

**Insurgents of the Sea:  
Institutional and Economic Opportunities for Maritime Piracy**

While piracy may evoke romanticized visions of swashbuckling, rum swigging, and skirt chasing pirates hoisting the Jolly Roger, it is not a relevant description of modern piracy. Maritime piracy has changed substantially by taking advantage of modernization and substantial upgrading of the weapons, vessels, and weapons it employs. In addition, as documented by the International Marine Bureau (IMB), the frequency of pirate attacks has increased significantly, with more than 2,200 piracy incidents occurring since 2004. We argue that piracy is a result of permissive institutional environments and the lack of legal forms of employment in states' fishing sectors. We investigate these arguments empirically using systemic and monadic-level data for the 1991-2009 period. Our empirical analyses show that state weakness and reductions in fish catch affect piracy as expected. These findings suggest that international efforts in combating piracy should center on improving the institutional environments and labor opportunities driving maritime piracy.

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## Introduction

In 2010, pirates launched 445 attacks against shipping vessels worldwide. This represents an 86% increase in piracy from 2006 and over a 300% increase from 1991. So far in 2011, there have been at least 11 hijackings and over 220 hostages have been seized, most by Somali pirates (IMB). While certain incidents have generated considerable media attention, such as the rescue of Maersk Alabama captain Richard Phillips by US navy SEALs in April of 2009, maritime piracy remains both under-exposed and under-explored. Indeed, a JSTOR search of political science periodicals for titles of articles brings up 323 using the term terrorism but only 25 using piracy. This limited research has meant not only that many conjectures have been proposed to explain recent incidents of piracy, but also that few of these conjectures have been subjected to empirical evaluation.

Most explanations for piracy involve the interaction of greed and state failure. That is, large increases in goods carried by the world's merchant ships have proved to be lucrative targets for maritime brigands that now have access to high-speed boats and powerful but light-weight weapons. Couple such greed with a lack of control of territorial waters and piracy supposedly flourishes. Countries such as Somalia, Indonesia, and Sri Lanka are frequently cited as empirical confirmation of such relationships. Despite significant numbers of pirate attacks off the coasts of these three countries, nearly 60% of non-landlocked states have experienced incidents of piracy in their territorial waters. The problem is considerably more widespread than just the Straits of Malacca, the South China Sea, or the Gulf of Aden.

Unlike terrorism, the public policy response to piracy has been limited. The United States and other countries have sent additional warships to the waters off Somalia and President Obama has publically pledged to "halt the rise of piracy," but as Chalk (2009) notes such limited actions have largely been ineffectual. While the UN Security Council did admittedly adopt resolution 1851, which legalizes the pursuit of pirates onto Somali territory, the authority applies only to cooperating states, extends merely for 12 months, and appears dependent on authorization from the Transitional Government of Somalia. Despite

efforts to combat piracy, both the drivers of piracy as well as effective tools to combat piracy remain misunderstood. For example, if piracy and terrorism are linked and the United States continues to serve as a lightning rod for terrorist organizations, then an increased US naval presence may actually increase attacks rather than decrease them (Luft and Korin, 2004).

Extant research on piracy remains both limited and largely anecdotal in character. Frequently only the most serious incidents receive attention and scrutiny and as such they present problems for generalization. Other accounts of piracy tend to be solely descriptive in orientation and while temporal trends may be noted, attempts to link piracy to other processes is ignored (e.g., Luft and Korin, 2004; Nankivell, 2004; Bradford, 2008). The few analytical studies that exist unfortunately are plagued by selection bias in their empirical research designs. For example, Hastings (2009) uses hijackings as the unit of analysis and attempts to explain variation in the incidence of cargo and ship seizures relative to kidnappings for ransom. Iyigun and Ratisukpinol (2010) also select piracy events as the unit of analysis and examine the occurrence of harm to ship crews. By selecting cases solely from the IMB (or similar) database, scholars introduce two types of bias into their models. First, one presumably exaggerates the country-level characteristics that are associated with piracy events, such as regime type, state fragility, and even perhaps coastline length. Second, a database only featuring information on pirate incidents cannot offer an accurate assessment of the basic incidence rate across countries and years.

This paper makes two contributions to the literature on maritime piracy. First, we propose a general explanation of maritime piracy that emphasizes the importance of institutional and economic opportunities. The presence of a permissive institutional environment is crucial as it provides pirates with safe havens to plan attacks and protect themselves from capture. In weak or failed states, governments lack effective control over their territory on land and sea, which creates conditions conducive for piracy. We also hypothesize that cost-benefit calculations affect individuals' decisions to engage in piracy. In particular, we expect that changes in labor opportunities in economic sectors most vital for potential pirate recruits,

such as the fishing industry, are correlated with piracy. Our empirical analysis confirms these expectations. Second, we attempt to resolve some of the research design weaknesses in earlier work on the incidence of piracy. Not only do we avoid selection bias by using a monadic-year unit of analysis that includes all states in the international system, but we also extend the temporal domain by examining cases from 1991-2007. Our exploration involves all piracy incidents (which include attempts and actual attacks), actual piracy attacks, and the more specific, but perhaps less under-counted, subset of hijackings per country-year. With this design, we can better assess whether state failure, violent conflict, and decreases in fish catch are associated with the incidence of piracy as hypothesized.

We proceed as follows. First, we provide a brief overview of historical patterns in maritime piracy. We then develop our theoretical explanations on the institutional and economic opportunities for piracy. Next we introduce our data and present descriptive statistics on spatial and temporal trends. We then evaluate the incidence of piracy at the systemic and nation-state levels of analysis and assess whether extant conjectures are empirically supported. We find that state weakness and economic motivations influence piracy as expected. We conclude by discussing the implication of our findings and offer suggestions for moving research on piracy forward.

## **A History of Piracy**

Mentions of piracy frequently conjure romanticized notions of swashbuckling, rum swigging, and skirt chasing buccaneers hoisting the Jolly Roger. While such images stem from the portrayal of piracy in literature and film, they are of limited use in understanding both ancient and more recent manifestations of maritime banditry. Piracy has a long history in the oceans of the world and its origins date back to the Phoenicians more than 4000 years ago. However, as maritime technology increasingly allowed sailing vessels to travel farther away from littoral zones, and without adequate policing of the high seas, piracy not only flourished but was largely sanctioned by the critical powers of the day (Nadelmann, 1990). Piracy was

a means by which individuals accrued wealth, but also a tool of political leaders to increase state power.<sup>1</sup> Further, as trade on the high seas increased with European colonization, cargo ships laden with spices, silks, ivory, and precious metals became lucrative targets for the corsairs of the day.

The Barbary pirates, for example, were the scourge of American merchant ships immediately following the Revolutionary War.<sup>2</sup> While the British were able to patrol the Mediterranean and protect their trade routes, most states simply paid tribute to the Deys of the Barbary States (Howarth, 1991). Ransoming crews (similar to today) as well as tributes were common responses to the North African corsairs. The U.S. in 1791, for example, offered \$49,000 to the Dey of Algeria for ransoming held U.S. sailors and created a tribute account to buy off the North African leaders (Howarth, 1991). Other countries, such as Holland, Austria, and Norway also paid for protection. Davis (2003) concludes that upward of a million European sailors were seized and sold into slavery during the height of Barbary power in the 18<sup>th</sup> and 19<sup>th</sup> centuries.

Piracy reached its heyday in the late 17<sup>th</sup> and early 18<sup>th</sup> centuries when it flourished in the seas adjacent to Europe and North America, as well as the Indian Ocean (Dear and Kemp, 2005: 430). Yet its success eventually produced a response by the British, whose naval forces had been substantially strengthened toward the end of the 17<sup>th</sup> century (Nadelmann, 1990). In part, the naval response to piracy by the British (as well as the Dutch, Spanish, and French) stemmed from the increasingly profitable maritime trade in goods to and from European colonies (DeNevers, 2007; Rediker, 2004). Consequently, political elites not only attempted to delegitimize criminality on the high seas, but also sought to crush it

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<sup>1</sup> In return for a letter of marque, which offered pirates some legitimacy through state sanction, governments received a share of the spoils (Conybeare and Sandler, 1993).

<sup>2</sup> The Barbary pirates were sponsored, in most instances, by sovereign states and thus the term privateer is more accurate. Yet, how much control the Sultans of North Africa had over these ships and crews is not entirely clear. A treaty between Charles V of Spain and the King of Tunis requires the North African leader to offer no shelter to corsairs, pirates, and robbers, which suggests that some pirate vessels were operating independently of state control (Montmorency, 1918).

through the use of naval power (Ritchie, 1986).<sup>3</sup> These actions were largely successful as buccaneers around the world were slowly eradicated and their state sponsors persuaded to close-down safe-havens (Lehr, 2007: *vii*; Nadelmann, 1990).<sup>4</sup>

Piracy all but disappeared from security discussions until the number of pirate attacks started to rise again in the late 1980s. Presumably, the reemergence of piracy can be attributed to two phenomena. First, the end of the Cold War weakened the political control of states previously supported by the superpowers, which reduced states' ability to provide maritime security. Coinciding with these developments was an increase in international business and trade as a result of globalization (Lehr, 2007: *viii*). Yet despite large increases in piracy incidents, modern manifestations of piracy continue to be largely ignored and thus remain underexplored.

