

Learning Against the Wind: Diversity and Performance on the Ships of the Dutch East India Company *

Filippo Carlo Wezel
USI Lugano (Switzerland)

Martin Ruef
Duke University

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Abstract

Learning is of paramount importance to organizations, often hinging on the accumulation of experience among workers. The returns from experience, however, are far from certain in large groups, marked by complex interdependencies and composed by a demographically diverse workforce. How do organizations manage to learn and improve their performance under these conditions? We claim that the standardization of work practices and procedures provides two key advantages. First, it magnifies the positive returns that a unit reaps from the experience of its workers. Second, standardization anchors the accumulated experience of workers to organizational routines that transcend the individual units in which they have worked. Increasing experience eases coordination among workers and attenuates the negative effects of diversity on a unit's performance. We test these arguments using data tracking the composition of ship crews in the Dutch East India Company (VOC), an organization that witnessed significant efforts at standardizing work practices and procedures in the face of increasing national diversity. We find preliminary support for our hypotheses from analyses of the time to completion of 2,200 voyages to Asia during the period between 1700 and 1796.

Keywords: Performance, Organizational Learning, Workforce Diversity

Introduction

Learning is essential to the performance of organizations. Much of the discussion on learning has centered on experience and the way in which knowledge is encoded, stored, and retrieved (see Ren and Argote, 2011). Small groups and teams have been investigated extensively with the aim of exploring the processes that encourage or hinder learning (for a review see Argote 2013). Scholars have noted that a homogeneous workforce achieves coordination more readily (Ophir et al., 1998), whereas shared experiences and routines promote knowledge transfers across teams and small units marked by limited complexity (Reagans et al., 2005; Darr et al., 1995). Learning is also facilitated by the existence of group structures characterized by centralized communication that improves resilience to turnover (e.g., Argote et al., 2018).

Although insightful, this body of research has left several questions unexplored. One of them concerns the fact that organizational strategies are structured around larger units and complex interdependencies among workers that have only limited parallels within small groups or teams. It remains unclear how organizations continue to improve their performance in those contexts, particularly when demographic diversity is not under the management's control and workers have few shared experiences (for a review, see Williams and O'Reilly, 1998). Under those conditions, we propose that the standardization of work practices and procedures provides two interrelated benefits to larger units. First, it ensures returns from the experience accumulated by the workforce, even when that experience is not shared directly among workers. Second, the consistency and reproducibility of practices and procedures helps soften demographic differences and may attenuate the negative consequences of diversity on a unit's performance.

Our paper tackles these questions by leveraging data concerning the operational performance of the ships of the Dutch East India Company (*Vereenigde Oostindische Compagnie*, henceforth VOC) from 1700 to 1796. During this time period, the VOC was confronted with increasing problems related to the shortage of labor. The solution to the problem was to extend the geographic scope of hiring and to tap into new pockets of the labor market (Sgourev and van Lent, 2017; Wezel and Ruef,

2017). In parallel, the VOC standardized the design and operations of its ships. This effort was particularly pronounced during the early decades of the eighteenth century (Guy, 2012). Did the VOC's efforts at standardizing ship design and work procedures help the company leverage the experience accumulated by its workforce to improve the performance of its ships? Additionally, did the positive effect of experience serve to overcome the challenges posed by increasing national diversity onboard? The results of our analyses suggest that the returns from workforce experience were higher when standardization was increasing and contributed to improve the performance of VOC ships, measured as the time taken to reach Asia. Moreover, by anchoring workers to organizational routines and practices that transcended individual units, standardization provided the workforce of the VOC with a shared mindset that addressed the coordination problems elicited by national diversity. This pattern of organizational learning was less obvious during times in which standardization was decreasing.

The pros and cons of our historical data merit some attention. On the one hand, the size and complex interdependencies observed on board of its ships make the VOC potentially comparable to modern-day organizations. Given the magnitude of the endeavor, the diverse workforce, the high turnover, and the need for coordination via information sharing (Hwang et al., 2015; Botelho, 2018), the VOC can be seen as similar to contemporary global organizations in search of ways to improve cross-cultural understanding among employees (Huber and Lewis, 2010). On the other, the use of historical data prevents us from observing the fine-grained learning processes described by the team literature. Moreover, the translation of the results to modern-day firms should be done with care. The high mortality observed onboard, as well as low levels of education and experience among the workers, have only limited parallels in today's workforce.

Notwithstanding these limitations, testing our arguments in this historical setting provides several methodological advantages, particularly with respect to the study of the consequences of national diversity. In modern organizations, a host of factors contribute to the sublimation of national identities. English is used as the lingua franca and employers keep religion out of the workplace. By

contrast, the characteristics of our historical case, marked by linguistic, religious, and cultural tensions, make it insightful for the study of the effects of these differences on a unit's performance. In addition, the nature of work on ships, conditioned by physical isolation, allows us to exclude several confounding effects with respect to learning and performance. By and large, we believe that the results of our analyses extend beyond the historical case of the VOC and illustrate how organizations may continue to learn in the face of (i) complex problems of coordination; and (ii) increasing national diversity among workers. The concluding section of the paper discusses the contributions of our research to the strategy literature.

VOC Ships in the Eighteenth Century

The Dutch East India Company (*Vereenigde Oostindische Compagnie*) was founded in the Dutch Republic in 1602, organized around six chambers located in various cities. The trade of the VOC with Asia quickly blossomed thanks to the monopoly granted by the Dutch government on the long-distance shipping of spices. While the company thrived during the seventeenth century, it gradually lost momentum over the eighteenth century in the face of shifting demand toward commodities outside the spice trade (e.g., tea and coffee), increasing competition from its English East India rival, and high fixed costs (Bruijn, 2011). During the seventeenth century, “the yields from auctions were equivalent to three times the purchase prices of the goods”, but the margins became much slimmer later on (Gaastra, 2003: 148). Enormous financial costs and new market preferences required that the company react to novel opportunities, particularly in the second half of the eighteenth century. Ultimately, these challenges proved too great for the VOC. A debt of 119 million guilders in 1796 led the state to nationalize the firm the following year (Gaastra, 2003).

The personnel needs of the VOC in the eighteenth century became massive and the difficulties in managing these employees further added to the company's problems. By then, “the VOC was the largest trade and shipping company in the world, with, in Asia alone, more than 20,000 European and Asiatic employees” (Morzer Bruyns, 1992: 143). The length of the voyage and the harsh conditions

on board were responsible for recurrent conflict, particularly among sailors and soldiers who originated from various nationalities (Worden, 2009). Diseases also spread rapidly on board and when arriving in Asia. As a result, only one out of three people were able to come back to the Netherlands (Bruijn, van Eyck and Heslinga, 1984). Beyond violence and disease, desertion further contributed to the lack of a stable workforce within the VOC (Wezel and Ruef, 2017). To attenuate this problem, the VOC was vigilant “in punishing its own servants for crimes, particularly desertion” (Ward, 2009: 44).

Recruiting new employees became an increasingly challenging task for each chamber that was responsible for equipping a ship and enlisting its crew (Gaastra, 2003). Kinship ties had traditionally played a major role in the hiring of seafarers. By the eighteenth century, however, the company’s workforce needs could no longer be satisfied via patrimonial networks that provided valuable interpersonal trust and normative bonds among seafarers. Because of high mortality rates, desertion, and resettlement, the local labor market was progressively drained (Bruijn, van Eyck and Heslinga, 1984). A scarce labor supply exacerbated the company’s need to recruit new European seafarers within an expanding geographic zone that included the German states, Scandinavia, England, France, and central Europe (van Lottum et al., 2011).

As a result, VOC ships witnessed a substantial growth of foreign employees during the eighteenth century (Sgourev and van Lent, 2017), much more so than the English East India Company, the company’s major competitor (van Lottum, Lucassen and van Voss, 2011). The complex interdependencies on board made experience a fundamental component of productivity however (van Lottum and van Zanden, 2014). For instance, “the combined, synchronized work at the capstan [a rotating machine used on sailing ships] reinforced the need for collective effort without regard to differences of pay or experience among the hands” (Guy, 2012: 177). The relevance of experience for ship performance was true at every level of the hierarchy. Foreigners, especially those with their first experience on VOC ships, often lacked such skills and were ill-prepared for the voyage (Sgourev and van Lent, 2017).

