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**The Pirates of Somalia: Coastguards of
Anarchy**

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The Pirates of Somalia: Coastguards of Anarchy

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Abstract

This paper analyses the underlying factors driving piracy off the coast of Somalia and examines the effectiveness of the international naval anti-piracy mission with respect to its declared aims. We show that while the navies perform well with respect to their short-term aims, they failed to contain the escalation of the piracy problem through 2009: pirates have been diverted from the Gulf of Aden into the Indian Ocean and the Arabian Sea. Evidence from domestic conditions in Somalia suggests that economic development and greater stability might in fact aid pirates.

1: Introduction

Piracy off the Horn of Africa has grown substantially in recent years. Data from the International Maritime Bureau reveals that there were 22 pirate attacks in 2000, rising to 108 in 2008 and 143 in the first half of 2009.¹ The types of incident involving pirates in the region have ranged from small-scale captures as in the recent capture of a British couple sailing round the world in their yacht (October 2009),² to large attacks with potential implications for international security, as when the Ukrainian tanker MV Faina was captured along with its cargo of battle tanks, artillery shells and grenade launchers.³ The estimated additional costs of specialty marine risk insurance for ships using the Gulf of Aden trade route in 2009 were estimated to be US\$ 400mn.⁴

In November 2008 the European Union mounted its first ever joint naval operation in response to increasing pirate activity off the coast of Somalia. In addition NATO's Operation Allied Protector and Operation Allied Provider and Combined Task Force 150, a joint task force led by the United States, are operating in the area. The aims of the naval intervention are to ensure that vessels of the World Food Programme (WFP) can deliver food aid to displaced people in Somalia, to protect shipping in the Gulf of Aden and deter pirates from operating in the region.

¹ See Diagram 1. The figures include incidents carried out by Somali pirates in the Arabian sea

² <http://news.bbc.co.uk/1/hi/england/kent/8330406.stm>

³ <http://edition.cnn.com/2008/WORLD/africa/12/18/somalia.pirate/index.html#cnnSTCText>

⁴ http://www.begbies-traynorgroup.com/investigations/news/08-12-15/surge_in_marine_piracy_likely_to_hit_costs.aspx

In this paper we aim to address three questions: Firstly, how has piracy in Somalia evolved in recent years and what have been its determinants? We observe a number of developments in Somali piracy. The number of attacks carried out has risen and the targets and methods used have changed. Initially men in skiffs armed with machetes attacked fishing vessels claiming to be “Somali coastguards” letting their victims go after extracting a “fine”. Pirates then moved on to hijacking cargo ships and yachts for ransom. Today’s pirates are armed with automatic weapons and operate from so called “mother-ships”, greatly increasing the potential range of operations. We show that piracy grows in response to past successful hijacks, probably because ransoms are used to acquire new equipment and because young men are drawn to the extremely lucrative opportunities in piracy.

Secondly, we examine to what extent the naval counter-piracy initiatives of the EU and NATO can be considered successful. We argue that while the navies correctly highlight their achievements in terms of deterring attacks on specific ships and in guarding food deliveries these are essentially short term successes.⁵ We analyse monthly attack data from 2000-2009 and daily attack data in 2008 and 2009. These show that deterrence events do not appear to have a negative effect on pirate activities in the long term. We show that, at best, the arrival of naval forces on the scene of an attempted hijack postpones further pirate activities by a matter of days. In addition pirates have extended their sphere of operation from the Gulf of Aden where shipping traffic and naval forces are concentrated into areas that are not easily monitored, such as the open waters off the coast of Somalia, the Arabian Sea and the Indian Ocean off the coast of Kenya, Tanzania and the Seychelles. This mirrors classic results from research on counter-terrorism where the securing of specific facilities diverts terrorists to soft targets.⁶

Thirdly, we attempt to answer the question to what extent Somali piracy is linked to the absence of authoritative government and lack of economic opportunity in Somalia. If piracy is linked to internal chaos in Somalia it is likely that the exclusively sea-based naval operations will have limited success as long as Somalia remains a failed state. Our results suggest that pirates benefit from local improvements in governance, which can occur even without the presence of an effective central government.⁷ A substantial gain in centralized stability might well reduce the incidence of piracy, but it is likely that short-term gains in local stability could increase pirate attacks. This result could thus have implications for how state reconstruction in Somalia ought to proceed.

