Why Didn't Slaves Revolt More Often During the Middle Passage?

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Abstract

Given the substantial suffering of enslavement, why didn't more slaves revolt during the Middle Passage of the Atlantic Slave Trade? We argue that the collective action problem was an important impediment to revolt. Revolts nearly always resulted in slave casualties, and crews tortured and killed conspirators. Overthrowing the crew benefited all of the slaves, so each slave had an incentive to free ride on others' efforts to secure freedom. Using a rational choice framework, we argue that slaves could more effectively overcome the collective action problem when there were fewer slaves aboard, fewer male slaves, and when the slaves were more homogenous. Data on slave voyages from 1750 to 1775 and archival and historical documents support these claims.

Keywords: Slave Revolt; Paradox of Revolution; Collective Action

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1. Introduction

Given the substantial suffering of enslavement, why didn't more slaves revolt during the Middle Passage of the Atlantic Slave Trade? A revolt by slaves against the crew is a classic case where the collective action problem can prevent production of a public good. All of the slaves on a ship enjoy the benefits of overthrowing the crew and regaining their freedom. However, accomplishing this task requires each individual to take risky actions that often results in torture and death. Each slave prefers to enjoy the benefits of freedom without bearing the substantial cost of helping to obtain it. As a result, each slave rationally chooses to free ride and no one is freed. Consistent with this, the historical record shows that slave revolts did not occur frequently. Estimates suggest that slaves revolted, at most, in as many as 8 to 10 percent of voyages, but the most reliable estimates suggest it may have been as few as only 2 percent of voyages (Behrendt, Eltis, and Richardson, 2001, 456). While the study of slave revolt on plantations has received substantial interest (Aptheker, 1943; Hummel, 1996), the more difficult revolution challenge—revolt during middle passage—has been neglected in the existing literature.[1]

Would-be participants could not rely on solutions commonly found in the context of political revolution (Lichbach 1994).[2] Outside parties almost never aided slaves during the Middle Passage, so the slaves had to rely on self-organization to overthrow the crew. Unlike many instances of political revolution, the potential conspirators did not choose to participate or live in the affected region—there were no voluntary entrance or exit options. Slaves could not recruit new members, arrange for outside finance, alter their membership, or increase their resources to affect collective action. In addition, crews controlled slaves with severe physical

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[1] Fogel and Stanley Engerman (1974) is a seminal work using economics to understand slavery. Several superb pieces offer rational choice explanations for overcoming the collection action problem of revolt among maritime trading merchants and pirate crews (Leeson, 2007a, 2009, 2010a, 2010b).

[2] The collective action problem of revolution has been studied extensively in a variety of contexts and with numerous methods (Mason, 1984; Muller and Opp, 1986; Bendor and Mookherjee, 1987; Klosko, Muller, and Opp, 1987; Finkel, Muller, and Opp, 1989; Lichbach, 1994, 1995, 1996; Goldstone, 1994; Moore, 1995; Kuran, 1989, 1991, 1997; Esteban and Ray, 2001; Goldstone, 2001, 2002; Dalton, Van Sickle, and Weldon, 2009; Olsson-Yaousiz 2010, 2012 Leeson, 2010a).

constraints and poor conditions. The solutions available had to be self-organized, bottom-up, and lack an outside patron or organizer. Moreover, slaves lacked much of the freedom that maritime sailors relied on to develop contractual solutions to predation and abuse.[3] This paper argues that, in addition to physical constraints, the collective action problem was an important impediment to revolt.

2. Model and Hypotheses

Historians have written extensively about the Atlantic Slave Trade, but their focus has avoided shipboard slave resistance. For many years, the professional consensus depicted slavery from the perspective of the slaveholder, with some scholars portraying enslaved Africans as passively accepting their fate (Elkins, 1976). While most historians no longer hold this view and the Elkins thesis has been severely criticized, slave resistance is still 'arguably the most understudied area of slave trade studies' (Diouf, 2003, x). What does exist focuses on either resistance in Africa or in the New World colonies (Thornton, 1998, 272-303). When slave resistance is studied, 'shipboard revolt is largely absent' (Taylor, 2006, 5).

Past explanations for revolt include slave mistreatment, excessive leniency, managerial ineptitude, reduction in crew strength due to illness, shipboard crisis, crew disunity or negligence, the numerical advantages of the slaves, and spontaneous uprising (Greene, 1944, 346-55; Wax, 1966, 1-15; Uya, 1976, 65-88; Miller, 1988, 151-58; McGowan, 1990, 5-29; Inikori, 1996, 53-92; Behrendt et al, 2001, 454-476; Taylor, 2006, 15-66). Some historians have discounted the rationality of slaves, suggesting 'the decision to rebel did not come about by evaluating the situation completely rationally and selecting the most logical solution' (Taylor, 2006, 66). We argue, on the contrary, that the key to explaining onboard insurrection requires adopting a rational choice framework to identify the collective action problem facing slaves.

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[3] A similar instance where collective revolt faced a substantial difficulty was in concentration camps (Maher, 2010).

The paper builds on the empirical work conducted in three important past examinations of onboard slave resistance. Behrendt, Eltis, and Richardson (2001) conduct a series of univariate difference of means tests and a single logit regression for ships that experienced resistance, and they tentatively conclude that African region and the proportion of male slaves explain when revolt occurs. They suggest that gender roles in West Africa drive their results. Taylor (2006) provides the most recent and comprehensive listing of known slave resistances. While he discusses many factors that might explain the patterns of resistance, he concludes, 'in the end, rebellions could occur under any circumstance' (Taylor, 2006, 66). Richardson (2001) emphasizes the importance of the political economy of the African slave supply regions, but he concedes, 'the conditions that increased the propensity of slaves to rebel are obscure' (Richardson 2001, 75). None of these sources considers the collective action problem, and we are aware of only one brief discussion of it in the Middle Passage literature (Rediker, 2007, 292).

