Patronage for Productivity: Selection and Performance in the Age of Sail*

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Abstract

Patronage is a byword for poor performance, yet its effect on the quality of selection is theoretically ambiguous. We study the selection effects of patronage in the world's most successful navy – the British Royal Navy between 1690 and 1849. Using newly collected data on the battle performance of more than 5,800 naval officers, we find that promotees with family ties to the top of the naval hierarchy outperformed unconnected ones. This result is not driven by better assignments, crews, or equipment. There was substantial heterogeneity among the admirals in charge of promotions. Discretion over appointments thus created scope for "good" and "bad" patronage. Because most admirals promoted on the basis of merit and did not favor their kin, the overall selection effect of patronage was positive.

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1 Introduction

A growing literature views the recruitment and allocation of public employees as a key determinant of state capacity and economic performance (Rauch and Evans, 2000; Dal Bó et al., 2013; Finan et al., 2017). Discretion in public appointments, or patronage,[1] is often regarded as a major source of inefficiency: it can lead to corrupt appointments, distort incentives, and undermine state effectiveness (Grindle, 2012).

Theory, however, offers ambiguous predictions about the effect of patronage on performance. Discretion over appointments has been shown to bias the allocation of public-sector positions (Akthari et al., 2018; Colonnelli et al., 2018; Xu, 2018), and may reduce incentives. At the same time, such discretion could improve selection, by allowing principals to use their private information – especially in environments where performance is difficult to evaluate (Prendergast and Topel, 1996; Allen, 2011). The ubiquity of patronage, not only throughout history but even in developed countries today, raises an intriguing question: are there environments in which discretion in the allocation of public-sector positions is beneficial?

We examine the costs and benefits of patronage and demonstrate that it can, indeed, lead to better selection. More specifically, we focus on the promotion of officers in the British Royal Navy during its 18th-century heyday. Our paper is the first to show empirically that, in a public-sector setting, patronage can have a favorable effect on selection. The sign and size of patronage effects depend on management style and on the extent of external competitive pressures. Promotions in the Royal Navy during wartime were – compared with peacetime – generally more merit-based and favoured better officers. This outcome is in line with models that see warfare as a driver of state capacity (Tilly, 1990; Besley and Persson, 2010; Gennaioli and Voth, 2015).[2]

The Royal Navy is a setting well suited to studying the selection effects of patronage. First, it was a large organization in which patronage was widespread. At its peak, the Royal Navy employed over 120,000 men, operating hundreds of ships. Between 1690 and 1849, the Royal Navy fought its way into the history books as the most successful navy on earth – playing a crucial role in Britain's rise as a global power (Kennedy, 2010). Officers of the Royal Navy were highly trained specialists commanding ships with large crews, often taking them to the farthest reaches of the globe. These officers were also skilled military

[1] "Patronage" is defined as the discretionary appointment of individuals to governmental or political positions (Webster's II New College Dictionary 1995).

[2] As Fukuyama (2011, p. 113) argues: "at war, meritocracy is not a cultural norm but a condition for survival".

leaders who commanded ships with as many as 120 guns. Their career progression relied heavily on connections.

Second, the military provides a setting where objectives are clear and outcomes are readily measurable. In contrast with civil administrators, who may pursue multiple objectives, defeating the enemy at sea is the raison d'être of naval officers: a ship either captures another vessel or is forced to surrender. Third, the Navy was rife with principal–agent problems because communications were slow and because effort could not be verified (Allen, 2002, 2011). Finally, the sheer size of the Navy and its intense fighting history during the 18th century allow us to observe – for many ships, crews, and captains – outcomes as well as the promotion and allocation choices made by a large number of decision makers: admirals of the Royal Navy.

Our study is based on the construction of a new, granular dataset. We assemble a yearly officer-ship–level panel, for the period 1690–1849, that covers almost the entire universe of British naval officers and warships. The resulting "matched captain ship" dataset includes information on 5,848 officers assigned to 3,904 ships. We also observe 4,193 promotion decisions made by 49 different Admiralty boards, which allows us to compare the promotion and performance patterns of those selected under different naval administrations.

To measure patronage, we collect information on family ties between naval officers and the two most senior naval leaders – the First Lord of the Admiralty and the Admiral of the Fleet – from a large genealogical database. Regular turnover at the top of the navy hierarchy (the "Admiralty") generates shocks to the connections of serving officers, which enables us to observe *the same* officer both connected and unconnected to the organization's apex.[3] We measure performance using battle outcomes: the number of captures, successful actions, and enemy units destroyed. The selection effects of patronage are estimated in a difference-in-differences (DiD) setting, in which we compare the performance of connected and unconnected officers before and after their promotion to post-captain. This promotion granted officers independent command over much larger ships, substantially increasing their span of control.[4]

To guide our empirical analysis, we adapt a canonical model of statistical discrimination

[3]Connections to the very top were crucial because all promotions to "post" rank had to be confirmed by the Admiralty in London. Nonetheless, officers also received patronage also from their commanding captain and admiral (Malcomson, 2007).

[4]Prior to being made "post", naval officers were typically employed in junior roles – for instance, as lieutenants serving under a captain in overall command. Only when assigned to small ("unrated") ships did they have command of a vessel. After being made "post", naval officers had much greater prospects of being assigned a ship and received automatic promotions to larger vessels based on seniority. In contrast, lieutenants had little employment security, received no automatic promotions, and commanded at best a small ship.

to emphasize the central trade-off between information and bias (Phelps, 1972). In our model, the principal (Admiralty) chooses to promote a connected or unconnected agent (naval officer). He derives utility from promoting good fighting officers, and from favoring family relations. The principal observes the performance of agents with some error, but knows more about the underlying ability of connected than of unconnected subordinates thanks to better information about the former. The principal may also be biased in the sense of deriving a private benefit from exhibiting favoritism (i.e., promoting kin). The net effect of patronage will thus depend on two key primitives: how much the principals favor merit, and the extent of bias.

We report three main results. First, we establish empirical patterns that map directly onto our model. In particular, we confirm not only that promotions are merit-based, but also that they are more so for officers connected to the Admiralty. Seen through the lens of our model, this result is consistent with better information and the absence (on average) of major biases.

Second, a comparison across promoted officers in an event study reveals that officers promoted while connected to the Admiralty outperform unconnected promotees thereafter. This positive performance difference persists over time, is not driven by the assignment to better ships, and holds even for officers whose promoting patron has rotated out of the Admiralty. To ensure that our results are not driven by the preferential allocation of ships and assignments to connected officers, we also perform a battle-level analysis. Thus we hand-coded 94 fleet actions, 263 flotilla actions, and 172 single-ship actions. For fleet and flotilla actions we show that, even conditional on being assigned to a particular position in the line of ships, connected promotees outperform; that is, they are more likely than their unconnected peers to sink, burn, or capture enemy ships (and correspondingly less likely to lose their own). In single-ship actions – chance encounters that provide exogenous variation in the matching of officers to enemy ships – connected promotees win markedly more often. It is interesting that this result is driven by a lower number of indecisive engagements.[5]

Third, we test for heterogeneity as predicted by our model, examining promotion decisions made under multiple Admiralties. We examine whether top "management teams" that made more merit-based promotions to post-rank were also more likely to pick connected officers that performed well afterward. These different "Admiralty styles" generate empirical variation in the model parameters that govern whether patronage effects are

[5]The implication is that "fighting spirit", or an unwillingness to break off engagement until a decisive advantage has been gained, was a key characteristic of successful officers.

positive or negative. In line with theoretical predictions, we find that connected promotees outperform unconnected ones even more so when the promoting Admiralty is more merit oriented. In contrast, connected promotees perform worse the more biased the promoting Admiralty is. Merit increases and bias decreases during periods of major wars – times during which the Admiralty's objectives are more closely aligned with the organizational objective.

Discretion over appointments thus created scope for good and bad patronage in the Royal Navy. Absent such discretion, admirals could not have exploited private information to pick those best suited to the job. The price of discretion was that poor admirals could make poor choices, favoring low-ability family relations or offspring of the political elite. On average, however, patronage made a positive contribution to the Royal Navy's fighting record.[6]

Our results contribute to the literature on selection and incentives in the public sector (Khan et al., 2015; Ashraf et al., 2016; Weaver, 2018; Ager et al., 2019; Bertrand et al., 2019; Khan et al., 2019). Rational and complex military organizations, such as the Royal Navy, foreshadowed the emergence of professionalized bureaucracies. Indeed, concepts such as meritocracy (often associated with "Weberian" bureaucracies) first emerged in the military. Although a range of papers show that homophily matters for the allocation of positions (see e.g. Azulai, 2017; Do et al., 2017), there is little systematic evidence on how it affects performance. Exceptions include Xu (2018), who shows that patronage disincentivizes favored colonial bureaucrats enough that they then raised less revenue; Colonnelli et al. (2018), who report that winning municipal mayors in Brazil employ less qualified personnel from their pool of supporters;[7] Lott (2013), who establishes that political influence reduces the quality of judges appointed to the bench in the United States; and Fisman et al. (2018), who demonstrate that scholars at the Chinese Academy of Science have less distinguished curricula vitae when they share hometown ties with admissions committee members. In contrast, evidence on the positive effects of discretion, including in family firms, are much more frequent in the private sector (Bertrand and Schoar, 2006; Fisman et al., 2017).[8] Our theoretical framework – which highlights the trade-off between infor-

[6] We know that connected promotees in the Royal Navy fought better. Yet because we do not have data on patronage in other navies, we do not know whether connectedness per se contributed to Britain's better relative performance.

[7] Brollo et al. (2017) document that, in closely contested elections' in Brazil, the winning party hires more of its own members – who are no less qualified (on average) than members of the opposition party.

[8] The exception is Hoffman et al. (2017); these authors find that private sector managers who ignore test recommendations hire workers that end up having shorter tenures.

mation and bias – makes precise the conditions under which patronage will have positive or negative effects on performance. Whereas other studies have focused on the characteristics of selected candidates, we examine the effect of selection on outcomes.

More broadly, our findings complement research on the role of social connections and discrimination (Bertrand and Duflo, 2016; Ashraf and Bandiera, 2018) by providing public-sector evidence that underscores the importance of "administrative styles" in predicting bias in promotions. We provide evidence that the style of leaders is not only important for performance in the private sector but can also increase state effectiveness (Bertrand and Schoar, 2003; Bloom and Van Reenen, 2007; Rasul and Rogger, 2017). Based on captains commanding capital ships – complex hierarchical organizations with hundreds of personnel – our results resonate with the literature on the selection effects of CEOs (Bertrand, 2009).[9]

We also relate to the historical literature on the Royal Navy. Historians have long attributed its superior performance to Britain's financial prowess: building, staffing, and maintaining large fleets and then supplying them effectively on the high seas for years (Dull, 2009; Rodger, 2005). Although most of the literature is descriptive, economic analyses of navy performance have stressed the role of high-powered incentives for officers and also for seamen. More specifically, the Royal Navy created incentives and enforced rules that compelled captains to fight (Allen, 2002), paid all the crew of successful ships substantial prize money (Benjamin, 2005), promoted men from the lower deck in response to performance (Benjamin and Thornberg, 2007), and successfully solved incentive problems in the provisioning of food for the crews (a.k.a. the victualling) of its large fleets (Allen, 2018). The Royal Navy also improved more rapidly over time than its rivals, gathering more experience in naval warfare and arguably learning more from it (Benjamin and Tifrea, 2007).[10] We agree that the Royal Navy's carefully balanced system of incentives figured prominently in its success. Yet for that system to work, the right men had to be in command because real-time monitoring was de facto impossible (Allen, 2002). We explore the role of patronage in selecting them.

Finally, this paper is related to previous work on the origins of state capacity. A growing literature has emphasized the importance of military competition for state building (Tilly, 1990; Besley and Persson, 2010) and pointed out that many of today's underdeveloped

[9] Finally, our result that the less constrained selection of leaders can lead to greater variance in performance echoes the findings of Jones and Olken (2005), who show that more autocratic regimes experience more uneven growth.

[10] Benjamin and Tifrea (2007) also argue that patronage in the Royal Navy mainly hastened promotions.

countries are located in areas with few interstate conflicts (Herbst, 2014). Contributions to the state-building literature have typically focused on the growth of taxation (Besley and Persson, 2010; Gennaioli and Voth, 2015). Our finding that meritocratic selection increased during wartime suggests that there is another and perhaps equally important channel from interstate conflict to state capacity – namely, improvements in the selection of key state personnel.

2 Historical background

In this section we summarize the Navy's organization, promotion system, and officers' incentives. We also identify the primary determinants of success in the "Age of Sail" and discuss the nature of the patronage system.

2.1 Size and organization

The Royal Navy has its origins in the armed merchant ships that fought at the behest of English kings and queens. The Spanish Armada's attempted invasion of England was defeated mainly by converted merchant ships (Rodger, 1999). Britain's Parliament in 1649 authorized the first large-scale program for building capital ships, the "Speaker" class (Dull, 2009). By the time of the Restoration in 1660, Charles II controlled a permanent fleet of purpose-built warships commanded by career officers (Rodger, 2005). As the frequency of warfare increased after 1700, the Navy expanded. By the 18th century, Britain found itself at war in one year out of three Brewer (1990) while the majority of government spending – as in other European countries – was for war-related purposes (Tilly, 1990; Gennaioli and Voth, 2015).

The Royal Navy absorbed a large share of overall military expenditures. Between 1690 and 1810, it grew from 147 to 752 larger ships. Ship armaments increased somewhat more slowly, from 10,000 to 43,000 guns. During peacetime, the navy typically shrank to a quarter or a fifth of its wartime strength (Figure A1). Of the more than 3,900 unique ships in our database, nearly a fourth (957) were large battleships (known as "ships of the line"). Another 1,024 were frigates; the rest were smaller, unrated ships typically sailed by lieutenants serving as commanders.