The paper is structured as follows. Section 2 provides some background material on Somalia, an overview of how Somali piracy developed over time and how the multi-lateral naval missions have attempted to resolve the piracy problem. Section 3 discusses the data and methodology of the statistical analyses, section 4 provides and analyses the results. Section 5 concludes.

2: Somalia, Somali Piracy and the Multilateral Naval Missions

⁵ <http://www.eunavfor.eu/category/press/feed/>

⁶ Enders and Sandler (2004)

⁷ Menkhaus (2007)

2:1 Somalia: a failed state

The United Republic of Somalia was formed from the former British protectorate of Somaliland and Italian Somalia and became independent in 1960. The first years of its independence were marred by border disputes with Ethiopia and Kenya and politics were characterised by fighting among various clans for political supremacy.

From 1969 to 1991 Somalia was governed by Mohammed Said Barre, who replaced the assassinated elected president Abdi Rashid Ali Shermake after a coup. His corrupt administration was based on cold-war fuelled foreign aid and “divide-and- rule” tactics, which generated deep animosities between clans.⁸ Around 75% of Somalis belong to the six major clan families: the Darod, Digil, Dir, Hawiye, Isaaq and Rahanwein. Of these the Darod clan has tended to be the most influential.⁹ When Western aid was drastically reduced after 1989, state failure was almost inevitable and clan battles erupted in 1991. Including the victims of the famine of 1991/92 (caused by widespread looting and banditry) an estimated quarter of a million Somalis died and a million fled to other countries during the civil war.¹⁰

The US and UN failed in their missions to restore order and safeguard relief supplies and ended their engagement in 1994 and 1995 respectively. In the resulting security vacuum Somali clan families strengthened their hold on political and economic life. Local polities emerged with Islamic courts backed by clan elders, business people and Muslim clergy re-establishing the rule of law in many communities.¹¹ At the central government level, however, it has proved impossible to find a way to find a way past the clan divisions and find a formula for power sharing.

Each attempt at building a government of national unity has ended in a narrow coalition taking power. In August 2000 clan leaders meeting in Djibouti appointed a transitional national parliament. Its elected president entered Mogadishu in October 2000 and announced the first government since 1991. However, the parliament was dominated by Mogadishu-based clans and elsewhere the government was not accepted as a government of national unity. The administration was fiercely opposed by those clans who had not done well in the distribution of posts as well as factions that were opposed to central government altogether.¹²

In October 2004 after two years of fresh peace talks a new transitional federal government (TFG) was inaugurated in Kenya and managed to meet in Somalia for the first time in February 2006. This time the TFG excluded the Mogadishu-based clans which had dominated the previous government and the Islamist groups from positions of power, reflecting at least partially the preferences of Ethiopian mediators. Islamist groups immediately began to contest the peace deal. From March to May 2006 fighting erupted between militias loyal to the Union of Islamic Courts (UIC) and the TFG.

⁸ Menkhaus (2007a)

⁹ Soerensen (2008)

¹⁰ Menkhaus (2007a)

¹¹ Menkhaus (2007a)

¹² Menkhaus (2007b)

In June 2006 the militias of the UIC took control of Mogadishu and parts of Southern Somalia. In December 2006 they were driven out of Mogadishu by Ethiopian troops and troops of the transitional government. However, fighting between insurgents and Ethiopian and government troops continues into 2009, with Mogadishu seeing the greatest disruption. All attempts at establishing a government in the capital continue to be disrupted by fierce gun battles, suicide bombings and political assassinations. More than 1.5 million people are estimated by the World Food programme to be internally displaced within Somalia and 2.87 million received food aid in 2009.¹³