What are similarities and differences between earlier and more recent forms of piracy? Research argues that differences arise in the geographic reach and the international assessment of piracy (Ong-Webb, 2007). Recent piracy events occur primarily in the territorial waters of states, whereas piracy during its height was carried out on the high seas (Murphy, 2009). In addition, earlier forms of piracy possessed at least conditional legitimacy. Privateering (the procurement of private vessels by states) was given a degree of official government sanction (Abbot and Renwick, 1999). In comparison, contemporary piracy is seen as illegitimate and is considered criminal activity under international law.<sup>5</sup> Yet there are also reasons to believe that substantial similarities between ancient and contemporary forms of piracy exist, especially with regard to explanations of piracy. Murphy (2009: 21) and Ong-Webb (2007) argue that many of the underlying

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<sup>3</sup> DeNevers (2007) maintains that norm promotion by great powers relies on coercion when directed at weak states and persuasion when directed at strong states.

<sup>4</sup> Interestingly, Nadelman (1990: 491) also maintains that the advent of steam power brought a final end to the incidence of piracy. Pirates could not keep up with steam powered vessels and the resources needed to build or buy such technologically advanced ships were out of reach of the pirates of the day. Unfortunately, technology now allows even the most resource-limited groups to chase down and threaten large merchant ships.

<sup>5</sup> The criminalization of piracy in international law was completed with the ratification of UNCLOS, which entered into force in 1994 and currently has 161 member states. In addition, many states have domestic legislation against piracy, although substantial variation exists (Murphy, 2007: 166).

factors contributing to piracy remain the same. For example, poorly regulated seas, favorable geography, sanctuaries on land, and economic opportunities provide opportunities and motives for pirates old and new. Such explanations of ancient and contemporary piracy are valuable for the purposes of this paper since we aim to understand the conditions leading to piracy. The subsequent section draws on explanations of piracy proposed in the literature and develops several theoretical conjectures.

### **Opportunities for Maritime Piracy**

Research on maritime piracy is mostly limited to case studies of individual piracy events and analyses of countries or regions with particularly pressing piracy problems (such as Somalia or Southeast Asia). Systematic analyses of piracy are rare and present mostly descriptive statistics (Ong-Webb, 2007; Murphy, 2009). An exception to this is work by Hastings (2009), Iyigun and Ratisukpinol (2010), and Jablonski and Oliver (2010), who use quantitative methods to analyze piracy incidents. Yet all of these studies explain variation in piracy attacks rather than developing general explanations of maritime piracy.<sup>6</sup> Nevertheless, existing research on piracy is helpful in that it allows us to develop a set of conjectures on the determinants of piracy. We center our theoretical argument on the institutional and economic opportunities for piracy. As outlined in more detail below, institutional opportunities create conditions conducive for piracy in that they allow for the planning and implementation of attacks and reduce the risk of capture. The absence of legal forms of employment creates economic opportunities for piracy, particularly when economic conditions threaten the livelihood of individuals most amenable for piracy, such as those employed in states' fishing industries.

#### *Institutional Opportunities for Piracy*

Piracy, while implemented at sea, begins and ends on land. Access to a state is essential because pirates need sanctuaries on land to plan attacks, protect themselves from capture, and conduct ransom

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<sup>6</sup> These studies include only piracy events in their empirical analyses, making it impossible to know whether the factors related to particular types of piracy events or temporal variation in the number of events might be equally present in countries without piracy.

operations. In addition, piracy groups need access to markets to dispose of their loot. The importance of a permissive political and legal environment is stressed in much of the literature on piracy (Murphy, 2007; Ong-Webb, 2007; Hastings, 2009; Iyigun and Ratisukpinol, 2010). We expect that states with permissive institutional environments, such as weak or failed states, are more likely to experience piracy. State weakness creates an enabling environment in which piracy can flourish. Weak states are states in which corruption, crime, and other social problems are rampant. While weak states can provide basic services such as transportation infrastructures and commodity markets, they struggle to adequately maintain them (Hastings, 2009: 214). In failed states, the government exerts little control over its territory and fails to provide public goods to its citizens. Pirates must have access to shores and anchorages to load and unload their cargo and conduct ransom negotiations. Consequently, piracy flourishes in areas with poorly guarded ports and underpaid security personnel, and such individuals are likely to conspire with pirates for compensation. Weak and failed states thus provide pirate operations with access to sanctuaries and markets necessary to operate. Without access to bases and markets on land, pirates face difficulty in protecting themselves from capture and disposing of their loot. In fact, research argues that piracy is a land-based activity that is implemented at sea (Murphy, 2008, 2009).

State weakness also reduces the capacity of states to combat piracy. Murphy (2009), for example, argues that lax antipiracy measures almost always stem from state weakness. Presumably, such states are either unable to fund maritime security measures or think that their resources should be spent on other priorities. Lacking well trained and equipped police and military forces, weak and failed states cannot protect their waters. Moreover, the international focus on terrorism in recent decades may have exacerbated this situation, as it has forced many states to devote extensive resources into homeland security initiatives (Chalk, 2009). The majority of piracy events occur in states' territorial waters, and success in combating piracy thus depends primarily on the capacity and goodwill of individual states (Murphy, 2009). Empirical evidence from individual cases such as Somalia or regions such as Southeast Asia largely supports



these arguments (Ong-Webb, 2007, Lehr and Lehmann, 2007; Kraska and Wilson, 2009). Quantitative research also suggests that state weakness and state failure explain variations in piracy attacks (Hastings, 2009).

In addition, research suggests that piracy occurs more frequently in regions troubled by civil war and unrest. For example, Murphy (2009) argues that piracy problems in Thailand, Lebanon, and Somalia were triggered by civil wars. Consequently, states experiencing the most severe forms of state weakness, such as state failure and subsequent collapse into violent conflict and disorder, are also likely to experience conditions amenable for piracy. Yet Hastings (2009) claims that state collapse into civil war could actually undermine the ability of organized groups to carry out sophisticated operations. These states may not be able to maintain the transportation infrastructure necessary for moving piracy loot and may lack markets necessary to find buyers (Hastings, 2009: 214). While Hastings (2009) does not explain the absence or presence of piracy, he shows that more sophisticated attacks are less likely to occur in failed or collapsed states. While this finding suggests that state collapse may deter the implementation of the most advanced attacks, it is likely that conflict and disorder increase opportunities for less-skilled forms of piracy.

Finally, weak institutional environments can create more direct opportunities for piracy by threatening the livelihoods of coastal fishing communities (Bawumia and Sumaila, 2010). Weak states' inability to protect their territorial waters can result in illegal, unreported, and unregulated fishing (IUU), which could result in the redeployment of fishers into illegal activities such as piracy. After the collapse of government institutions in Somalia in the early 1990s, for example, commercial foreign fishing vessels began working off the Somali shoreline, frequently invading its territorial waters and exclusive economic zone, and thus displacing local fishers (Lehr and Lehmann, 2007). While such infringement by third parties may increase fish catch for these foreign actors, IUU fishing reduces the fish stock available for local communities and also threatens the long-term health of fisheries through overexploitation. The next section evaluates the effect of economic opportunities on potential pirates more specifically. Taken together, the

above insights suggest that state weakness and state collapse should be positively correlated with piracy incidents.

*Hypothesis 1: Weak and failed states are more likely to experience piracy incidents in their territorial waters.*

*Hypothesis 2: States in the midst of civil war are more likely to experience piracy incidents in their territorial waters.*

#### *Economic Opportunities for Piracy*

In addition to state weakness and state failure, economic opportunities are helpful in explaining individuals' willingness to engage in piracy. A lack of economic opportunities is frequently cited as the prime driver of modern-day piracy (Ong-Webb, 2007, Murphy, 2009; Iyigun and Ratisukpinol, 2010; Jablonski and Oliver, 2010). Similar to opportunity-cost explanations of insurgency and civil war, this argument expects that the absence of legal or gainful labor employment drives individuals to pursue extralegal appropriation such as piracy (Hirshleifer, 1995; Skaperdas, 2002; Collier and Hoeffler, 2004). Empirical evidence strongly supports such arguments. Collier and Hoeffler (2004), for example, show that civil war is a phenomenon that primarily affects poor countries. More recent micro-level analyses of insurgency also demonstrate that individuals are sensitive to the costs associated with rebel activity as compared to legitimate activity. A study of the Colombian insurgency by Dube and Vargas (2007) shows that price increases in labor-intensive and capital-intensive goods correlate with increases in insurgent activity.

Implicit in these arguments is that the gains from piracy outweigh the benefits of other forms of economic activity and the risks involved in committing piracy events. In line with this argument, we expect that the absence of legal opportunities is related to individuals' decisions to engage in piracy. Research suggests that economic factors play an important role in piracy recruitment. Based on interviews with pirates in the Straits of Malacca, Frécon (2005: 25) argues that pirates "are recruited among these numerous fishermen, unemployed sailors and taxi-boat captains." Burnett (2002) and Murphy (2009) also emphasize

that piracy recruitment occurs frequently among unemployed fishermen. In addition, research on Somalia emphasizes that the depletion of fish stock by Somali and foreign fishing boats after the collapse of the Barré regime in 1991 was a key factor driving the adoption of piracy by Somali fishermen (Weir, 2009).