Standardization of Ship Design and Operations at the VOC

The difficulties created by an unstable and increasingly diverse workforce called for a number of organizational changes aimed at sustaining organizational learning. The philosophy of the VOC leadership became oriented toward reducing “the most complex machine of the epoch to a book-keeping shorthand, in which ships and their crews could be understood as exchangeable logistical elements in the Company’s business” (Guy, 2012: 54). Standardizing a ship’s architecture and functioning was vital to this aim. In the eyes of the top managers of the company (the *Heren XVII*), standardization provided various advantages, from coping with a culturally diverse workforce to improving the timeliness of ships. Indeed, “speed was critical to success in intercontinental trade – [requiring] faster voyages to better meet market demand and to limit the loss of perishable goods” (Bruijn et al., 1987; Sgourev and van Lent, 2017: 9).

A push toward standardization and rationalization also came from the VOC shareholders, who were increasingly concerned about reduced profits in the eighteenth century (Guy 2012). In 1701, building on the lawyer Pieter van Dam’s service with the VOC, a treatise called the “*Description of the Company*” was published. This book went to great lengths in outlining “the Company’s holdings and factories, its trade goods and assets, the terms of its charter and by-laws, and its shipping and shipbuilding; it offered a complete manual for VOC operations” (Guy, 2012: 110). Considerable energy was directed at standardizing the physical form of the ships, through the establishment of a centralized production site nearby Amsterdam and the declaration of standard sizing of ships in 1697 (de Jong, 2010; Guy, 2012). This classification system not only defined the scale of the ships, but also “standardized in detail the positions of the masts, the dimensions of all sorts of parts, the size of the sails, the size of the anchors, and the amount of ropework, and even the type of wood that should be used for different parts” (de Jong, 2010: 21-22). Other changes were directed at improving the utilization of space onboard, reducing the area occupied by armaments and rationalizing working and living spaces. In the early 1740s, the VOC’s top colonial administrator, Gustaaf Willem van Imhoff, proposed further improvements in the construction of the ships and called for the use of technical

drawings to ensure the replicability of designs (Guy, 2012). The English shipwright Charles Benthams, the architect of this redress, introduced three new ship types, namely the 150, 138, and 120 foot-long vessels (Gawronski, 1990). From 1742, “the master shipwright at all yards of the VOC had to construct the *retourschepen* [ships designed to travel to Asia and return to Holland] using prescribed and predetermined frames” (de Jong, 2010: 74)

Formalization in ship design and operations also increased under Governor-General van Imhoff. Officers’ job titles were changed (i.e., captains, lieutenants, and cadets, rather than commanders and mates) in the hope of recruiting naval officers (Bruijn 2011) and of regulating behaviour on board through naval hierarchy (Wezel and Ruef, 2017). The *Académie de Marine* (a naval academy) was created in Batavia in 1743, while the *Zeemanscolleges* (Seaman’s Colleges) were founded in 1749 in Rotterdam. The naval code of discipline (‘Artikelbrief’, or *Article-Letter*) grew in size, reaching 121 articles in 1742 (Bruijn, 2011). Rules and procedures allowed the formalization needed by the VOC to socialize and train future seafarers. First and second mates had to sit through an examination to prove their knowledge of instruments and techniques for navigating the high seas. The last chamber to put this requirement into place was Rotterdam in 1737 (Bruijn, 2011). An increasing reliance on documents, procedures, and rules in the VOC was instrumental in reducing the discretion of its servants and curtailing the autonomy of its masters.

Thanks to these changes, standardization of the VOC reached its culmination in the 1740s (de Jong, 2010). However, a number of van Imhoff’s initiatives (i.e., the change of job titles and opening of officer’s schools) were revoked soon after his death in 1755 (Bruijn 2011). New experimentation also initiated as “local master shipwrights started tinkering with the official design of the *retourschip* and used it to regain some initiative” (de Jong, 2010: 123; Guy, 2012). A three-decker conversion of the standard ship, for instance, was also constructed by the yard of Middleburg and sailed in 1764. Other yards like the one of Rotterdam had already implemented a few local adaptations to the standard designs before this date. The financial difficulties faced by the VOC in the 1770s and 1780s inevitably toned down organization-level coordination and standardization, led to the introduction of new and

specialized ships, and reduced the importance of standardized vessels. As a result, de Jong concludes that “the network surrounding the *retourschip* might have been on the brink of breaking up into separate networks, each geared to a specific type of more specialized ships” (2010: 123). Similarly, the lack of manpower required that the VOC become more lenient in managing its seafarers on board. While the code of discipline remained largely untouched, the enforcement of the rules got diluted (Wezel and Ruef, 2017).

This brief overview suggests that the VOC promoted organizational standardization during the eighteenth century. Two distinct periods are discernable however: one marked by *increasing* standardization (i.e., from 1700 to 1755); and another by *decreasing* standardization and local experimentation (from 1756 to 1796). We leverage the variance in intensity across these two periods to understand how much the standardization of ship design and work procedures helped the VOC (a) reap the benefits of workforce experience, even when it was not shared directly among workers and supervisors; and (b) employ such experience to overcome the challenges posed by increasing national diversity onboard.

Theoretical Background and Hypotheses

Within the VOC, the long time required to reach Asia and the high mortality rate reduced to a minimum the possibility of maintaining an intact group of seafarers across journeys, eventually diluting some of the preconditions of learning (Earley and Mosakowski, 2000; Reagans et al., 2005). Working within a stable group increases knowledge of the skills and competencies of each member. Under conditions of unstable membership and the presence of a diverse workforce, it becomes significantly more difficult to learn and coordinate efforts among workers (Huber and Lewis, 2010; but also see Argote, Aven, and Kush, 2018).

National diversity on board VOC ships exposed the crews to coordination challenges, decreased social solidarity, and lower interpersonal trust. Did standardized work processes and procedures allow the company to continue improving from experience? Our conceptual argument is

organized in three hypotheses. First, we review the pitfalls created by national diversity on a unit's performance and introduce our baseline hypothesis. Second, we note how the standardization of work processes and procedures sustains learning by magnifying the returns from experience and allows the transfer of knowledge across units. Third, we elaborate how higher workforce experience serves to attenuate the harmful performance consequences of differences in culture and language among workers. We expect the baseline hypothesis (H1) to hold under both periods marked by different levels of standardization. The same is not true for the other two hypotheses (H2 and H3), which are more likely under *increasing* than *decreasing* standardization.

National Diversity and Unit Performance

Culturally homogeneous groups tend to outperform heterogeneous counterparts and face fewer struggles in learning (Watson et al., 1993; see also Argote, 2013). While this generalization has been debated for creative outcomes, idea generation, and the introduction of healthy variance in group decision-making (Phillips et al., 2009; see also Levine et al, 2019), it has received considerable empirical support in the case of routinized tasks and operational performance (for a review see Williams and O'Reilly, 1998).

When considering operational outcomes, scholars often point to two mechanisms as responsible for the existence of a negative relationship between national diversity and group performance. First, national diversity decreases the social integration of individual workers. The premise lies in the principle of homophily: people socialize with others with whom they share common life experiences and values, while they are less likely to bond and communicate with dissimilar others. Homophily feeds cohesiveness, defined as "the degree to which members of the group are attracted to each other" (Staw, 1981: 213), and increases the communication and emotional involvement of group members (DiTomaso et al., 2007). Second, social identity theory (Tajfel, 1981; Turner, 1987) suggests that people use social comparison to define themselves. Such a process of self-categorization requires the use of salient and relation-oriented characteristics, such as nationality.

Under the premise of membership in a positively-valued category, an individual maximizes the differences between her group and that of others. In-group and out-group heuristics impact the perception and behavior of an individual by reducing the level of trust and cooperation with outside members (Williams and O'Reilly 1998; Pelled, Eisenhardt and Xin, 1999). Notwithstanding various qualifying conditions, both mechanisms point to a negative effect of national diversity on performance (Stahl et al., 2010).

