sailors singled out for better treatment in this case were the last signers, since the Round Robin had no discernable last signers. As I discuss below, in this respect the Round Robin still served its purpose in that "last signers" couldn't be systematically favored under the claim they were forced if a mutinous plot were discovered.

cost–benefit considerations created an incentive for each individual would-be mutineer to defer leadership to someone else. However, if no crewmember would lead rebellion, the mutiny couldn't happen.

To see this explicitly consider the following set of equations, which model a sailor's expected return of leading or following mutiny:

$$E(L) = (\rho + \rho_l)\theta - (1 - (\rho + \rho_l))v_l \quad (3.1)$$

$$E(F) = \rho\alpha - (1 - \rho)v_f \quad (4.1)$$

Eq. (3.1) expresses a crewmember's expected payoff of leading the mutiny. ρ is the probability that mutiny is successful, where $\rho \in [0, 1]$. ρ_l is the crewmember's perception of the change in the probability of mutinous success if he leads the rebellion as opposed to following the revolt, where $\rho_l \in [0, 1]$ and $\rho_l \leq 1 - \rho$. Like before, α is his payoff if mutiny is successful, where $\alpha > 0$. v_l is his cost if the mutiny fails and he's its leader, which takes the form of captain retribution, where $v_l > 0$. Eq. (4.1) expresses a crewmember's expected payoff of following the mutiny where everything is the same as in (3.1) except for the term, v_f , which is the crewmember's cost in terms of captain punishment if the mutiny fails but he isn't its leader, where $v_f > 0$.

Although the number of participants in rebellion influences mutiny's chance of success, there's no reason to think that success or failure depends on which participant initiates rebellion by being the first to sign a mutinous document. Mutiny's success doesn't depend on whether any given individual leads or follows the rebellion as long as he participates; i.e., $\rho_l = 0$. Further, we know the captain punishes the leader of a failed mutiny more heavily than a follower; i.e., $v_l > v_f$. So, in Eqs. (3.1) and (4.1) we simply have:

$$E(L) = \rho\alpha - (1 - \rho)v_l \quad (3.2)$$

$$E(F) = \rho\alpha - (1 - \rho)v_f \quad (4.2)$$

And, since $v_l > v_f$, no crewmember has an incentive to lead mutiny. Because no one will lead mutiny, mutiny never happens and crewmembers' abusive captain perpetually preys on them.

To help overcome this problem, merchant crews constructed the Round Robin in a simple but effective way. Each sailor would sign the petition, but would do so around the edges of a circle, creating a hub-and-spoke type layout. The first four signatories signed at the north, south, east and west "spokes" of the circle respectively. As Uring "relate[d] the Manner of a Round Robin" in this capacity (1726, p. 178):

They take a large Sheet of Paper, and strike two Circles, one a good Distance without the other; in the inner Circle, they write what they have a mind to have done; and between the two Circular Lines, they write their Names, in and out, against the Circles; beginning like the four Cardinal Points of the Compass, right opposite to each other, and the rest as they go on signing one opposite to the other and so continue till the Paper is filled; which appears in a Circle, and no one can be said to be first, so that they are all equally guilty (1726, p. 178; see also, Records of Captain Henry Bolton February 4, 1701¹¹).

As Uring indicates, this hub-and-spoke layout was to prevent a captain unmoved by his crew's complaints from identifying the mutinous ringleader who he could otherwise single out for punishment. Alternatively, if crewmembers used the Round Robin to secretly plot a mutiny and clandestinely collect signatures to determine the strength of their forces, its simple but clever construction prevented the captain from identifying and singling out the leader for punishment if the plot was discovered or failed. "[T]hat is, the Names were writ in a Circle, to avoid all Appearance of Pre-eminence, and least any Person should be mark'd out . . . as a principle Rogue among them" (Johnson, 1726–1728, p. 290).¹² Or, as William Betagh described it, "Robine is a mutinous letter, at the bottom of which every subscriber sets his hand in a round ring, to avoid being called first in the mutiny" (1728, p. 36).