Anecdotal reports on piracy gains support the notion that the payoff from piracy influences individuals' decisions to engage in piracy. Reports often focus on episodes with spectacular gains, such as the \$10 million ransom for a South Korean tanker hijacked off the Somali coast in 2010 (Gettleman, 2010). However, paying attention to such episodes is potentially misleading as it suggests that piracy would always be preferable to legal forms of employment and also neglects the significant risks involved in criminal activity. While it is difficult to get precise data on piracy takings, two studies present more conservative estimates. Based on original reports faxed from pirated ships, Vagg (1995) analyzes cash takings in 154 pirate attacks occurring in Indonesian waters between 1991 and 1992. He finds that majority of attacks produced a gain between \$100 and \$5,000, which even if split among several individuals, suggests a substantial return given that Indonesia's GDP per capita was around \$2,500 at the time. In a more recent study, Valencia and Johnson (2005) estimate the average takings between \$5,000 and \$15,000 per attack.

Two studies present more systematic evidence for the importance of economic considerations. Iyigun and Ratisukpinol (2010) show that GDP per capita helps explain fluctuations in different types of piracy attacks. Jablonski and Oliver (2010) evaluate the effect of price changes on piracy and show that increases in the price of labor-intensive goods such as sugar and rice result in increases in the number of piracy attacks. However, while we do not dispute that fluctuations in macroeconomic conditions or prices for particular goods influence the frequency of piracy attacks, we expect that economic opportunities more specifically linked to piracy are left out in such studies.<sup>7</sup> We expect that individuals employed in fishing sectors should be most amenable to engage in piracy. Fishermen have the skill set and equipment necessary

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<sup>7</sup> Moreover, as mentioned earlier, neither of these studies includes cases without piracy attacks, thus not allowing for the possibility that these economic factors are equally present in states without piracy problems.

for piracy. As Murphy (2009: 370) points out, piracy requires experience in navigation, coastal piloting, and ship handling, and successful piracy operations depend on knowledge of local sea conditions and shipping patterns. Consequently, fluctuations in states' fishing sectors should be most relevant for individuals' decisions to engage in piracy attacks. Reduced economic opportunities in states' fishing sectors should be correlated with increases in piracy events since they affect the individuals with the most relevant skill sets for piracy. Decreases in fish catch could thus lead to the redeployment of fishers into criminal activities such as piracy (Hendrix and Glaser, forthcoming). Whether decreases in fish catch are the result of IUU fishing or other causes, such decreases should increase motivations to engage in piracy.

In addition to the lack of opportunities available to potential pirates in their local economies, decisions to turn to piracy are likely also influenced by the availability of lucrative targets at sea. The reemergence of piracy is attributed at least in part to large increases in the volume of international trade (Lehr, 2007).<sup>8</sup> Considering that between 80 and 90% of international trade is transported on ships, increases in international trade and maritime traffic create important opportunities for gains from piracy (Bateman, 2007). We thus expect that increases in trade volumes are important in creating opportunities for piracy.<sup>9</sup> Iyigun and Ratisukpinol (2010) do not find a significant effect of trade on different types of piracy attacks, but the authors do not evaluate whether trade is correlated with the presence or absence of piracy.

In line with the above discussion, we expect that states with fewer economic opportunities are more likely to experience piracy. In addition, we expect that increases in national or regional trade volumes create more opportunities for piracy.

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<sup>8</sup> More accurately, maritime piracy has never disappeared completely, but was limited to small areas and occurred less frequently. In line with our argument, the persistence of piracy was most prominent in areas close to important trading routes, such as the Southeast Asian archipelago (Murphy, 2008: 162).

<sup>9</sup> We evaluate the impact of increases in regional trade rather than national trade for two reasons. First, we have emphasized the importance of economic opportunities and permissive institutional environments as explanations for piracy. Presumably, weak or failed states are unlikely to experience strong economic growth and increases in trade, making regional patterns more important. Second, the targets of piracy attacks are international ships and their cargo, not domestic goods, which could be more easily intercepted on land.

*Hypothesis 3: States with fewer economic opportunities are more likely to experience piracy incidents in their territorial waters.*

*Hypothesis 4: States with higher volumes of national or regional trade are more likely to experience piracy incidents in their territorial waters.*

## **Research Design**

Limited data currently exist on pirate attacks. Presumably data collection efforts concentrating on the use of armed force code such incidents, but only if state military forces are involved and for certain data projects only if casualties occur. Importantly, armed conflict between or within states remains the principal focus of such data efforts. Consequently piracy events contained in these datafiles could only be uncovered through a review of individual case descriptions. Identifying these cases would still ignore most piracy incidents that fail to involve state authorities and are directed at private merchant ships. What is needed is an effort, such as the RAND Database on Worldwide Terrorism Incidents, which is focused specifically on documenting and describing pirate attacks.

The International Maritime Organization (IMO) and the International Maritime Bureau (IMB) are the two international organizations most closely involved in the detection and combating of maritime piracy. Yet these organizations define piracy differently. The IMO, a UN agency, adopts the definition outlined in the United Nations Convention Law of the Sea Convention (UNCLOS). Piracy is defined as illegal acts committed for private ends against persons or ships on the high seas.<sup>10</sup> There are several problems with this definition, such as the difficulty of determining which acts are considered illegal and how to determine whether piracy's goals are private. Most problematic, however, is that this definition is only concerned with piracy on the high seas, meaning that incidents in states' territorial waters are not

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<sup>10</sup> Piracy consists of "(a) any illegal acts of violence or detention, or any act of depredation, committed for private ends by the crew or the passengers of a private ship or a private aircraft, and directed: (i) on the high seas, against another ship or aircraft, or against persons or property on board such ship or aircraft; (ii) against a ship, aircraft, persons or property in a place outside the jurisdiction of any State; (b) any act of voluntary participation in the operation of a ship or of an aircraft with knowledge of facts making it a pirate ship or aircraft." Available at [http://www.un.org/Depts/los/convention\\_agreements/texts/unclos/part7.htm](http://www.un.org/Depts/los/convention_agreements/texts/unclos/part7.htm)

considered acts of piracy.<sup>11</sup> Yet data collected since the early 1990s show that the vast majority of piracy attacks occur in states' territorial waters (Murphy, 2007; Ong-Webb, 2007). Restricting piracy to violent events occurring in the high seas would thus exclude up to 85-93% of violent maritime incidents (Murphy, 2009: 17).

The IMB is a division of the International Chamber of Commerce and frequently considered the most reliable data source on piracy (Ong-Webb, 2007). The IMB defines piracy as “an act of boarding or attempting to board any ship with the intent to commit theft or any other crime with the intent or capability to use force in the furtherance of the act.”<sup>12</sup> This definition thus includes actual and attempted attacks against ships whether they are anchored, berthed, or steaming. From when the IMB opened its doors in 1990 to 2010, over 5,000 piracy incidents have been documented (see Figure 1).

Critics have pointed out that the inclusion of attacks against ships in ports (and territorial waters more generally) could inflate the number of incidents recorded by the IMB. Yet it is also widely suspected that under-reporting of piracy incidents underestimates the occurrence of piracy (Murphy, 2009: 67-69; Ong-Webb, 2007: 39-40; Chalk 2009). Data collection on piracy is dependent on self-reporting by government authorities, ship-owners, or the victims of an attack, which suggests several reasons for why under-reporting might be common. First, states may not want to be characterized as having a piracy problem. Similarly, ship-owners have reasons to omit incidents to avoid subsequent costly security features or increases in insurance premiums (Hastings 2009). Finally, victims were likely exposed to duress and may not be able to provide detailed descriptions of an incident. In addition to including piracy events regardless of where they occur, the definition used by the IMB has the advantage of putting emphasis on the intent of actors to use force, which is useful in that it focuses on the threat or use of violence and excludes cases of

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<sup>11</sup> States' territorial waters extend up to 12 nautical miles from their coastline. Consequently, control of these waters is subject to domestic law and the provisions of UNCLOS do not apply.

<sup>12</sup> International Maritime Bureau, *Piracy and Armed Robbery Against Ships: Annual Report, 1 January – 30 December 2010*, p. 3.

petty theft. Consequently, we believe that the IMB definition is more appropriate and employ this definition in our empirical analyses.

Indeed, even if under-reporting reduces the total number of incidents included in the IMB datafile, it does not inevitably mean the ratio of pirate attacks across regions, countries, or years will be biased. Causal models therefore will not necessarily produce inaccurate coefficient estimates. However, to avoid drawing unwarranted conclusions from suspect data, we distinguish among piracy incidents (which include attempted and actual attacks), actual attacks, and hijackings. In particular, hijackings, given their seriousness, do not suffer from the same under-reporting that plagues more minor incidents (Hastings 2009).<sup>13</sup> We use all three data series in our empirical analyses below to ensure confidence in our results.

We begin by creating two different datasets of piracy. First, we use year as the unit of analysis and code all piracy incidents occurring globally. From the IMB we record information for 20 years: 1991-2010. For example, in 1991 107 incidents get reported, with 103 actual attacks, 4 attempted attacks, and 1 hijacking. In 2003, 445 incidents are reported, with 332 attacks, 113 attempted attacks, and 19 hijackings.

The piracy data are also coded by region (see Figure 2). As one can see from Figure 2, Southeast Asia and Africa account for a sizable majority of incidents. In fact, approximately 65% of all piracy incidents occur off the coasts of sub-Saharan Africa and Southeast Asia. Nigeria and Somalia tend to dominate the African incidents while Malaysia, Thailand, the Philippines, and Indonesia account for most of the incidents in S.E. Asia. Still, nearly every littoral state in sub-Saharan Africa, S.E. Asia, and the Far East has experienced some piracy according to the IMB data. Our analyses at the systemic level are meant to broadly correlate piracy with other general trends occurring at the same time, such as terrorism, trade, armed conflict, state failure, and democracy. As one might expect, sub-Saharan Africa and Asia also have on average the highest incidence of state fragility, low Polity scores, and at least in Asia high values of total trade. South and Southeast Asia also witness high numbers of terrorist attacks.