These theoretical arguments have been applied primarily to small groups and top management teams. A similar understanding of the functions and dysfunctions of larger units composed by diverse nationalities nevertheless remains preliminary. In fact, surprisingly little research on diversity has been carried out at a higher level of analysis than groups or TMTs (Jackson et al., 2003) and the limited existing evidence “is far from being clear” (Joshi et al., 2011: 531). We contend that the communication, trust, and social categorization problems associated with demographic diversity will be heightened in the context of larger groups. Social categorization represents a cognitive shortcut that individuals are especially reliant on within these complex organizations (Taylor, 1998). The workers observed in larger units are organized through a division of labor that often sorts them together by nationality. In the presence of interdependencies, this division of labor may exacerbate cross-cultural misunderstandings, distrust, and communication problems among workers. Therefore, we propose that national diversity hampers the operational performance of a unit.

This was likely to be the case on board VOC ships, especially when considering national differences among crewmembers. While it may seem anachronistic to talk about nationalities in the eighteenth century, historians (e.g., Anderson, 2004; Hobsbawm, 2012) have recognized the emergence of proto-nationalism during this period, “refer[ing] to feelings of collective belonging that are potentially congruent with modern nations” (Lunsford, 2005: 259-260).¹ National differences

¹ This was particularly true among the Dutch who had already developed national consciousness. As Lunsford (2005: 72-74) notes: “the Netherlands’ particular history—most significantly, its revolt against Spain—occasioned the creation of a national spirit that unified and motivated Dutch men and women throughout the seven member provinces.”

were salient in numerous ways on VOC ships. For instance, nationality served to channel seafarers into different careers: the Dutch were most common among the seamen, whereas the Germans were most common among the soldiers. Even within the same career, nationalities and religion played a substantial role in the structuring of work teams, known as *baks* (Guy, 2012). Such distinctions created a problem because on VOC ships, unlike merchant naval ships, seamen and soldiers were interdependent as “soldiers were obliged to undertake watch duty and occasionally other tasks on board” (Worden, 2016: 18). As a result, national divides were salient to seafarers and reinforced by differences in career, language, and religion. Not surprisingly, the relationship across nationalities was conflictual and rivalries “were both spontaneous and ritualised” (Worden, 2016: 18), foreigners played a dominant role in mutinies (Bruijn et al., 1980), and masters were aware of the difficulties of managing a nationally diverse crew (Roepers and van Gelder 2002, as cited in Sgourev and van Lent, 2014). Building on this argument, we propose that national diversity negatively affects the operational performance of a unit by reducing cohesiveness and increasing the potential for conflict among workers.

Hypothesis 1 (Baseline Prediction, Period Independent): The higher the national diversity of a workforce, the lower a unit's performance.

The Consequences of Standardization on Returns from Experience

Learning from direct experience is a strong driver of performance improvements (e.g., Argote and Darr, 1990; Baum and Ingram, 1998) and worker experience positively affects the performance of individuals (Thorndike, 1898) and teams (Pisano et al., 2001). Reagans and his colleagues (2005), for instance, showed that both team-specific and shared experience improved the performance of surgical teams. Similar results were also obtained experimentally by Gino and colleagues (2010).

Capturing the returns from workers' experience in larger and less stable units is difficult though. The existence of complex interdependencies and the larger scale of the group dilute the

efficacy of individual experiences and challenge the transfer of knowledge across workers. Shared experience is also reduced by turnover. When confronted with these problems, the standardization of work practices and procedures may be particularly valuable in helping organizations reap the returns from workforce experience. Three main reasons justify this claim. First, standardization allows workers to focus on the 'big picture', constructing mental models that overlap and are more useful in their specific task environment (Huber and Lewis, 2010). Second, it improves communication among workers, empowering them with a shared vocabulary that is more likely to be understood by other members. Finally, standardization of work processes and procedures also facilitates coordination, by allowing workers to anticipate the behaviors and actions of their peers.

Standardization therefore magnifies the returns that organizations obtain from the experience of their workforce by facilitating transfers of experience among workers within the same unit and across units. In fact, while the knowledge embedded in a specific context rarely transfers, the knowledge embodied in routines does. This conclusion was apparent from Argote and Darr's (2000) study of a pizza franchise company that replicated its formula across locations via standardized procedures. Thanks to its encoding into routines, local learning was transferred through locations and across franchises. Embedding knowledge in routines and standardized procedures allows organizations to preserve the gains from the accumulated experience of their workers (Rao and Argote, 2006; Ton and Huckman, 2008). Due to their complex interdependencies, larger units are even more likely to benefit from this approach.

As mentioned before, standardization in the VOC encompassed both ship-building and work practices on board. The Company established shipyards at Oostenburg near Amsterdam, the biggest manufacturing facility in Europe at the time of its construction. The leadership of the VOC soon realized that organized labor on its ships had much in common with the functioning of a factory due to the regular pace of work and the repetitive nature of several tasks (Guy, 2012; also de Jong, 2010). Building on this premise, vast efforts were dedicated by the VOC in the early decades of the eighteenth century toward rationalizing "spaces and occupants, replacing an order reliant on the

traditional skills of well-rounded, experienced seafarers with one composed of discrete operations that could be conducted by industrial workers” (Guy, 2012: 219). Thanks to the standardization of space and ship operation, the value of workforce experience transcended individual VOC units and extended to seafarers within the lower ranks.

Because standardization at the VOC was on the rise during the first half of the eighteenth century, we propose that the positive returns from workforce experience were accentuated during that period:

Hypothesis 2: The experience accumulated by workers provides greater improvements in a unit’s performance in times of increasing standardization.

The Moderating Effect of Experience on the Negative Consequences of National Diversity

Coordination and information integration are necessary to improve the performance of large units, but they are difficult to achieve in the face of social categorization and cultural biases. The consistency and reproducibility of practices and procedures obtained via standardization eases communication, prompts shared mental models, and facilitates coordination among workers (see also Huber and Lewis, 2010). These conditions make the value of experience more salient to the workforce, thereby downplaying categorical information (which hinges on whether employees belong to the same or to a different category, see Hwang et al., 2015). Existing research confirms that improved cross-understandings among workers benefit cohesion and decision-making quality (Hutzschenreuter and Horstkotte, 2013). Under standardization, experience is more salient and transferable across employees, and thus holds the potential of attenuating the negative effect that national diversity exerts on a unit’s performance.

The interdependent, complex, and synchronized work processes on VOC ships made the role of coordination among workers particularly important. Yet, it was difficult to achieve in the presence of national divides. A more experienced workforce benefitted coordination in several ways. For

instance, “membership of a *bak* [work unit] that contained experienced mariners or junior officers could carry various advantages, including better treatment from the officers, protection from victimization and greater potential for training and promotion” (Guy, 2012: 225). Under standardization, an experienced crew was more likely to establish a climate of generalized trust that endowed a ship with cohesiveness and lower levels of interpersonal conflict among workers. Increasing experience allowed crews to more easily reconcile opposing views of members and provided them with common values and goals. By anchoring workers to organizational routines and practices that transcended specific ships, an experienced crew was also more capable of addressing the various challenges related to differences in social origin or tradition.

We therefore predict that the level of experience among workforce members attenuates the negative effects of national diversity on a unit’s performance during times of increasing standardization.

Hypothesis 3: The level of experience accumulated by workers attenuates the negative effect of national diversity on a unit’s performance in times of increasing standardization.