The traditional exposition of the paradox of revolution follows Tullock (1971, 1974). In the context of slave revolt, the rational slave estimates the probability, given his lack of participation, that a revolt will be successful, p, and that it will fail, $1-p$. If the slave revolt succeeds, he benefits A; if it fails he benefits B, with ($A > B$). The slave anticipates that his marginal contribution to increasing the probability of a successful slave revolt is p_p and the risk of punishment from participating is $C > 0$. The rational slave's expected payoffs from participating in revolt are therefore:

$$U_{abstain} = Ap + B(1-p) \tag{1}$$

$$U_{participate} = A(p+p_p) + B(1-(p+p_p)) - C \tag{2}$$

The typical assumption is that when there are a large number of people, the marginal contribution of a particular person's participation is low, such that $p_p = 0$. From this, formula (2) becomes:

$$U_{participate} = Ap + B(1-p) - C \qquad\qquad (3)$$

With C > 0, the greater expected payoff for the rational slave is to abstain from participation in a revolt always. However, among smaller groups the marginal contribution of a particular person's participation increases, with $p_p > 0$. When p_p is sufficiently large, the rational slave participates in the insurrection. This is the intuition in Olson's (1971, 35) seminal analysis, wherein he explains, "the larger the group, the farther it will fall short of providing an optimal amount of a collective good." This suggests our first hypothesis,

***Hypothesis 1**: Slave revolt is more likely when there are fewer slaves onboard.*

Smaller groups can facilitate public good provision more effectively than larger groups can. Small groups can monitor the contributions of each member more closely, and each individual contribution is more important to the production of the public good, so individuals are less likely to free ride on others' efforts.

Slaves needed to communicate with each other in order to plan a revolt, signal the beginning of a revolt, react in unison during it, and maintain control of the ship afterwards. Communication also allowed slaves to use public shaming to induce participation. People who share the same history, culture, language, and social identity face lower costs of successfully engaging in collective action than strangers who cannot communicate with each other. This is a commonly recognized impediment to cooperation and public good provision (for instance Leeson 2007b; Habyarimana, Humphreys, Posner, and Weinstein 2007).

***Hypothesis 2**: Slave revolt is more likely when the slaves share an ethnic and*

lingual community.

We examine these hypotheses with both quantitative and qualitative evidence. The qualitative sources come primarily from archival materials—newspapers, ship logs, letters, accounts written by veterans of the trade, and even narratives written by survivors of the Middle Passage. These

primary documents provide details of the history of shipboard slave insurrections and are vital to the study of shipboard revolt. The quantitative data comes from *Voyages: The Trans-Atlantic Slave Trade Database*. This dataset, which is now available through a website funded by the National Endowment for the Humanities, the W.E.B. Du Bois Institute for Afro-American Research at Harvard, and Emory University, provides details for 34,948 voyages, which have helped facilitate the study of cultural, demographic, and economic change in the Atlantic world from the late sixteenth to mid-nineteenth centuries. Nearly all historical assessments of the trade written after this database's release have used this quantitative data, and its reliability is well established within the historical literature.

3. Transatlantic slave trade and middle passage

3.1. Historical overview

The Atlantic Slave Trade 'was the largest intercontinental migration in world history before the nineteenth century,' forcibly relocating an estimated twelve million people to the New World between 1515 and 1866 (Curtin, 1971, 302; also Thornton, 1998). To understand the nature and difficulty of slave revolt, it is imperative to examine the process of capture and enslavement prior to the slave's transition into European hands. Military enslavement in the aftermath of war was the most typical form (Thornton, 1998, 99; Rediker, 2007, 98). One witness of the trade described war as the 'robbery of inland, defenseless creatures, who are hurried down the coast with the greater cruelty… [of] a very poor life' (Atkins, 1735, 176). War was a 'euphemism for the organized theft of human beings' (Rediker, 2007, 99). Judicial servitude was a second prominent process of enslavement. African societies sentenced criminals to slavery. Many Africans and European abolitionists thought that the judicial processes in West Africa had been corrupted so that 'all Punishments are chang'd into Slavery…they strain for crimes very hard in

order to get the benefit of selling the criminal…every trifling crime is punished in the same manner' (Moore, 1738, 29-30).

Many slaves were forced to travel great distances to reach the West African coast, especially as the areas around the coast had been exhausted of its human supply. Since the presence of European ships on the coast was intermittent, once along the coast, slaves waited in barracoons until a European trader appeared. While confined here, 'large numbers of slaves accumulated within these pens…squatting helplessly, naked, on the dirt and entirely exposed to the skies… [they] slept in their own excrement, without even a bonfire for warmth' (Miller, 1988, 390). During meals, 'ten or twelve of them feed together out of a trough, precisely like so many hogs; there is even less care taken of them than of brutes' (Wadstrom, 1787, 29).

Once purchased, slave traders forced them into small vessels and then ferried them to a larger slaving vessel anchored offshore. Before boarding these smaller ships, the 'men were all put into irons, two and two shackled together to prevent mutiny' (Phillips, 1930 [1693-1694], 402). These slaves, as Middle Passage survivor Ottobah Cugoano noted, encountered a 'most horrible scene' where nothing could 'be heard but rattling of chains, smacking of whips, and groans and cries of fellow men, some would not stir from the ground when they were lashed and beat in the most horrible manner' (Cugoano, 1787, 9). In the process of boarding the ship, the Africans were so 'willful and loth to leave their own country' that many times they 'leap'd out of canoes' where they would stay 'under water till they were drowned' (Phillips, 1930, 402). For the slaves who boarded the ship, 'an iron collar and chain were fastened to their necks' and both legs were "put into irons" as they were forced below the ship's deck (Clarkson, 1789, 57).