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<sup>13</sup> Hijackings typically involve the seizure of a vessel, its crew, or both.

The second dataset we build defines the state-year as the unit of analysis.<sup>14</sup> We have a total of 3550 cases, but fewer than half that enter the statistical models for evaluation due to missing cases on some of our right-hand side variables. In theory, the 3550 cases are based on 197 countries over the 1991-2008 time period. However, all of the analyses at the monadic level control for contiguity to ocean waters, which reduces our number of states by 43 and leaves 2778 observations in the data. These land-locked countries obviously cannot experience piracy in their territorial waters (since they have none) and thus are removed from the analyses.<sup>15</sup> In addition, we include only piracy incidents that occurred in states' territorial waters. As mentioned above, this seems reasonable since the majority of piracy events happen in territorial waters.<sup>16</sup>

Of the approximately 2800 non-land-locked country years in our dataset, 20% show at least one incident of piracy while 5% show 6 or more incidents (see Figure 3). Given the limited temporal domain of the IMB data it is hard to know whether the fairly substantial decrease in country-years without incidents (so increase in country-years with incidents) between 1991 and 1997 is a function of data collection or actually reflects a real increase in piracy that begins to stabilize in the late 1990s. The second series in Figure 3 shows the percentage of country-years without hijacking incidents. This series only begins in 1993, but does not demonstrate the same trend early on, although the dip in 1997 corresponds to a similar increase in overall piracy incidents in that same year. We compare these two series to international terrorism incidents as coded by the RAND Project on World Wide Terrorism. The percentage of country-years with terrorist incidents is higher in the early 1990s, but by the late 1990s, the number of countries experiencing at least

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<sup>14</sup> We use EUGene to create the monadic data-file (Bennett and Stam, 2000).

<sup>15</sup> In point of fact, there is no land-locked country that experiences a pirate attack according to the IMB data.

<sup>16</sup> We could add these piracy incidents on the high seas by including them for the country closest to the location of the incident, but we do not actually know whether pirates are based in that state. Thus, it seems prudent to include events in territorial waters only.



one piracy incident is actually higher than terrorist incidents and the two series remain fairly close over the first decade of the 21<sup>st</sup> century.<sup>17</sup>

#### *Independent Variables*

The first two hypotheses involve the relationships between state fragility, violent armed conflict and piracy. Permissive institutional environments have been the focus of most of the descriptive accounts of individual pirate attacks. Data for state fragility come from the Center for Systemic Peace at the University of Maryland and are available from 1995 onward. The measure ranges from 0 to 25 with higher scores indicating greater state weakness. Both Afghanistan and Somalia receive scores of 25; Somalia in 2008 and Afghanistan in 1995. Most OECD countries score 0 or close to 0, such as Japan, the United States, Austria, Belgium and the Netherlands. To assess the relationship between armed conflict and piracy, we rely upon information provided by the collaborative efforts of the Peace Research Institute of Oslo (PRIO) and the Department of Peace and Conflict Research at Uppsala University (Eriksson, et al. 2003). The Armed Conflict Dataset codes contestations between governments and governments and insurgencies where at least 25 battle-related deaths occur.<sup>18</sup>

The third and fourth hypotheses focus on economic opportunities for piracy. To evaluate whether decreases in states' fishing industries create economic opportunities for piracy, we include data on fish catch collected by the FAO Fisheries and Aquaculture Statistics Collection Global Production Tables.<sup>19</sup> These data are based on officially reported numbers from FAO member countries and appended by estimates based on FAO expert analysis, regional organizations, and comparisons with official trade statistics when official data

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<sup>17</sup> We should point out that the total number of terrorist incidents is considerably larger than pirate attacks. For example, RAND reports 2,295 total terrorist incidents in 2008 (although only 204 are international in character), while IMB lists only 195 piracy incidents in territorial waters. Somalia, in 2008, experienced 49 international terrorist attacks, 135 domestic terrorist attacks, and 19 pirate incidents.

<sup>18</sup> In this way we examine broadly the effect armed conflict, both inter- and intra-state, has on the incidence of piracy.

<sup>19</sup> <http://www.fao.org/fishery/statistics/global-capture-production/en>.

are missing or unreliable.<sup>20</sup> Since piracy is carried out at sea, we only include data on marine fish catch and exclude inland fish catch from the analysis. The mean yearly catch is 363 mt but the standard deviation is 1,106 mt, suggesting significant unit heterogeneity. We follow Hendrix and Glaser's (2010) guidance in dealing with potential bias from such heterogeneity and calculate the first difference of log(marine fish catch). The catch growth variable has a mean of 0.008 and a standard deviation of 0.329 and represents the change in marine fish catch from one year to the next. While we expect that changes in sectors most relevant for individuals' decisions to engage in piracy are most important, we also evaluate whether national aggregates can function as proxies for economic opportunities. To measure the incentives citizens of countries may have to engage in piracy more generally, we use current year GDP per capita provided by the Penn World Tables Version 6.3. We log-transform the GDP per capita to reduce the impact of highly skewed values. To evaluate the fourth hypothesis, we supplement these data with measures of regional and global trade (Barbieri et al., 2008; World Trade Organization). Barbieri et al. (2008) code trade volumes for each individual country in each year and we aggregate the trade values by country for each COW region to create the regional trade measure.<sup>21</sup> The merchandise measure is aggregated at the global level and reflects the total value (in billions of current U.S. dollars) of trade in tangible goods, such as agricultural products, fuel, iron, steel, chemicals, textiles, and clothing.<sup>22</sup>

### *Control Variables*

Several other conjectures discussed in the literature could increase piracy at the systemic level as well as the propensity for certain countries to experience greater numbers of attacks in their territorial waters. We model these relationships in the statistical models presented below to offer a more complete picture of the correlates of piracy. To empirically test these conjectures we include control variables for

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<sup>20</sup> In the systemic models, we use annual economic growth rate of OECD states (<http://stats.oecd.org>). We considered using aggregate statistics on fish catch to enhance comparability between systemic and monadic models, but it is not clear that monadic expectations translate neatly into systemic ones (Ray, 2001). Illegal fishing may reduce the fish stock available to indigenous fishers yet at the same contribute to increases in fish catch globally.

<sup>21</sup> Trade volumes for each country are measured as the value of a state's imports and exports in millions of current U.S. dollars.

<sup>22</sup> See the WTO's international trade statistics.

geographic location, terrorism, and the persistence of piracy over time. We further include controls for material power, regime type, and population size.

The need for favorable geography is frequently emphasized in the piracy literature (Ong-Webb, 2007; Murphy, 2009, Hastings, 2009). In particular, states with long coastlines, archipelagic makeup, numerous islands, or located in proximity to strategic shipping lanes offer opportunities for piracy (Ong-Webb, 2007: 46). The concentration of piracy events along the Straits of Malacca and around the waters of Indonesia seemingly supports such arguments. Emphasis on favorable geography also suggests that piracy, while a global phenomenon, tends to be regionally concentrated, particularly in areas close to major shipping lanes such as East Africa and Southeast Asia. Regional dummies are included to test broad geographic trends, and coastline length in kilometers is incorporated to control for variation across countries in the size of territorial waters. Regional classifications come from the Correlates of War and the CIA World Factbook provides data on coastline length.<sup>23</sup>

Another argument suggested in the literature is that piracy is more likely to flourish where a maritime tradition is present (Ong-Webb, 2007; Murphy, 2009). Societies with large groups of maritime-oriented people develop the skills necessary for piracy and pass them on over generations. For example, experience with navigation at sea, coastal piloting, and knowledge of local sea conditions such as tidal movements, currents, winds, and visibility are necessary for piracy. In societies where such skills are common, piracy can become culturally acceptable as an alternative livelihood. We operationalize the presence of maritime traditions by including a lag of piracy events in the previous year.

Since 9/11, concerns over maritime terrorism have heightened. In particular, pirate attacks against cruise ships carrying large numbers of Western tourists, war ships of Western navies, or attacks on the large amount of cargo necessary to sustain international trade are among the scenarios that worry maritime

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<sup>23</sup> The CIA World Factbook also was used to identify land-locked and littoral states.

security experts.<sup>24</sup> While existing work on the piracy-terrorism nexus investigates the likelihood of terrorist groups attacking at sea rather than proposing causal relationships between piracy and terrorism, it suggests two possible consequences of terrorism on piracy events. Since the root causes of both phenomena are similar, one may expect that increases in terrorism contribute to increases in piracy and vice versa. Yet as Bradford (2008) points out, it is also possible that the relationship is more complicated. Since resources are scarce and terrorism is largely seen as the more imminent threat, states may spend more money on combating terrorism, which could subsequently reduce the resources available to counter piracy. In turn, reductions of terrorist events as a result of successful counterterrorism policies could actually lead to increases in piracy attacks. Information on terrorist attacks comes from the RAND database on World Wide Terrorism.<sup>25</sup> We use the RAND measure of total terrorist attacks, which sums domestic and international terrorism.