Expressing the Round Robin's effect on the first-mover problem in terms of Eqs. (3.2) and (4.2) is straightforward. Since in the presence of this institution a predatory captain can't identify the mutiny's leader, if the mutiny fails, he can't subject the first-mover to harsher punishment. Thus from the individual crewmember's perspective:

$$E(L) = \rho\alpha - (1 - \rho)v_f \quad (3.3)$$

$$E(F) = \rho\alpha - (1 - \rho)v_f \quad (3.4)$$

Under the Round Robin institution mutiny's expected return is the same whether a crewmember leads or follows. Crewmembers are therefore indifferent to moving first or following, enabling mutiny to take place.

This isn't to say that merchant ship captains didn't attempt to identify mutinous leaders and single them out for punishment when mutiny failed or they discovered a plot to rebel. They certainly did. When Captain Uring caught wind of his

¹¹ Contained in Jameson (1923, p. 248).

¹² This reference to the Round Robin's use wasn't for mutiny on a ship, but instead was a case in which several pirates, desiring clemency from the British government, petitioned for their innocence but didn't want any one of them to be identified as the leader and thus subject to the harshest punishment if the government rejected their claim.

crew's plan to revolt aboard his ship he sought to locate the Round Robin and pinpoint its initiator before it was concluded, "they not having had Time to compleat it, some of them being as yet not so hardy to enter into it" (1726, p. 177).

Uring ordered "All the Seamens Chests . . . upon Deck, in order to search for the Round Robin, that I might know who to fix it upon, I began with one of the Men whom I knew to be a seditious Fellow, which I suspected to be the chief Conspirator." The Round Robin prevented the captain from obtaining evidence that this "seditious Fellow" was the ringleader. But it didn't prevent him from punishing the sailor on his unconfirmed suspicion nonetheless. "I gave him two or three such Strokes with a Stick I had prepared for that purpose . . . the Blood running about his Ears, he pray'd for God's sake that I not kill him" (Uring, 1726, pp. 176–177).

Despite this seaman's unfortunate fate, even in this case the Round Robin appears to have fulfilled its function in preventing harsher first-mover punishment. Because of the Round Robin the captain couldn't identify the *actual* mutiny plotting initiator and was forced to more-or-less arbitrarily assign blame to one of the signatories he didn't like instead. In accomplishing this, Round Robins, even when discovered and mutinous plots were foiled, protected their initiators from being singled out for additional punishment, this cost being imposed on one of the signing crewmembers randomly instead. Thus, while there remained a cost of rebellious failure, under the institution of the Round Robin the expected cost for any individual sailor tended to be the same whether he initiated or followed in plotting mutiny. By distributing the expected cost of mutinous failure equally, the Round Robin tended to reduce the added disincentive of leading revolution and thus helped overcome the first-mover problem that otherwise threatened to prevent attempted mutiny.

The Round Robin's roundness also helped sailors overcome the first-mover problem by creating important common knowledge.¹³ Chwe (2001) discusses how individuals have used roundness to create the common knowledge required to coordinate their actions in several other contexts. For example, by arranging seats at a business meeting in an inward-facing circle, roundness encourages eye contact, contributing to participants' knowledge that others are following, and that these individuals are aware that they're aware that they're following, and so on.

When signing the Round Robin sailors may have found it convenient to arrange themselves in an inward-facing circle, permitting the kind of eye contact, and thus common knowledge creation, Chwe (2001, pp. 30–36) describes. However, the most important way the Round Robin's roundness helped generate common knowledge was through the circular arrangement of sailors' names rather than of the sailors themselves. Circularly arranging sailors' names on the Round Robin not only gave the individual mutineer a sense of security. It informed him that *other* sailors also had that sense of security, and that these other sailors knew that he knew they had this security, *ad infinitum*.

As the number of signatories to a prematurely discovered Round Robin increased, any individual sailor's probability of being singled out by the captain for additional punishment fell. Thus only in the limiting case in which all mutiny desiring sailors signed a prematurely discovered Round Robin was the added cost of leading rebellion totally removed. The easiest way to assure this was to secure the signature of all desiring mutineers at the document's inception. Since merchant crews tended to be small, in most cases satisfying this condition couldn't have been particularly difficult.