Each individual ship required an enormous expenditure: "Even smaller ships in the English navy of the 18th century cost more than the largest industrial companies had in capital" (Brewer, 1990). Pay for seamen along with the cost of sails, cordage, food, powder,

shot, and the spars all added to the expense of running a fighting navy. Royal dockyards and private yards built and repaired warships, and the Victualling Board bought and distributed provisions for the ships (Baugh, 2015; Allen, 2018).

The Royal Navy was run by the Board of Admiralty, which consisted of several Lord Commissioners of the Admiralty. These commissioners were a mix of naval officers ("Sea Lords") and politicians, and the Board's president was known as the First Lord of the Admiralty. The Admiralty devolved many powers and decisions to station commanders and to admirals commanding fleets. Although the UK Cabinet set overall naval strategy, the Admiralty presided over the naval administrative system. While in foreign stations, appointments could be made by station chiefs, these needed to be confirmed by the Admiralty (Pope, 2013).[11] Therefore, a crucial aspect of Admiralty power was the control of officer appointments and assignments:

> ... power of patronage was the key to the eighteenth-century Admiralty's authority, the one element which counterbalanced weakness to command and near inability to punish. (Rodger, 1984, p. 245)

2.2 Career progression

Most aspiring officers went to sea at an early age – 10 or 12 was common. Connections usually mattered from the very first day, as most young gentlemen were entered in a ship's books through the patronage of a friendly captain. Depending on their age, they would either join as midshipmen or be promoted to that position from able seaman or captain's servant. Training was almost entirely informal; the ship captain was in charge of organizing lessons in seamanship, gunnery, and navigation. Midshipmen who had served for six years aboard Royal Navy ships, and who had absorbed all the material necessary to fight and sail a ship, could apply for the rank of lieutenant; such applicants were examined by a tribunal of active captains chosen by the Admiralty (Pope, 2013). Although "interest" (i.e., connections) likely affected promotion prospects at the margin, the examination itself was taken seriously. The Royal Navy had no use use for lieutenants who were not highly competent seamen.

[11] There are numerous examples of the Admiralty overturning local station commanders' recommendations and provisional appointments; there are also many documented cases of the Admiralty forcing appointments on local commanders, picking men who had not been recommended by the station chief (Malcomson, 2007).

Upon receiving a commission, the new lieutenant had to wait for an appointment (and could easily end up "on the beach", or on half-pay). Larger ships would carry many lieutenants, and their role varied as a function of seniority. Lieutenants attended to the day-to-day running of the ship, from readying stores for long voyages to daily sailing and the commanding of gun crews. They also kept the ship's log, which was necessary for monitoring the captain (Allen, 2002).

Lieutenants could also be appointed as "Master and Commander". As such, they would be in charge of a small vessel (typically sloops-of-war with no more than 20 guns). Such ships often sailed with messages or were used to intercept coastal traffic. Command of even a small vessel constituted a valuable opportunity to distinguish oneself.[12]

The decisive step in a naval officer's career was promotion to *post-captain* – that is, the officer in command of a larger vessel. Many lieutenants were never promoted. Both performance and connections mattered for this consequential promotion, but battlefield performance mattered above all else: "for a young officer who hoped for command, or for post-rank, nothing was more swiftly effective than to take an enemy ship of equal or greater force" (Rodger, 1987, p. 295). Once appointed as a post-captain, further career progression was by strict seniority. If a lieutenant was made "post" at a young age and continued to receive ship assignments, eventual promotion to admiral was all but guaranteed as long as he survived. Initial appointment of post-captains was typically to a sixth-rate or fifth-rate ship, frigates with 20–32 guns and a crew of 150–300. Step by step, captains would then progress to larger and larger ships until they were put in command of a first-rate ship of the line, carrying 80–120 guns and a crew of 850 (Baugh, 2015).

Once they reached the top of the captain's list, naval officers qualified for promotion to admiral – first to rear admiral, then to vice admiral, and finally to admiral. Each of these positions was assigned to a specific fleet (e.g., the Admiral of the Red commanded the British Home Fleet). Admirals could also find themselves without a command ("yellow admirals"), a form of early retirement that allowed the Admiralty to promote younger men to command fleets and squadrons.

2.3 Success in the Age of Sail

No European navy had a major technological advantage compared to its peers. Shipbuilders competed vigorously with each other, and frequent captures of enemy ships dis-

[12] Although a lieutenant appointed as commander was in effect acting as the captain of a ship, he would not yet have the rank of "captain" – although, out of courtesy, he would normally be referred to as such.

seminated innovations. British-built ships were not the best; historians debate whether French-built vessels were better (Allen, 2002; Rodger, 1987), and the Spanish *Santísima Trinidad* was the largest warship of the age. Naval engagements were nearly always decided by the relative size of fleets, by the armament of individual vessels in ship-to-ship duels, and above all, by the seamanship, fighting skill, and motivation of captains and their crew.

Despite the similarity of ships, battle outcomes for most of the 18th century were heavily one-sided. During the Napoleonic Wars, for example, the Royal Navy lost only 166 ships (of which five were ships of the line) while inflicting the loss of 1,201 ships (159 ships of the line) on its enemies. This "exchange ratio" was a staggering 7:1 on average and 32:1 for battleships.[13] According to Forester (2012, p. 29),

> the British Navy could look back with complacence over a record of victories frequently gained and easily won. Time and time again it had faced numerical odds and had emerged triumphant . . . There had been single-ship actions too numerous to count, and in the great majority of these actions British ships had been victorious, and often over ships of greater tonnage, with more guns and larger crews.

Why did the Royal Navy outfight its enemies? Skill was one factor. Britain could draw on the manpower of a large merchant navy – but then so could the Dutch and French navies (Allen, 2002). In wartime, recruitment by force ("the press") was common and ensured that the Royal Navy had first pick of prime seaman.[14] Since Britain often blockaded enemy fleets, its seaman had more practice than their enemies. A highly professional officer corps also enhanced the fighting power of the Royal Navy; in contrast to the British army, for example, commissions could not be purchased but had to be earned through exams and appointments.[15] There were also no major organizational upheavals, such as the drastic egalitarian reforms that undermined the fighting power of the French Navy after 1793. Finally, there is some evidence that British crews sustained a higher rate of fire than its foes – the result of extensive (albeit informal) training.[16]

[13] Most 18th-century conflicts resulted in similar ratios; during the Seven Years' War (1756–1763), for instance, the Royal Navy was arguably even more successful than it was during 1793–1815 (Allen, 2002).

[14] Rodger (1987) analyzes the crews of several ships from the middle of the 18th century and finds that the share of pressed men averaged 15%. Another 56% were volunteers, and 26% re-enlisted after having been "paid off" for their previous service. The rest of a ship's company were officers.

[15] See Allen (2011) for a general theory of when purchasing commissions works better than patronage.

[16] Rodger (1987) cites several examples of British warships firing at a rate of one broadside every minute or two.

The principal challenge for a naval commander during the Age of Sail was to find the enemy fleet. Without modern means of communication, visual contact was necessary to bring fleets into action. Frigates serving as "eyes of the fleet" were in high demand. Nonetheless, much of the naval history of the 18th century consists of chance encounters and month-long cat-and-mouse chases, such as the long-delayed meeting of the British and combined French–Spanish fleets at Trafalgar (which followed a chase to the West Indies).

The Royal Navy had a number of structural advantages, but it also observed self-imposed rules that contributed to its success (Allen, 2002). Chief among these rules was a strong bias in favor of taking action against an enemy. Principal–agent problems are highly characteristic of military organizations (van Creveld, 2004) – and nowhere more so than on the high seas in the Age of Sail, when messages from the Admiralty could take months to reach a commander (Allen, 2002). From the mid-18th century onward, Navy regulations did not even allow British captains to avoid confrontation with an enemy of broadly similar size. Instead, they were required to do their utmost to attack and defeat the enemy vessel.[17] When efforts were deemed to be insufficient, the consequences could be severe. Loss of a ship brought an automatic court martial, and convicted navy officers could suffer the ultimate punishment. An instructive case is that of Admiral Byng; he was executed for failing to capture, as ordered, Menorca from the French in 1759. Contrast this with the behavior of the Royal Navy's main competitor:

> French fleets never attacked, as indeed they had never attempted to do since 1704. Their tactics when opposed by fleets of equal strength were mainly defensive. (Tunstall and Tracy, 1990, p. 7).

2.4 Patronage in the Royal Navy

Patronage was an important factor in personnel decisions of the Royal Navy. Boys joining a ship for the first time often did so through family connections; and promotion to midshipman, lieutenant, and post-captain were all affected by how much "influence" (i.e., connections) an officer had at higher levels of the naval hierarchy, in Parliament, and at court. How could such a system produce competent captains in large numbers?

[17] "British commanders were expected to defeat enemy forces much stronger than their own . . . In single ship actions, it was reckoned that a British ship had a good chance against an enemy of 50 per cent greater gun power and crew" (Lavery, 1998, p. 317).

A simple example can illustrate the extent to which nepotism pervaded Navy careers. A young man, the sixth of eleven children of an Anglican reverend, joins the Navy at age 13. He begins as a seaman serving on *HMS Raisonnable*, which is commanded by his maternal uncle, Captain Maurice Suckling. Soon he is promoted to midshipman and begins officer training. After serving in a variety of ships, he is first appointed acting lieutenant. He passes the examination as lieutenant, aged 19, in front of an examining board presided over by his uncle, who has in the meantime risen to the position of Comptroller of the Navy, or the chairman of the Navy Board in charge of most Navy spending (except wages) – that is, with responsibility for shipbuilding, repairs, victualling, powder, and shot.

Immediately after his promotion, the young naval officer is appointed as lieutenant in a 32-gun frigate, *HMS Lowestoffe*. After capturing various enemy ships and taking prizes, the lieutenant is appointed commander of the tender *Little Lucy*. The newly appointed commander makes a positive impression on his superior, who therefore sends him to the flagship of Sir Peter Parker, admiral at the Jamaica station. After a successful attack on a Spanish fort, Parker puts his protégé in charge of *HMS Hinchinbrook*, a 28-gun frigate. He is thus made a post-captain at age 21, an appointment decided by the local station commander and confirmed by the Admiralty. Within two years, he has transitioned from lowly midshipman to captain of a major warship (Coleman, 2001).

The young man was, of course, Horatio Nelson – arguably one of history's most outstanding naval officers. He would later command the fleets that vanquished enemy fleets at the Battle of Abukir and of Trafalgar. There is no questioning his various talents and abilities as a captain, naval commander, and strategist. Yet without his uncle's influence, Nelson – who had a weak constitution that left him ill for months on end, was no great navigator, and who suffered from seasickness all his life – would probably never have risen to the top of the Navy hierarchy. Instead, patronage from several highly ranked officers ensured that he became one of the most rapidly promoted captains in the Royal Navy.

Naval historians have indeed argued that patronage enhanced the performance of the Royal Navy because it facilitated selection based on ability. The skill and values of the leaders choosing the next set of fighting captains were crucial:

> we are mistaken to suppose that a system based on personal influence must necessarily have chosen unworthy men. This would have been so if the persons with the power of choice had placed other qualities above professional ability – for example . . . choosing officers only from noble blood, as the French navy normally did . . . *a system of patronage to identify and advance men of ability . . .*

> *might be at least as efficient as any examination or annual report in bringing skillful officers to the head of the profession.* (Rodger, 1987, p. 275, emphasis added)
>
> patronage, properly used, did much to save the country in wartime by giving outstanding men rapid promotion . . . the effect . . . because of patronage, luck, or endeavour, was that . . . the right men ended up in the right jobs.(Pope, 2013, pp. 24, 29)

Cases such as Nelson's illustrate that patronage and performance could go hand in hand. Next, we introduce a conceptual framework that clarifies how and when patronage can enhance performance in our setting.

3 Conceptual framework

We use a signal extraction framework to motivate our empirical analysis. To clarify matters, we propose a simple framework that abstracts from incentive effects and focuses on the selection margin that admirals face when making promotion decisions.

3.1 Setup

Each agent belongs to one of two groups, $j \in \{1, 0\}$; some agents are connected to the principal ($j = 1$) whereas others are unconnected ($j = 0$). The performance g of an agent is given by $g = a + \varepsilon$, which depends on the agent's ability a and on noise ε. The principal observes performance g and group membership j but cannot directly observe either ability or noise. The ability of agents is distributed as $a \sim N(\mu_j, \sigma^2)$, and the noise in the measurement of performance is distributed as $\varepsilon \sim N(0, \sigma^2_{\varepsilon j})$.

Assumption 1. The mean ability of connected agents is weakly lower than that of unconnected agents: $\mu_1 \leq \mu_0$.

This assumption reflects the more constrained nature of the pool of connected candidates – as compared with the pool of unconnected candidates – from which the principal can choose. The assumption also works "against" an ability advantage for connected agents, which makes the screening problem interesting.

Assumption 2. Principals observe the performance of connected agents with less noise: $\sigma^2_{\varepsilon 1} < \sigma^2_{\varepsilon 0}$. Without loss of generality, we set $\sigma^2_{\varepsilon 1} = 0$.

So when assessing performance, principals are better able to distinguish luck from ability for connected than for unconnected subordinates. This assumption reflects the informational advantage of connections. The principal, whose objective function is $U = a + b_j$, seeks to promote higher-ability agents; the principal may also derive a benefit b_j from selecting a group-j agent. Thus principals might exercise favoritism and derive a private benefit from selecting connected agents, in which case $b_1 > b_0 \geq 0$. To simplify the presentation, we normalize $b_0 = 0$. We refer to this preference for connected agents as *bias*.