2:2 Somali Pirates

Pirates in Somalia operate in this context of general lawlessness. A low level of opportunistic and small scale pirate activity has taken place in the Gulf of Aden and the Red Sea for many years. Geographical opportunity is an important factor in piracy: attacks are more likely to be successful where geographical features dictate that international shipping traffic moves close to the shore and is highly concentrated. Slow boats are easier to board.¹⁴ Initially the attacks were based on acts of theft or extortion and often targeted fishing vessels, which were (illegally) fishing off the Somali coast. Pirates used small boats (skiffs) and basic weaponry and were therefore restricted in their operations. They can be repelled by crews taking the initiative spraying water from fire-hoses and throwing items overboard.¹⁵

The collapse of political and civil order in Somalia and the absence of central law enforcement in the coastal regions meant that pirates could vastly increase the profitability of their activities by hijacking and holding ships for ransom. Attacks increased in frequency and audacity. Ships can be held mostly unchallenged by the authorities in the ports of Eyl, Hobyo and Gharardeere until ransom negotiations are concluded.¹⁶ Increasing returns from piracy appear to have funded technological improvements, such as small arms, automatic weapons and rocket propelled grenades. This has raised the stakes for crews who want to resist pirates.

The other main innovation has been the use of motherships from which the small skiffs (which are still being used for attacks) are launched. The use of motherships extends the radius of operations well beyond the coastal waters off Somalia. Pirates can move unnoticed in the shipping lanes until ready to launch an attack and are no longer confined to harbour during the monsoon season. Motherships are mostly fishing vessels and diving-boats, which are hijacked and used for a period until their stores run out, the crew is ransomed or the vessel's use as a mothership is suspected.¹⁷

Below we model the drivers of piracy in the Gulf of Aden and off the coast of Somalia. We build the model on the hypotheses outlined by Murphy (2007), who stresses that piracy is first and foremost an issue of opportunity and promise of reward

¹³ <http://www.wfp.org/countries/somalia>

¹⁴ Murphy (2007)

¹⁵ For example the IMB piracy reports provide the following examples: on 13 February 2002, an attack on the bulk carrier Altair was aborted after the "duty officer ... increased speed, zigzagged the ship's course and activated fire hoses." On 24 April 2009 pirates left when the crew of the cargo ship Boularibank "activated water hydrant and released timber baulks into the sea."

¹⁶ BBC (18/09/2008) *Life in Somalia's Pirate Town* <http://news.bbc.co.uk/1/hi/7623329.stm>

¹⁷ See for example <http://www.eunavfor.eu/2009/11/eu-navfor-assists-indian-dhow-released-by-pirates/>

and only secondarily an issue of poverty. We look at opportunity, costs, risks, resources and poverty as the potential determinants of piracy. We add variables on the activities of the international naval forces to examine whether they have been able to significantly change the incentives for pirates by increasing the risks associated with carrying out acts of piracy.

2:3 The Multilateral Naval Mission

As the Gulf of Aden presents a perfect geographical opportunity for piracy there is a history of attacks on ships in this area. However, the problem has escalated in recent years and naval security patrols have been formally operating in the Gulf of Aden and off the coast of Somalia since August 2008 (diagram 1).

Even before formal security patrols started naval vessels provided occasional assistance to attacked ships and the navy mounted a small number of rescue operations of hijacked vessels.¹⁸ In response to these rescue operations pirates adapted their strategies, threatening to kill hostages if attacked and holding at least part of the crew on land during ransom negotiations to discourage rescue attempts of boats in Somali harbours. The navies' focus has therefore shifted to prevention and deterrence, with ever more international naval vessels present in the Gulf of Aden coming from EU and NATO countries as well as Japan, Russia and China.¹⁹

In December 2008 the EU formalised its engagement in the region with operation EU NAVFOR Atalanta. The three declared aims of the EU NAVFOR are 1) “the protection of vessels of the World Food Programme (WFP) delivering food aid to displaced persons in Somalia”, 2) the “protection of vulnerable vessels” transiting through the area and 3) to “bring an end to acts of piracy and armed robbery” in the region.²⁰ In what follows we analyse the success of the naval mission with respect to the three aims above.