Data, Measures, and Method

Data

To test our hypotheses, we make use of data on VOC sea-voyagers compiled by the Dutch National Archives (Nationaal Archief, 2008). The database provides information about almost every ship (i.e., unit) and seafarer involved in outbound voyages to Asia during the period 1700-1796 (see Bruijn, Gaastra and Schöffner, 1987). The data were compiled from two different sources of information. First, the logbooks provide information concerning each voyage, including the year of the voyage and exact date of departure and arrival. Second, information about individual seafarers is obtained from the ship’s pay-registers. About 95 percent of the pay-registers have been preserved (Bruijn, 2011). The database covers 2,726 voyages to Asia during this period, 2,413 of which (about 88%) targeted

Batavia (i.e., Jakarta). To avoid heterogeneity across destinations, we focus our analyses on 2,200 voyages involving this port.²

On Board VOC ships

Aside from some functional differences (i.e., lighter ships for intra-Asia trading and bigger ones for outward voyages), the organization of seafarers on board VOC ships was relatively standardized during the eighteenth century. The division of labor and hierarchy were particularly important to ensure the smooth functioning of a ship. Moreover, because of limited space and leisure time, work at sea was often described as “virtual incarceration and assimilation into a regimen of despotic discipline and authority” (Rediker, 1989: 159).

Responsibility for navigation and for carrying out the master’s orders rested with the master and his mates who were responsible for commanding the shift and overseeing the functioning of the ship, organized around watches (see below). The master was responsible for keeping the logbook. The first mate held primary responsibility for navigation; the second and third mates were responsible for the sails. Carpenters, boatswains, ship gunners, stewards and surgeons enjoyed authority inherent in their specialties.

The operational activities of the ship revolved around labor, food, order, and maintenance and were coordinated by the petty officers (for more details see also Wezel and Ruef, 2017). As for labor, every sailor and soldier was allocated to shifts of seven men (called *baks* or quarters). The quarters were assigned to watches. Each watch lasted for four hours and the day was composed by six watches. The watch was managed by a boatswain (or one of his mates), the quartermaster (an expert seaman with no special training), and three seamen (knowledgeable of the rigging and the sails). Food was offered twice a day and managed by the steward (who kept track of all the food supplies on board) and by the cook. The master-at-arms was in charge of order and of the dispensation of punishments.

² The decreased number of observations included in our final database is due to missing information on the master or on the ship (e.g., yard of origin). We also excluded those few journeys involving only regiments.

Maintenance was in the hands of several specialists. The cooper supervised the opening and closing of barrels. The carpenter took care of the maintenance of the ship and of the boats. The master of weapons took care of the canons and the ammunition. The surgeon was given the task of medical care.

National differences reinforced these occupational distinctions as they channelled seafarers towards specific positions (e.g., Germans were more likely to be soldiers; Dutch mostly seamen). They acted as a centripetal force for sorting seamen into *baks* and as a centrifugal one when pitching seafarers against each other. Frequently, the divide across nationalities was based on language or religion. The Dutch language had already acquired its distinctiveness from German, having dropped the original Germanic case system by the end of the sixteenth century (Lass, 1990). Nonetheless, language was more likely to be an issue for French and British seafarers than for many Germans, especially those originating from north-western states (whose dialect did not differ much from Dutch). For the average German, the main source of discrimination in career progression tended to involve religion, because the official religion of the VOC was a Dutch Reformed branch of Protestantism (Tzoref-Ashkenazi, 2015). Lutherans were increasingly tolerated by the end of the eighteenth century, but Catholics continued to be much less welcome. The difficulty in managing religious tensions on board is witnessed by the rules and regulations dedicated to this topic in the *Artikelbrief*, in particular concerning the abuse of God's name and the avoidance of religious disputes.

Whether due to communication difficulties or religious differences, the increasing number of foreigners on VOC ships during the eighteenth century brought new challenges to the company (Bruijn, Gaastra and Schöffer, 1987; Sgourev and van Lent, 2017; van Lottum and van Zanden, 2014). Given the need for synchronized and collective work on each ship, physical proximity and mutual job interdependencies exacerbated national divisions. Punishment was seen as a necessary tool among officers, otherwise "their own lives would certainly not be safe for a moment among that unruly rabble" (Dash, 2002: 89-90). Experience with the VOC became increasingly important because only a small proportion of seafarers enlisted more than once (Guy, 2012).

Measures

Dependent Variables. The test of our hypotheses requires a performance-related variable for each unit. We rely on the premise that organizational learning can be proxied by the reduction in time to perform a given task (e.g., Thorndike, 1898; Reagans et al., 2005). We build on this logic and measure *ship performance* as the number of days between the date of departure from the Netherlands and the date of arrival in Batavia for each ship. Voyage times were a fundamental metric for all the East India Companies, as a matter of taking advantage of commercial opportunities, minimizing risk and costs, and imposing sovereign rule on territories half a world away from Europe (e.g., Stern, 2016; Sgourev and van Lent, 2017). The mean voyage length of about 240 days observed in our dataset is close to the value provided by other authors (Gaastra and Bruijn, 1993). Due to the presence of a few outliers, we logged this variable.

Key Independent Variables. To construct our key measure of *national diversity* at the level of each unit (i.e., each ship) we followed two steps. First, we assigned every city of origin included in our dataset to one of the six following regions: Netherlands, Germany, Scandinavia, France, England, and others.³ Comparing measures of diversity, authors in different fields have concluded that the Simpson index is one of the most reliable options available (Magurran, 2003). The index for the s th ship included in our dataset in a given year t can be formally represented as:

$$SI_{s,t} = \sum_{r=1}^6 p_r^2,$$

where p_r is the proportion of individuals from the r th region. The variable ranges between $1/6$ (maximum diversity) and 1 (no diversity). When subtracting it from 1, the reverse logic applies as increasing values of the measure point to greater national diversity. A vast body of research in economics, sociology, and management has employed this measure to assess the effects of diversity,

³ The residual category “others” is observed in about 5% of our observations and includes cities located in regions such as Switzerland, Malta, Italy, and Spain. Britain and France, while small in seafarer numbers, are kept as separate categories because of their conceptual relevance, both as competitors of the VOC and in relation to potential language barriers. A measure of diversity that focuses only on variations in the percentage of Dutch, Germans, and Scandinavians has a 0.99 correlation with the one used in this paper.

often labelling it as the Blau index. This variable is used to test Hypothesis 1. We expect its negative effects to be period-independent.

Table 1 reports the distribution of values of the index across the two periods under investigation. The variance observed in Table 1 over time is primarily due to the labor market shortage faced by the VOC, which was increasingly unable to sustain its growth via the Dutch national market (Sgourev and van Lent, 2017). The exogenous shock of the labor shortage, in conjunction with nature of the hiring process, ensured little control over the level of national diversity observed on board. In fact, even masters had little impact on the recruitment of their crew, as hiring was the chambers' responsibility. While not ruling out endogeneity completely, these unique characteristics of our case reduce such concerns.

 Insert Table 1 about here

Our arguments about experience required us to track the career of each of the half-million seafarers in the VOC database (Nationaal Archief, 2008) and calculate the number of times they had travelled to Asia before the current trip. To measure the level of workforce experience, we summed the individual number of trips of the crewmembers and divided the result by the number of crewmembers. In so doing we created a measure of the *average experience of the whole crew*. We computed this variable as follows:

$$AverageExperienceWholeCrew_T = \frac{1}{N_T} \sum_{i=1}^{N_T} \sum_{t=1}^{T-1} Exp_{it},$$

where the average experience of the whole crew in the T-th trip is the average of all N_T seafarers' previous (T-1) experience, with Exp_{it} , being value 0 or 1, denoting whether or not seafarer i appears in trip t. We use this variable to test Hypothesis 2. The interaction between *average experience of the whole crew* and the *national diversity* variables is used to test Hypothesis 3. As explained in the theory section, we expect the coefficients of the variables used to test Hypothesis 2 and 3 to be stronger

during the period of increasing standardization (1700-1755) compared to those obtained during decreasing standardization (1756-1796).

Controls. To isolate the effects of national diversity and average experience on performance, we added several ship-level and voyage-specific controls to our models. We recognize that organizational learning may unfold at different levels and in different ways. The VOC for instance learned about better ways to reach destinations across the journeys it completed to Asia. To this end, we created a variable that counted the cumulative number of journeys to Asia (*VOC's number of trips*). A similar type of learning may be realized at the ship level, so we counted the number of trips to Asia of the focal ship (*ship's number of trips*). Moreover, because top officers played a fundamental role on board, their accumulation of experience through multiple journeys should be ruled out too. We created a variable that counted the number of times that the master had made the trip to Asia (*experience master*).