3.2. The collective action problem of revolt

The most difficult experience of enslavement remained—the Middle Passage. A former slave described his experience as he was 'put down under the decks' where he 'received such a salutation in [his] nostrils as [he] had ever experienced…so that with the loathsomeness of the stench and crying together, [he] became so sick and low that he was not able to eat' (Equiano, 1791, 51-52). While below the deck of the ship, captives were chained together in holds that were designed to house the maximum number of slaves. Slaves had as little as three feet of room between the floor and ceiling (Taylor, 2006, 28). A second layer was built so that another group of slaves could be loaded above (Taylor, 2006, 28). On average, slaves spent eleven weeks in these conditions during Middle Passage, with mortality rates averaging about 10 percent for the entirety of the trade (Behrendt et al, 2001, 454). Approximately 1.5 million slaves died during Middle Passage (Taylor, 2006, 37). In addition to these terrible conditions, other problems like spoilage of food, shortage of water, and endemic diseases were ubiquitous.[4]

In order for Africans to rebel, they needed to overcome a number of problems. They needed to free themselves from their iron manacles, shackles, and chains. Insurrectionists had to find a way through the locked, fortified gratings of the hold to reach the ship's deck. This task presented substantial difficulties, as slave ships were built and organized to prevent insurrection (Rediker, 2007, 292). Slaves then needed to overcome the armed crew, who averaged about thirty men on the typical slaving voyage. Even if successful until this point, Africans would then, unless still in sight of the African coast, need to sail the ship to a location where they could reclaim their freedom, either at home or to a coastline where slave traders were absent. This last difficulty led many Europeans to 'commonly imagine, the Negroes Ignorance of Navigation will always be a Safeguard' against the possibility of slave insurrection (Atkins 1735, 175). Because

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[4] For more information on mortality, see Steckel and Jensen (1986).

almost all slaves lacked experience sailing, this proved to be a significant problem for would-be revolutionaries.

In order to overcome these physical constraints, slaves needed to act collectively. Taylor argues that 'the success of any attempted rebellion ultimately lay not in the intelligence or cunning of its leader or facilitators but in the numerical advantage resulting from all or most of the Africans fighting together as one determined body for one common goal' (Taylor, 2006, 94). Slave resistance often failed because of an insufficient number of slaves participating. In 1788, for example, slave revolt aboard the French ship *Licorne* ultimately proved futile because only a portion of the 446 slaves on board participated (Taylor, 2006, 80). In general, slave participation during insurrection was tentative, and many slaves were afraid, apathetic, and even antagonistic to revolt (Taylor, 2006, 107).

Overcoming the collective action problem was difficult for several reasons. First, the cramped and filthy space made cooperation difficult, and the extreme scarcity of the holdings led to hostility among the slaves. The conditions of the holding area drove slaves to madness, and as one historian explains, 'in their frenzy some killed others in the hope of procuring more room to breathe. Men strangled those next to them, and women drove nails into each other's brains' (Bennett, 1969, 41).[5] Second, they had to avoid detection by slave crews who were vigilant against revolt. The crew singled out and punished Africans who they suspected of conspiracy (Taylor, 2006, 69). In addition to avoiding detection by crews, slaves had to prevent their conspirators from informing crewmembers. The crew enticed slaves to inform them about plans of revolt by offering privileges and benefits, so slaves were uncertain about who was trustworthy (Taylor 2006, 77-79).[6] In at least two cases, slaves were given their freedom for tipping off or sabotaging revolts (Taylor, 2006, 108). The Rhode Island ship *Mary* in 1796 avoided rebellion

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[5] Of course, the difficulty of coordination does not preclude the possibility of using other cues and low effort coordination devises to elicit cooperation (e.g. Manzini, Sadrieh and Vriend 2009).
[6] Slave crews also hired Africans to act as "guardians" over slaves (Smallwood 2007).

when the ship's first mate was 'informd by one of our Slaves that was not confined but on deck as a Sailor, that the Slaves had intentions of taking the ship' (Donnan, 1930, 374-375). Because of this information, the life of one crewmember was saved and the informant was offered freedom upon reaching the coast. Slaves could also defect to the side of the crew during a revolt. In 1704, a slave aboard the *Eagle* saved a crewmember 'when a young lad about seventeen years old, whom we [the slavers] had been kind to, interposed his arm and received the blow' which had been intended to kill the sailor (Snelgrave, 1734, 167-168). The young man was given freedom upon arriving in the Americas.

Participation in slave resistance carried substantial risks. The moment of revolt was dangerous, and casualties during the initial insurrection were common. As a retired slaving captain explained, 'an attempt to rise upon the ship's company brings on instantaneous and horrid war; for, when they are once in motion, they are desperate; and where they do not conquer, they are seldom quelled without much bloodshed on both sides' (Newton, 1788, 15-16). Estimates suggest that an average of 25 to 32 slaves died during an insurrection, though this might overestimate deaths because revolts with no or fewer deaths are less likely to have been reported (Richardson, 2001, 74; Taylor, 2006, 115).

Slaves also faced substantial costs if revolt failed. Jean Barbot advised ship captains to 'Spare no effort to repress their insolence and, as an example to the others, sacrifice the lives of all the most mutinous. This will terrify the others and keep them obedient. The way of making it clear to them, I mean the form of punishment that scares Africans most, is buy cutting up a live man with an ax and handing out the pieces to the others' (Harms, 2002, 272; Taylor, 2006, 113, also 112-118). A female slave who participated in a revolt was tied up by her thumbs and slashed with knives until she died (Atkins, 1735, 72-73; Taylor, 2006, 90). The surgeon on the ship *Pearl* sliced open the back of twelve conspirators and rubbed saltwater in the wounds (Taylor, 2006,

113). After a failed revolt on another ship, the crew tied one rebellious boy up with bricks and threw him overboard (Taylor, 2006, 113).