3.2 Promotion choices and performance

The principal will promote the connected agent if the expected utility from doing so – conditional on observing a given level of performance – is higher: $E[U|g, j = 1] > E[U|g, j = 0]$. The expected utility from promoting an agent from group j with observed performance of g is

$$E[U|g, j] = \left(\frac{\sigma^2}{\sigma^2 + \sigma^2_{\varepsilon j}} g + \left(1 - \frac{\sigma^2}{\sigma^2 + \sigma^2_{\varepsilon j}} \right) \mu_j \right) + b_j. \tag{1}$$

The conditional distribution of ability given performance is normal, with mean equal to a weighted average of the performance and the unconditional group mean (DeGroot, 2004).

Equation (1) captures the basic trade-off that a principal faces when making promotion decisions. The principal would like to promote the agent who yields the highest (private) utility. On the one hand, the principal is better able to identify higher-ability candidates among connected (than among unconnected) subordinates owing to better information, as modeled using the smaller measurement error $\sigma^2_{\varepsilon j}$. On the other hand, favoritism (b_1) might distort the selection. Even if an agent is known to be of low ability, a biased principal might nonetheless promote the connected agent if the private benefit from doing so is sufficiently large. Hence the model yields two propositions that address how family ties interact with promotion and performance. (All proofs are given in Appendix C.)

Proposition 1: Complementarity in performance and connections. *The link between promotion and performance is stronger for those agents who are connected to the principal:* $\frac{\partial E[U|g,j=1]}{\partial g} > \frac{\partial E[U|g,j=0]}{\partial g}$.

Since the performance of connected agents is observed with less noise, the principal can more reliably attribute the observed performance to ability. Given our extreme assumption that $\sigma^2_{\varepsilon 1} = 0$, performance is a perfect measure of the agent's ability. The principal will therefore be more responsive to performance when assessing connected agents – which is the value of better information (Jia et al., 2015).

Proposition 2: Performance and promotions. *In the absence of bias, connected promotees outperform unconnected promotees on average. The positive performance gap between connected and unconnected promotees declines as bias increases. Although connected promotees outperform unconnected promotees if bias is sufficiently small, there is a threshold $b > \bar{b}$ above which connected promotees underperform relative to unconnected promotees.*

If there is no bias ($b_1 = 0$), then the principal will promote the connected agent *only if* the observed performance is above average, and will promote unconnected agents only if performance is below average. The ability to pick the highest-ability agent from the pool of connected agents reflects the value of better information. In the presence of bias, the performance implications depend on the trade-off between superior information and bias. Whereas better information makes it easier for principals to identify talent among connected agents, bias leads the principal to lower the promotion threshold for connected agents.

Figure 3 illustrates these results. We first consider the case of an unbiased principal. The figure's dashed line plots the expected payoff from promoting a connected agent with observed performance g; the solid, flatter line plots the expected payoff from promoting an unconnected agent with the same performance g. Because of better information, the relationship between performance and promotion is steeper for connected agents (Proposition 1). The unbiased principal will promote the connected agent whose performance exceeds the average performance μ_0 of the unconnected agent. If the connected agent's performance is below μ_0, the principal can – owing to better information – see that this is not a case of bad luck. In that event, the unbiased principal is better-off promoting an unconnected agent.

In the case of bias, however, the principal will lower the performance "bar" for connected agents (Proposition 2). This case is seen in Figure 3 as a shift away from the dashed line: there is now a wedge between the unbiased promotion rule that selects purely on performance and the promotion rule that also accounts for a private benefit. The area in the figure marked "Promote only when biased" is the range in which connected promotions

will be of lower quality.[18]

4 Data and descriptive evidence

We now describe the data used in our empirical analysis, their limitations, and the sources from which the data were derived.

4.1 Personnel and ship data

Our core data are from Threedecks,[19] a Web resource that features detailed information on vessels, crews, and naval actions. Threedecks constitutes the most comprehensive data source on the personnel and ships of the Royal Navy and on fighting events during the Age of Sail. It has assembled information on 25,229 ships, 33,959 seamen, and 1,022 actions and battles among European sea powers (the major ones being British, French, Spanish, Dutch, and Portuguese).[20] The dataset is maintained by naval enthusiasts; it is a trusted source referenced by the National Maritime Museum in Greenwich, United Kingdom.

We extract Threedecks' complete records to construct our main dataset, restricting the sample to the classic Age of Sail (1690–1849). We omit lower-tier seamen and petty officers, confining the sample to British lieutenants, commanders, post-captains, and admirals (i.e., to "naval officers"). Then we combine the individual-level panel of officers and positions with the ship-level panel to construct a matched "ship–officer" dataset. The resulting ship-level panel contains rich data on outcomes such as the number of actions undertaken, the number of enemy ships captured or destroyed, and whether the ship itself was captured, wrecked, or sunk.

We conduct a series of validation exercises to assess the coverage and quality of the data. To evaluate the coverage, we compare the number of rated ships included in our data to the complete record of all rated ships (Colledge and Warlow, 2010). This comparison yields a coverage rate of 95%. To assess the data quality, we randomly sampled 1% of the officers and checked their careers against standard references (Clowes et al., 1897; Syrett and DiNardo, 1994).

[18] Such promotions definitely occurred: "no obviously stupid captain was appointed. But occasionally an officer who was a competent seaman but had defects in his character which should have barred him did in fact obtain command because of influence: he or a relative... knew an admiral or minister." (Pope, 2013, p. 54).

[19] http://www.threedecks.org

[20] We downloaded the data in September 2018; the numbers are correct as of that date.

Our final dataset contains information on 3,904 ships and on the careers of 5,848 officers over a period of 160 years, a total 82,958 officer-ship-year observations. Figure 1 plots the variation over time. It should come as no surprise that fighting events cluster during wartime, when there is a spike also in our dataset's number of officers. At the peak, we can reference 500 fighting events per year and connect them to 1,500 officers. Table 1 shows the summary statistics for the main sample at the officer level. An officer remains in the Royal Navy for an average of 12.5 years and commands a ship for about 6.4 years. The average officer serves on 3.5 different ships with an average of 32 guns. Naval officers in our dataset spend only 18% of their entire service span on large battle ships, the ships of the line. Finally, half of all officers make it to post-captain and higher, although few (only 3%) ever become admirals.

4.2 Measuring performance

The key criterion for promotion to post-captain was success at sea (Rodger, 1987). We use three measures to proxy for success at sea: (i) the capture of enemy ships (ii) the sinking of enemy ships and (iii) the participation in fleet actions.

An advantage in the naval setting is that such measures are well-recorded and objective. Captures of enemy ships were recorded and well documented by the Royal Navy. Naval officers kept detailed ship logs and reported about sea battles in letters to the Admiralty. Furthermore, events like the sinking of an enemy ship, or participation in fleet and flotilla actions, were widely reported. Table 1 provides a overview of these measures. On average, each officer could claim one enemy capture, while only 14% of captains ever lost a ship to the enemy. The likelihood of other performance-related events (e.g., the number of actions seen or ships destroyed) is lower.

Table 2 shows that promotions to post-captain can indeed be systematically predicted by differences in captures, sinkings of enemy ships and actions participated. Because promotion decisions were based on an officer's entire record, we construct cumulative measures of performance. All regressions include year, officer and tenure fixed effects. Among officers with the same tenure, those who captured more enemy vessels, sank more enemy ships, and fought in more actions were more likely to be promoted (columns [1] to [3]). For example, one additional ship captured increased the chance of promotion by 14.5 p.p.

Since all three measures reflect the success of naval captains, we combine them into a single measure of performance. We do so combining the number of captures, sinkings

and actions, and calculating a cumulative measure.[21] As column [4] shows, variation in the combined measure – which we call "cumulative battle performance" – consistently predicts promotions to post-captain. Among officers of the same seniority, those who either capture or sink more enemy ships, or participate in more actions, were more likely to be promoted.

4.3 Measuring family ties

Our analysis focuses on connections to the two top admirals – the First Lord of the Admiralty and the Admiral of the Fleet. These two officers were central to all personnel decisions: who was allowed to command which vessel and who was put on half-pay, whether an officer would serve in a distant and disease-ridden station or near home, and whether a captain's junior officers would themselves receive promotions. In home waters, all appointments were made directly by the Admiralty; its control of overseas promotions and appointments increased with time (Rodger, 2005).

We use genealogical data from the Peerage dataset[22] to check for whether officers were connected to the Admiralty. This dataset contains family tree data for the peerage of Britain as well as the royal families of Europe, including genealogical data on the British elite and military. We link officers in our dataset to the Peerage data by matching based on full name, title, year of birth, and year of death. For 11% of officers, the geneological data can be used to measure family distance to the Admiralty. Given the data's antiquity and that many officers rose from the middling classes (and thus are not included in the elite dataset), we consider this to be a reasonable match rate.[23] Since the family trees of nearly all admirals are mapped out, we can assume that the remaining officers are unconnected to their superior. Since our empirical strategy exploits within-officer variation in connectedness, this assumption does not introduce selectivity issues – if anything, it is likely to bias our estimates toward zero and thus to yield more conservative results. For the subset of matched officers, we compute the shortest distance in pre-determined family ties.[24] We then consider an admiral and an officer to have shared ancestry (family ties) if the degree

[21] There are alternative ways to construct a summary index measure. For example, we also validated our measure by computing the first principal component across all dimensions. The combined cumulative measure, however, has a more natural and simpler interpretation.

[22] http://www.thepeerage.com

[23] In comparison, Xu (2018) obtains a match rate of 34% for governors of the British Empire 1854–1966, who are recruited from a much more elite population.

[24] *Pre-determined* family ties capture direct blood relatedness through links with earlier generations. These ties exclude marriages, which form network links endogenously.

of separation is sufficiently close.

There is a trade-off in choosing a cut-off that defines "closeness". Although a low degree of separation increases the likelihood of an actual social tie, a low cut-off reduces the number of admirals and officers who are classified as kin. Since the empirical strategy exploits observing the same officers under changing connectedness to the Admiralty, it follows that a lower degree will reduce the number of switchers. We thus consider a naval officer to be *connected* when he is separated by no more than 16 degrees from either of the two leading admirals. This definition, which follows the one given by Xu (2018), captures the extent to which two individuals have a shared ancestry. The cut-off value may appear "generous", but it is in line with the enormous weight that contemporaries placed on pedigree and social connections – as evidenced by the numerous publications listing the family trees of noblemen and -women. The results do not critically depend on the chosen cut-off, and we also provide robustness checks using a continuous measure.[25]

Figure 2 illustrates the variation in the share of naval officers who were connected, according to this measure, between 1690 and 1849. Although only a few officers were linked to the top of the naval administration in the first decades of the 18th century, their share increased over time. During the Revolutionary Wars against France, that share peaked at more than 20% of the total. It then fell sharply after a highly successful career admiral from a middling background, John Jervis (Earl of St. Vincent), became First Lord of the Admiralty and decided to curtail the role of "influence" in naval appointments.

Out of the 5,848 officers in our dataset, 562 were at some point of their career connected through family ties to the Lord Admiral or the Admiral of the Fleet. Because the particular individuals who hold those positions come and go, we observe variation over time in connectedness to the very top of the Navy hierarchy. Among the 562 officers who were ever connected, 196 are connected throughout their career (always connected). For the 366 who experience a switch in their ties to the Admiralty, the average "switcher" enjoyed ties to the Admiralty for 60% of his time on active service.

[25]The results are robust to cut-offs of between 14 and 20 degrees of separation. Figure A2 shows two distributions - the light gray distribution is the distribution of degrees of separation between pairs of randomly sampled individuals from the peerage dataset (i.e. the elite of England). The dark gray distribution is the actual distribution of degrees of separation between officers and admiralties. It shows that (connected) naval officers and admirals were on average closer in terms of degrees of separation than members of Britain's noble elite. It also illustrates that our cut-off of 16 degrees of separation actually corresponds to the closest 20% pairs when benchmarked against the random pairs. This implies that, while 16 degrees of separation may sound quite distant, it was actually not. Recall that these measures are conditional on naval officers having any connection; if we were to compare with the universe of officer, including those who are never connected, 16 degrees of separation would be even closer.

4.4 Battle-level outcomes

Finally, we make use of the rich documentation of naval engagements to construct battle-level outcomes. These range from famous single-ship actions (e.g., *HMS Java* versus *USS Constitution* in 1812) to full-scale fleet actions like the Battle of Trafalgar, which involved 74 battle ships. These naval engagements have been carefully documented by the Royal Navy and subsequent historians.

We focus on two types of engagements, of which the first comprises fleet and flotilla actions. These actions involve multiple ships on both sides. We use Threedecks to identify, for our study period of 1690–1849, 94 fleet actions and 263 flotilla actions with a total of 972 British ships involved. The second type of engagement is single-ship actions. These are "chance" engagements between two opposing ships, often of relatively equal size. We were able to identify 172 single-ship actions.

For each of these actions, we conduct careful qualitative research by drawing on historical accounts (such as those provided by Clowes for the years 1794–1803) and descriptions from the *London Gazette*. This approach allows us to code officer-ship-action–level information on whether a given officer captured an enemy ship, retreated, or saw his own ship captured. We link the officers and ships involved to our main dataset and thereby obtain the gun count of ships, battle outcomes, as well as performance-related characteristics such as experience.

5 Empirical results

5.1 Promotion, performance and family ties

We test Proposition 1 in two steps. First, we describe broad patterns of promotion to post-captain, and how it is influenced by connectedness and performance. We then narrow down our data to a subset of officers for whom we can identify the effect of becoming connected.

5.1.1 Survival and panel analysis

Promotion to post-rank is an absorbing state. Connected officers were promoted much more rapidly; their probability of promotion within 10 years of passing the lieutenant exam is at least 3 times higher. How did performance and connectedness interact? Before examining this question econometrically, we plot simple 'survival' curves as a function of

connectedness and performance (Figure 4).