Finally, we control for military capabilities, regime type, and population size. States with greater military capacity should be better equipped to fight maritime piracy. In addition, we expect democratic states to have lower rates of maritime piracy. Democratic leaders should be more concerned with public

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<sup>24</sup> Incidents of maritime terrorism such as the Al Qaeda attack on the *USS Cole* in 2000 or an attack against the French supertanker *Limburg* in 2002 seemingly confirm such fears (Luft and Korin, 2004). Moreover, maritime attacks by groups such as the Abu Sayyaf group in the Philippines, the Free Aceh movement in Indonesia, or the maritime arm of the Tamil Tigers in Sri Lanka support the notion that a pool of insurgent groups capable and willing to carry out maritime terrorism exists (Gunaratna, 2008; Snoddon, 2007). Perhaps most crucially, there are important similarities between piracy and terrorism when it comes to the conditions that give rise to both phenomena. Both the piracy and the terrorism literature emphasize how permissive institutional environments, such as weak or failed states, create the conditions conducive to violence. Yet despite these similarities, there are reasons to believe that the threat of maritime terrorism is exaggerated. Young and Valencia (2003) and Murphy (2009) stress that the goals pursued by pirates and terrorists are quite different. Terrorist groups have political goals and commit attacks that create attention and publicity beyond the immediate act. Pirate groups, on the other hand, have goals that are primarily economic and thus want to avoid attention in order to lower their chances of capture and continue their operations in the future. In consequence, pirates would have little interest in attacks against maritime chokepoints or major ports because they would disrupt the flow of ships and thus potential piracy targets, yet such attacks would be highly attractive for terrorist groups. In addition, piracy researchers stress that the tools and expertise needed to carry out terrorist attacks at sea differ substantially from land attacks, which would imply that the tactic of choice for the vast majority of terrorist groups would point to land-based targets (Gunaratna, 2008; Murphy, 2009).

<sup>25</sup> RAND researchers code by country and year the number of domestic and international terrorism events. Countries without any terrorist attacks include Canada in 2007 and 2008, Sweden and Norway in many years, and even some African countries such as Equatorial Guinea, Gambia, and Mauritania. OECD countries with terrorism incidents include the United States, Spain, Italy and Germany. Columbia in 2002, Turkey in 1999, Iraq during the height of the insurgency in 2005 and 2006, and Thailand in 2005 experience some of the highest numbers of terrorist events, typically several hundred in these years and several thousand for Iraq.

goods provision than their authoritarian counterparts and thus have greater incentives to combat criminal activities. Population size may be linked to piracy by providing pirate groups with a larger pool of potential recruits. Control measures of material power, regime type, and population size come from the Correlates of War dataset on national capabilities (CINC), Polity IV data, and the Penn World Tables, respectively.<sup>26</sup>

### *Systemic Analysis*

We begin our analysis at the systemic level. Two different statistical estimators are used to model forms of piracy. First, a Tobit estimator is used for modeling all piracy incidents and all pirate attacks (which is simply a subset of incidents). Second, we model hijackings using a Poisson estimator. Both estimators are run with robust standard errors. The choice of estimator derives from an assessment of the distribution of each series. The data on piracy incidents has a mean of 272 and a standard deviation of 118.5, while the pirate attacks series has a mean of 191.6 and a standard deviation of 77.7. Given the large number of incidents and attacks we observe each year, we thought a standard regression model, albeit one that recognizes the lower boundedness of the series, made sense. The hijack series has a mean of 15.8 and standard deviation of 13.8. Visually, the first two series appear normally distributed while the hijack series reveals a distribution more characteristic of a Poisson process.

With between only 14 and 17 observations to work with at the systemic level, we do not expect to uncover strong empirical results. Yet, unexpectedly the models produce some fairly robust evidence on the correlates of piracy. We include models run on three different dependent variables. First we use the overall piracy series (models 1 and 2). Then we use the subset of piracy incidents defined by IMB as attacks (models 3 and 4). Lastly, we run our analysis on only hijackings (models 5 and 6). Models are run with and without the state fragility index since we lose 3 additional years of data when the SFI measure is included and the fragility measure incorporates aspects of regime type, armed conflict, and wealth.

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<sup>26</sup> To create a dichotomous variable for democracy-non-democracy, we use the Polity2 measure and a cutoff of 6.

For overall piracy and attacks, there appears to be strong evidence of persistence in the data series. The dependent variable lags are consistently positive and significant indicating a reinforcing trend. With other variables set at their mean values, 50 pirate incidents in the previous year increase the current year's incidents by about 25. This relationship generally holds for the subset of attacks as well, although the substantive effect is somewhat smaller.

Our primary conjectures involve the influences of state fragility and armed conflict on piracy. We find only limited support for the relationship between state fragility and the incidence of piracy. Model 5 using hijackings provides the only statistically significant relationship and yet the effect is not what we expected. Increases in the number of failed states actually decreases the level of hijackings observed. This is not what we observe in our monadic-year analysis (discussed below) where increases in a state's fragility index increase both piracy in general and hijackings. Perhaps the systemic level of analysis simply aggregates away important variation in these series. In fact, we do find some evidence of regional variation such that increases in the number of failed states contribute to increasing piracy in Southeast Asia, but not the Americas.

Unlike state failure, armed conflict has strong negative effects on overall piracy and attacks, but little influence on hijackings. In fact, our Tobit model predicts 374 piracy incidents when armed conflict is at its minimum value of 29. When armed conflict is at its highest value of 53 the model predicts only 82 incidents. One can generally see this trend in Figure 1. Armed conflict tends to trend down from 1991-2003 while piracy is trending up. Yet, the number of armed conflicts does increase after 2003 and piracy also witnesses an increase beginning in 2006. It may be that armed conflict does not indicate state weakness but in fact strength. States that fight must field forces and coordinate military operations both of which require central planning, revenue generation, and at least a minimum level of legitimacy.

Some empirical support emerges for the relationships between regime type, trade, and piracy. Increasing numbers of democracies in the inter-state system generally push down the incidence of piracy

while increasing the value of trade in merchandise weakly correlates with higher numbers of pirate incidents and attacks. Both results seem intuitive. We find little evidence for a relationship between terrorism and piracy despite the suggestion by some experts that they are related. Yet, we also observe that expanding economic opportunities reduces the most serious form of piracy, namely hijackings. This result squares with research on civil war where economic growth decreases the risk of civil war (Collier and Hoeffler 2002).

#### *Monadic-Year Analysis*

Our systemic level data admittedly offer limited leverage in describing and explaining piracy. As such, we now turn to a dataset that specifies the country-year as the unit of analysis. With individual states, we can more specifically evaluate the institutional and economic opportunities that may produce or drive piracy.

We model piracy incidents by using a general estimating equation with a negative binomial specification and an AR(1) error structure. As before we limit our analyses to littoral states and measure  $Y$  as the number of piracy incidents per country-year. On average we have approximately 1370 observations spread across 113 separate states depending on the model employed. Similar to our systemic analyses, we include separate models for all pirate incidents, actual piracy attacks, and the subset of just hijackings. We report our findings in Tables 2 and 3. Table 2 includes the linear coefficient estimates across our five separate models while Table 3 offers incidence-rate ratios for Models 3 and 4 from Table 2 as well as evidence on marginal effects.

The results presented in Tables 2 and 3 show support for several of our hypotheses. We start by jointly discussing models 1-3 for piracy incidents and attacks since results in these models are very comparable. Findings for model 4 on hijackings are discussed separately. Whereas the number of failed states in the international system did not correlate with aggregate piracy numbers, we find strong evidence that state fragility substantially increases the incidence of piracy at the state level. The results show a positive and significant relationship between state failure and piracy in all models presented in table 2,

demonstrating that permissive institutional environments create conditions conducive to all piracy incidents, including piracy attacks and hijackings. Varying the state failure variable from one standard deviation below the mean to one standard deviation above, we observe a 250% increase in the number of piracy events. Clearly, failed and weak states drive piracy higher as suggested in our first hypothesis. The second variable used to operationalize institutional opportunities does not confirm our hypothesis. The presence of internal armed conflict has no effect on piracy incidents or actual attacks, thus not supporting hypothesis 2. A different finding emerges for the hijacking model, which will be discussed in more detail below.

We also find support for some of our hypotheses on economic opportunities. The variable measuring growth rates in states' fish catch is negative and significant in models 1 and 3, thus indicating that increases in fish catch reduce opportunities for piracy as expected. In substantive terms, the effect of fish catch is small, showing that varying this variable  $\pm$  one standard deviation reduces piracy attacks by 12%. We also compare these results to a more general indicator for economic opportunities. Model 2 presents results for GDP per capita (log) as an alternative operationalization of economic opportunities for piracy. The variable fails to reach conventional levels of statistical significance, thus confirming the expectation that changes in states' fishing sectors are more influential in driving piracy than aggregate national indicators. We find no evidence that regional trade plays a role in overall piracy. While the coefficient for regional trade is positive, it does not reach conventional levels of statistical significance. We thus cannot confirm hypothesis 4, which expected that increases in regional trade function as economic opportunities for piracy.

Several of the results in the monadic models also confirm our systemic findings. At the state level, piracy remains strongly persistent over time. In substantive terms, varying the lag of piracy  $\pm$  one standard deviation increases piracy attacks by 22%. One sees yearly jumps like this in many hotspots around the world. Nigeria, for instance, goes from 14 pirate incidents in 2002 to 39 in 2003. Somalia jumps from two in 2004 to 35 in 2005 and China observes an increase of 20 pirate attacks from 1994 to 1995. We again find



strong empirical support for the abating of piracy by democratic regimes and processes. Aggregate levels of democratic states in the international system correlate with declining piracy numbers and the same relationship is uncovered at the state level. Democratic states reduce piracy events in territorial waters by 27%. If we set the fragility index to the mean level for democratic states as well (5.99 compared to the average of 9.34) piracy incidents decrease by an even larger 47%.