Somalia is one of the poorest countries in the world. It has probably the world's highest need for food relief relative to the size of its population: out of a total population of around 10 million Somalis the World Food Programme aims to support 3.64 million people suffering malnutrition because of conflict, displacement and drought. 90% of the food aid is transported by sea.²¹ After attacks on a number of WFP deliveries all captains of large cargo ships bringing in food supplies have requested protection.²² A naval escort system was implemented in November 2007 and there have been no attacks on WFP transports under escort. The WFP was therefore able to scale up its operations from delivering 10,000MT of food supplies in

¹⁸ For example: January 2002, September 2003, march 2005 and January 2006. IMB piracy reports

¹⁹ See Appendix 1

²⁰ “bring an end to acts of piracy and armed robbery” used in the original wording of the Atalanta mission – see for example: <http://www.medicalnewstoday.com/articles/133184.php> and http://www.german-info.com/press_shownews.php?pid=1010. However, this seems to have been amended recently to “deterrence, prevention and repression of acts of piracy and armed robbery off the Somali coast” <http://www.consilium.europa.eu/showPage.aspx?id=1518&lang=en>

²¹ <http://www.wfp.org/countries/somalia>

²² For example see <http://www.eunavfor.eu/2009/11/eunavfor-warship-louise-marie-protects-wfp/> and <http://www.eunavfor.eu/2009/11/eu-navfor-escorts-amisom-vessel/>

2007 to 35,000MT in 2008 and an estimated 50,000MT in 2009.²³ There is therefore no doubt about the success of the naval mission in this respect.²⁴

To achieve the second aim of protecting vulnerable shipping the naval forces provide a number of services. The first is advice to ship-owners about security measures to minimise the risk of attacks such as speed and route of travel, evasive actions and securing decks, based on detailed analysis of past attacks.²⁵ Secondly, ships are advised to travel through the Gulf of Aden in a specific transit corridor patrolled by naval vessels. There are also group transits with naval escorts based on ship speed.²⁶ Finally, ships that come under attack can request assistance from naval vessels; though there is no guarantee that assistance will be rendered in time to prevent pirates from boarding. Once pirates have successfully boarded a ship, the naval forces do not intervene to avoid risking the lives of the crew or endangering the cargo.²⁷ Navies monitor the progress of hijacked vessel and sometimes render assistance after a vessel is ransomed.²⁸

The success of the above measures in protecting vulnerable shipping is debatable. On the one hand the IMB reports 50 attacks abandoned at the arrival of naval ships and helicopters from January 2008 to June 2009. On the other hand deterrence was not perfect because there were 251 attacks during this period (143 of these in 2009). 72 of the 251 attempts resulted in a successful hijacking.

The naval mission's third aim referred to the long-term goal of deterring Somali pirates from operating. The measures taken here are the presence of naval vessels to aid attacked ships, confiscation of pirates' equipment and boats and the detention and trial of pirates caught in the act of piracy. Due to the operation of forces from different nationalities it is difficult to collate data on the number and timing of events when pirates intercepted, detained and tried. In any case, the effect of detentions and trials on subsequent acts of piracy is debatable. On the one hand arrested pirates are prevented from committing acts of piracy, but on the other hand detention followed by political asylum in a Western country could be an attraction in itself.²⁹ Given the lack of economic opportunity in Somalia and the potential rewards of pirate activity (or arrest!), there is unlikely to be a shortage of recruits to replace any arrested pirates.³⁰ In any case as the burden of proof required for a conviction is high, most pirates are released either immediately or after trial.³¹

²³ <http://www.wfp.org/stories/wfp-logistics-somalia-2009>

²⁴ However, there is a question of whether using frigates to escort slow cargo ships to Mogadishu at an estimated cost of US\$300,000 a day is the most cost effective solution or whether private security firms could provide protection more cheaply.

²⁵ <http://www.mschoa.eu/>

²⁶ http://www.icc-ccs.org/index.php?option=com_content&view=article&id=70&Itemid=58

²⁷ Ransoms have so far been very much lower than the combined value of cargo and ships. See BBC (18/09/2008) *Life in Somalia's Pirate Town* <http://news.bbc.co.uk/1/hi/7623329.stm> and Soerensen (2007)

²⁸ Released ships are vulnerable to being attacked again as they are low on stores and fuel, run by an often traumatised crew and slowed down by soiling from long periods in harbour.