All officers start as lieutenants. As individuals are promoted to post-captain, the share as yet unpromoted declines. Gray lines indicate the share of unconnected officers who have not yet been promoted, and black lines indicate their connected peers in the same circumstances. The dashed (resp. solid) lines represent high-performing (resp. low-performing) officers. We define "high performance" as commanders who have accumulated at least two fighting events – corresponding to the top 30%. The results show that both connected and unconnected promotees gained from performance, and that unconnected but high-performing officers did about as well as the connected but "normal" officers. The figure also suggests that the gains from performance are greater for connected officers: the difference between solid and dashed lines is larger and increases more rapidly for connected than for unconnected promotees.

We can demonstrate the same complementarity between performance and connections using a standard panel analysis. This allows us to use additional fixed effects to control for possible confounding factors. We estimate following regression model for officer i in year t with $k = K(i,t)$ years of tenure,

$$y_{it} = \alpha q_{it-1} + \beta c_{it} + \gamma q_{it-1} \times c_{it} + \theta_i + \tau_t + \nu_{K(i,t)} + \varepsilon_{it}; \tag{2}$$

where $y_{it} = 1$ only if officer i was promoted to post-captain in year t (otherwise, $y_{it} = 0$). The variable q_{it-1} is the cumulative performance measure. To ensure that this measure of performance is pre-determined and not driven by the contemporaneous allocation choices of the Admiralty, we measure cumulative performance up to the *previous* year. The indicator variable c_{it} is set to 1 if officer i has family ties to the Admiralty in year t (and is set to 0 otherwise). θ_i and τ_t to denote (respectively) officer and year fixed effects. ε_{it} is the error term, which we cluster at the officer level. Finally, we restrict the sample to officers who can still be promoted.

The officer fixed effects θ_i are key to our empirical strategy. They constrain the identifying variation to "within-officer" variation in connectedness stemming from the turnover of the Admiralty. This variation allows us to isolate the effect of connections by only comparing the promotion prospects of the *same* officer with and without ties to the top. Importantly, turnover at the Admiralty is driven by political turnover in London that is unrelated to war or naval performance (Table A1).

Table 3 shows the results. They confirm the complementarity between performance and connections in determining promotion decisions. All regressions include year and

tenure fixed effects. When comparing among officers with the same years of service, an additional fighting event adds 4.9 percentage-points (p.p.) to the probability of promotion in a given year (column [1]). Officers with family ties to the Admiralty are 6.8 p.p. more likely to be made post than unconnected officers. Compared to an unconditional annual promotion probability of 8.3 p.p., this is a large difference.

In column [2], we include the interaction between performance and connections. As in the survival analysis, performance and connections are complements – the association between promotion and performance is stronger for those who are connected to the Admiralty. This outcome is consistent with the interpretation that admirals have better information (Section 3). Finally, column [3] reports results using officer fixed effects. Since officer fixed effects absorb any time-invariant cross-officer differences in promotion, performance, and connectedness, any level differences in quality between connected and unconnected officers are absorbed. The effect of connectedness weakens considerably and becomes statistically insignificant. This suggests officer-specific unobservable correlates of connectedness *also* affect promotion decisions – as would be the case if, for example, connected individuals were of systematically higher quality. Crucially, the interaction between performance and connections remains positive and statistically significant. Finally, Figure 5 confirms the complementarity using a non-parametric version of column [3].[26]

While the complementarity between performance and connections is consistent with the information channel of our model, the additional "boost" could simply reflect bias. To examine this possibility, we also look at the effect of "bad" performance – losing a ship. If the observed effects reflected bias, we would observe an asymmetry: positive performance would be rewarded more and bad performance penalized less. Interestingly, while officers who see their ship captured or sunk are significantly less likely to make post. The promotion penalty for poor performance is *even larger* for kins, providing additional support for our interpretation emphasizing better information.

5.1.2 Event study evidence - newly connected officers

To interpret our results as causal, the interaction between performance and connections has to be exogenous. We now focus on the sample of switchers in our data – officers who become newly connected to the top of the Admiralty due to turnover at the top of the navy hierarchy. Admiralty turnover was primarily driven by cabinet reshuffles (Table A1). As admirals turned over at the top because of reshuffle, politics, retirement, illness and death,

[26]The patterns also holds using a standard Cox proportional hazard model (Appendix D and Figure A3).

some officers gained connections, while others lost them or remained unconnected. This allows us to conduct an event study by constructing balanced panels around a five-year window of each Admiralty turnover.

Overall, we have 49 officers for whom Admiralty turnover generated a change in their connectedness. 924 officers remain unconnected. Figure 6 shows how variation in cumulative performance in the year before the Admiralty turnover affects the promotion probability around the turnover event. The coefficients are estimated conditional on officer, year, tenure and year-around-the-turnover fixed effects (Appendix Table A2 reports the regressions).

Reassuringly, there are no pre-trends before the turnover event – high-performing officers were more likely to become connected or remain unconnected. In this sample also, performance and connections were complements for promotions to post-captain: greater performance predicted promotion, but the relationship between merit and performance is *even stronger* for those who suddenly become connected as a result of changes at the top of the Navy hierarchy.

5.2 Post-promotion performance

Were connected promotees actually more effective fighting captains? Ex ante, it is unclear if these officers would outperform as post-captains (Proposition 2). If admirals favor their kin, connections will substitute for ability and help lower-quality officers to be promoted. Conversely, if admirals screen on unobservable characteristics that predict greater performance, connected promotees should outperform even their high-achieving but unconnected peers.

5.2.1 Event study evidence

We first examine the performance difference between connected and unconnected promotees before and after promotion to post-captain. We create a balanced panel of promoted officers for whom we have data in the five-year window around the year of "making post". This ensures that our results are not driven by changes over time in the composition of the officer pool. Our analysis is based on a balanced panel of 638 officers, of whom 16% are connected promotees. We also present results using the full sample to make use of the entire dataset.

We estimate, for officer i in year t and promotion cohort $m = M(i)$,

$$q_{it} = \beta C_i \times post_{it} + \theta_i + \tau_t \times \nu_{M(i)} + \mu_{K(i,t)} + \varepsilon_{it}; \tag{3}$$

where q_{it} measures the performance of officer i in the five years around the promotion window. The indicator C_i is set equal to 1 if the officer was connected to the Admiralty in the year of making post and is otherwise set to 0; $post_{it}$ is a dummy set to 1 only for officers who have been promoted to post-captain. In this DiD setting, the coefficient of interest β measures the difference in performance between connected and unconnected promotees after both were promoted to post-captain, captured by the interaction $C_i \times post_{it}$. As before, θ_i are officer fixed effects and $\mu_{K(i,t)}$ are tenure fixed effects. Finally τ_t are year fixed effects which, once interacted with promotion cohort fixed effects $\nu_{M(i)}$, constrain the comparison to connected and unconnected officers promoted in the same year, for each year of the five-year window. Finally, the standard errors are clustered at the officer level.

The results are shown in Panel A of Table 4. There is no statistically significant difference between connected and unconnected promotees in the years prior to their promotion to post-captain. Afterward, however, those promoted while connected to the Admiralty consistently outperform by 0.126 captures, sinkings or actions per year (column [1]). Compared to the mean of the dependent variable (0.177), the relative post-promotion increase in performance is large. In column [2] we add officer fixed effects, which "partial out" time-invariant, individual-specific differences that may be correlated with connectedness – for instance, that connected officers tend to come from more elite families. As before, the identifying variation thus results from officers who experience a switch in their connectedness to the Admiralty around the promotion window. Despite this more restrictive specification, the pattern remains robust. Finally, Figure 7 illustrates our finding graphically (based on Table 4, column [2] estimated flexibly for each year around the promotion window). There are almost no differences between connected and unconnected officers before promotion; after promotion, there is a large and persistent positive performance gap in favor of the connected.[27]

The results so far are based on a balanced sample. While this alleviates concerns that the results may be driven by composition changes, a drawback is that the resulting sample is much more limited. In column [3] we thus extend the analysis to the full sample. The

[27] Figure A4 shows the selection effects using a continuous measure of connectedness. While noisier, the positive selection effect declines with greater degrees of separation between the promoted officer and the Admiralty.

results remain comparable.

Admirals could provide relatives with better inputs or more attractive assignments – for example, by allocating them more skilled crews or by sending them to more promising theaters of war. In column [4] of Table 4, we control for contemporaneous connectedness to the Admiralty. Interestingly, the effect of connected promotions on performance persists, suggesting that it is the past promotion decision affecting a previously connected officers drives our result – a selection effect.[28] To corroborate this conclusion, column [5] restricts the sample to officers whose promoting admiral rotates out following the promotion. In line with the notion of better screening, connected promotees continue to outperform even if their patron is no longer in office.

Captures, sinking and actions are relatively rare events, which makes it harder to pin down effects. To obtain a better performance measure at any given year, we compute the cumulative performance of an officer up to the current year. As Table 4, column [6] shows, the results remain comparable – connected promotees outperform unconnected ones by an additional 1.3 captures.[29]

5.2.2 The role of assignment

Following promotion to post, the better performance of connected versus unconnected promotees could operate through one or more of three channels. First, connected promotees may have been given command more often (reducing time "on the beach"). Second, they might have received better ships and crews and thus more opportunities to distinguish themselves. Third, officers could actually perform better for any given assignment, ship, and crew. To investigate these three channels, in column [1] of Table 4's Panel B we repeat the event study of Panel A while using a dummy set to 1 if the focal officer is given command over a ship in a given year. As can be seen by the values reported in that column, connected promotees enjoy a 10.4% point greater likelihood of actually commanding a ship after promotion to post-captain. In addition, connected promotees appear to outperform whenever they do command a ship. In columns [2]–[5] of Panel B, we repeat the performance event study but restrict the analysis to officers given a ship (and thus had a chance to perform). Conditional on commanding a ship, connected promotees still outperform

[28] Contemporaneous within-officer changes in connectedness also increase performance. This is consistent with a positive incentive effect based on loyalty or reputational concerns (Xu, 2018).

[29] Overall, the results are robust when using alternative measures of performance such as dummies for high performance or excluding participation in actions (potentially more subject to favoritism) from the combined measure (Table A3).

unconnected promotees.

Connected officers may have received better ships, but as columns [3] and [4] show, controlling for gun count or including ship fixed effects leaves our estimate for connected officer outperformance unaffected. In column [5], we include controls for the ship's age as well as an indicator set equal to 1 for ships that were refitted in a given year. Once again, the point estimates remain comparable. Finally, we assess whether the performance gap can be explained by better crews. The naval records contain information about when crews were paid off, which enables us to reconstruct crew turnover for each ship and to identify the years when a ship had the same crew. Again, even a richer set of controls leaves our estimate essentially unchanged (column [6]). Finally, we return to the result in Panel A, column [5] – even connected officers who lost their relative in high office quickly after promotion outperformed. This in its own right speaks against the risk of our results being driven by relatives providing their kin with better equipment.

5.2.3 Early vs. late promotion - within-connected analysis

The analysis so far only looked at officers promoted to post-rank. Connected officers who were promoted may have differed from unconnected, promoted officers in a variety of ways, not all of which we can control for. To resolve this issue, we now limit the comparison to connected officers only. The historical literature has emphasized the importance of advancing talented officers *quickly*. Historians have argued that one of the principal advantages of patronage was that it allowed to "identif[y] and promote... good men very fast, as far as post rank" (Rodger, 2005). We exploit the fact that we observe connected officers who are promoted, as well as connected officers who are *not* promoted by one of their relatives (but eventually are promoted by an unconnected Admiralty). This gives us a unique opportunity to examine the quality of selection – we have information on the choice set from which promotees are chosen, and are thus able to observe their later performance. If patronage "worked" because it allowed the leading admirals to pick the "right" officers, those *not* promoted should perform less well once they were finally "made post" by a succeeding admiral.

We now compare the performance of connected officers who were promoted early (i.e. when a relative was in office) with the performance of equally connected peers who were passed over by their relative, but were eventually promoted. This is done in the same way as before, using a five-year window around the promotion to post.

Table 5 reports the results. The early-promotion dummy is 1 if a given connected offi-

cer was by a relative in the Admiralty; it is 0 if a captain is "passed over" by a relative in the Admiralty, but eventually promoted by a non-relative. Post is a dummy that is 1 after the promotion to post-captain. Among connected officers, those who are promoted early perform better than those who are passed over and promoted under a subsequent Admiralty. While early promotees perform equally well as late promotees pre-promotion, early promotees outperform significantly once given post (column [1]). The results remain comparable when using officer fixed effects (column [2]), carry over to the full sample (column [3]) and also hold using the cumulative performance measure (column [4]).

5.2.4 Fleet and single ship actions

Connected officers may have received "better" assignments, making it easier to capture enemy vessels. To deal with this issue, we look at a subset of fighting activity – fleet actions and single ship actions. In both of these, connected and unconnected officers fought. Placed in the same position, we ask whether the former seized the chance to distinguish themselves to a greater extent than the latter.

Fleet actions. We have information on 1,959 British officers who fought in fleet and flotilla actions. On average, they were outgunned – they fought with less than two thirds of the enemies' numbers of ships and guns. In almost 14% of actions, an officer's ship captured an enemy ship; in 2%, they lost their own. Connected promotees constitute 21% of our sample (Table A5).

Table 7, Panel A examines performance in fleet action. Column [1] of that panel shows that connected promotees are 8 p.p. more likely to capture an enemy ship than unconnected promotees – a sizeable increase over the 13.9% base rate. This effect is unchanged when we control (in column [2]) for promotion-year fixed effects and post-captain experience. In column [3] we introduce fixed effects for the position of ships, thereby controlling for whether a ship is in the vanguard, center, or rear of the battle line. Column [4] controls for the relative size and strength of fleets. Although a British fleet with more vessels made it harder for any individual officer to distinguish themselves, a fleet with more guns on average had greater success. In column [5], we repeat the exercise for British *losses*. The main result here is the opposite of the one for British captures: a connected promotee was much less likely than an unconnected one to lose his ship to the enemy. The effect is substantial, as average losses for connected captains were less than half those of unconnected captains.