However, if, for instance, several potential mutineers weren't present when the Round Robin was created, simultaneously securing all desiring mutineers' signatures wasn't possible. In these cases it was possible the captain could prematurely discover the Round Robin before all mutiny desiring crewmembers had signed it. This possibility increased the expected cost of signing the document compared to not, which could reintroduce the first-mover problem despite the Round Robin's clever circular construction. In practice this may simply have meant that Round Robins tended to be signed by all desiring mutineers at their inception. If several potential signatories weren't available to consider signing at some particular time, the others could wait for an opportunity when they were. Nevertheless, this potential difficulty points to an important limitation on the Round Robin's ability to overcome the first-mover problem more generally. Since as the size of a revolution-desiring population rises the ability of all would-be rebels to sign simultaneously decreases, Round Robins are most effective in small- N situations and can become ineffective for sufficiently large- N situations.

Similar logic suggests why Round Robins are also more effective when the proportion of mutiny desiring sailors that signs at it's inception (or at least before it is prematurely discovered) is higher. The foregoing discussion assumes that if a merchant ship captain prematurely discovers a Round Robin, he attempts to single out the first mover for punishment. However, provided that a predatory captain doesn't punish a portion of his crew so large that he either (a) incites a violent crew response or (b) maims so many sailors that his crew doesn't have enough healthy men to finish the voyage, he might seek to punish *all* of the document's signatories as joint leaders of rebellion. As the proportion of the mutiny desiring crew that has signed the prematurely discovered Round Robin increases, the captain's ability to pursue this strategy without violating conditions (a) or (b) decreases, reducing sailors' cost of being early signers of the document. This enhances the Round Robin's ability to overcome the first-mover problem. Conversely, as the proportion of the mutiny desiring crew that has signed a Round Robin before it's prematurely discovered decreases, it becomes easier for the captain to punish all of its signatories without violating conditions (a) and (b), increasing the cost of being an early signatory to the document and reducing the Round Robin's effectiveness in overcoming the first-mover problem.

For these reasons Round Robins are specifically suited to relatively small- N rebellions and can break down because of the first-mover problem as N grows large. This shouldn't be especially surprising since the Round Robin institution emerged in

¹³ For an excellent discussion and overview of common knowledge, its importance, and applications in economics, see Geanakoplos (1992).

response to a small-*N* problem situation, specifically as a means of facilitating small-*N* rebellions. However, it suggests the Round Robin institution, at least as it operated to facilitate revolution on early 18th-century merchant ships, is unlikely to emerge in the same form to facilitate larger scale rebellions.

My analysis has neglected an important question related to the Round Robin's ability to facilitate mutinous participation and leadership. Why wasn't the Round Robin institution itself also plagued by the collective action problems of rebellion this paper considers? The very act of creating an institutional solution to the problems of revolution was also threatened by free-rider problems. The sailor who proposes the Round Robin identifies himself as a mutineer to his fellow sailors, putting himself at risk. The problem is analogous to demanding a secret ballot in a committee meeting chaired by a ruthless person known to punish dissenters. The individual who demands the secret ballot, and anyone who voices support for this procedural move, opens himself up to retaliation. How then are secret ballots ever proposed? Or, in this paper's context, how was it that the Round Robin was ever proposed? Clearly both secret ballots and the Round Robin have been used, which means somebody did in fact propose them.

Kuran's (1995) important work discusses this problem and explains how this can be. According to Kuran (1995, pp. 50–52), some individuals, who he calls "activists," have unusually intense needs to truthfully express themselves. Because truthful self-expression is such an important part of their utility function, "[t]hey are inclined to speak their minds even at the risk of severe punishment, and regardless of whether truthful speech can make a difference" (Kuran, 1995, p. 50). Although they may be motivated by sympathy, empathy, or a sense of fairness, such activists needn't have other-regarding preferences. As Kuran (1995, p. 50) points out, it's quite enough that their goals are intensely held, whether they're selfish or altruistic. As I discuss below, on 18th-century merchant ships, "activist" sailors' goals were likely influenced by selfish and unselfish concerns. Though, to the extent that unselfish motives played a role, as Kuran's analysis suggests, this need not have been the case; activism was possible without it.

It's activists who first propose things like secret ballots. Because of intense expressive need, their benefit of doing so outweighs the cost associated with the risk of making this suggestion. Similarly, it's activists who first propose Round Robins. Sailors with unusually strong desires to speak out against an abusive captain who they believe should be removed from power assume the risk of proposing the Round Robin because their private cost–benefit calculus militates in favor of doing so. Once the Round Robin has emerged in a particular instance, the logic discussed above takes hold.