Given these obstacles, it seems unlikely that rebellion would ever occur. Rebellions did take place in perhaps as many as 8 to 10 percent of slave voyages (Behrendt, Eltis, and Richardson, 2001, 456).[7] Recorded cases of revolt with documentation provide 493 specific instances of shipboard resistance (Taylor, 2006, 9). Initiating a revolt did not guarantee success, but slaves did gain freedom in at least 120 rebellions (Taylor, 2006, 135). This rarely resulted in a return to their former lives, however, as slaves hardly ever returned to Africa (Behrendt, Eltis, and Richardson, 2001). Most acts of slave resistance failed to achieve their goal of freedom, but the ever-present threat of revolt did have a beneficial effect. The additional cost of preventing slave revolt reduced the volume of the slave trade by an estimated nine percent, leading to roughly 600,000 fewer slaves shipped to the Americas over the course of the trade (Behrendt, Eltis, and Richardson, 2001).

4. Evidence on slave revolts

4.1. Total slaves and total male slaves

Our analysis uses data from 1750 to 1775. This particular period is subject to less reporting bias than other periods (Taylor, 2006, 9; Behrendt et al, 2001, 455). The period saw the widespread circulation of newspapers that reported on slave revolts. Because ship-owners and investors placed much of the blame for Middle Passage revolt on a ship's captain, there was a 'great incentive [for the captain] to keep certain things quiet, since a substantial part of a captain's reputation in the slave trade…depended on his ability to control the Africans aboard his vessel and keep losses to a minimum' (Taylor, 2006, 3). Much of the data prior to 1750 is based on

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[7] Slaves also engaged in more subtle resistance in the form of self-mutilation, suicide, and invoking religious curses and warfare (Bly, 1998).

private ship logs kept by the captain and company records created from these logs, biasing the data of onboard slave insurrection. During the 1750s in England 'there were seventeen [new] daily, tri-weekly, and weekly newspapers circulating in London alone and another 40 in the provinces' and during this time 'stories from slave colonies and slave voyages began to form the subject matter of their columns in a way that commerce in long-distance non-human commodities never had' (Eltis and Engerman, 2010, 149). It is far more likely that a record of revolt would exist after this time because newspapers obtained reports of revolt from sailors, rather than relying only on the word of captains who may have had an incentive to conceal these reports. The 1760s and 1770s compose the period when 'reports of slave revolts in newspapers are their most frequent' (Eltis and Engerman, 2010, 152).[8]

The data during this period also include the English maritime newspaper *Lloyd's List*, which is 'perhaps the most comprehensive and independent single source for eighteenth century British ships' (Eltis, 2000, 18; Richardson, 2001, 72). Improved data during this period is not limited to the British slave trade alone. Records still exist in their entirety for the French port of Nantes whose authorities required returning slave ship captains to submit detailed accounts of completed voyages, which contain 'the least reporting bias [for insurrection]…of any national sources' (Behrendt et al, 2001, 457).

Several events make data after 1775 less reliable or useful. The best French records exist only until 1777. The outbreak of the American Revolution in 1776 and the French Revolution likely led to less representative public records of the slave trade. The British slave trade may 'have reached its peak [in 1775] before…the American Revolution' and the growing abolitionist movement either outlawed the trade or regulated the conditions on ship, making later periods problematic for comparison (Richardson, 1987, 241). In sum, the dissemination of information through print media, public records, world events, and the abolitionist movement makes 1750 to

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[8] See Eltis (2009) on the reporting of slave shipboard insurrections and Black (1987) on 18th century newspapers.

1775 the least biased sample available and includes the height of the trade (there were more voyages in this period than any other 25-year period).

Slaves were not randomly assigned to a particular voyage, as slave traders sometimes actively and consciously chose the number and mix of slaves to bring aboard. However, this is not problematic empirically because the slaves themselves could not self-sort onto particular voyages. From their perspective, their fellow shipmates were an exogenous factor.

Our sample contains 5,946 observations of slave voyages, including 152 instances of revolt. However, many of the regressions have substantially fewer observations because of missing data. We created a dummy variable for revolt, which is labeled 1 for those voyages that experienced insurrection (144 observations), those where a substantial insurrection was planned but thwarted by the slave ship captain and crew (7 observations), and those where the original source labeled the insurrection "cut-off" (1 observation).[9] The comparison group is labeled 0 and includes all other observations in the dataset. As our dependent variable is dichotomous—either the voyage resulted in a revolt or not—a logit model is appropriate and corresponds to our underlying theory of slave revolt.

We estimate a model of slave revolt (SR) using a logit regression

$$(1) \qquad SR_i = \beta_0 + \beta_1 Z_i + \varepsilon_i,$$

where $SR_i = 1$ if a slave revolt occurred and 0 otherwise and Z_i is a matrix of variables of interest. Two variables—the total number of slaves onboard and total male slaves—address our hypotheses directly. The other variables in the matrix were selected based on prior explanations for revolt and include the number of days the ship was slaving, whether slaves were from the Upper Guinea region, the percentage of child slaves, the number of crewmembers at the outset of

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[9] This definition of revolt follows both the *Voyages* database and past research on slave revolts (Behrendt et al, 2001; Richardson, 2001).

the voyage, crew deaths during Middle Passage, and crew deaths along the African coast. Table 1 provides summary statistics.

Our first hypothesis predicts that ships with a smaller number of slaves will be more likely to revolt. The individual slave's choice to participate in the revolt has a relatively greater influence on the outcome and monitoring is easier in smaller groups than in larger groups. In larger groups, a single slave might have less to contribute, and by not participating, he could avoid the dangers of resistance and the brutal punishments meted out if revolt failed. Past research is consistent with this hypothesis. Using a univariate difference in means test, Behrendt, Eltis, and Richardson (2001, 458) find that vessels that experienced rebellion carried fewer slaves per ton and fewer slaves per crewmember. In addition, vessels that experienced revolts were more likely to have a lower ratio of male slaves, a finding they deem 'counterintuitive.' Replicating this analysis with our data yields an average of 263 slaves for ships experiencing a revolt and 305 slaves for those that did not.