As our arguments transcend the experience of the leadership, we followed the same procedure used for the crew experience and created a measure of *average experience of the officers*.⁴ Because conflict and turnover represent two ways whereby national diversity affects unit performance, the sum of all individual instances of punishment and desertion in any given voyage were added as controls (*number of punishments* and *number of desertions*). We identified instances of conflict by relying on cases where the pay registers record the punishment of seafarers, and their obligation “to work for the company while earnings were confiscated with a declaration of the pay forfeited” (Nationaal Archief, 2008). We confined the measurement of these events to those cases in which punishment took place before a ship reached Asia. The registers also identify instances of desertion, which were likewise limited to cases that took place before reaching Asia.⁵

⁴ This variable was computed in the following way. $AveExpOff_T = \frac{1}{NO_T} \sum_{i=1}^{NO_T} \sum_{t=1}^{T-1} ExpOff_{it}$, where average experience of officers in T-th trip is the average of all NO_T officers' previous (T-1) experience, and $ExpOff_{it}$, with value 0 or 1, denotes whether or not officer i appears in trip t as an officer.

⁵ Note that the database does not include Asian and European workers recruited in Asia, who were arguably at greater risk of desertion.

The master was assisted by one or more masters-at-arms, who enforced VOC rules and were the *de facto* executors of justice on board. We measured the extent of enforcement by counting the number of master-at-arms on each ship (*number of master-at-arms*). Crew size varied across voyages with potential effects for socialization and conflict (*number of seafarers on board*). To rule out the effects induced by direct experience at sea or familiarity with seamanship (Sgourev and van Lent, 2017), the percentage of seafarers who originated from a port city was also included in our models (*percentage of seafarers originating from port cities*). Journeys in which regiments were on board were different from others, so we identified those few instances in which regiments were present (*regiment on board*). Finally, performance directly correlated with the hardship of the journey. So, we created a dummy variable coded for voyages where the ship’s logs reported harsh weather conditions or that the ship was attacked (e.g., *bad weather or attacked*).

Three dummy variables were created to isolate the diverse hiring practices of *larger chambers* compared to smaller ones (i.e., Amsterdam, Enkhuizen, and Zeeland vs Rotterdam, Delft, and Hoorn). Construction yard fixed effects were also added to our models. Chamber and yard fixed effects allow us to control for systematic and time-invariant differences in the quality and diversity of the workforce across VOC ‘subsidiaries’. To fully capture the historical evolution of the VOC, we also added a dummy variable for the period from 1742 to 1755 (van Imhoff’s era). Table 2 shows the correlations among the variables included in our analyses. None of the correlations raises collinearity concerns.

Insert Table 2 about here

Results

Table 3 presents the OLS models of voyage duration for 2,200 ship voyages to Batavia during 1700-1796, with standard errors clustered at the level of captains (i.e., ship masters). Models 1-3 examine the effects of national diversity on ship performance. Models 4 to 7 report the estimates across the two periods marked by different intensity of standardization (i.e., 1700-1755 *versus* 1756-1796).

Insert Table 3 about here

The estimates for the control variables in Model 1 suggest that learning operates at different levels of analysis and reduces the number of days needed by a ship to reach its destination. In particular, a *master* who has a level of experience one standard deviation above the mean (i.e., two voyages to Asia) is likely to be two percent faster than a novice, or about five days in relation to the average voyage duration (see *experience master*). The *ship's prior trips to Asia* played a similar role. As expected, the disruption of work processes through turnover is evident from the coefficient estimate for the *number of deserters*, which suggests that at one standard deviation above the mean of this variable (i.e., at seven deserters on the way to Asia), voyage duration was four percent above that observed for a ship that did not experience any desertion.

The estimate of the national diversity coefficient indicates that as diversity moves from the minimum to the maximum value observed in our data (i.e., from 0.03 to 0.75), voyage time was delayed by about 15 days relative to the average duration (i.e., about 6% slower). This result highlights the complications of managing nationally diverse ships and provides support for Hypothesis 1. In Model 2, the estimate of the variable related to crew experience suggests that as the experience of the crew moved from one standard deviation below to one above the mean (i.e., from 0.11 to 0.33), a voyage became 7 days faster (about 3%). Model 3 suggests that this effect was not due to the average experience of the officers.⁶

Models 4 and 5 test Hypothesis 2 by splitting our sample across the two periods marked by a different intensity of standardization. As the estimates of those models show, the returns from experience are magnified under heightened standardization (comparison of coefficient estimates across periods, $p < 10$, one tailed test). Model 6 and 7 follow the same logic to test Hypothesis 3.

⁶ In models not reported here we re-estimated Model 3 by excluding the variable 'experience of the whole crew'. In this specification, the coefficient of the officer experience variable fails to reach statistical significance.

Crew experience moderates the negative consequences of national diversity for performance, but this interaction is only statistically significant during the period of increasing standardization. A graphical inspection of the results reported in Model 6 suggests that under conditions of increasing standardization, crew experience consistently improved performance, particularly when the crew had diverse national origins (see Figure 1a). The same exercise applied to the estimates reported in Model 7 suggests that under decreasing standardization, experience did not necessarily improve performance (and could worsen it), unless a crew was very diverse (see Figure 1b). At the mean value of national diversity observed during the years 1700-1755 (about 0.5), a crew endowed with one standard deviation of experience above the mean took 17 fewer days to reach Asia than a counterpart with one standard deviation below the mean. At the mean value of national experience observed during the period 1756-1796 (about 0.6), only a negligible difference in voyage duration is observed across levels of experience of one standard deviation above and below the mean (1 day less).⁷ These results provide some support for Hypothesis 3, though we acknowledge that there is no significant difference in the slope of the moderating effect across the two historical periods (i.e., the estimates of the interaction effects in Models 6 and 7 are statistically indistinguishable).

Insert Figure 1a and 1b about here

Additional Analyses

To shed further light on the results reported in Table 3, we ran three additional analyses. First, part of our reasoning about the beneficial effects of standardization on experience stems from the ease of knowledge transfer across units. With the aim of disentangling the effect of crew experience into ship-specific and ship-independent components, we divided the number of trips of each seafarer according to whether or not they occurred on the same ship. Then, we created two measures, labeled

⁷ The reported values are obtained from the computation of simple slopes through the margins routine available in STATA, holding all other variables at their means.

as *average ship-specific experience* and *average experience with other ships*.⁸ The results of the period analysis reported in Table 4 confirm that while the more accessible effect of *ship-specific experience* holds across periods, the consequences of *experience with other ships* improved performance and attenuated the negative effects of national diversity solely during increasing the period of standardization (compare Models 2 and 4 of Table 4). Once again, there is no significant difference in the slope of the moderating effects across historical periods.

 Insert Table 4 and 5 about here

A second set of robustness checks involves the role of officers' experience during the period of increasing standardization (1700-1755).⁹ Model 1 of Table 5 reports the estimates of a model that interacts average officers' experience with the national diversity variable. As expected, the negative effect of national diversity on performance remains unaltered by different levels of officers' experience. Our theoretical arguments however point to standardization as magnifying the effects of experience net of those induced by shared experience. Model 2 and 3 of Table 5 report the estimates of the joint experience variables, measured at the level of officers and also of the whole crew. We created these measures by computing the number of times that each dyad enlisted on board had travelled together (see Reagans et al., 2005: 873). Then we summed and averaged these values across officers or the entire crew (*Average joint experience officers* and *Average joint experience whole crew*).¹⁰ The estimates of these models confirm that during heightened standardization: (a) the returns

⁸ The latter variable was obtained by subtracting the value of average ship-specific experience from that of average experience of the whole crew. As expected, a low average value of ship-specific experience is observed in our database, whereas average ship-independent experience is higher, at least in relative terms.

⁹ In separate models, the interaction between the joint experience of the entire crew and national diversity turned out to be statistically insignificant. Moreover, because of the relatively high correlation between the experience and joint experience variables, we omitted the former in some unreported models. The interaction shown in Model 3 of Table 4 remained statistically insignificant in this model specification.