Invoking activists doesn't render the Round Robin unimportant for helping overcome the first-mover problem. If being one of the first sailors to sign a rectangular mutinous document is riskier than verbally proposing its use, even if an activist sailor proposes this, no one – including him – may be willing to be the first to sign. Thus, despite the sailor's proposal, the proposed mutiny never gets off the ground. In contrast, by remedying this first-mover problem, a *circular* mutinous document (i.e., a Round Robin) – if an activist proposes it – succeeds in launching the mutiny.

The Round Robin's success in facilitating mutiny begs the question of why merchant ship captains didn't try to undermine it. As Kuran (1995) highlights, for example, in many organizations, ranging from small departments to states, there are periodic elections by secret ballot to enable the discontent to throw out incompetent or abusive leaders. Rulers or leaders who know they're unpopular seek to undermine the anonymity of this procedure, and thus reduce expressed opposition, by fostering the perception that the danger of being discovered and punished is greater than it really is. For instance, during the 1979 referendum on turning Iran into an "Islamic Republic," the Iranian government created the impression that it could identify voters who cast their ballot in the negative and would punish them for doing so (Kuran, 1995, p. 14). Similarly, in the communist world, political leaders censored news pointing to the popularity of their opponents, understated attendance figures at opposition rallies, and encouraged snitching to undermine the prospect of rebellion (see, for instance, Kuran, 1995, pp. 207, 122–125).

Merchant ship captains also sought to manipulate sailors' beliefs about the likelihood of being detected as mutiny sympathizers and, judging from the relative infrequency of mutinies, were often successful. However, their ability to do so was imperfect, creating some scope for Round Robins to facilitate mutiny. The particular context of merchant shipping prevented captains from pursuing several measures they might have taken to thwart sailors' reliance on this institution to coordinate rebellion. Censorship, for instance, wasn't much of an option for merchant captains. Sailors had to communicate to perform their jobs and such communication created opportunities to plot mutinies. Further, merchant sailors and officers often slept and ate in separate quarters on their ships. Even if a captain could prevent his seamen from communicating at work, unless he wanted to "slum it" for meals and sleeping, he couldn't prevent them from consorting when they weren't working.

Captains could rely on snitches to keep them abreast of rebellious grumblings that might be afoot. But here too they were limited. Divisions on merchant ships tended to fall along predictable lines. Although officers disagreed amongst each other and sailors did too, on many issues of contention, such as those involving pay and provisions, officers' interests were aligned one way and sailors' interests were aligned another. In very crude terms, the natural division on a merchant ship was between the captain and his officers on the one side, and the ordinary sailors on the other.¹⁴

This division made captains' reliance on snitches more difficult by making potential snitches easier to identify. For instance, "[t]he captain's side almost always consisted of the steward and the surgeon" who were consequently "both generally regarded as 'tell-Tails to Cap[tai]ns'" (quoted in Rediker, 1987, p. 235). Mutiny desiring sailors thus found it easier

¹⁴ I say very crude because some ordinary sailors might find their interests aligned with the captain's in any particular case and some officers – particularly the lower-level ones – might find their interests aligned with the bulk of the ordinary sailors in any particular case.

to prevent being snitched on by plotting outside the presence of officers, who were most likely to snitch. A captain could overcome this problem by recruiting an ordinary sailor as his snitch. But this was difficult since, as Rediker (1987, p. 248) discusses, there was an “emphasis on hospitality and cooperation, reciprocity and mutuality” among 18th-century merchant sailors. This emphasis contributed to a strong norm of loyalty and unity among the ordinary seamen, especially when their interest conflicted with that of the officers, militating against such behavior. As one 18th-century merchant sailor found out, even befriending a captain could earn his fellow sailors’ antipathy and suspicion: “I soon got in favor with the Master and his Mates, but the Sailors did not like me, but called me ‘man-of-war’s dog’” (quoted in Rediker, 1987, p. 235).

A final measure merchant captains could take to undermine sailors’ mutinous aspirations was simple intimidation, for example by imprisoning or otherwise punishing seamen who so much as looked like they might be considering rebellion. As 18th-century captain Thomas Troubridge put it: “Whenever I see a fellow look as if he was thinking, I say that is mutiny” (quoted in Woodman, 2005, p. 100). But this strategy had its limitations too. Imprisoning a sailor on the slightest suspicion was costly because, while imprisoned, he was no longer available to work. This was a significant problem on thinly crewed merchantmen where imprisoning a single sailor could reduce the workforce by 10 percent. The other difficulty with punishing sailors on the mere hint of suspicion was that it could strengthen the remaining crew’s desire to mutiny. As merchant captains became more arbitrary in their punishments, the benefit of replacing them increased, increasing the probability sailors would rebel.