We first examine the effect of the total number of slaves on revolt with seven different logit regressions, using the total imputed number of slaves variable provided by the *Voyages* dataset. This allows us to control for other possible explanations of revolt, including African region, the percentage of slaves who were children, the number of crew at the outset of the voyage in Europe, crew deaths during the Middle Passage, and crew deaths on the African coast. All but two of these variables are drawn directly from the slave trade dataset and have been identified in past research as being associated with shipboard insurrection. To measure the influence of region, which has been identified as the single most important factor in the incidence of revolts, we created a dummy variable of the three Upper Guinea regions, Senegambia, Sierra Leone, and the Windward Coast. These regions are grouped together because they accounted 'for just over 10 per cent of the slaves leaving Africa; however, over 40 per cent

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of the voyages with slaves revolts came from these regions' (Behrendt et al, 2001, 457- 466).

Thus, we include Upper Guinea as a regional control, since past research has identified it as one

of the key variables explaining Middle Passage slave revolt. Days spent slaving measures the

days spent along the African coast, which may be important since longer loading times on the

coast imply more exposure to risk of revolt (Behrendt et al, 2001, 458; Richardson, 2001, 76).[10]

The days spent slaving variable is calculated following a formula that also includes the tonnage

of the ship. Table 2 displays the regression results for our first hypothesis.

The first column (1) reports estimates of revolt for the fixed effects of total number of

slaves, days spent slaving, and Upper Guinea. This control captures the potential importance of

days spent along the African coast since it has been argued that slaving vessels along the coast

were more prone to rebellion due to African deficiencies in maritime navigation, and the regional

impact of slaves taken from Senegambia, Sierra Leone, and the Windward Coast. In this

specification, the estimated relationship between total number of slaves onboard and revolt is

negative and statistically significant. By controlling for the Upper Guinea region, our findings

suggest that the Upper Guinea region is important as a determinant for revolt. As expected, as the

number of days spent along the African coast increases, slaves are more likely to revolt. The

second column (2) controls for all of the previous factors with the addition of percentage

children, which was identified as statistically significant to revolt in earlier statistical analysis

(Behrendt et al 2001, 558). Controlling for these variables, no variable is statistically significant;

however, the estimated relationship between total number of slaves and revolts still remains

negative. One concern with the estimates in column (2) is the substantial drop in observations

and the large standard error of the percentage children variable. Because the age of slaves was

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[10] Because days spent slaving is something that few ships recorded and because total days was typically dependent on the size of the ship, we utilize the equation provided by Behrendt et al (2001, 458) to calculate the total number of days spent along the African coast.

infrequently reported, these results may be affected by reporting bias which could explain the difference in significance between columns (1) and (2).

Column (3) controls for the total number of slaves, days spent along the African coast, the regional variable Upper Guinea, and the number of crew at the outset of the voyage. This is used to capture the possible influence of the relative strength of the crew in revolt. The estimated relationship between total number of slaves and revolt remains negative and statistically significant. The Upper Guinea region and the days spent along the coast also remain positive and statistically significant. Building on the idea of crew strength accounted for in column (3), the next treatments (4) and (5) include an additional control variable to account for the differences in crew deaths during the entire voyage. The results show a positive association between the likelihood of revolt and the number of crew deaths. However, because we expect a greater number of crew deaths on vessels that experienced revolt, it is important to point out that 'crew mortality was…as much an effect as a cause of revolts' (Behrendt et al, 2001, 462). The potential for error created by the inclusion of total crew deaths during the Middle Passage cannot be ignored, but it is worth noting that the total number of slaves maintains its negative relationship and statistical significance with revolt.

Columns (5) and (6) include control variables for sailor deaths along the African coast. This controls for possible differences in the reduction of crew strength because of illness and death along the African coast. Again, it is impossible to know if crew deaths along the African coast were a potential cause or effect of rebellion. Moreover, the large reductions in the number of observations removes statistical significance for all variables, except for negative relationship associated with the total number of slaves onboard. Column (7) controls for all of the variables used in Behrendt, Eltis, and Richardson (2001, 460)—with the addition of total number of slaves

and the elimination of the percentage of slaves who were male. These results also find that the only variable that remains statistically significant is total number of slaves.[11]

Table 3 reports the marginal effects at the mean of the independent variables. Consistent with the coefficients reported in Table 2, the slope of the probability curve indicates a negative relationship between the total number of slaves and revolt while also remaining statistically significant in all but one regression. The results in Table 3 indicate that adding an additional 100 slaves, holding all other variables equal to their mean values, decreases the probability of revolt between 0.007 and 0.028. When the probability of revolt in the aggregate data is at most 10 percent and more realistically 2 percent, a change of 0.7 percent to 2.8 percent suggests this is an important influence. While the number of days spent slaving and the Upper Guinea variable are less robust than the total number of slaves, when they are statistically significant, they also have economic significance.

These results are generally supportive of the first hypothesis. The estimated magnitudes of the relationship between total number of slaves and revolt are not only statistically significant and in the predicted direction, but also have practical significance. The percent change in odds for a one unit increase in total slaves is associated with between -0.2 percent to -0.8 percent chance of revolt. For illustrative purposes, with the addition of one hundred slaves to the vessel, the estimated odds of revolt would decrease anywhere from 20 percent to 80 percent, holding all other variables constant.[12] In regressions one and three (which contain the most observations) the range of percent change in the estimated odds of revolt for the addition of one slave is -0.3 percent to -0.6 percent. In sum, when controlling for other influences, a smaller total number of slaves onboard is associated with more slave revolts.

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[11] Crews were not more lax when they had relatively fewer slaves aboard. Slave crews remained vigilant, recognizing that slaves "were frequently plotting insurrections" and more importantly in terms of numbers "if a vessel has but thirty slaves they are for attempting to rise" (Francis, 1716; Newton, 1788, 54-80; as saw in Taylor, 2006, 83).