¹⁰ The average joint experience variable was computed as follows: $AverageJointExperience_T =$

$\frac{1}{N_T(N_T-1)/2} \sum_{i=1}^{N_T} \sum_{i \neq j}^{N_T} JointExp_{ij}$, where average joint experience on T-th trip is the total number of pairwise

joint experience before divided by the total number of pairs which is the number of combinations in choosing 2 out of N_T , and $JointExp_{ij}$ denotes whether or not seafarer i and j had ever travelled together before. Similarly the joint

from experience occur independently from those due to joint experience (comparison of coefficient estimates in Model 2 of Table 5, p. <0.1); and (b) joint experience is less powerful in attenuating the negative effect of national diversity on performance.¹¹

Third, it is clear that the transferability of experience rested on comparability across ships. The changes introduced in 1697 allowed the VOC to turn “the art of shipbuilding into an assemblage of prefabricated, exchangeable parts” (de Jong, 2010: 22). Arguably the strongest effort in this direction took place at the yard in Amsterdam, a modern site “in view of the standardized and efficient assemblage of mass-products in wood” (Gawronski 2003: 135). Building on this evidence, we replicated Model 3 in Table 2, confining the sample solely to ships constructed in Amsterdam. As expected, the estimates of this alternative model specification (available upon request) point to a similar and even slightly stronger effect of experience (in magnitude) compared to the estimates reported in the main models.

Discussion and Conclusions

Now more than ever, learning is essential to the strategy and performance of organizations. Learning has been studied extensively at the level of teams (Ren and Argote, 2011) and within relatively simple organizational units (Darr et al., 1995). Less is known about the performance of larger and more complex units that represent the backbone of many organizations. Similar units also face the additional challenge of being exposed to a less stable and nationally diverse workforce. National diversity comes with coordination and communication problems that can negatively impact

experience of officers was calculated according to the following formula: $AverageJointExperienceOfficers_T = \frac{1}{NO_T(NO_T-1)/2} \sum_{i=1}^{NO_T} \sum_{\substack{j=1 \\ i \neq j}}^{NO_T} JointExpOff_{ij}$, where average joint experience of officers on T-th trip is the total number of pairwise joint experience both as officers before divided by the total number of pairs which is the number of combinations in choosing 2 out of NO_T , and $JointExpOff_{ij}$ denotes whether or not officer i and j had ever travelled together before.

¹¹ A further check concerned the experience developed by the entire crew with nationally diverse members. We created this variable by taking the average value of diversity for each seafarer’s career. When aggregated at the level of the ship, this measure turned out to be highly correlated (.80) with the experience variable for the whole crew. The results obtained from this “experience with diversity” variable turned out to be qualitatively similar to those reported in Table 2. Different and more fine-grained data would be needed to unpack these effects.

operational performance (Ophir et al, 1998; Earley and Gibson, 2002; Gibson and Gibbs, 2006). It remains unclear how organizations learn under these conditions.

The volatile international labor market faced by the Dutch East India Company during the eighteenth century provides a useful context for addressing this question. Due to the size and diversity of the crews and coordination difficulties faced on board, the ships of the VOC may be seen as early-modern organizational units. We have posited that the increasing standardization of the VOC allowed the firm to seize the advantages of workforce experience by improving information processing and cohesion (Huber and Lewis, 2010). The results of our analyses provide some initial evidence in this direction, as well as highlighting the role of increasing levels of workforce experience in attenuating the negative effects of national diversity on ship performance. The lack of significant differences across periods in these estimates may be explained by the fact that, while standardization within the VOC changed in intensity over time, a consistent effort in this direction persisted throughout the eighteenth century. This was also true during the period from 1756 to 1796, when national diversity was at the highest levels, organizational efforts at standardization remained yet started losing momentum. We hope that future research will test our arguments in empirical contexts marked by sharper differences in organizational standardization over time.

Our paper contributes to the literature on strategic management in several ways. The first contribution pertains to strategies that emphasize knowledge (e.g., Kogut and Zander, 1996) and strategic human capital (e.g., Wright et al., 2014) as essential to the competitive advantage of organizations. This stream of research has highlighted the role of knowledge retention via employee loyalty (e.g., Gambardella et al., 2015). Our paper provides an organizational perspective on this problem. In particular, we suggest that in the face of high mobility and a nationally diverse workforce, learning can be fostered through the development of standardized work practices and procedures. Standardization, we argue, sustains trust and cohesion among workers and reduces cross-cultural misunderstandings among them. Under those conditions, experienced workers are seen as legitimate sources of knowledge, a highly desirable situation when mutual coordination is needed. Increasing

levels of workforce experience also provide the additional advantage of attenuating the negative consequences of diversity, reducing the salience of categorical information and promoting a primacy of contextual information. Our findings resonate with those obtained by various authors. For instance, scholars have argued that shared experience among workers attenuates the negative effects of national diversity (Earley and Mosakowski, 2000). Moreover, increasing individual experience has been shown to facilitate knowledge sharing in virtual environments (Hwang et al., 2015). Last, the performance of groups confronted with turnover is enhanced by the existence of centralized and hierarchical structures of communication (Argote et al., 2018). Our paper borrows from each of these studies but it also expands on them. We extend the arguments regarding centralized communication coordination to the standardization of work processes and procedures,¹² which in turn induce benefits that transcend the development of shared experience among workers. We consider the results of our paper particularly relevant for modern-day organizations that are routinely challenged by limited membership stability and by increasing national diversity of the workforce. We look forward to further research that will investigate alternate strategies that facilitate knowledge sharing among workers (e.g., Janardhanan et al., 2019).

A second contribution is to research on cross-cultural management. While global businesses have been common since the time of the VOC, multinational teams have only recently been explored from an organizational perspective (Haas and Cummings, 2015; Tasheva and Hillman, 2018). The vast majority of this research has emphasized the psychology of individual members or studied small groups, such as top management teams (Carpenter et al., 2004; Kaczmarek and Ruigrok, 2013). As a result, research on the effects of national diversity at a more aggregate level remains scant (Joshi et al., 2011). Notwithstanding this limitation, one of the main take-aways of existing research is that the time a team spends together transforms the negative effect of diverse cultures and values into an asset

¹² In this respect our arguments are also consistent with those of Reagans and his colleagues (2005). A key difference though lies in the fact that standardization vary in intensity over time in our case. Thanks to this variation, we are able to provide quasi-counterfactual evidence about the effects of standardization on the returns from experience. Note also that Reagans and his colleagues do not elaborate on the moderating effects of experience on national diversity. Last but not least, their units involve small teams (about 2.5 people on average).

(Earley and Mosakowski, 2000). The development of joint experience, a common identity, and knowledge about who does what is essential to this explanation (Ren and Argote, 2011). But how can multicultural groups develop a common identity and foster learning in the presence of high turnover and limited joint experience? Our study addresses this question by highlighting that, in the presence of standardized work practices and procedures, workforce experience represents a powerful means to attenuate the effect of salient cultural differences among workers. The VOC context is ideal in this respect as differences among nationalities in mercantile capitalism were stable and informative to seafarers. Moreover, the growing diversity of crews made identity threats (Sharif, 1966) and fear of status loss (Pettit, Yong, and Spataro, 2010) particularly salient. These features of our empirical context are important, since the intergroup biases responsible for negative consequences rest on the existence of a challenge to the distinctiveness of a social group and on complex interdependencies among workers, similar to those observed on VOC ships (van Knippenberg et al., 2004).