4. Concluding remarks

The Round Robin facilitated maritime revolution by helping merchant sailors overcome the collective action problems that stood in the way of mutiny. On the one hand, the Round Robin informed individual sailors about the support they could expect from their comrades if they mutinied against a predatory captain, assuring them that their participation in mutiny would be joined by others’ participation. On the other hand, the Round Robin’s simple circular construction helped crewmembers surmount the first-mover problem that plagues rebellion.

This institution of maritime rebellion is important for several reasons. First, it suggests that individuals can and do devise institutional solutions to the problems of revolution, helping explain why we observe such rebellion when, *prima facie*, rational cost–benefit calculus from the perspective of potential individual participants appears to make revolution impossible.

Second, in doing this the Round Robin points to a purely rational-choice explanation of revolution. It’s unnecessary to invoke “collective rationality,” altruism, or other deviations from traditional rational choice analysis to explain rebellion. Further, in creating a rational choice account of revolution, it’s unnecessary to appeal to “selective incentives,” which a number of researchers have criticized. Institutional solutions to the collective action problems that plague revolution, such as the Round Robin, align the interests of potential participants in rebellion in a way that alters the payoffs of revolution vs. revolutionary abstention in their rationally self-interested cost–benefit calculus.

Finally, the Round Robin highlights the fact that, although collective action problems confronting revolution are complex, institutional solutions to these problems can be simple. The Round Robin was nothing more than a written contract, signed in a circle by desiring rebels. As noted above, in larger- N situations this precise institutional mechanism for surmounting the problems of revolution is more difficult and, if N grows large enough, could break down. Thus what is important to take away from the Round Robin isn’t the applicability of this specific institutional arrangement, *per se*, for solving collective action problems that stand in the way of revolution in general. Rather, this institution suggests that even in situations of revolt requiring the coordination of many more individuals, relatively simple mechanisms for facilitating rebellion are possible and individuals have an incentive to find them.

At the same, it’s important to be cautious in expressing optimism for individuals’ ability to overcome hurdles that stand in the way of their ability to rebel. Even with the Round Robin, successful mutiny in the early 18th century was rare despite the fact that merchant ship conditions seem to have called for it more frequently. The Round Robin wasn’t restricted to the 18th century or to British sailors. It first emerged in 17th-century France when petitioners complaining to the king signed their petition in the form of a “*rond ruban*” – i.e., a “round ribbon” – to prevent the king from identifying the petition’s instigators (Mackay, 1877, p. 372). At least a few seafarers used the Round Robin in the 17th century as well (see, for instance, Abbott, 1848, p. 99). The Round Robin was also occasionally used in the 19th century, and not necessarily by merchant sailors. For example, during the War of 1812, American soldiers used a Round Robin to complain to their commander (Mahon, 1991, p. 48). Nevertheless, the Round Robin, or parallel institutions, doesn’t appear to have been used outside Europe and was used infrequently even there. This suggests that frustrating factors, such as population size, or superiors’ ability to successfully undermine their inferiors’ rebellious intentions, prevented many would-be rebels from using the Round Robin to facilitate revolution, and that finding appropriate solutions to the problems of revolution can be difficult.

Acknowledgements

I thank Tyler Cowen, Chris Coyne, David Friedman, Jack Goldstone, Werner Troesken, the Editor, and two anonymous referees for helpful comments and suggestions on an earlier version of this paper. The financial support of the Kaplan Fund and the Mercatus Center at George Mason University is also gratefully acknowledged.