[12] For methods used to interpret economic significance see Long and Freese (2006, 177-181)

To test the robustness of this finding, we can also examine how the likelihood of revolt varied based on the number of male slaves onboard. Since the initial—and most dangerous—stages of resistance required the greatest physical demands, male slaves were the key actors involved in producing the public good. They had to battle armed crewmembers, faced a substantial risk of harm in the process, and torture and death in the case of failure. A smaller number of male slaves will more easily overcome the collective action problem because monitoring is less costly and each individual's contribution is more important.[13] Table 4 displays the regression results when including data on the number of male slaves, and Table 5 reports the marginal effects.

These tests control for the same variables as the results in Tables 2 and 3, except total number of slaves onboard is replaced by the total number of male slaves onboard. Consistent with the second hypothesis, in all of the treatments in both the logit regression and the marginal effects of the independent variables, the number of male slaves onboard has a negative and statistically significant relationship with the likelihood of revolt. The probability of revolt decreases with an increase in the number of male slaves. However, because of the large number of observations dropped with inclusion of data on the number of male slaves, the number of days spent slaving and the Upper Guinea region are no longer significant.

Table 5 reports the marginal effects at the mean of the independent variables for the total number of male slaves. Like with the coefficients reported in Table 4, the slope of the probability curve denotes a negative relationship between the total number of male slaves and revolt while also remaining statistically significant in all regressions. The results in Table 5 indicate that

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[13] Gaspar has identified the 'supportive functions of women within the slave community' and the 'nonconfrontational resistance' of women who through child rearing were the 'principal shapers of the culture of resistance' while on land (1996, 232). The act of insurrection aboard ships, however, required confrontational resistance to overthrow the white captors.

adding an additional 100 male slaves onboard, holding all other variables equal to their mean values, reduces the probability of revolt between 3.0 and 4.6 percent.

As with total number of slaves, the number of male slaves onboard is not only statistically significant in the proper direction, but has real world significance. Calculating the change in percentage in odds for a one unit increase in total male slaves, each additional male slave has the effect of a percent change in the odds of revolt ranging from -0.9 percent to -1.0 percent. If we interpret the relationship as causal, an addition of fifty male slaves to the vessel, would decrease the odds of revolt by at least 45 percent and as much as 50 percent, holding all other variables constant. Moreover, when controlling for the total number of males and the variables hypothesized as potential causes of revolt by historians, no other values remain statistically significant.

4.2. Slave homogeneity

During the Middle Passage, the degree of homogeneity among the slaves was important to acting collectively. Historically, norms of solidarity provide an important method of mitigating the free rider problem of revolutionaries (Goldstone 1994). Mechanisms that facilitate self-enforcing exchange often reduce social distance so people can reduce their perceived heterogeneity (Leeson, 2005). While slaves certainly shared a common goal, solidarity was less effective because 'those around them were complete strangers with bizarre customs and indecipherable languages' (Taylor, 2006, 25). Though some similarities in language and culture may have existed in western and central African communities, they were incredibly diverse and included more than fifty different language communities according to modern classification (Thornton, 1998, 186).

The second hypothesis suggests that the more homogenous slaves were—the more slaves that came from fewer language and cultural groups—the easier it would be to affect collective action and revolt. Because of the lack of suitable data to measure the homogeneity of slave groups, this part of our analysis draws on qualitative, primary documents and the work of historians.[14]

Ship captains and other professionals involved in the slave trade provide support for the importance of homogeneity. They recognized the danger of cultural and lingual homogeneity and attempted to 'choose them [slaves] from severall parts of ye Country, of different Languages; so that they find they cannot act jointly' (Rediker, 2007, 57). Slavers purchased people of varying language groups in an attempt to have 'every Sort on board, [so] there will be no more likelihood of their succeeding in a Plot, than finishing the tower of *Babel*' (Smith 1744, 28) Royal African Company surveyor William Smith understood the diversity of African languages contending further that the languages of Senegambia were 'so many and so different…that the natives, on either side of the [Gambia] River cannot understand each other' (Smith, 1744, 28; Rediker, 2007, 276). John Atkins similarly understood that 'further management and caution [was] to be taken with slaves on board…[one] shall intermix [the slaves]…because cautions where a cargo is of one Language, is so much the more requisite' (Atkins, 1734, 171-172). The Captain of the English ship *Ferrers* was warned 'that as he had on board so many negroes of one Town and Languages, it required the utmost care and Management to keep them from mutinying' (Snelgrave, 1734, 187; Rediker, 2007, 277; Taylor, 2006, 81). By collecting slaves from many

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[14] While the *Voyages* database provides the number of slaves shipped from each coastal country, this does not accurately indicate where slaves actually originated (Nunn, 2008, 145). Nunn's important work on the effect of slavery on African underdevelopment overcomes this data deficiency using a variety of sources, such as "records of sale, slave registers, slave runaway notices, court records, church records, and notarial documents" all pointing to the ethnicity of the slaves (2008, 146; see also Nunn 2007 and Nunn and Wantchekon 2011). We cannot replicate this method because most of these records were documented after the slaves had landed in the Americas and thus prohibits examination at the time of voyage. There is currently insufficient information to calculate the number of slaves from a particular language or cultural group at the vessel level

parts of Africa, slavers hoped to squash any chance of rebellion.[15] Captains understood that 'people from different language groups may have been unable to communicate effectively with one another, making the planning of a rebellion nearly impossible, even when it was a mutually desired goal' (Taylor, 2006, 80).

Slaves from different language and cultural groups struggled even to coordinate to accomplish simple tasks. Describing his interaction with a freed African in the 1780's, abolitionist John Riland noted the scars where the slave's 'flesh look[ed] seamed and rugged' because the slave had been chained to another slave during the Middle Passage and they did 'not well understand each other's language,' causing them to do 'exactly contrary to what [each other] meant' (Riland, 1827, 22-24). Captain James Bowen noted when 'Men of different Nations' were locked together, they would often fight against each other (Bowen, 1789; as cited in Rediker, 2007, 272). By shackling men of different language groups together, the captains hoped to avoid the 'risk [of] cooperation and hence conspiracy' instead electing to 'shackle men of different races and risk fighting, disorder, and injury' (Rediker, 2007, 272). Different language and cultural groups struggled to cooperate to accomplish tasks as simple as moving while below the deck, suggesting that collectively rebelling against a vigilant, armed crew was especially difficult. This fact has led one historian to note, 'the whites have no greater security than the diversity of the negroes' languages' (Wood, 1975, 180).