Single-ship actions. Single ship actions typically resulted from chance encounters on the high seas. The Royal Navy dominated in single-ship actions between ships of broadly

similar size. Out of 172 such encounters, British captains captured or sank 115 enemy ships, lost only 16 ships, and engaged in 41 inconclusive skirmishes (from which the enemy withdrew 32 times). Because they are a good indicator of fighting ability, the British public viewed defeat in single-ship action as particularly shameful (Lambert, 2013).

Figure 9 summarizes the main result, plotting the probability of success for the British ship as a function of its share of all guns. A single-ship action is deemed won if the enemy ship was either captured or sunk. Connected officers had a uniformly higher chance of success, of 75-80%. The chances of success for unconnected officers are lower for any gun ratio, often by 25-35%. In Panel B of Table 7, we examine success in single ship actions more formally. Column [1] gives a simple comparison of the winning rate between connected and unconnected promotees. Connected promotees are significantly more likely to win: they are 23 p.p. more likely (on average) to emerge victorious in a single-ship engagement (column [1]). Compared with the mean of the dependent variable, this difference amounts to a 35% increase. To ensure that the higher capture rate is not driven by more favorable terms of engagement, columns [2] and [3] control for the number of guns as well as the gun ratio (i.e., the ratio of own to enemy guns). Even though ships with a more powerful broadside were more likely to win, controlling for gun ratios leaves the gap in winning rate nearly unaffected.

Finally, columns [2] and [3] also control for the year of promotion to post-captain and for experience; recall from Section 1 that the latter was, according to Benjamin and Tifrea (2007), one of the Royal Navy's competitive advantages. As before, the point estimate remains almost constant. Officers promoted while connected to the Admiralty thus had a significantly higher success rate, in single-ship encounters, than did unconnected promotees. Although connected promotees were no less likely to *lose* an engagement (column [4]), their overall higher success rate is driven by a smaller number of inconclusive engagements (column [5]): in essence, connected officers either lost or won and never experienced a draw; whereas nearly a fourth of all unconnected officers fought indecisive engagements. Indecisive engagements occurred if one ship breaks away after a period of fighting, and is not pursued by its adversary. A major determinant of connected promotees' superior performance was therefore "fighting spirit" – a willingness to fight until victory was won, and the determination to pursue an enemy that was trying to get away.

5.3 The role of Admiralty styles

We have shown that connected promotees outperform unconnected promotees as post-captains, but this average result may mask considerable heterogeneity. Naval historians have emphasized that the possible benefits of patronage depended on whether the top of the hierarchy "used a system of patronage to identify and advance men of ability" (Rodger, 1987, p. 275), or engaged in nepotism to promote their kin. A large literature on management styles (see e.g. Bertrand and Schoar, 2003; Bloom and Van Reenen, 2007) suggests that selection effects may vary with "management style".[30]

Not all First Lords of the Admiralty championed a meritocratic mindset. The historical literature emphasizes differences in style between different leaders at the Admiralty. Some senior officers strongly emphasized merit in appointments, and said so publicly. Others, like the 2nd Earl of Spencer, were known for their favoritism. Admiral Anson, First Lord of the Admiralty from 1757 to 1762, argued that

> "my constant method ... has been to promote the lieutenants to command whose ships have been successfully engaged upon equal terms with the enemy, without having any friend or recommendation, and in preference to all others, and this I would recommend to my successors if they would have a fleet to depend on." (Rodger, 1987)

Seen through the lens of our model, differences in governance styles will reflect Admiralty-specific variation in two parameters: admirals' propensity to promote based on merit because of differences in their ability to observe performance ($\sigma^2_{\varepsilon j}$); and the extent to which admirals exercise favoritism to bias the allocation of positions toward their kin (b_1). We apply these predictions to the data by exploiting data on promotions to post-captain under *different* Admiralties over time. We use each combination of First Lord of the Admiralty and Admiral of the Fleet as a separate observation, which yields 49 different combinations of top naval administrators.

First, we assess the level of meritocracy in these "management teams" by estimating α and β from Equation (2) for each Admiralty. Panel A of Figure 8 shows that, for certain Admiralty teams, performance had little effect on promotion chances – and that, with a few management teams, there is actually a negative association between performance and promotion. Yet for most admiral combinations, the effect of merit was strictly positive. Second, we estimate the extent of family bias for each Admiralty. Panel B in Figure 8 reports

[30] Admiralties were under constant pressure to promote the sons of the high nobility and of well-connected politicians (Rodger, 2005, pp. 512–15).

our estimated connection premia for the different Admiralty "teams". Few admirals discriminated against relatives, and mild favoritism was the norm: coefficients are almost all positive but are mostly small and not statistically significant. Some, however, showed blatant favoritism. The two measures are inversely correlated:[31] Admiralty teams that showed favoritism gave lower weight to merit in promotions, which supports (at least indirectly) our claim to be measuring "style".

Table 6 uses the estimated coefficients for merit and bias to explain the performance of post-captains. We now bootstrap the standard errors to account for the estimation's two-stage nature. Column [1] repeats our baseline estimate of the differential performance of connected officers around their promotion to post-captain. In column [2], we show that officers promoted by Admiralty teams that prioritized merit picked (connected) subordinates who proved to be more successful. Column [3] indicates that the opposite also holds: more bias in promotion decisions resulted in worse performance. In other words, there was conspicuous underperformance by connected promotees who owed their appointment to Admiralties that favored relatives (i.e., irrespective of merit). Finally, we corroborate these findings using an alternative shifter of management style – namely, war. War years are periods during which the Admiralty's incentive to select the highest-performing officers was arguably greater.[32] We do indeed find that officers promoted during periods of war performed better, especially those who were connected to the Admiralty (column [4]).

These results suggest that the better performance of relatives in the Royal Navy varied with the management style of top naval bureaucrats. Meritocracy-minded admirals accelerated the careers of talented relatives, who went on to outfight comparable officers. Yet, when the leading naval staff practiced nepotism by rewarding relatives with plum assignments independent of performance, fighting power suffered – connected appointees were not up to the task. The net effect of patronage therefore depended on the probity and judgment of the decision makers at the top of the naval hierarchy. The fact that connected promotees on average outfought the unconnected brother officers during the period of our study underlines that patronage in the Royal Navy on average selected the more talented candidates.

[31] The correlation is both negative and statistically significant. The correlation coefficient is: -0.351.

[32] The link between performance and promotion is even stronger for connected officers during periods of war, but this outcome may also reflect better information (Appendix Table A7).

6 Conclusion

Winston Churchill famously argued that the Royal Navy ran on "rum, sodomy, and the lash." In its heyday, it was also a nepotistic institution, where personal connections could make a huge difference to promotion prospects. Using individual-level data on officers' fighting records during the 18th century, we start by establishing that connected promotees outperformed (on average) unconnected ones. This is important because economic theory has long argued that patronage can have positive effects, but there was no hard evidence to suggest that it offered tangible benefits.

Two factors can explain this result. First, connected officers could expect greater rewards for performance; for example, an officer's accomplishments are noticed more readily if he has an uncle at the head of the Admiralty. Second, admirals might simply know their relatives better than nonrelatives, which allows for factoring in intangible factors that predict future officer effectiveness. We establish that merit paid, on average, for both the connected and unconnected – but that it yielded greater rewards for those with family ties to top admirals. This empirical pattern is consistent with connected admirals having better information.

Officers related to the men at the top of the navy hierarchy made better fighting captains. Promoted officers were given not only larger ships, but also more autonomy in their command. Connected officers outperformed unconnected ones by a large margin once they were awarded independent command, despite the fact that connected and unconnected officers performed similarly prior to that time. Selection was thus a key factor underlying the effectiveness of patronage in the 18th century Royal Navy. To reinforce this point, we show that admirals whose promotion decisions were usually based on merit were also better at picking relatives who performed well post-promotion.

These findings have broader implications. They emphasize the importance of selection for performance. In an institutional environment where promotions are discretionary, *how* discretion is used is critical. If "good" principals use their discretion to promote the highest-performing subordinates, then propitious patronage will prevail. In contrast, "bad" principals will beget nepotism by promoting subordinates who, once they rise to the rank of admiral, are more likely to abuse patronage. Our results do not suggest that patronage itself is always beneficial for organizational performance. However, they demonstrate that personal ties may help to resolve information asymmetries in environments where true talent is difficult to observe. As such, patronage can serve as a second-best solution to the problem of identifying talent.