References

- Abbott, J., 1848. *History of King Charles the First of England*. Harper and Bros, New York.
- Benson, B.L., 1989. The spontaneous evolution of commercial law. *Southern Economic Journal* 55, 644–661.
- Betagh, W., 1728. *A Voyage Round the World*. Printed for T. Combes, London.
- Chalmers, J.A., Shelton, R.B., 1975. An economic analysis of riot participation. *Economic Inquiry* 13, 322–356.
- Calhoun, C.J., 1988. The radicalism of tradition and the question of class struggle. In: Taylor, M. (Ed.), *Rationality and Revolution*. Cambridge University Press, Cambridge, UK, pp. 129–175.
- Chong, D., 1991. *Collective Action and the Civil Rights Movement*. University of Chicago Press, Chicago.
- Chwe, M.S.-Y., 2001. *Rational Ritual: Culture, Coordination, and Common Knowledge*. Princeton University Press, Princeton.
- Coleman, J.S., 1990. *Foundations of Social Theory*. Belknap, Cambridge.
- Davis, R., 1962. *The Rise of the English Shipping Industry in the Seventeenth and Eighteenth Centuries*. Macmillan, London.
- DeNardo, J., 1985. *Power in Numbers: The Political Strategy of Protest and Rebellion*. Princeton University Press, Princeton.
- Earle, P., 1998. *Sailors: English Merchant Seamen, 1660–1775*. Methuen, London.
- Elster, Jon., 1988. Marx, revolution and rational choice. In: Taylor, M. (Ed.), *Rationality and Revolution*. Cambridge University Press, Cambridge, UK, pp. 206–228.
- Finkel, S.E., Muller, E.N., Opp, K.-D., 1989. Personal influence, collective rationality, and mass political action. *American Political Science Review* 83, 885–903.
- Friedman, D., 1979. Private creation and enforcement of law: a historical case. *Journal of Legal Studies* 8, 399–415.
- Frohlich, N., Oppenheimer, J.A., 1970. I get by with a little help from my friends. *World Politics* 23, 104–120.
- Frohlich, N., Oppenheimer, J.A., Young, O.R., 1971. *Political Leadership and Collective Goods*. Princeton University Press, Princeton.
- Geanakoplos, J., 1992. Common knowledge. *Journal of Economic Perspectives* 6, 52–83.
- Gifford Jr., A., 1993. The economic organization of 17th-through mid-19th century whaling and shipping. *Journal of Economic Behavior and Organization* 20, 137–150.
- Gunning, J.P., 1972. An economic approach to riot analysis. *Public Choice* 8, 31–46.
- Goldstone, J.A., 1991. *Revolution and Rebellion in the Early Modern World*. University of California Press, Berkeley.
- Goldstone, J.A., 1994. Is revolution individually rational? *Rationality and Society* 6, 139–166.
- Ireland, T., 1967. The rationale of revolt. *Papers on Non-Market Decision Making* 3, 49–66.
- Jameson, J.F. (Ed.), 1923. *Privateering and Piracy in the Colonial Period*. Macmillan, New York.
- Johnson, C., 1726–1728 [1999]. *A General History of the Pyrates: From Their First Rise and Settlement in the Islands . . . to which is Added a Short Abstract of Statue and Civil Law*, in: Schonthorn, M. (Ed.), *Relation to Piracy*, 2 vols. Dover, New York.
- Kurrid-Klitgaard, P., 1997. *Rational Choice, Collective Action and the Paradox of Rebellion*. Institute of Political Science and Political Studies Press, Copenhagen.
- Kuran, T., 1989. Sparks and prairie fires: a theory of unanticipated political revolution. *Public Choice* 61, 41–74.
- Kuran, T., 1991. The East European revolution of 1989: is it surprising that we were surprised? *American Economic Review* 81, 121–125.
- Kuran, T., 1995. *Private Truths, Public Lies: The Social Consequences of Preference Falsification*. Harvard University Press, Cambridge.
- Leeson, P.T., 2005. Self-enforcing arrangements in African political economy. *Journal of Economic Behavior and Organization* 57, 241–244.
- Leeson, P.T., 2007a. An-arrrgh-chy: the law and economics of pirate organization. *Journal of Political Economy* 115, 1049–1094.
- Leeson, P.T., 2007b. Trading with bandits. *Journal of Law and Economics* 50, 303–321.
- Leeson, P.T., 2007c. Efficient anarchy. *Public Choice* 130, 41–53.