Looking at specific instances of rebellion highlights the confounding effects of diverse languages and cultures. In reference to a mutiny aboard the *Elizabeth* in 1721, Captain William Snelgrave notes that the ship's Cooper was found 'lying on his back, quite dead' because of insurrectionists (Snelgrave, 1734, 177-179). However, the slaves currently onboard (the others

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[15] It's important to note that even though slavers attempted to purchase Africans among distinct cultural and language groups, they were able to accomplish this without leaving their first port of embarkation, in large part because of the cultural and linguistic diversity of Africa. In fact, for the entire slave trade only about 12% of voyages documented traveling to a second African port to purchase slaves.

had apparently escaped) knew nothing of the matter; for there had been no design of mutinying amongst them because of the more than 'one hundred of the Negroes then on board, being bought [from] Windward, did not understand a word of the Gold Coast Language, and so had not been involved in the plot.' (Snelgrave, 1734, 177-179). Had the one hundred Windward Coast slaves understood the language of the Gold Coast slaves, it might have been possible for them to escape as well (Snelgrave 1734, 180).

Compounding these problems further, many slaves saw other language, ethnic, and cultural groups as enemies (Rediker, 2006, 295). Looking at the three Gold Coast groups for instance, 'whenever insurrections have occurred on board of slave ships…as the Fantees and Asshantees were invariably the promoters of them, the Chambas, as if to be revenged on them [for the history of the other two groups in enslaving the Chambas], always assisted the crews in suppressing these mutinies, and keeping them [the Fantees and Asshantees] in subjection' (Adams, 1823, 9; Rediker, 2006, 272). Because of cultural differences, one African cultural group decided not only to abstain from rebelling against their white captors, but also to interfere with the rebellion so that the other ethnic group could not gain power. This level of collective failure was not reserved to these specific groups. Aboard the 'English Vessel *Brome,* an intriguing report noted simply that when the 'Jollofes rose, the Bambaras sided with the master'' (Eltis, 2000, 229 in Taylor, 2006, 80). On yet another occasion, a captain upon discovering an insurrectionary plot 'made inquiries and learned that the Crepes were unwilling to take sides with those [Akwambo slaves] planning the evil' (Svalesen, 2000, 114). Heterogeneity prevented slave revolt by thwarting communication among conspirators and the distrust or hatred among regional rivals.

5. Conclusion

Slaves faced tremendous physical and psychological abuse during their capture, sale, and transport across the Middle Passage. The horror of this historical period, what W. E. B. DuBois called the "most magnificent drama in the last thousand years of human history," can be difficult to comprehend. We suggest a rational choice theory of slave revolt that emphasizes the collective action problem to understand when slaves were able to revolt. Using quantitative evidence on slave voyages from 1750 to 1775, this paper argues that the collective action problem was an important impediment to slave revolt. Slave ships with fewer slaves and fewer male slaves were more likely to revolt because they could monitor against free riding and induce greater participation. Our finding suggests that explanations that rely entirely on "African-based" causes for revolt, like social, religious, and political conditions peculiar to certain regions, are less important explanations for revolt than slaves' ability to overcome the collective action problem. Relying on historical and archival materials, we also argue that the greater degree of homogeneity facilitated revolt. Ship captains actively sought to diversify their purchases with slaves from different regions so that collective action would be more difficult.

Slaves could not rely on most of the solutions commonly used by rebels to produce the public good of revolt, including assistance from outsider donors and patrons, improving effectiveness by reorganizing, recruiting new participants, increasing competition among enemies to thwart their oppression, exiting, increasing access to resources, or lowering their costs. Because slaves could not rely on these solutions, the only way to secure their freedom was the contractual solution that emerged from self-organization. Slaves produced self-organized solutions in an attempt to save their lives, recapture their freedom, and in a few rare cases, return to Africa.

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TABLE 1
SUMMARY STATISTICS

Variable Name	Min.	Max.	Avg.	Std. Dev.	Obs.	Definition
Dependent Variable						
Slave Revolt	0	1	0.03	0.158	5946	=1 if slave insurrection occurred, planned but thwarted, and "cut-off"
Independent Variables						
Total Slaves	1	936	265.58	128	5822	The total number of slaves onboard the slaving vessel
Total Males	13	432	154.27	84.5	667	The total number of male slaves onboard the slaving vessel
Upper Guinea	0	1	0.25	0.432	5946	=1 if slaves are from Senegambia, Sierra Leone, or Windward Coast
Days Spent Slaving	119.93	168.34	134.05	6.55	4650	Calculated value for days spent along the African coast
Percentage Children	0	0.92	0.28	0.142	606	The ratio of children compared to adult slaves onboard
Crew at Outset	2	164	29.60	12.4	3493	The number of crew at European departure
Crew Died	0	68	6.72	6.48	956	The number of crew deaths throughout the entire voyage
Crew Deaths African Coast	0	40	3.06	3.86	716	The number of crew deaths while on the African coast