We also find support for the importance of favorable geography. The coast length variable is positive and significant, and varying this indicator  $\pm$  one standard deviation increases piracy by 69%. Overall piracy varies across regions as one would expect from anecdotal accounts of specific incidents. Asia, in particular, accounts for a substantial amount of the piracy observed. The countries of Southeast Asia and the Far East experience nearly 50% of piracy events occurring in territorial waters. The waters off of Africa also produce high levels of piracy, which has been increasing since 2006 (see Figure 2). The Americas experience considerable piracy as well with 72 incidents in 2003 and 37 in 2009. Europe witnesses the fewest pirate attacks, but still confronts a real foreign policy problem. Europe as a whole suffered 29 total attacks and three hijackings over the 18 year period from 1991-2008. Of these, Italy faced six incidents and Albania five.

Population and material power also correlate strongly with piracy at the state level. The substantive effect of changes in population size is strong. If we vary the population variable from one standard deviation below the mean to one standard deviation above, the expected number of piracy attacks increases by 1463%. Varying the Composite Indicator of National Capabilities by  $\pm$  one standard deviation decreases pirate events by 34%. It seems safe to conclude that material power, particularly in the form of military might, enables governments to deter and contest piracy in their territorial waters.

Our models of hijackings also show strong empirical relationships. Hijackings, like overall piracy, show that state weakness robustly pushes the incidence of hijackings higher. The substantive relationship between state weakness is stronger for hijackings than all types of piracy attacks. In fact, while a one unit

increase in the fragility index increased piracy incidents by 9%, a similar one-unit increase in fragility raises the number of hijackings by 16%. Varying the fragility index from one standard deviation below to one standard deviation above the mean produces a 659% increase in piracy events.

An interesting finding emerges for the presence of internal armed conflict. Contrary to our expectations, the presence of violent conflict reduces the incidence of hijackings. Varying this variable  $\pm$  one standard deviation reduces the rate of hijackings by 49%. Yet the presence of fighting between insurgents and government forces may pose problems for pirates as resources might have to be allocated to combat government efforts to close such rebel funding sources. Alternatively, the presence of civil war and the destruction of markets and infrastructure that accompanies such violence may make it more difficult for pirates to engage in the most sophisticated piracy attacks (Hastings, 2009).

Support for our hypotheses on economic opportunities is more limited in the hijacking model. Neither the fish catch variable nor the regional trade variable have a significant effect on hijacking. Yet it is conceivable that the underlying motives of individuals engaged in more sophisticated forms of piracy are different from pirates carrying out more basic attacks. While threats to economic livelihoods may help explain why individuals first become engaged in piracy, pirates capable of carrying out sophisticated attacks could reap economic benefits that outweigh possible gains from legal forms of employment even when such opportunities are on the upswing. As in earlier models, we cannot confirm an effect of regional trade on piracy. Apparently, increases in regional trade volumes do not create opportunities considered valuable enough to forgo legal labor opportunities.

Regime type also demonstrates a stronger effect on hijackings. Compared to autocratic states, democratic regimes reduce the incidence of hijackings by 61%. Results for other control variables such as population, material power, the persistence of piracy over time, and regional patterns are very similar to models 1-3. In addition, geographic factors influence piracy as in earlier models although it is interesting to observe that the substantive effect of geography on hijackings is much larger. Varying the coast length

variable increases hijackings by more than 900% compared to only 69% in the attack model. Piracy in the form of hijackings seemingly demands more forceful responses by governments and the international community. As such, the length of a country's coastline measures the difficulty state authorities confront in policing territorial waters. Pirates presumably recognize their ability to evade government authorities and seize upon the opportunity to obtain large ransom payments.

With hijackings, we also observe significant effects coming from terrorism. Terrorism appears to drive piracy higher, and it could be that piracy in the form of hijackings provides a financial pipeline to terrorist organizations. Or perhaps the hijackings of private merchant ships, many of which transport goods to and from the developed West, reflects an effort by terrorist groups to impose costs on powerful commercial interests that might subsequently lobby for a more robust military response that might re-focus attention on the collateral damage caused by American and NATO foreign policy actions.

The final model presented in table 2 explores possible interactions among the covariates of piracy presented in models 1-4. Presumably, many of our variables could interact with each other in their effect on piracy. In a preliminary analysis of such conditional relationships, we include an interaction term between the fragility index and the democracy variable in model 5. Results show that the negative effect of democracy on piracy is conditional on states' fragility level. The result shows that democracies with low state fragility have lower expected counts of piracy, but that the relationship is reversed for democracies with high levels of fragility. We present this finding in a more intuitive manner in figure 4. As can be observed in the graph on the left-hand side, democracies have higher rates of piracy attacks than non-democracies once fragility levels reach values of 18 or higher. Consequently, the effect of state weakness is stronger in fragile democratic states, making such countries particularly prone to maritime piracy. The figure on the right-hand side of figure 4 evaluates whether the interaction term included in model 5 is statistically significant across the range of the fragility measure. Using a one-tailed test, we observe that the combined effect of fragility and regime type is significant only when fragility is at low or moderate levels

(values between 0 and 12) and when fragility is at its highest (value of 25). Results for control variables in this model are very similar to other models.

## **Conclusion**

Our goal in this paper was to provide an explanation of maritime piracy that highlights institutional and economic opportunities. Focusing on attacks in states' territorial waters, we show that state weakness consistently increases the incidence of all piracy events. State weakness provides an environment that allows pirate groups to flourish as it reduces the capacity of states to combat piracy. Contrary to our expectations, our models do not confirm that internal armed conflict has a similar effect on piracy, but in fact show that the presence of civil war reduces the incidence of hijackings. We believe this unexpected finding results from an inability of pirates to implement the most sophisticated attacks amid instability and violent fighting. In addition, we find support for our arguments on economic opportunities for piracy. States with reductions in fish catch are more likely to experience piracy, indicating that threats to the livelihoods of coastal communities drive individuals to piracy. Our results thus confirm that the lack of labor opportunities in sectors most amenable to piracy is more influential in driving individuals to piracy than aggregate economic opportunities. While we do not find the same effect of changes in fish catch in the hijacking model, we argue that hijackings may be driven by motivations that differ from other incidents, although more research on what drives different forms of piracy attacks is clearly necessary.

Additional findings show support for a variety of theoretical conjectures presented in the literature. Historical patterns of piracy strongly influence the incidence of attacks in the present, which suggests the presence of maritime-oriented cultures in which piracy is considered acceptable as an alternative livelihood. In addition, regime type, population size, and states' military power affect piracy. Finally, we find empirical support for favorable geography and regional variation. The effect of terrorist attacks is contingent on the

type of piracy attacks. Higher numbers of terrorist attacks result in higher numbers of hijackings, but do not affect other piracy events.

To our knowledge, this study is the first systematic assessment of institutional and economic opportunities for piracy. Previous research focuses only on countries in which piracy actually occurred, a limitation we overcome by including all countries with coastlines in our empirical analysis. In addition, our analysis accounts for a variety of additional explanations emphasized in the emerging literature on maritime piracy. Taken together, our paper suggests a set of general mechanisms that help understand the incidence of maritime piracy. Having established these patterns, future research could investigate more specific explanations of maritime piracy. For example, the literature on cases such as Somalia and Sri Lanka suggests that gains from piracy have helped support violent insurgencies (Lehr and Lehmann, 2007). Consequently, maritime piracy might function as a source of income for insurgent groups, an explanation neglected in the literature on civil wars. The availability of location data on piracy incidents and armed conflict events could allow for empirical investigation of such expectations. In addition, our findings confirm earlier research suggesting that various types of piracy attacks could be driven by differing motives (Hastings, 2009). While results for all piracy incidents and actual attacks are very consistent, interesting findings emerge from the hijacking model, which warrants further exploration.

Our findings also suggest implications for international efforts in combating piracy. The prevalence of piracy in states' territorial waters and the strong effect of state weakness and economic factors on such events suggest that attempts to stem these developments should focus on altering permissive institutional environments and providing labor opportunities for potential pirates.