²⁹ Based on interviews with naval officers and risk consultants. Some governments have made arrangements that pirates will be prosecuted in Kenya to lower the attractiveness of being arrested. <http://www.nytimes.com/2009/04/24/world/africa/24kenya.html>

³⁰ *Somali Pirates living the high life* <http://news.bbc.co.uk/1/hi/world/africa/7650415.stm>

³¹ See Times Online November 29, 2009 *Navy releases Somali pirates caught red-handed*

The destruction of equipment is likely to have a less ambiguous effect on subsequent pirate activities. Arms, boats and GPS / telephone equipment are likely to represent a significant capital outlay for pirate groups. The case is less clear for motherships, however, which are thought to be hijacked and used for limited periods only. We will therefore try answering the question to what extent the naval mission was successful by statistical analysis: can we find evidence that there were fewer attacks because of naval deterrence events or the institution of the transit corridor?³²

3: Model, Data and Methodology

We model piracy off the coast of Somalia from January 2000 to June 2009. The model is loosely based on the “reasons for piracy” outlined by Murphy (2007).³³ A number of the factors are, however, time invariant in Somalia and we therefore focus on those variables where we see variation over time. Our initial hypotheses are the following:

1. Piracy is a function of **opportunity**: the more shipping traffic there is and the easier it is to attack them the higher the number of pirate attacks.
2. Piracy is a function of **risk**: piracy will be lower during monsoon seasons and when there is greater law enforcement through international naval forces.
3. Piracy is a function of **resources**: The more equipment can be funded, the higher the incidence of piracy.
4. Piracy is a function of **poverty**: If conditions in the Somali economy significantly worsen or households are in need of additional resources to make specific expenditures, more men may be attracted to piracy.
5. Piracy is a function of **costs**: piracy is an economic activity – if costs rise (*ceteris paribus*) then we would expect piracy to decrease.

We test a number of models, taking a general to specific approach to modelling, i.e. we use a wide set of variables initially and then test down to a specific model by eliminating insignificant variables. In the results section we report the preferred specifications as well as commenting on the variables which were eliminated. We use a number of different geographical and temporal aggregations to shed light on the connections between piracy and its potential determinants.

The first series of tests looks at the **Monthly number of incidents**. We use both basic OLS regression and a time series Tobit to take into account that just under a third of total observations are zero observations– i.e. no attack took place. There is a clear time trend in the data with overall piracy around Somalia and Aden increasing over time and the series also becomes more volatile (diagram 1). We include a lagged dependent variable in the model and use robust standard errors to correct for this

<http://www.timesonline.co.uk/tol/news/world/africa/article6936318.ece>. The Combined Maritime Forces reported on 23 October 2009 that 611 pirates were encountered between 22 August 2008 and 23 October 2009. Of these 358 were immediately released. 242 were turned over for prosecution. Out of 59 trials, 24 resulted in the release of the pirates. Only 11 pirates were killed.

³² We are lacking data about the timing and scale of arrests, but are working on this.

³³ Legal and jurisdictional weakness, favourable geography, conflict and disorder, under-funded law enforcement, permissive cultural environment and promise of rewards.

pattern. We check that the residuals do not exhibit a time trend and are normally distributed. As an additional robustness check we also model the **Change in attacks** from one month to the next. This difference variable makes the series stationary, but the variance of the series increases towards the end. We correct for this heteroskedasticity problem by using robust standard errors.

We model three series in the monthly analysis: firstly we model Somali piracy as one phenomenon. Secondly, we split the series into attacks in the Gulf of Aden and attacks made in the Indian Ocean off the Somali coast, the Arabian Sea and as far South as the Seychelles. The reason for this approach is that while all attacks are presumed to be carried out by Somali pirates we want to check whether the effect of additional security measures in the Gulf of Aden has been to suppress piracy or simply divert pirates to less easily patrolled areas.