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Figures and Tables

Figure 1: Royal Navy size and fighting events

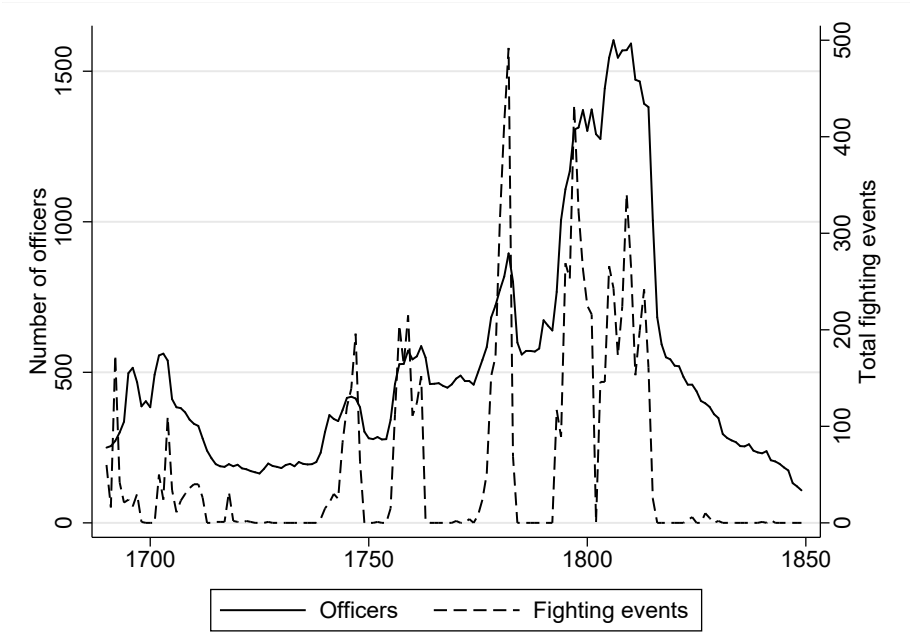


Figure 2: Promotions to post-captain and share of connected officers

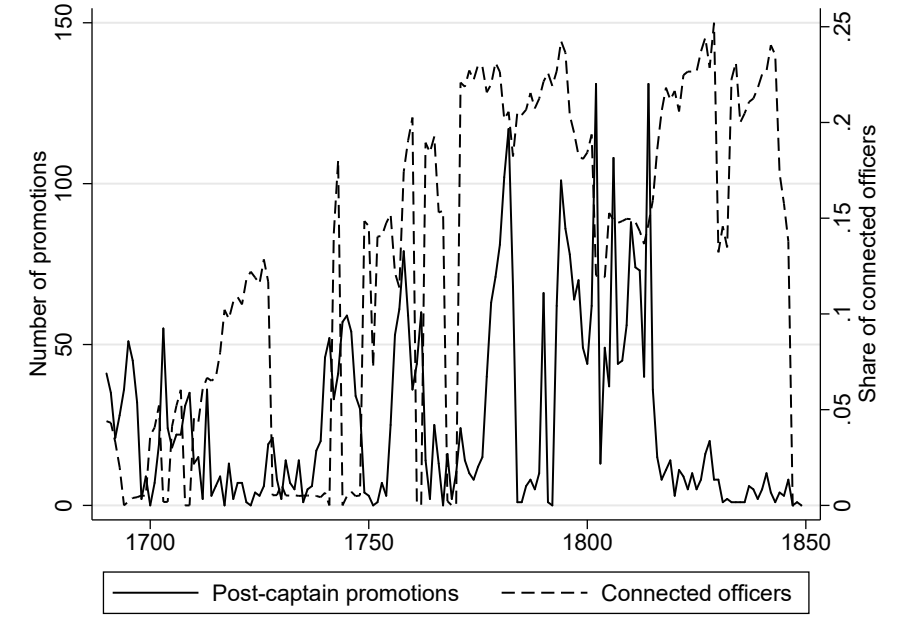


Figure 3: Selection of officers and performance

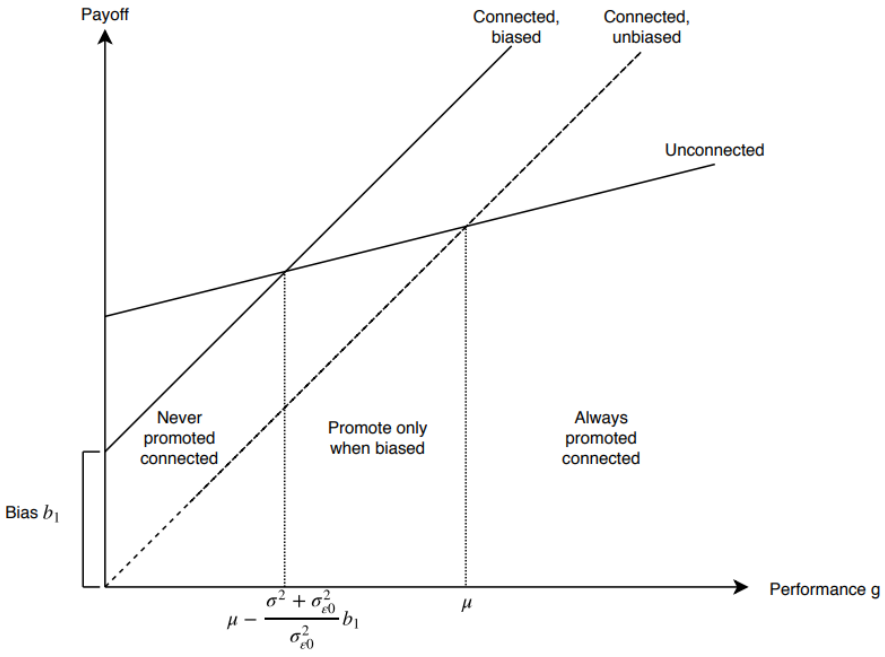


Figure 4: Promotion hazard rates by connectedness and performance

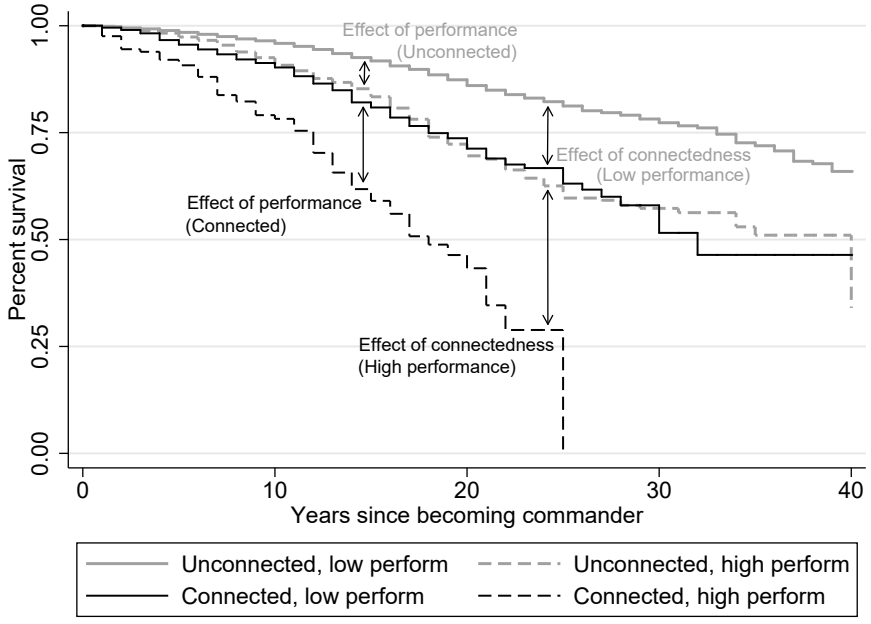
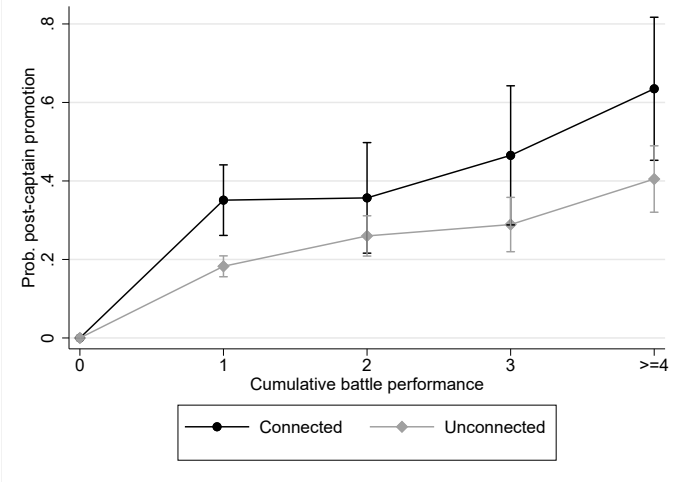
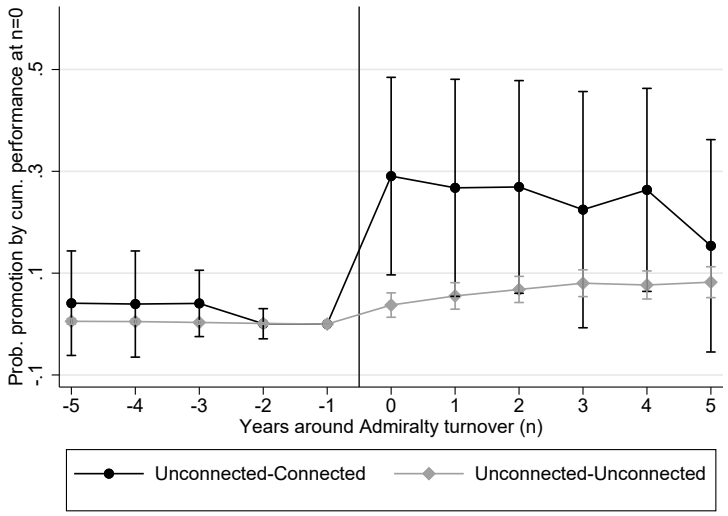


Figure 5: Merit-based promotion to post-captain by ties to Admiralty



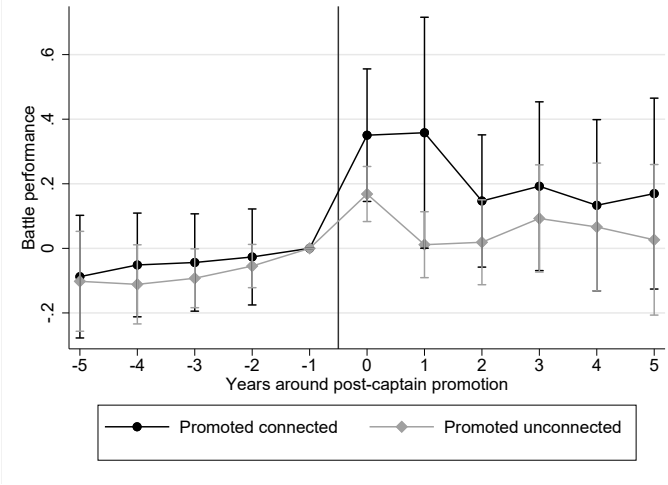
Notes: This figure shows the relationship between cumulative performance and promotion to post-captain, broken down by connectedness to the Admiralty. Estimates are relative to the omitted category of no performance. Regression includes officer FEs, tenure FEs and year FEs. 95% confidence intervals. Standard errors clustered at the officer-level.

Figure 6: Merit-based promotion by ties to incoming Admiralty (Event study)



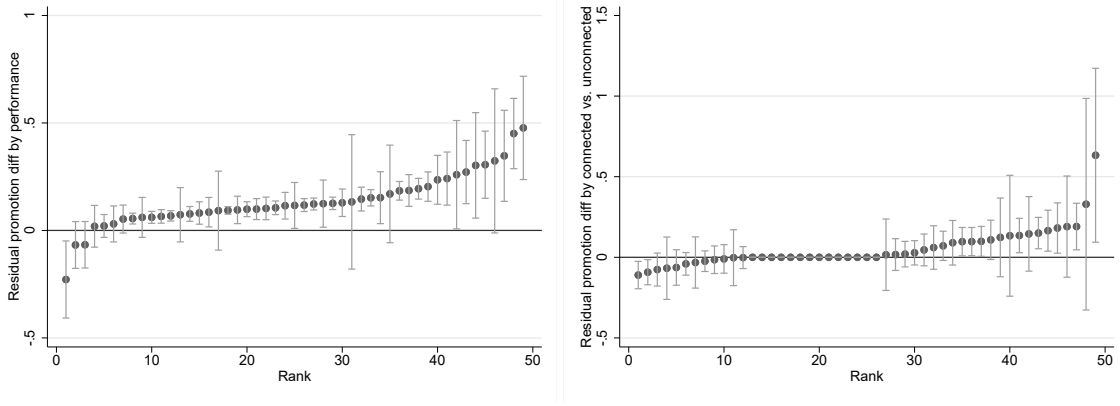
Notes: This figure compares the promotion probability of officers with different levels of cumulative performance the year before the Admiralty turnover ($n = 0$), before and after the turnover in a balanced 5 year window (relative to year before turnover $n = -1$). The regressions are estimated separately for officers who become connected to the Admiralty ($N = 49$) and those who remain unconnected throughout ($N = 924$). Regressions include officer $\times$ turnover FEs, years around the turnover fixed effects (FE), tenure FEs and year FEs. 95% confidence intervals. Standard errors clustered at the officer-level. The vertical line separates the period prior to promotion from the one thereafter.

Figure 7: Battle performance around promotion window by connectedness



Notes: This figure shows the battle performance of connected and unconnected officers during a five-year window around the year of their respective promotions to post-captain. Time of treatment is year=0, which is when officers are promoted. 95% confidence intervals. Standard errors clustered at the officer-level.

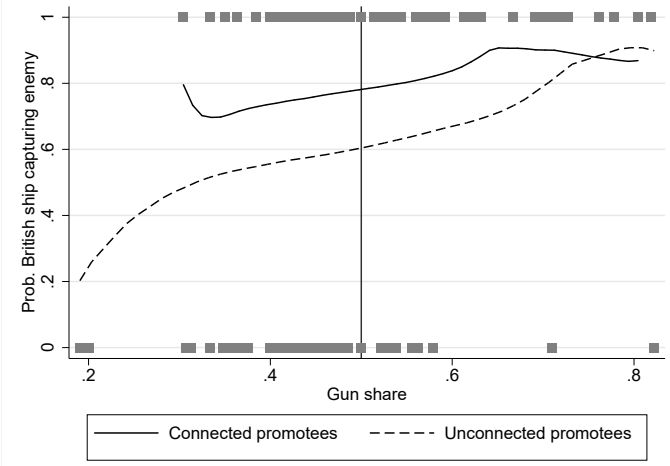
Figure 8: Heterogeneity in merit promotions and bias by Admiralty



(a) Merit (b) Biased promotion

Notes: This figure depicts the elasticities of battle performance and promotion (Panel A), as well as the average promotion gap between connected and unconnected officers (Panel B), controlling for performance, estimated for each Admiralty (i.e. for each Lord Admiralty–Admiral of the Fleet pair). 95% confidence intervals. Standard errors clustered at the officer-level.

Figure 9: Probability of victory in single ship actions



Notes: Each dot represents one observation. Lines are local polynomials for connected and unconnected officers (at time of promotion). The y-axis measures the gunshare (of the British ship), defined as $gunshare = guns_B/[guns_B + guns_E]$, where $guns_B$ and $guns_E$ indicate the number of guns of the British and enemy ship, respectively. A gunshare of 0.5 indicates a ship-to-ship duel between evenly matched men-of-war.

Table 1: Descriptive statistics of naval officers

	[1] Mean	[2] SD	[3] IQR	[4] Obs.
Years of service	12.54	13.25	15	5,848
Total years commanding ship	6.39	5.06	7	5,848
Number of ships commanded	3.46	3.24	4	5,848
Ship of the line	0.186	0.27	0.33	5,848
Guns	32.31	20.46	33.66	5,808
Enemy ships captured	1.04	2.23	1	5,848
No. of flotilla/fleet actions	0.50	1.17	0	5,848
Enemy ships sunk	0.02	0.18	0	5,848
Own ships lost	0.14	0.37	0	5,848
Made post	0.47	0.49	1	5,848
Made admiral	0.03	0.17	0	5,848

Notes: The unit of observation is the naval officer (i.e., all lieutenants, commanders, post-captains, and admirals). The sample includes all the naval officers who served during our study period of 1690–1849. We report the mean (column [1]), standard deviation (column [2]), interquartile range (column [3]), and the total number of officers (column [4]). A "ship of the line" is a large naval warship.

Table 2: Measures of performance and promotion - validation

	[1]	[2]	[3]	[4]
	Promoted to post-captain=1			
Mean of dep. var	0.069	0.069	0.069	0.069
Cumulative # ships captured $t-1$	0.145***			
	(0.013)			
Cumulative # ships sunk $t-1$		0.024***		
		(0.008)		
Cumulative # actions participated $t-1$			0.144***	
			(0.013)	
Cumulative battle performance $t-1$				0.102***
				(0.009)
Year FEs	Y	Y	Y	Y
Tenure FEs	Y	Y	Y	Y
Officer FEs	Y	Y	Y	Y
Observations	32,495	32,495	32,495	32,495

Notes: The unit of observation is the officer-year. This table reports how different measures of officer performance relate to promotion decisions. *Cumulative # ships captured* $t-1$ is measured as the cumulative number of enemy ships captured up to the previous year. *Cumulative # ships sunk* $t-1$ is measured as the cumulative number of enemy ships sunk up to the previous year. *Cumulative # actions participated* $t-1$ is measured as the cumulative number of actions participated up to the previous year. *Cumulative battle performance* $t-1$ is measured as the combined cumulative number of actions, enemy units destroyed, and captures up to the previous year. The sample includes all unpromoted officers between 1690 and 1849. Standard errors (in parentheses) are clustered at the officer-level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 3: Promotion to post-captain, battle performance and connectedness

	[1]	[2]	[3]	[4]
	Promoted to post-captain=1			
Mean of dep. var	0.0830	0.0830	0.0690	0.0690
Cumulative battle performance $t-1$	0.049***	0.044***	0.094***	
	(0.005)	(0.005)	(0.009)	
Connected	0.068***	0.051***	-0.001	0.060**
	(0.007)	(0.007)	(0.019)	(0.026)
Cum. battle performance $t-1 \times$ Connected		0.060***	0.061***	
		(0.015)	(0.021)	
Own ship taken				-0.061***
				(0.005)
Own ship taken $\times$ Connected				-0.066***
				(0.019)
Year FEs	Y	Y	Y	Y
Tenure FEs	Y	Y	Y	Y
Entry-year FEs	Y	Y		
Officer FEs			Y	Y
Observations	33,427	33,427	32,495	32,495