- Leeson, P.T., 2008. Social distance and self-enforcing exchange. *Journal of Legal Studies* 37, 161–188.
- Leeson, P.T., 2009a. The invisible hook: the law and economics of pirate racial tolerance. *NYU Journal of Law and Liberty* 4, 139–171.
- Leeson, P.T., 2009b. The calculus of piratical consent: the myth of the myth of social contract. *Public Choice* 139, 443–459.
- Leeson, P.T., 2009c. *The Invisible Hook: The Hidden Economics of Pirates*. Princeton University Press, Princeton.
- Leeson, P.T., 2009d. The laws of lawlessness. *Journal of Legal Studies* 38, 471–503.
- Leeson, P.T., Boettke, P.J., 2009. Two-tiered entrepreneurship and economic development. *International Review of Law and Economics* 29, 252–259.
- Lichbach, M.I., 1994. Rethinking rationality and rebellion: theories of collective action and problems of collective dissent. *Rationality and Society* 6, 8–39.
- Lichbach, M.I., 1995. *The Rebel's Dilemma: Collective Action and Collective Dissent*. University of Michigan Press, Ann Arbor.
- Lichbach, M.I., 1996. *The Cooperator's Dilemma: Social Order and Collective Action*. University of Michigan Press, Ann Arbor.
- Mackay, C., 1877. *The Gaelic Etymology of the Languages of Western Europe*. Trubner and Co., London.
- Mahon, J.K., 1991. *The War of 1812*. De Capo Press, New York.
- Mason, T.D., 1984. Individual participation in collective racial violence: a rational choice synthesis. *American Political Science Review* 78, 1040–1056.
- Mincinton, W.E., 1989. Characteristics of British slaving vessels, 1698–1775. *Journal of Interdisciplinary History* 20, 53–81.
- Moore, W.H., 1995. Rational rebels: overcoming the free-rider problem. *Political Research Quarterly* 48, 417–454.
- Morris, R.B., 1965. *Government and Labor in Early America*. Harper and Row, New York.
- Muller, E.N., Opp, K.-D., 1986. Rational choice and rebellious collective action. *American Political Science Review* 80, 471–488.
- Muller, E.N., Opp, K.-D., 1987. Rational choice and rebellious collective action revisited. *American Political Science Review* 81, 561–564.
- Olson, M., 1965. [1971] *The Logic of Collective Action*. Harvard University Press, Cambridge.
- Opp, K.-D., 1989. *The Rationality of Political Protest: A Comparative Analysis of Rational Choice Theory*. Westview Press, Boulder, CO.
- Opp, K.-D., 1994. Repression and revolutionary action. *Rationality and Society* 6, 101–138.
- Popkin, S.L., 1979. *The Rational Peasant: The Political Economy of Rural Society in Vietnam*. University of California Press, Berkeley.
- Popkin, S.L., 1988. Political entrepreneurs and peasant movements in Vietnam. In: Taylor, M. (Ed.), *Rationality and Revolution*. Cambridge University Press, Cambridge, UK, pp. 9–62.
- Rediker, M., 1987. *Between the Devil and the Deep Blue Sea: Merchant Seamen, Pirates and the Anglo-American Maritime World, 1700–1750*. Cambridge University Press, Cambridge, UK.
- Rodger, N.A.M., 1996. *The Wooden World: An Anatomy of the Georgian Navy*. Norton, New York.
- Silver, M., 1974. Political revolution and repression. *Public Choice* 17, 63–71.
- Skyrms, B., 2004. *The Stag Hunt and the Evolution of Social Structure*. Cambridge University Press, Cambridge, UK.
- Taylor, M., 1988. Rationality and revolutionary collective action. In: Taylor, M. (Ed.), *Rationality and Revolution*. Cambridge University Press, Cambridge, UK, pp. 63–97.
- The Tryals of Captain Jack Rackam, and other Pirates . . . , 1721 [2007]. *Jamaica*. In: Baer, J.H. (Ed.), *British Piracy in the Golden Age*, vol. 3. Pickering and Chatto, London, pp. 7–66.
- Tilly, C., 1978. *From Mobilization to Revolution*. Addison-Wesley, Reading, MA.
- Tullock, G., 1971. The paradox of revolution. *Public Choice* 11, 89–99.
- Tullock, G., 1974. *The Social Dilemma: The Economics of War and Revolution*. Center for the Study of Public Choice, Blacksburg, VA.
- Uring, N., 1726 [1928]. *The Voyages and Travels of Captain Nathaniel Uring*. Cassell and Company Ltd., London.
- Woodman, R., 2005. *A Brief History of Mutiny*. Carroll and Graf, New York.