Our paper also contributes to organizational sociology, a subfield where empirical debates have emerged about the effects of diversity for the performance of firms, with a specific focus on measurement issues (e.g., Herring, 2009; Stojmenovska, Bol, and Leopold, 2017). Two limitations, we believe, play a role in our preliminary understanding of how national diversity affects a unit's performance. First, surveys, experiments, and interviews have been the most prevalent methods used to understand the link between multinational diversity and group functioning (see Stahl, Maznevski, Voigt, and Jonsen, 2010). While valuable, these approaches often fail to reproduce the complexity of decision-making and interactions in real organizations. Second, even when using objective measures of performance, such as customer satisfaction, revenues, stock performance, or market share, the effects of national diversity are at risk of being confounded with alternative mechanisms. As soon as national diversity becomes valued for its own sake by internal and external stakeholders, social desirability may bias the measurement of group performance. This is especially true in modern global firms, where diversity statements and perspectives serve as a signal of management's commitment to a broad and inclusive workforce, as well as congruence with the broader norms of world society (Ely

and Thomas, 2001; Berrey, 2015). The historical data employed here are distinct and, admittedly, some results of our analyses may be hard to generalize to contemporary organizations. Nonetheless, the VOC's effort to recruit an increasingly diverse labor force, marked by visible and salient divisions, alongside the company's emphasis on operational performance, provides a rare opportunity to study the returns from national diversity in a historical period where such diversity was not valued for its own sake. While the results of our analyses highlight the difficulties of managing culturally diverse groups, they also provide new evidence of ways to address adverse effects elicited by national diversity.

The limitations of our study provide various opportunities for developing additional research on the effects of experience and national diversity on the performance of larger units than TMTs or groups involved in lab experiments. Our approach benefits from the use of large-scale data, but suffers from their historical and observational nature. A true causal test of the effects of standardization would require that we hold a variety of other factors constant. Needless to say, we are unable to do so within our research design and thus leave inquiry into alternative mechanisms, particularly those that may also operate within smaller groups, to future research. While subject to reasonably fine-grained documentation, the group processes discussed in this paper remain unobserved. Our focus on experience is also consistent with the existing literature, but experimental evidence is needed to clarify how learning really works in nationally diverse units, and to effectively rule out endogeneity concerns. Last but not least, the specific context of ships as total institutions (Goffman, 1957) and our historical data invite particular care in generalizing these results. For instance, conflict, one of the main mechanisms through which national diversity affects performance, takes a very specific meaning in our context, which is hardly comparable to the one observed in contemporary organizations. While our models control for the number of conflict events on each voyage, it is reasonable to imagine that the physical violence often associated with these instances could influence the negative relationship between national diversity and performance in various ways, potentially exacerbating performance outcomes. While non-negligible, we believe these limitations are

outweighed by the advantages provided by our historical case with respect to research design, especially in rendering national differences and experience highly relevant to the process of organizational learning and isolating those learning dynamics from external influence over extended periods of time.

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Table 1. National Diversity by Period and Quantiles

	10th	25th	50th	75th	90th
Period 1700-1755	0.23	0.38	0.50	0.60	0.65
Period 1756-1796	0.50	0.56	0.61	0.64	0.67

Table 2. Correlations among the Variables Used in the Analyses

	Mean	Std. Dev.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1 Log of voyage duration	5.48	0.20	1.00															
2 Average experience officers	0.62	0.39	-0.05	1.00														
3 Average experience whole crew	0.22	0.11	-0.11	0.65	1.00													
4 National diversity	0.52	0.15	0.01	0.10	0.00	1.00												
5 Experience master	0.87	1.18	-0.06	0.12	0.08	0.13	1.00											
6 Ship's prior trips to Asia	5.70	2.86	-0.04	0.05	0.03	-0.04	0.05	1.00										
7 VOC's prior trips to Asia	1323.25	766.85	-0.03	0.00	-0.01	-0.07	-0.01	0.01	1.00									
8 Percentage of seafarers from port cities	0.62	0.10	0.00	-0.21	-0.02	-0.18	-0.06	-0.05	0.00	1.00								
9 Number of deserters same ship before Asia	1.39	5.60	0.17	-0.01	-0.06	0.05	-0.01	-0.01	-0.01	-0.05	1.00							
10 Number of punishments same ship before Asia	0.05	0.39	0.03	0.00	-0.01	0.03	-0.03	0.01	0.01	0.00	0.00	1.00						
11 Regiment on board	0.01	0.11	-0.01	-0.04	-0.08	0.08	0.04	-0.06	0.00	-0.05	0.03	-0.01	1.00					
12 Number of seafarers on board	246.71	81.91	-0.01	0.10	-0.10	0.38	0.19	0.11	-0.04	-0.34	0.15	0.04	0.09	1.00				
13 Bad weather or attacked	0.01	0.10	0.03	-0.05	-0.03	-0.02	0.00	-0.02	-0.04	0.02	0.11	0.00	-0.01	0.00	1.00			
14 Number of master-at-arms	0.86	0.38	-0.02	0.14	0.04	0.04	0.13	0.06	-0.02	-0.22	0.05	0.02	0.03	0.43	0.01	1.00		
15 Period 1700-1741	0.50	0.50	0.09	-0.13	0.00	-0.55	-0.16	0.10	0.06	0.34	-0.06	-0.02	-0.11	-0.50	-0.02	-0.23	1.00	
16 Period 1742-1755	0.16	0.36	-0.01	-0.01	-0.07	0.22	0.03	0.06	0.00	-0.21	0.04	0.06	-0.05	0.12	0.01	0.12	-0.43	1.00

Table 3. OLS Estimates of Voyage Duration, 1700-1796

VARIABLES	(1) Log of voyage duration Full sample	(2) Log of voyage duration Full sample	(3) Log of voyage duration Full sample	(4) Log of voyage duration 1700-1755	(5) Log of voyage duration 1756-1796	(6) Log of voyage duration 1700-1755	(7) Log of voyage duration 1756-1796
Average exp. whole crew # National diversity						-0.515+ (0.295)	-1.249 (1.028)
Average experience officers			0.025+ (0.014)	0.020 (0.017)	0.018 (0.024)	0.018 (0.017)	0.018 (0.024)
Average experience whole crew		-0.134** (0.039)	-0.191** (0.054)	-0.258** (0.065)	-0.083 (0.103)	-0.051 (0.134)	0.643 (0.597)
National diversity	0.084* (0.042)	0.090* (0.042)	0.084* (0.042)	0.170** (0.048)	0.278* (0.131)	0.285** (0.082)	0.585* (0.295)
Experience master	-0.009* (0.004)	-0.007* (0.004)	-0.008* (0.004)	-0.009 (0.005)	-0.002 (0.005)	-0.009 (0.005)	-0.003 (0.005)
Ship's prior trips to Asia	-0.005** (0.002)	-0.005** (0.002)	-0.005** (0.002)	-0.007** (0.002)	-0.000 (0.003)	-0.007** (0.002)	-0.000 (0.003)
VOC's prior trips to Asia	-0.000+ (0.000)	-0.000+ (0.000)	-0.000+ (0.000)	-0.000* (0.000)	-0.000 (0.000)	-0.000* (0.000)	-0.000 (0.000)
Percentage of seafarers from port cities	-0.030 (0.047)	-0.037 (0.047)	-0.026 (0.048)	-0.026 (0.056)	-0.004 (0.109)	-0.014 (0.056)	0.003 (0.109)
Number of deserters same ship before Asia	0.005** (0.002)	0.005** (0.002)	0.005** (0.002)	0.005** (0.001)	0.011** (0.003)	0.005** (0.001)	0.011** (0.003)
Number of punishments from same ship before Asia	0.018* (0.008)	0.018* (0.008)	0.018* (0.008)	0.018* (0.009)	0.006 (0.021)	0.017+ (0.009)	0.008 (0.021)
Regiment on board	-0.004 (0.044)	-0.014 (0.044)	-0.013 (0.045)		-0.028 (0.048)		-0.029 (0.048)
Number of seafarers on board	0.000* (0.000)	0.000 (0.000)	0.000 (0.000)	-0.000* (0.000)	0.000** (0.000)	-0.000* (0.000)	0.000** (0.000)
Bad weather or attacked	0.049 (0.037)	0.042 (0.037)	0.043 (0.037)	0.064 (0.056)	-0.029 (0.041)	0.066 (0.055)	-0.026 (0.042)
Number of master-at-arms	-0.011 (0.014)	-0.006 (0.014)	-0.006 (0.014)	-0.015 (0.016)	0.010 (0.032)	-0.012 (0.016)	0.013 (0.032)
Period 1700-1741	0.077** (0.014)	0.074** (0.014)	0.074** (0.014)	0.037* (0.015)		0.040** (0.015)	
Period 1742-1755	0.035** (0.013)	0.029* (0.013)	0.029* (0.013)				
Constant	5.439** (0.049)	5.475** (0.049)	5.472** (0.050)	5.619** (0.055)	5.126** (0.123)	5.565** (0.061)	4.938** (0.210)
Big Chamber Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yard Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,200	2,200	2,200	1,446	754	1,446	754
R-squared	0.068	0.072	0.073	0.093	0.102	0.095	0.103