Notes: The unit of observation is the officer-year. This table reports how promotion to post-captain is related to battle performance, connectedness and their interaction. *Cumulative battle performance* $t-1$ is measured as the cumulative number of actions, enemy units destroyed, and captures up to the previous year; *connected* is a dummy variable set to 1 if the officer shares family ties to the Admiralty (and set to 0 otherwise). The sample includes all unpromoted officers between 1690 and 1849. *Own ship taken* is a dummy that is set to 1 if the officer's ship was captured or sunk. Standard errors (in parentheses) are clustered at the officer-level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 4: Battle performance around promotion to post-captain

Panel A	[1]	[2]	[3]	[4]	[5]	[6]
	Battle performance					Cum.
Mean of dep. var	0.177	0.177	0.146	0.146	0.150	2.333
Connected promotee	0.002					
	(0.024)					
Connected promotee × Post	0.126*	0.125*	0.084***	0.087***	0.092***	1.286***
	(0.066)	(0.066)	(0.026)	(0.026)	(0.028)	(0.328)
Connected				0.043**	0.045**	0.219*
				(0.017)	(0.018)	(0.118)
Promotion cohort × Year FEs	Y	Y	Y	Y	Y	Y
Tenure FEs	Y	Y	Y	Y	Y	Y
Officer FEs		Y	Y	Y	Y	Y
Sample	Balanced		Full sample		Rotate out	
Observations	6,753	6,753	52,376	52,376	49,402	49,402

Panel B	[1]	[2]	[3]	[4]	[5]	[6]
	Command	Cumulative battle performance				
Mean of dep. var	0.484	2.092	2.096	2.104	2.104	2.101
Connected promotee × Post	0.104***	1.107***	1.103***	0.720***	0.714***	0.721***
	(0.028)	(0.207)	(0.207)	(0.178)	(0.178)	(0.180)
Ship gun count			0.001			
			(0.001)			
Promotion cohort × Year FEs	Y	Y	Y	Y	Y	Y
Tenure FEs	Y	Y	Y	Y	Y	Y
Officer FEs		Y	Y	Y	Y	Y
Ship FEs				Y	Y	Y
Ship-year controls					Y	Y
Ship-crew FEs						Y
Sample	Full	Commanding ship				
Observations	52,376	24,417	24,371	24,158	24,158	23,438

Notes: The unit of observation is the officer-year. This table reports how performance is related to connectedness in the year of promotion to post-captain during a five-year window around that promotion. *Battle performance* is measured as the number of actions, enemy units destroyed, and captures in a given year. *Cumulative battle performance* is measured as the cumulative number of actions, enemy units destroyed, and captures up to the current year. *Connected promotee* is a dummy set to 1 if the officer has family ties with the Admiralty in the year of his promotion to post-captain (and is otherwise set to 0). *Post* is a dummy set to 1 in the year and the after a officer was promoted to post-captain. The balanced sample includes all post-captains in a five-year promotion window around the year they made post. In **Panel A**, columns [5]-[6] is based on the subset of officers whose promoting admirals rotated out by the fifth year after promotion. In column [6], the dependent variable is the *cumulative performance*. In **Panel B**, the sample for columns [2]-[6] is the subset of officers who commanded a ship. Ship gun count is the number of guns of the assigned ship. Ship-year controls are the vessel's age, and a dummy set to 1 if the ship was repaired in the year. Ship-crew FEs are fixed effects for each crew that was serving on the ship. Standard errors (in parentheses) are clustered at the officer-level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 5: Within-connected analysis: Early vs. late promotion and performance

	[1]	[2]	[3]	[4]
	Battle performance			Cum.
Mean of dep. var	0.247	0.247	0.155	3.452
Promoted early	-0.006			
	(0.020)			
Promoted early × Post	0.103**	0.079**	0.022***	0.491***
	(0.048)	(0.031)	(0.008)	(0.105)
Choice year × Year FEs	Y	Y	Y	Y
Tenure FEs	Y	Y	Y	Y
Choice year × Officer FEs		Y	Y	Y
Sample	Balanced sample		Full sample	
Observations	4,431	4,431	25,999	25,999

Notes: The unit of observation is the officer-year. In columns 1 + 2, the sample is restricted to officers connected to the Admiralty at some point. If an officer was passed over by a relative – i.e. a relative was in the Admiralty, and chose not to promote – but eventually are promoted to post-captain by a non-relative, we consider the promotion "late". All those who are promoted by a relative are classified as "promoted early". This table reports how performance is related to early vs. late promotion to post-captain during a five-year window around that promotion. *Battle performance* is measured as the number of actions, enemy units destroyed, and captures in a given year. *Cumulative battle performance* is measured as the cumulative number of actions, enemy units destroyed, and captures up to the current year. *Promoted early* is a dummy that is 1 if the officer is chosen for post-captain promotion. *Post* is a dummy set to 1 in the year and the after a officer was promoted to post-captain. Columns [1]-[2] are based on the balanced five-year window sample around the post-captain promotion. Columns [3]-[4] use the full sample. Standard errors (in parentheses) are clustered at the officer-level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 6: Battle performance of connected promotees by Admiralty style

	[1]	[2]	[3]	[4]
	Cumulative battle performance			
Mean of dep. var	2.161	2.161	2.161	2.161
Connected promotee × Post	1.370***	1.692***	1.481***	-0.008
	(0.322)	(0.387)	(0.320)	(0.337)
Merit × Post		-0.031		
		(0.080)		
Connected promotee × Merit × Post		1.224**		
		(0.523)		
Biased promotion × Post			-0.363***	
			(0.077)	
Connected promotee × Biased promotion × Post			-0.607***	
			(0.232)	
War × Post				1.007***
				(0.172)
Connected promotee × War × Post				1.889***
				(0.519)
Year around promotion FEs	Y	Y	Y	Y
Tenure FEs	Y	Y	Y	Y
Officer FEs	Y	Y	Y	Y
Observations	54,101	54,101	54,101	54,101

Notes: This table reports how battle performance for connected promotees is related to Admiralty style. *Cumulative battle performance* is measured as the cumulative number of actions, enemy units destroyed and captures up to the previous year. *Post* is a dummy set to 1 after the officer was made post (and set to 0 otherwise). *Connected promotee* is a dummy set to 1 for officers who were promoted to post-captain while being connected to the Admiralty. *Merit* is the elasticity of performance with respect to promotions by the promoting Admiralty (see Table 3), normalized to a mean 0 and a SD of 1. *Biased promotion* is the gap between connected and unconected officers in promotion rates to post-captain by the promoting Admiralty, normalized to a mean 0 and a SD of 1. *War* is a dummy that is set to 1 for the promoting Admiralties that served during a period of war. The balanced sample includes all post-captains in a five-year promotion window around the year they made post. Standard errors (in parentheses) are clustered at the officer level; standard errors in columns 2-3 are bootstrapped (1,000 repetitions, with values reported in brackets). *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 7: Battle-level performance and connected promotions

Panel A: Fleet and flotilla actions	[1]	[2]	[3]	[4]	[5]
	Captured enemy ship				Lost
Mean of dependent variable	0.139	0.139	0.139	0.139	0.0207
Connected promotee	0.083***	0.081***	0.080***	0.078***	-0.015**
	(0.026)	(0.028)	(0.028)	(0.027)	(0.007)
Ratio ships British fleet/enemy fleet				-0.592***	-0.103
				(0.171)	(0.109)
Ratio guns British fleet/enemy fleet				0.314*	0.083
				(0.161)	(0.108)
Battle-type FEs	Y	Y	Y	Y	Y
Promotion-year FEs		Y	Y	Y	Y
Years-since-promotion FEs		Y	Y	Y	Y
Order-of-battle FEs			Y	Y	Y
Observations	1,959	1,936	1,936	1,936	1,936
Panel B: Single-ship actions	[1]	[2]	[3]	[4]	[5]
	Wins single-ship action			Loss	Draw
Mean of dependent variable	0.669	0.669	0.663	0.0964	0.241
Connected promotee	0.200***	0.231***	0.226***	-0.008	-0.218***
	(0.071)	(0.075)	(0.075)	(0.055)	(0.062)
Ratio guns British ship/enemy ship			0.167***	-0.072***	-0.095*
			(0.056)	(0.022)	(0.049)
Controls		Y	Y	Y	Y
Observations	172	172	166	166	166

Notes: This table reports how the performance of post-captains in fleet, flotilla, and single-ship actions is related to an officer's connection to the Admiralty when promoted to post-captain. In **Panel A**, the unit of observation is the officer-ship-battle. In columns [1]-[4], the dependent variable is a dummy set equal to 1 if the officer successfully captured an enemy ship (and set to 0 otherwise). In column [5], the dependent variable is a dummy set to 1 if the officer's ship was captured or sunk by the enemy. Battle-type FEs distinguish between flotilla and fleet actions. Order-of-battle FEs involve the ship's position in the line (i.e., either vanguard, centre and rear). *Ratio ships British fleet/enemy fleet* is equal to the total number of British ships divided by the total number of enemy ships that were involved in the fleet or flotilla action; *Ratio guns British fleet/enemy fleet* is the total number of guns across all British ships divided by the total number of guns across all enemy ships involved in the fleet or flotilla action. In **Panel B**, the unit of observation is the single-ship action. Winning is defined as either capturing or sinking an enemy ship; losing is defined as being either captured or sunk by the enemy; inconclusive engagements are viewed as a draw. *Ratio guns British ship/enemy ship* is equal to the own number of guns divided by the enemy number of guns. Controls include the year of promotion to post-captain and the number of years since that promotion. Standard errors (in parentheses) are clustered at the officer-level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

A Appendix Tables

Table A1: Determinants of Admiralty turnover

	[1]	[2]	[3]
	Admiralty turnover		
Mean of dep. var	0.306	0.306	0.306
New monarch	0.069	0.080	0.071
	(0.142)	(0.145)	(0.145)
New cabinet	0.255***	0.245**	0.249**
	(0.096)	(0.097)	(0.097)
War time		0.082	0.131
		(0.076)	(0.103)
Performance connected			-0.004
			(0.070)
Performance unconnected			-0.032
			(0.077)
Linear trend	-0.001	-0.001	-0.001
	(0.001)	(0.001)	(0.001)
Observations	160	160	160

Notes: The unit of analysis is the year. Relating Admiralty turnover to political turnover, wars and overall battle performance. The dependent variable *Admiralty turnover* is a dummy that is 1 if either the Admiral of the Fleet or First Lord of Admiralty turned over in the given year, and 0 otherwise. *New monarch* is a dummy that is 1 if a new monarch came into power in that given year, and 0 otherwise. *New cabinet* is a dummy that is 1 if a new cabinet was created and 0 otherwise. *War time* is a dummy that is 1 if Britain is at war in the given year, and 0 otherwise. *Performance connected* is the total number of captures, ships sunk and actions participated for officers connected to the Admiralty, while *Performance unconnected* is the total for those officers unconnected to the Admiralty. Robust standard errors (in parentheses). *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A2: Merit-based promotion by ties to incoming Admiralty (Event study)

	[1]	[2]	[3]	[4]	[5]
	Promoted to post-captain=1				
Mean of dep. var	0.0958	0.0958	0.149	0.0926	0.0957
Cumulative battle performance	-0.001				
year before turnover ($t = -1$)	(0.002)				
$\times$ Post turnover	0.067***	0.065***	0.226**	0.063***	0.063***
	(0.012)	(0.012)	(0.107)	(0.012)	(0.012)
$\times$ Post turnover $\times$ Connected					0.163*
					(0.097)
Year FEs	Y	Y	Y	Y	Y
Tenure FEs	Y	Y	Y	Y	Y
Year-around-turnover FEs	Y				
Officer FEs		Y	Y	Y	Y
Sample	Pooled		Become connected	Remain unconnected	Pooled
Observations	31,145	31,144	592	29,681	31,120

Notes: The unit of analysis is the officer-year. Relating promotion to post-captain to cumulative battle performance around Admiralty turnovers. *Cumulative battle performance year before turnover* is the cumulative combined number of captures, actions participated and enemy ships sunk the year before the Admiralty turnover. *Post turnover* is a dummy that is 1 after the Admiralty turnover and 0 before. *Connected* is a dummy that is 1 if the officer is connected to the Admiralty in a given year. Sample is a balanced 5 year panel around each officer-specific Admiralty turnover event. Robust standard errors (in parentheses) are clustered at the officer level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A3: Alternative measures of battle performance - Selection effect

	[1]	[2]	[3]	[4]	[5]	[6]
	Battle performance				Excluding	
	Baseline	≥ 1	≥ 3	Action	Capture	Sunk
Mean of dep. var	0.146	0.0845	0.0142	0.0995	0.0490	0.144
Connected promotee × Post	0.084***	0.028**	0.012**	0.064***	0.019	0.085***
	(0.026)	(0.012)	(0.005)	(0.023)	(0.012)	(0.026)
Promotion cohort × Year FEs	Y	Y	Y	Y	Y	Y
Tenure FEs	Y	Y	Y	Y	Y	Y
Officer FEs	Y	Y	Y	Y	Y	Y
Observations	52,376	52,376	52,376	52,376	52,376	52,376

Notes: The unit of observation is the officer-year. This table reports how performance is related to connectedness in the year of promotion to post-captain during a five-year window around that promotion. *Battle performance* is measured as the number of actions, enemy units destroyed, and captures in a given year. *Cumulative battle performance* is measured as the cumulative number of actions, enemy units destroyed, and captures up to the current year. *Connected promotee* is a dummy set to 1 if the officer has family ties with the Admiralty in the year of his promotion to post-captain (and is otherwise set to 0). *Post* is a dummy set to 1 in the year and the after a officer was promoted to post-captain. The dependent variable in column [1] is the baseline measure of battle performance. The dependent variable in column [2] is a dummy for whether officer participated in any action, captured or sunk an enemy ship. The dependent variable in column [3] is a dummy if the number of actions, captures or enemy sinking is at least 3 (top 1%). In columns [4]-[6], we separately drop each dimension (action, capture, sinking) from the overall battle performance measure. Standard errors (in parentheses) are clustered at the officer-level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A4: Counterfactual performance of non-commanding officers

	[1]	[2]	[3]	[4]
		Battle performance		
Mean of dep. var	0.309	0.299	0.146	0.661
Connected promotee × Post	0.093*	0.060**	0.084***	-0.013
	(0.052)	(0.026)	(0.026)	(0.034)
Promotion cohort × Year FEs	Y	Y	Y	Y
Tenure FEs	Y	Y	Y	Y
Officer FEs	Y	Y	Y	Y
Imputed performance	n/a	Mean	Top 20%	Top 10%
for non-commanding		0.246	0	1
Sample	Commanding		Full sample	
Observations	24,410	52,376	52,376	52,376

Notes: The unit of analysis is the officer-year. Standard errors (in parentheses) are clustered at the officer level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A5: Descriptive statistics - Fleet/Flotilla actions

	[1] Mean	[2] SD	[3] IQR	[4] Obs.
Enemy ship captured	0.138	0.419	0	1,959
Own ship captured	0.020	0.141	0	1,959
Ship guns	52.18	24.61	42	1,959
Ratio # own ships/ # enemy ships	0.577	0.196	0.268	1,959
Ratio total # guns / total # enemy guns	0.626	0.201	0.316	1,959
Connected promotees	0.207	0.405	0	1,959

Notes: The unit of observation is the officer-ship-battle.