The second set of tests is based on **Daily Observations of attacks 2008 / 2009**: We analyse daily data for the period of the naval intervention. We analyse the factors which determine whether or not pirates chose to attack on a given day using logit analysis. Given that there are a few (22 /545) occasions when there is more than one attack in a day we also use an ordered logit to analyse the three possible outcomes. Again we analyse the total sample and the Gulf of Aden and the rest of Somali piracy separately. The following section describes the data.

Dependent variables:

The analysis is based on the database published annually by the International Maritime Bureau (from 1997 to 2008 and quarterly reports for Q1 and Q2 in 2009). The IMB provides narratives on all incidents of piracy reported (voluntarily) by captains and ship-owners. From the narratives we can distinguish between successful raids, successful boarding with subsequent rescue and unsuccessful attempts. The latter includes incidents of various degrees of severity ranging from suspicious (unidentifiable) vessels spotted by radar several nautical miles away³⁴ to actual attempts where shots were fired and boarding was attempted.

It is likely that the dependent variable is measured inaccurately. (Attempted) Piracy is often not reported, because it is thought to reflect badly on the shipping companies.³⁵ Additionally, reported incidents of successful boarding may lead to lengthy forensic investigation during which the ship will be confined to harbour.³⁶ However, once the naval forces arrived in the Gulf of Aden in recognition of the piracy problem, the “stigma effect” of reporting piracy was reduced. Indeed the presence of the Navy makes skippers more likely to report suspicious vessels either to request help or to help with the counter-piracy effort. The massive increase in reported attempts in 2008 / 2009 is therefore likely to be a combination of a rise in pirate activity and an increase in reporting. For this reason we experimented both with the raw data series and taking natural logs of (1+ events) to compress the distribution and give less weight to the large observations. Below we report the results for the series with the logarithmic transformation, which shows a significantly better fit than the raw data series.

³⁴ E.g. 13.06.2009 “Two skiffs were detected on radar by the tanker underway. Tanker made evasive maneuvers, increased speed warned other ships...”

³⁵ Murphy (2007)

³⁶ Interviews with ship owners

Monthly analysis

- 1) Monthly number of incidents in region (Red Sea, Aden and Somalia)
- 2) Monthly number of incidents in Aden
- 3) Monthly number of incidents in Somalia
- 4) Change in the number of attacks from one month to the next

There is a clear time trend in the data with overall piracy around Somalia and Aden increasing over time (diagram 1). There is no obvious impact from the naval counter-piracy mission on the total number of incidents. However, during 2009 incidents off the coast of Somalia clearly increase, while the pattern in Aden remains comparable to the previous year.

Short run model

- 5) Dummy of whether or not an attack occurred on a given day
- 6) Ordered variable whether none, one or more than one attack occurred on a given day

Independent variables

Opportunity:

- 1) **Suez shipping:** We have collected data from 2000-2009 on the number of ships, the cargo tons and the revenues collected through Suez as a proxy for the volume and value of shipping passing through the Gulf of Aden.³⁷
- 2) **Transit corridor:** From February 2009 the naval forces advised shipping to use a specific corridor through the Gulf of Aden, which is patrolled by naval vessels. In addition ships were given the option of joining escorted convoys through the corridor.
- 3) **Fullmoon and Clearfullmoon:** This set of variables is based on the 5 days around each full moon during which navigation is easiest.³⁸ For the second variable we interacted a dummy of whether or not there was rainfall on the Somali coast (Afgoi) with the fullmoon variable to remove full moons during which there was likely cloud cover and hence no additional advantage for pirates.

Risk

The main risks to pirates in addition to those of being killed or wounded by a resisting crew (which we assume to be constant) are those of navigating in small vessels in potentially rough seas and the risk of encountering a naval patrol. Because of endogeneity issues we cannot use the presence of naval forces in the region as an explanatory variable: the navies are present because of the piracy problem, not the other way round. We use the following variables:

- 1) **North-East monsoon:** We enter a dummy variable for the windy period in Aden from *January-March*. Low visibility due to sandstorms over the desert and coastal areas and high swells make it dangerous to navigate in skiffs.
- 2) **Southwest Monsoon:** There is a second monsoon period in Aden from *June-August*. Again, low visibility due to sandstorms over the desert and coastal areas and high swells make it dangerous to navigate in skiffs