Robust standard errors in parentheses, ** p<0.01, * p<0.05, + p<0.10 two tailed tests

Table 4. Period-by-Period Analyses. OLS Estimates of Voyage Duration, 1700-1796

VARIABLES	(1) Log of voyage duration 1700-1755	(2) Log of voyage duration 1700-1755	(3) Log of voyage duration 1756-1796	(4) Log of voyage duration 1756-1796
Average ship-specific experience # National diversity	-8.146* (3.170)		-13.681** (3.706)	
Average experience with other ships # National diversity		-0.607* (0.306)		-1.110 (1.046)
Average ship-specific experience	1.053 (1.393)	-1.987** (0.705)	7.096** (2.061)	-0.588 (0.540)
Average experience with other ships	-0.174** (0.052)	0.077 (0.128)	-0.018 (0.081)	0.642 (0.610)
National diversity	0.208** (0.051)	0.291** (0.080)	0.370** (0.135)	0.553+ (0.292)
Experience master	-0.008 (0.005)	-0.008 (0.005)	-0.002 (0.005)	-0.002 (0.005)
Ship's prior trips to Asia	-0.006** (0.002)	-0.006** (0.002)	-0.000 (0.003)	-0.000 (0.003)
VOC's prior trips to Asia	-0.000* (0.000)	-0.000* (0.000)	-0.000 (0.000)	-0.000 (0.000)
Percentage of seafarers originating from port cities	-0.026 (0.055)	-0.022 (0.055)	0.007 (0.108)	-0.018 (0.107)
Number of deserters from same ship before Asia	0.005** (0.001)	0.005** (0.001)	0.011** (0.003)	0.011** (0.003)
Number of punishments from same ship before Asia	0.016+ (0.009)	0.017+ (0.009)	0.006 (0.021)	0.008 (0.021)
Number of seafarers on board	-0.000 (0.000)	-0.000+ (0.000)	0.000** (0.000)	0.000** (0.000)
Bad weather or attacked	0.078 (0.051)	0.075 (0.053)	-0.031 (0.040)	-0.028 (0.041)
Number of master-at-arms	-0.017 (0.016)	-0.011 (0.017)	0.007 (0.032)	0.009 (0.032)
Period 1700-1741	0.041** (0.015)	0.042** (0.015)		
Regiment on board			-0.033 (0.048)	-0.030 (0.048)
Constant	5.588** (0.055)	5.555** (0.060)	5.082** (0.125)	4.976** (0.208)
Big Chamber Fixed Effects	Yes	Yes	Yes	Yes
Yard Fixed Effects	Yes	Yes	Yes	Yes
Observations	1,446	1,446	754	754
R-squared	0.101	0.099	0.110	0.106

Robust standard errors in parentheses, ** p<0.01, * p<0.05, two tailed tests

Table 5. OLS Estimates of Voyage Duration. Alternative Explanations for the Period, 1700-1755

VARIABLES	(1) Log of voyage duration 1700-1755	(2) Log of voyage duration 1700-1755	(3) Log of voyage duration 1700-1755
Average joint experience officers # National diversity			0.428 (0.322)
Average joint experience whole crew		8.075 (5.443)	8.129 (5.412)
Average joint experience officers		-0.040* (0.019)	-0.135+ (0.072)
Average experience officers # National diversity	0.022 (0.078)		
Average experience officers	0.011 (0.031)	0.033 (0.024)	0.012 (0.027)
Average experience whole crew	-0.256** (0.065)	-0.413** (0.090)	-0.391** (0.092)
National diversity	0.158* (0.068)	0.131** (0.050)	0.104* (0.052)
Experience master	-0.009 (0.005)	-0.008 (0.005)	-0.008 (0.005)
Ship's number of trips to Asia	-0.006** (0.002)	-0.007** (0.002)	-0.007** (0.002)
VOC's prior trips to Asia	-0.000* (0.000)	-0.000+ (0.000)	-0.000+ (0.000)
Percentage of seafarers originating from port cities	-0.027 (0.056)	-0.017 (0.060)	-0.024 (0.059)
Number of deserters from same ship before Asia	0.005** (0.001)	0.005** (0.001)	0.005** (0.001)
Number of punishments from same ship before Asia	0.018* (0.009)	0.019* (0.008)	0.019* (0.008)
Number of seafarers on board	-0.000* (0.000)	-0.000 (0.000)	-0.000 (0.000)
Bad weather or attacked	0.063 (0.056)	0.015 (0.065)	0.015 (0.065)
Number of master-at-arms	-0.015 (0.016)	-0.007 (0.017)	-0.009 (0.017)
Period 1742-1755		-0.040** (0.015)	
Period 1700-1741	0.037* (0.015)		0.042** (0.015)
Constant	5.624** (0.057)	5.663** (0.056)	5.638** (0.060)
Big Chamber Fixed Effects	Yes	Yes	Yes
Yard Fixed Effects	Yes	Yes	Yes
Observations	1,446	1,381	1,381
R-squared	0.093	0.092	0.094

Robust standard errors in parentheses ** p<0.01, * p<0.05, two tailed tests

Figure 1a. Interaction of National Diversity and Crew Experience During the Period 1700-1755

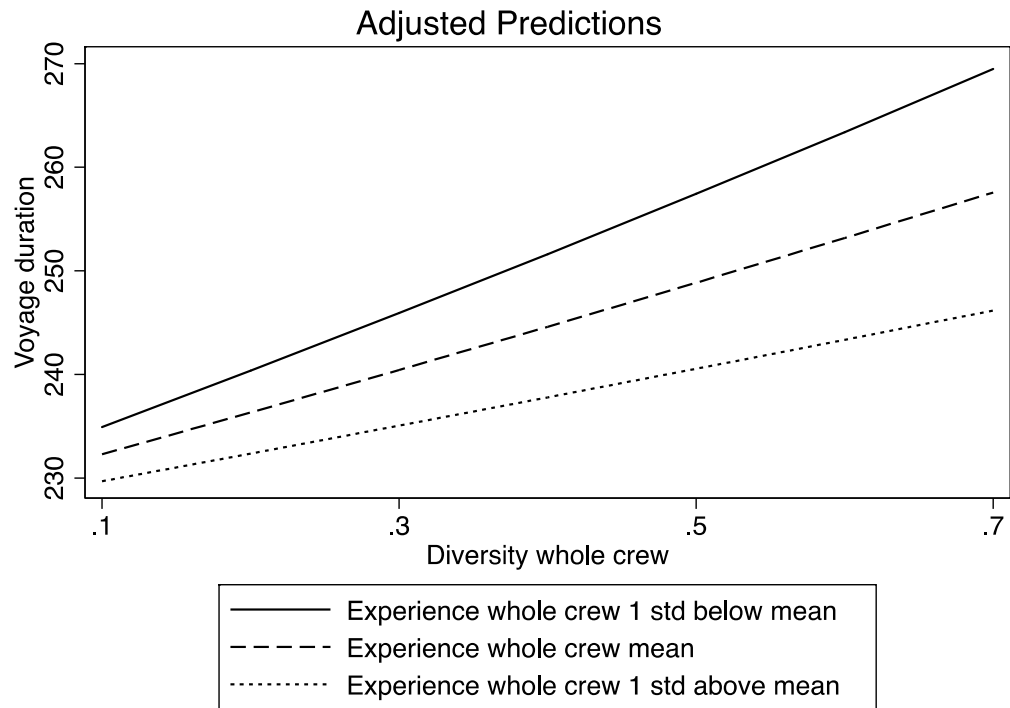


Figure 1b. Interaction of National Diversity and Crew Experience During the Period 1756-1796