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**TABLE 1: Models of Piracy Incidents, Piracy Attacks, and Hijackings at the Systemic-Year Level**

	<b>Model 1</b>	<b>Model 2</b>	<b>Model 3</b>	<b>Model 4</b>	<b>Model 5</b>	<b>Model 6</b>
	All Piracy Incidents	All Piracy Incidents	Only Piracy Attacks	Only Piracy Attacks	Only Hijackings	Only Hijackings
Lag of Piracy Y	.49* (.29)	.60** (.28)	.34* (.24)	.50** (.23)	-.017 (.017)	.005 (.021)
Failed States	-6.93 (11.64)	-----	-3.23 (8.46)	-----	-.14** (.07)	-----
Terrorism	.01 (.03)	.01 (.02)	.01 (.02)	-.001 (.01)	.000 (.000)	-.000 (.000)
Democracies	-12.45*** (3.29)	-12.44*** (3.93)	-8.42*** (2.87)	-8.09*** (1.82)	.01 (.01)	.03 (.03)
$\Delta$ Merchandise (annual)	.02 (.02)	.03** (.02)	.01 (.01)	.02* (.01)	-.000 (.000)	.000 (.000)
OECD Growth	2.37 (19.32)	4.92 (17.11)	.26 (10.63)	1.32 (9.14)	-.33*** (.09)	-.35** (.21)
Armed Conflict	-14.23** (7.75)	-12.17*** (3.81)	-12.93** (5.09)	-8.80*** (3.30)	-.02 (.04)	-.02 (.09)
Constant	1688.82*** (215.94)	1501.50*** (226.73)	1302.19*** (167.25)	1063.24*** (143.51)	4.70*** (1.87)	1.88 (4.43)
/sigma	51.17 (11.61)	49.48 (9.77)	31.14 (5.73)	33.47 (4.99)	-----	-----
N	14(0)	17(0)	14(0)	17(0)	14	17
Pseudo R <sup>2</sup>	.08	.13	.10	.14	.42	.40

**Note:** Year is the unit of analysis. Y is defined as the total number world-wide pirate incidents, or the subsets of attacks and hijackings. We use a Tobit estimator with robust standard errors and a lower limit set at 0 for models using all piracy incidents and piracy attacks. For modeling hijackings, we use a Poisson estimator with robust standard errors. \* $p < .10$ ; \*\* $p < .05$ ; \*\*\* $p < .01$  one-tailed tests.

**TABLE 2: GEE Models of Piracy Incidents and Hijackings at the Monadic-Year Level**

	<b>Model 1</b>	<b>Model 2</b>	<b>Model 3</b>	<b>Model 4</b>	<b>Model 5</b>
	All Piracy Incidents	All Piracy Incidents	Only Piracy Attacks	Only Hijackings	Only Piracy Attacks
Lag of Piracy/Hijackings	.022*** (.005)	.023*** (.005)	.028*** (.006)	.258*** (.058)	.026*** (.006)
Fragility Index	.104*** (.017)	.084*** (.022)	.094*** (.017)	.152*** (.034)	.062** (.024)
Intra-State Conflict	-.233 (.145)	-.233 (.147)	-.188 (.151)	-.678** (.315)	-.170 (.152)
Ln Fish Catch	-.273* (.143)	-----	-.375** (.151)	-.157 (.573)	-.379** (.148)
Ln GDP per capita	-----	-.160 (.116)	-----	-----	-----
Ln Regional Trade	.025 (.158)	.065 (.159)	.027 (.167)	.178 (.321)	.014 (.167)
Ln Coast Length	.154*** (.056)	.160*** (.055)	.107* (.058)	.685*** (.099)	.120** (.059)
Terrorism Incidents	-.001 (.001)	-.0008 (.001)	-.002 (.002)	.004* (.003)	-.002 (.002)
Democracy	-.285* (.156)	-.295* (.156)	-.315* (.163)	-.943*** (.299)	-1.026*** (.378)
Fragility*Democracy	-----	-----	-----	-----	.058** (.026)
Ln Population	.553*** (.064)	.541*** (.064)	.596*** (.068)	.230** (.113)	.604*** (.069)
Material Power (CINC)	-15.961*** (3.358)	-15.847*** (3.350)	-15.820*** (3.446)	-20.698*** (6.485)	-15.803*** (3.488)
Western Hemisphere	.050 (.194)	.053 (.194)	.110 (.202)	-1.522*** (.444)	.208 (.208)
Europe	-2.111*** (.350)	-2.133*** (.350)	-2.025*** (.364)	-1.731*** (.652)	-1.831*** (.373)
Africa	-.672 (.500)	-.620 (.497)	-.686 (.526)	-.729 (.984)	-.555 (.529)
Middle East/North Africa	-2.335*** (.380)	-2.212*** (.382)	-2.421*** (.408)	-1.482** (.667)	-2.371*** (.410)
Constant	-7.072*** (2.495)	-6.027 (2.606)	-7.258 (2.634)	-13.012** (5.048)	-6.842*** (2.650)
N	1370	1366	1370	1370	1370
Wald $\chi^2$ ( $p <$ )	417.21 (.000)	427.49 (.000)	385.03(.000)	219.62(.000)	381.54(.000)

Note: Y is the number of total piracy incidents or hijackings. We use an xtgee estimator with negative binomial specification and AR(1) error structure. \* $p < .10$ ; \*\* $p < .05$ ; \*\*\* $p < .01$  two-tailed tests.

**TABLE 3: Marginal Effects for Models of Piracy and Hijackings**

	<b>Model 3</b> IRR Only Piracy Attacks	<b>Model 3</b> $\Delta$ in Predicted Count	<b>Model 3</b> Percent $\Delta$ in Predicted Count	<b>Model 4</b> IRR Only Hijackings	<b>Model 4</b> $\Delta$ in Predicted Count	<b>Model 4</b> Percent $\Delta$ in Predicted Count
Lag of Piracy/Hijackings	1.028*** (.006)	0.264 0.323	+22.3%	1.294*** (.075)	0.014 0.017	+20%
Fragility Index	1.099*** (.019)	0.145 0.513	+249.7%	1.164*** (.039)	0.006 0.045	+658.8%
Intra-State Conflict	.829 (.125)	----- -----	----- -----	.508** (.160)	0.018 0.009	-49.4%
Ln Fish Catch	.687** (.104)	0.276 0.243	-12%	.855 (.489)	----- -----	----- -----
Ln Regional Trade	1.027 (.172)	----- -----	----- -----	1.195 (.384)	----- -----	----- -----
Ln Coast Length	1.113* (.065)	0.241 0.408	+69.2%	1.984*** (.198)	0.005 0.052	+919.6%
Terrorism Incidents	.998 (.002)	----- -----	----- -----	1.004* (.003)	0.016 0.026	+65.4%
Democracy	.730* (.119)	0.325 0.237	-27.1%	.389*** (.116)	0.027 0.001	-61.1%
Ln Population	1.816*** (.123)	0.074 1.157	+1463%	1.259** (.142)	0.001 0.028	+185.7%
Material Power (CINC)	1.35e <sup>-07</sup> *** (4.64e <sup>-07</sup> )	0.304 0.201	-33.9%	1.03e <sup>-09</sup> *** (6.65e <sup>-09</sup> )	0.019 0.011	-42.1%
Western Hemisphere	1.117 (.226)	----- -----	----- -----	.218*** (.097)	0.023 0.005	-78.3%
Europe	.132*** (.048)	0.416 0.055	-86.7%	.177*** (.115)	0.024 0.004	-83.3%
Africa	.504 (.265)	----- -----	----- -----	.483 (.475)	----- -----	----- -----
Middle East/North Africa	.089*** (.036)	0.383 0.034	-91.1%	.227** (.151)	0.023 0.005	-78.3%
N	1370			1370		
Wald $\chi^2$ ( $p <$ )	385.03(.000)			219.62(.000)		

Note: Changes in predicted counts are calculated by varying continuous variables  $\pm 1$  SD from the mean and dichotomous variables from 0 to 1.