³⁷ it is likely to be less good as a proxy for shipping along the coast of Southern Somalia

³⁸Trade Winds: *Pirate Moon Party* 30 September 2009
<http://www.tradewinds.no/andalso/article545237.ece>

- 3) **Deterrence:** we class a deterrence event as one in which a hijack attempt was reported to have been interrupted by a naval ship or helicopter arriving on the scene. We have not included incidents in which it is clear that the naval forces appeared well after the attempt had been abandoned. In the monthly series we use a count of the number of deterrence events in the month.
- 4) **Rescue:** A rescue is any incident in which the pirates boarded a ship but the ship was then taken over by security forces and the hostages were released without ransom. Sometimes pirates were taken prisoner in the process.

Resources and technology

- 4) **Lagged dependent variable:** This is a proxy for the level of resources accumulated in previous periods.
- 5) **Success:** we class as a success any reported incident where the pirates either stole property from the ship or (more often) extracted a ransom from the owners. We use several lags of this variable, as ransom negotiations take some time to conclude.
- 6) **Motherships** We use a dummy taking the value one from the point when “motherships” are first mentioned in an annual IMB report (2005 – the dummy takes the value 1 from January 2005). Motherships allow pirates to launch piracy attacks further from the coast and perhaps make them less dependent on weather conditions.

Poverty

Few specific details are known about the Somali economy. The IMF’s 2009 assessment of Somalia simply states that the Somali government “has not been able to restore order” and that the “absence of an internationally recognised government and official information about economic and financial developments precludes a full assessment...”.³⁹ The CIA Factbook estimates that 65% of GDP comes from agriculture and fishing. The principal agricultural products are bananas, sorghum, corn, coconuts, rice, sugarcane, mangoes, sesame seeds, beans; cattle, sheep, goats.⁴⁰ We therefore use rainfall as a proxy for economic activity, given that much of the economy is based on agriculture, which is mostly rainwater-fed or based on irrigation from the Juma and Shabelle Rivers.⁴¹

- 7) **Rainfall:** We have records of monthly and daily rainfall for three weather stations in central Somalia for the period 1997-2009 (with two minor interruptions for one of these weather stations).⁴² We constructed: average rainfall per month, difference from long run monthly average (1997-2008), monsoon dummies for average rainfall exceeding 20 for a month, a “missing

³⁹ IMF (2009)

⁴⁰ <https://www.cia.gov/library/publications/the-world-factbook/geos/so.html> There is also a service sector estimated to produce ca 25% of GDP. It is based around the intermediation of remittances from Somalis abroad and telecommunications with said community. Lindley (2009) and Seikh and Healy (2009) provide overviews of this sector, which may also provide finance for pirate activity. We are currently in the process of sourcing data on remittance flows.

⁴¹ SWALIM Streamflow data are not yet available

⁴² Beletweyne, Bullo Burti and Jowhar. Jowwjar data are missing from September to December 2004 and have been estimated based on rainfall in the other stations.

rain” dummy if there is a shortfall of rain compared to the long run average by 30mm and a “wet” dummy for months in which there was any rainfall.⁴³

- 8) **Ramadan**: Ramadan could have a positive effect on piracy if resources are needed to finance the festivities.⁴⁴ We used the dates of Ramadan for daily analysis, for the monthly series we constructed one dummy if there were more than 10 Ramadan days in the month and a dummy if there were any Ramadan days in the month. A negative effect would be observed if illicit activity was shunned during the religious festival.⁴⁵

Costs

The general hypothesis is that piracy thrives on lawlessness and disorder.⁴⁶ It is doubtlessly true that pirates need safe havens outside the control of the government and hence with a low probability of security force interventions. However, piracy is also an economic activity that potentially suffers from disorder, as hostages need to be fed, kept in reasonable condition and under the pirates’ control for ransoming. Outbreaks of civil unrest can disrupt food supplies, but perhaps more importantly they would raise the cost of guarding prey from other groups who could extract ransoms.