Table A6: Balance table – Single-ship actions

	[1]	[2]	[3]	[4]
	Promoted		Diff	
	Connected	Unconnected	(1)-(2)	Obs.
Own guns	35.91	28.58	7.33***	172
			(2.58)	
Enemy ship guns	31.57	30.49	1.07	166
			(3.05)	
Ratio # own guns / # enemy guns	1.28	1.10	0.17	166
			(0.11)	
Enemy men	268.07	248.70	19.36	128
			(31.95)	
Own capture	0.083	0.088	-0.005	172
			(0.048)	
Enemy capture	0.791	0.556	0.235***	172
			(0.080)	

Notes: The unit of observation is the single-ship action. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

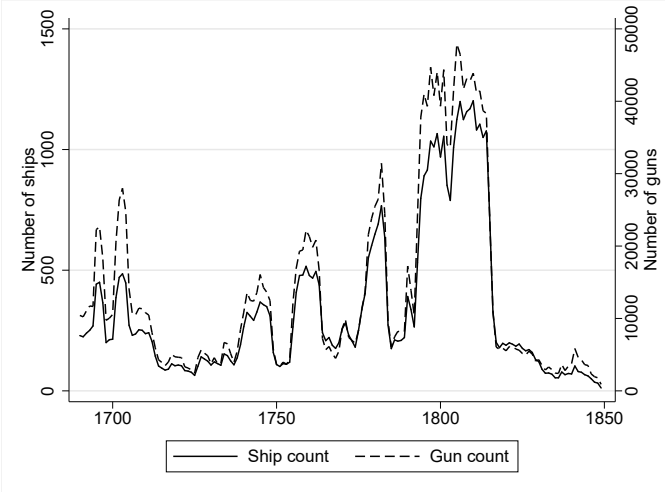
Table A7: More meritorious promotions during wartime

	[1]	[2]	[3]
	Promoted to post-captain=1		
Mean of dependent variable	0.099	0.099	0.099
Cumulative battle performance $t-1$	0.093***	0.072***	0.077***
	(0.009)	(0.011)	(0.010)
Connected	-0.001	-0.022	-0.015
	(0.019)	(0.022)	(0.022)
Cum. battle performance $t-1 \times$ Connected	0.061***	0.060***	-0.008
	(0.021)	(0.021)	(0.032)
Connected $\times$ War		0.035**	0.025
		(0.017)	(0.017)
Cum. battle performance $t-1 \times$ War		0.023**	0.018*
		(0.010)	(0.010)
Cum. battle performance $t-1 \times$ War $\times$ Connected			0.075**
			(0.033)
Year FEs	Y	Y	Y
Officer FEs	Y	Y	Y
Observations	38,179	38,179	38,179

Notes: The unit of analysis is the officer-capture event. Standard errors (in parentheses) are clustered at the officer level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

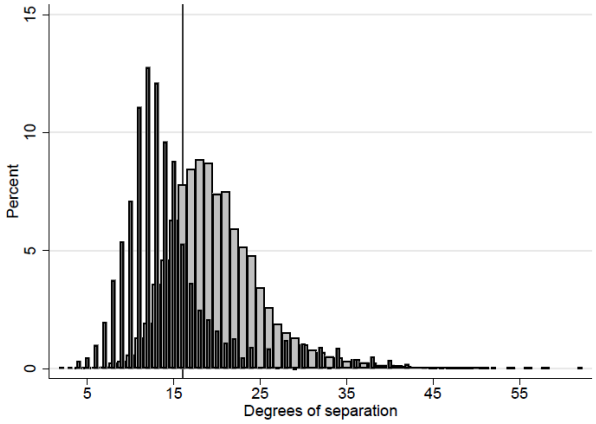
B Appendix Figures

Figure A1: Size and fighting power of the Royal Navy, 1690-1849



Notes: This figure plots the number of British Royal Navy ships and total number of guns over time.

Figure A2: Degrees of separation in the peerage and among naval officers



Notes: The light grey bars indicate the degrees of separation between two randomly chosen people in the peerage dataset; the dark bars, between *connected* naval officers and admirals. The distribution for naval connections is shifted markedly to the left, indicating that naval connections are relatively close. The graph illustrates that 16 degrees of separation indicates relatively close connections.

Figure A3: Promotion hazard rates by connectedness/performance - predictive margins

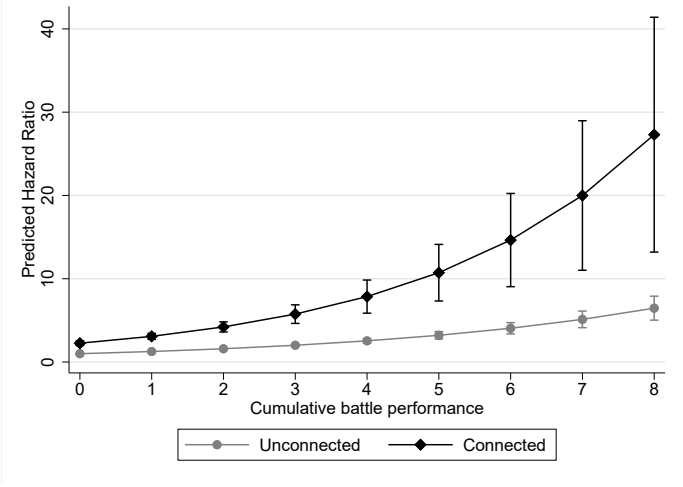
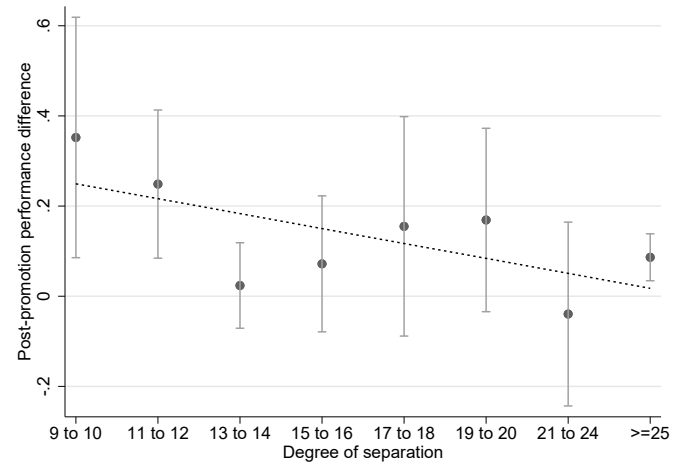


Figure A4: Merit-based promotion to post-captain by ties to Admiralty



Notes: This figure shows the relationship between cumulative performance and promotion to post-captain, broken down by connectedness to the Admiralty. Estimates are relative to the omitted category of no performance. Regression includes officer FEs, tenure FEs and year FEs. 95% confidence intervals. Standard errors clustered at the officer-level.

C Appendix Model Proofs

Proposition 1: Complementarity in performance and connections. *The link between promotion and performance is stronger for those agents who are connected to the principal:* $\frac{\partial E[U|g,j=1]}{\partial g} > \frac{\partial E[U|g,j=0]}{\partial g}$.

Proof: Using Equation (1) to differentiate with respect to g, we obtain

$$\frac{\partial E[U|g,j]}{\partial g} = \frac{\sigma^2}{\sigma^2+\sigma^2_{\varepsilon j}} \tag{4}$$

$$\frac{\partial E[U|g,j=1]}{\partial g} - \frac{\partial E[U|g,j=0]}{\partial g} = 1 - \frac{\sigma^2}{\sigma^2+\sigma^2_{\varepsilon 0}} > 0 \tag{5}$$

Here we use $\sigma^2_{\varepsilon 1} = 0$ (Assumption 2) and the inequalities $0 < \frac{\sigma^2}{\sigma^2+\sigma^2_{\varepsilon 0}} < 1$.

Proposition 2: Performance and promotions. *In the absence of bias, connected promotees outperform unconnected promotees on average. The positive performance gap between connected and unconnected promotees declines as bias increases. Although connected promotees outperform unconnected promotees if bias is sufficiently small, there is a threshold* $b > \bar{b}$ *above which connected promotees underperform relative to unconnected promotees.*

Proof: By Equation (1) and Assumption 2 ($\sigma^2_{\varepsilon 1} = 0$), the principal will promote the connected agent over the unconnected agent only if $E[U|g,j=1] > E[U|g,j=0]$

$$g + b_1 > \frac{\sigma^2}{\sigma^2+\sigma^2_{\varepsilon 0}} g + \left(1 - \frac{\sigma^2}{\sigma^2+\sigma^2_{\varepsilon 0}}\right)\mu_0 \tag{6}$$

$$g > \mu_0 - \frac{\sigma^2+\sigma^2_{\varepsilon 0}}{\sigma^2_{\varepsilon 0}} b_1 \tag{7}$$

No-bias benchmark: Let $b = 0$ in Equation (7). In that case, the principal promotes connected agents only if their performance exceeds the average of unconnected agents.

We can use Equation (7) to write the expected difference between the performance of

connected and unconnected agents as

$$E[g|g > \mu_0 - \frac{\sigma^2 + \sigma^2_{\varepsilon 0}}{\sigma^2_{\varepsilon 0}} b_1, j = 1] - E[g|j = 0] \tag{8}$$

$$= -(\mu_0 - \mu_1) + \sigma \frac{\varphi\left(\frac{(\mu_0-\mu_1) - \frac{\sigma^2+\sigma^2_{\varepsilon 0}}{\sigma^2_{\varepsilon 0}} b_1}{\sigma}\right)}{1 - \Phi\left(\frac{(\mu_0-\mu_1) - \frac{\sigma^2+\sigma^2_{\varepsilon 0}}{\sigma^2_{\varepsilon 0}} b_1}{\sigma}\right)} \tag{9}$$

here we use that the sum of two normally distributed random variables $g = a + \varepsilon$ is distributed as $N(\mu_j, \sigma^2 + \sigma^2_{\epsilon 0})$, with $\sigma^2_{\varepsilon 1} = 0$ (Assumption 2). Setting $b = 0$ now yields

$$E[g|g > \mu_0, j = 1] - E[g|j = 0] = -(\mu_0 - \mu_1) + \sigma \frac{\varphi(\frac{\mu_0-\mu_1}{\sigma})}{1 - \Phi(\frac{\mu_0-\mu_1}{\sigma})} \tag{10}$$

which is always positive given that $\mu_0 \geq \mu_1$ (Assumption 1) and the inequality $\frac{\varphi(z)}{1-\Phi(z)} > z$ for $z = (\mu_0 - \mu_1)/\sigma$.

Positive bias: We start with the Equation (9). If $b_1 \to 0$ then we are back to the first best, where connected agents weakly outperform unconnected agents in expectation (Proposition 1). If $b_1 \to \infty$, then the performance gap will be $-(\mu_0 - \mu_1) \leq 0$ (Assumption 1). Since Equation (9) is a continuous function and is also monotonically declining in b_1, there must be a threshold $\bar{b}$ below which connected promotees outperform and above which they underperform.

D Promotion speed by connectedness - Hazard model

To demonstrate statistically the strength of the additional effect of performance on promotion for the connected officers, we estimate the determinants of the time to promotion using a standard Cox proportional hazard model:

$$D_{it} = D_o(t) exp(\alpha c_{it} + \beta q_{it} + \gamma P_{it} \times c_i t) + \varepsilon_{it} \tag{11}$$

In this expression, D_{it} is the risk of promotion and $D_0(t)$ is the baseline hazard function evaluated at year t (i.e., the baseline likelihood of promotion); α measures the effect of being connected (c_{it}), and β the effect of performance (q_{it}), again defined as the cumulative

number of actions and captures; and γ, the coefficient of interest, captures the added effect of performance on promotion prospects for connected officers. Figure A3 plots – separately for connected and unconnected officers – the promotion hazard rates as a function of cumulative performance. Better performance translates into faster promotion, and especially so for Admiralty-connected officers. The crucial question in our setting is whether performance *paid off more* for connected than for unconnected officers. Since the effect of γ depends on P_{it}, it follows that the interaction's significance cannot be determined by looking at its t-statistic. Instead, we calculate the conditional marginal effect of being connected as a function of performance. Figure A3 presents the result by plotting $\frac{\partial D}{\partial C}$. The higher the performance, the greater the derivative of promotion with respect to connectedness. Thus the *additional* increase in promotion prospects is always higher for connected officers and increasing with the number of enemy actions and captures. The magnitude of the effect also grows; with even a single event it is already above unity (lower bound = 1.38), and it then increases thereafter with every extra step on the performance scale.