TABLE 2
ONBOARD SLAVE RESISTANCE
LOGIT REGRESSION RESULTS FOR TOTAL SLAVES

Independent Variable:	Coefficient (Standard error)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant	-10.914*** (1.868)	-4.456 (3.993)	-9.968*** (2.502)	-10.112*** (3.355)	-7.868 (7.146)	-10.374 (7.461)	-9.814 (7.683)
Total Number of Slaves	-0.003*** (0.001)	-0.002 (0.002)	-0.004*** (0.001)	-0.006*** (0.002)	-0.006 ** (0.003)	-0.007** (0.003)	-.008 ** (0.003)
Days Spent Slaving	0.058*** (0.014)	0.020 (0.030)	0.050** (0.020)	0.060** (0.026)	0.047 (0.054)	0.066 (0.056)	0.061 (0.058)
Upper Guinea	0.824*** (0.194)	0.423 (0.383)	0.748*** (0.224)	1.005*** (0.349)	0.808 (0.615)	0.565 (0.695)	0.605 (0.701)
Percentage Children	--	-1.085 (1.279)	--	--	0.067 (2.073)	0.608 (2.394)	0.504 (2.439)
Crew at Outset	--	--	0.018* (0.009)	--	--	--	--
Crew Deaths	--	--	--	0.039*** (0.019)	0.049 (0.042)	--	0.115 (0.079)
Crew Deaths on African Coast	--	--	--	--	--	0.044 (0.063)	-0.079 (0.105)
Observations	4550	520	3379	940	291	250	249
McFadden R^2	0.034	0.016	0.038	0.104	0.097	0.102	0.118

Notes: Asterisks indicate statistical significance as follows: ***=1%, **=5%, *=10%

TABLE 3
MARGINAL EFFECTS FOR TOTAL SLAVES

	Marginal Effects at the Means (Standard error)						
Independent Variable:	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Total Number of Slaves	-0.00007*** (0.00002)	-0.00014 (0.00012)	-0.00010*** (0.00003)	-0.00019*** (0.00005)	-0.00026** (0.00011)	-0.00027*** (0.00011)	-0.00028*** (0.00010)
Days Spent Slaving	0.00146*** (0.00035)	0.00148 (0.00216)	0.00127** (0.00050)	0.00206** (0.00089)	0.00192 (0.00222)	0.00256 (0.00216)	0.00222 (0.00211)
Upper Guinea	0.025*** (0.007)	0.034 (0.034)	0.022*** (0.008)	0.048** (0.023)	0.045 (0.045)	0.027 (0.040)	0.027 (0.040)
Percentage Children	--	-0.079 (0.093)	--	--	0.003 (0.086)	0.024 (0.093)	0.018 (0.089)
Crew at Outset	--	--	0.0004* (0.00023)	--	--	--	--
Crew Deaths	--	--	--	0.001** (0.001)	0.002 (0.002)	--	0.004 (0.003)
Crew Deaths on African Coast	--	--	--	--	--	0.002 (0.002)	-0.003 (0.004)
Observations	4550	520	3379	940	291	250	249
Marginal Effects after logit regression	0.026	0.079	0.026	0.036	0.043	0.040	0.038

Notes: Asterisks indicate statistical significance as follows: ***=1%, **=5%, *=10%

TABLE 4
ONBOARD SLAVE RESISTANCE
LOGIT REGRESSION RESULTS FOR TOTAL MALES

Independent Variable:	Coefficient (Standard error)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant	-7.295* (3.2847)	-5.6195 (3.999)	-5.80 (4.899)	-7.318 (6.14)	--6.228 (6.659)	-9.124 (7.277)	-8.334 (7.549)
Number of Male Slaves	-0.005*** (0.002)	-0.0066*** (0.002)	-0.007** (0.003)	-0.011** (0.004)	-0.011** (0.004)	-0.012** (0.007)	-0.011** (0.004)
Days Spent Slaving	0.040 (0.024)	0.0320 (0.027)	0.023 (0.040)	0.042 (0.046)	0.034 (0.004)	0.055 (0.053)	0.047 (0.055)
Upper Guinea	0.320 (0.359)	0.331 (0.3655)	0.607 (0.428)	0.763 (0.601)	0.769 (0.606)	0.549 (0.688)	0.599 (0.693)
Percentage Children	--	-1.221 (1.253)	--	--	-0.0384 (1.95)	0.763 (2.30)	0.8169 (2.33)
Crew at Outset	--	--	0.0331 (0.0253)	--	--	--	--
Crew Deaths	--	--	--	0.037 (0.042)	0.039 (0.042)	--	0.0816 (0.076)
Crew Deaths on Coast	--	--	--	--	--	0.035 (0.062)	-0.048 (0.098)
Observations	594	517	436	298	291	250	249
McFadden R^2	0.0304	0.0385	0.050	0.011	0.116	0.116	0.125

Notes: Asterisks indicate statistical significance as follows: ***=1%, **=5%, *=10%

TABLE 5

MARGINAL EFFECTS FOR TOTAL MALES

Marginal Effects at the Means
(Standard error)

Independent Variable:	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Number of Male Slaves	-0.00038*** (0.0001)	-0.00046*** (0.00016)	-0.00045*** (0.00017)	-0.0004** (0.00013)	-0.00041** (0.00013)	-0.00041** (0.00014)	-0.0040** (0.00013)
Days Spent Slaving	0.003 (0.001)	0.002 (0.0018)	0.0014 (0.002)	0.0015 (0.0017)	0.002 (0.0018)	0.002 (0.002)	0.002 (0.002)
Upper Guinea	0.0225 (0.027)	0.0247 (0.0296)	0.049 (0.037)	0.037 (0.002)	0.038 (0.039)	0.024 (0.036)	0.025 (0.0365)
Percentage Children	--	-0.0836 (0.084)	--	--	-0.0014 (0.072)	0.027 (0.081)	0.028 (0.0277)
Crew at Outset	--	--	0.002 (0.002)	--	--	--	--
Crew Deaths	--	--	--	0.001 (0.002)	0.0014 (0.002)	--	0.0028 (0.003)
Crew Deaths on African Coast	--	--	--	--	--	0.001 (0.002)	-0.0016 (0.003)
Observations	594	517	436	298	291	250	249
Marginal Effects after logit regression	0.069	0.074	0.066	0.038	0.038	0.036	0.035

Notes: Asterisks indicate statistical significance as follows: ***=1%, **=5%, *=10%