**FIGURE 1:** Global Piracy Incidents, Democratic States, and Highly Fragile States, 1992-2010

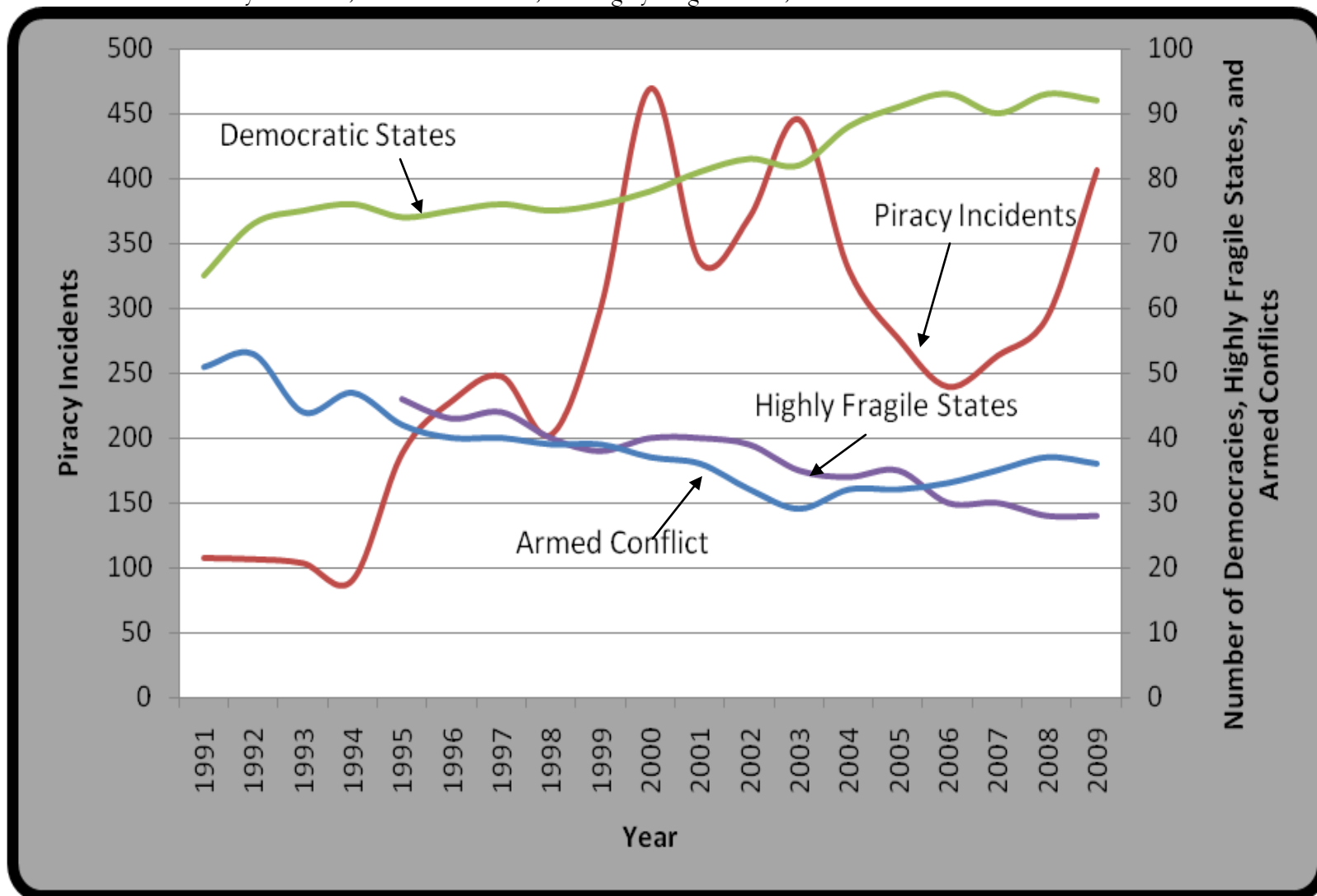


FIGURE 2: Total Piracy Incidents by Region, 1992-2009

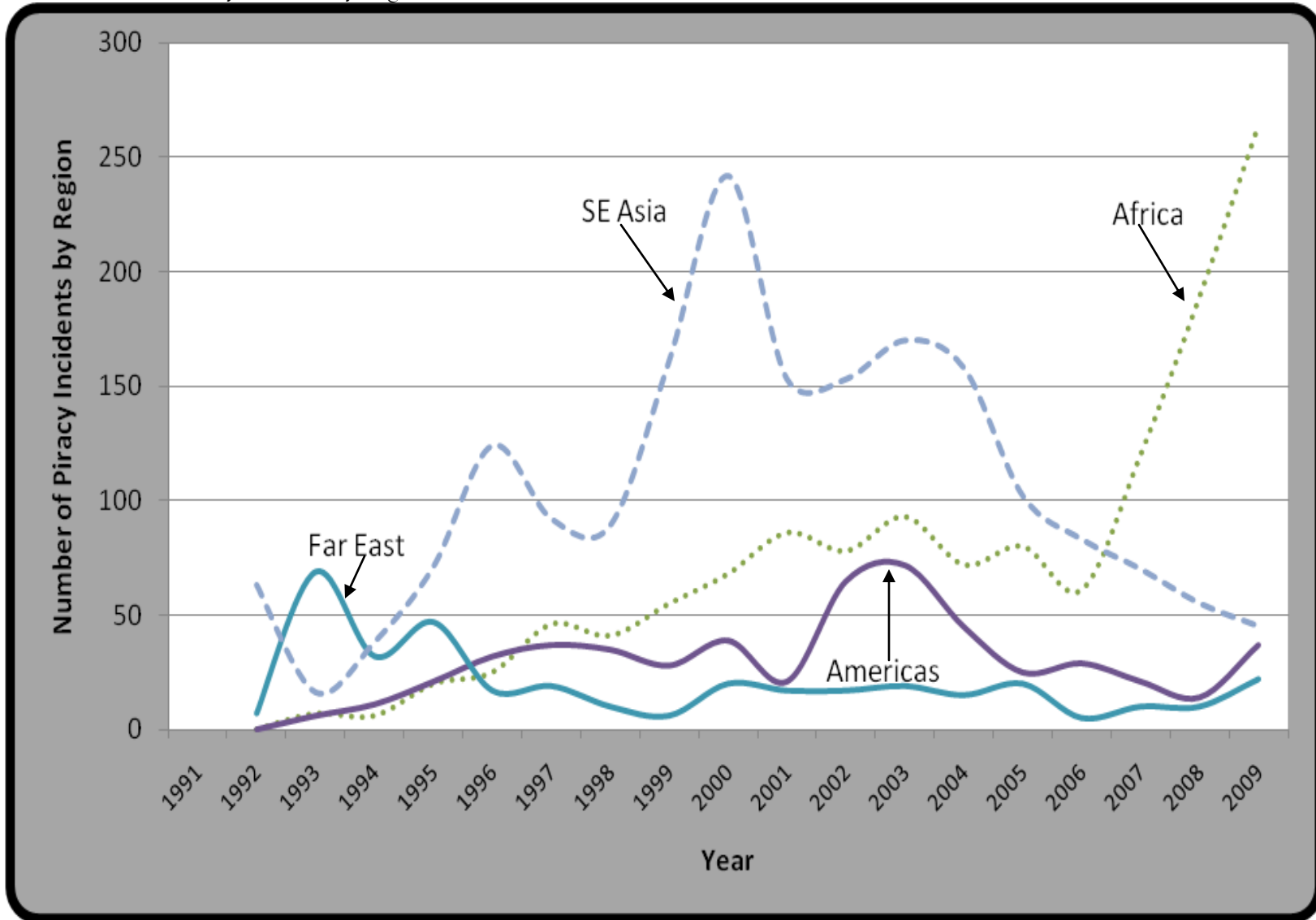
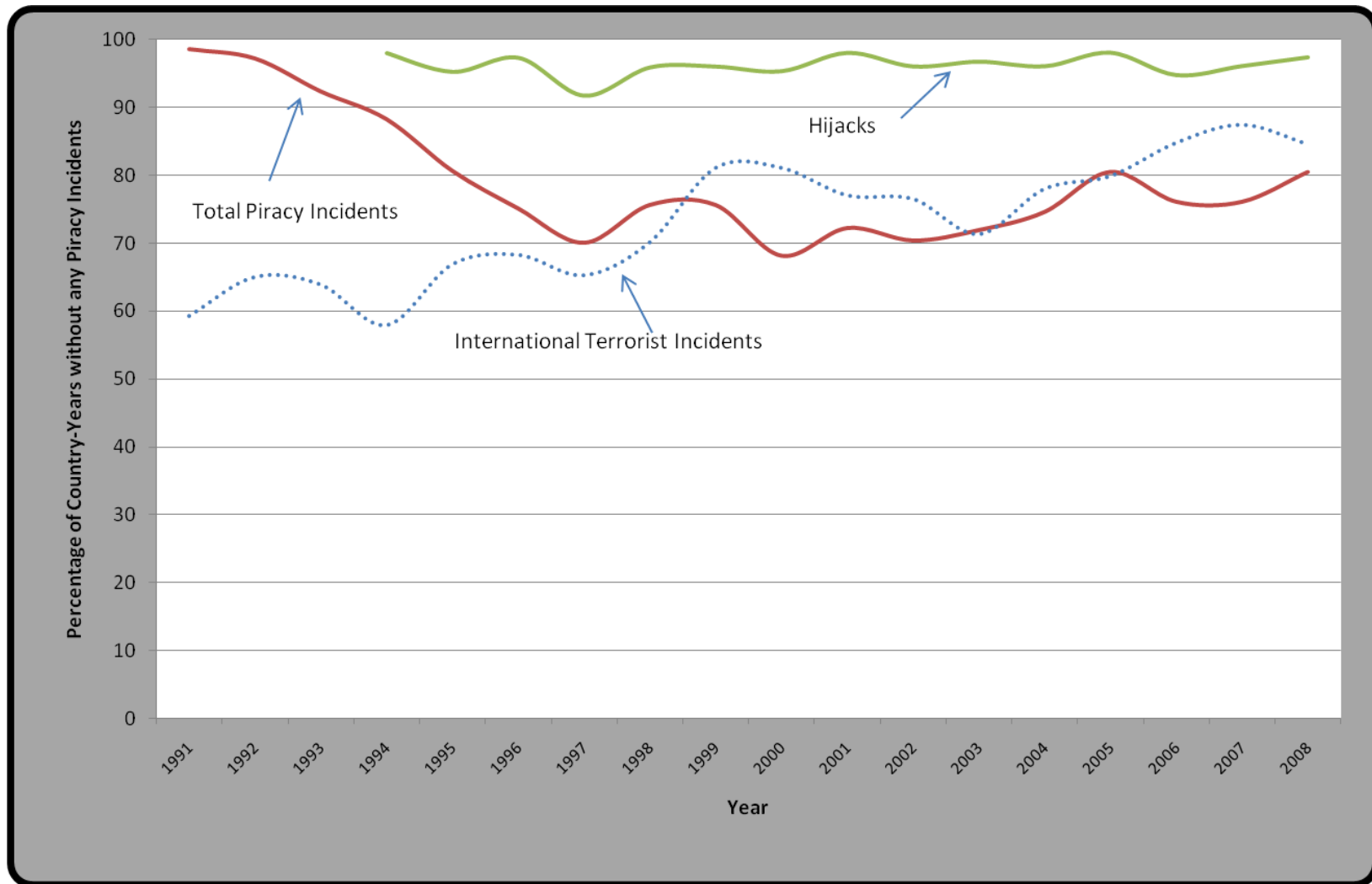


FIGURE 3: Percentage of Country-Years without Incidents, 1991-2008



**FIGURE 4:** Influence of State Fragility on Piracy Attacks Controlling for Regime Type, 1991-2008