Throughout the period under investigation there has not been an effective central government in Somalia, though there have been variations in the degree of civil conflict. Unfortunately the data situation on violent conflict in Somalia mirrors that on economic activity. The PRIO dataset on civil war is extremely vague on the total number of fatalities in the civil conflict. For example the entries for 1993 and 1994 have lower and upper bounds of 25 and 6000 respectively. There are no data at all between 1997-2001 and 2003-2005.⁴⁷ Somalia clearly did not have sufficient security to allow foreign observers to operate effectively or at all. The only concrete information we have about civil conflict directly impacting on piracy is during the brief period during which the UIC replaced the transitional government in Mogadishu in 2006. The UIC took some drastic and highly visible measures against pirates. Perhaps more importantly they conquered the ports of Hobyo and Gharardeere in late 2006 directly disrupting pirate activity.

As for the business environment, Menkhaus (2003, 2007a) argues persuasively that absence of government does not necessarily mean absence of governance. After years of political instability, local governance has emerged based around clans, elders, businesspeople and mosques. In many areas these structures are strong enough for people to transact with confidence, as the experience of money transfer companies in Somalia shows.⁴⁸

In the absence of concrete information on governance we take an innovative approach to proxying for violent conflict and the ease of contracting. We use data collected by

⁴³ We additionally used the International food price indices from the FAO for cereal, sugar and oil prices to proxy for import costs, but this was not significant in any of the regressions.

⁴⁴ Pirates appear to be able to get credit on the basis of a successful hijack. . See BBC (18/09/2008) *Life in Somalia’s Pirate Town* <http://news.bbc.co.uk/1/hi/7623329.stm>

⁴⁵ Attacks could, however, be increased if a high proportion of the target vessels are believed to be staffed with observant Muslims.

⁴⁶ Murphy (2007)

⁴⁷ Lacina and Gleditsch (2005).

⁴⁸ Lindley (2009)

the Somalia Water and Land Information management agency (SWALIM).⁴⁹ SWALIM is funded by development agencies, the EU and the United Nations and is rebuilding the data collection network for rainfall and river stream-flow data in Somalia following the civil war. The organisation has attempted to revive the 52 pre-war weather stations. Data collection simply requires locating a measuring gauge in a particular way, reading daily data and sending a monthly report in the post.

In the Somali context the well resourced SWALIM must be an exceptionally attractive employer. However, SWALIM has found it very difficult to reach many of the old stations and in several cases has had to site stations in alternative locations. Once a station is under contract, rainfall data are often patchy. Occasionally contracted stations simply do not submit a report to SWALIM, so that days or whole months are missing (diagram 3). Apparently this is generally linked to a worsening security situation – i.e. staff cannot leave their homes or have fled the area because of territorial disputes.⁵⁰ Several stations were discontinued after reporting lapsed for a number of months, which explains the occasional drop in the number of stations contracted.

We therefore use the following three rough proxies for local conditions in which (pirate) business is carried out.

- 9) **Contractual environment:** We use the percentage of pre-war stations contracted as a proxy for the feasibility of entering into a long-term contract / supply relationship and building (very) basic infrastructure.
- 10) **Civil conflict:** We use the number of stations not reporting as a (rough) proxy for the intensity of civil conflict.
- 11) **UIC dummy:** We also use a dummy for the period of the UIC control in Mogadishu from June to December 2006.

4: Results and Discussion

4:1 Monthly observations: total incidents

Table 2 about here

The lagged dependent variable (i.e. the number of incidents in the preceding period) is highly significant and positive in all models. This provides support for the hypothesis that once groups acquire resources suitable for piracy, they will continue in the business. There is also some evidence that a success in the previous month increases pirate effort (small positive coefficient), but this is not always significant. There is, however, robust evidence that a success 4 months ago increases current piracy levels. This makes perfect sense given that it generally takes at least 2 months to negotiate a ransom and then presumably some time for the new boats / weapons to arrive.

Improvements in the contracting environment also appear to benefit pirates (5% significance, small positive coefficient). This contradicts the assertion that pirates thrive on domestic chaos. Instead the suggested interpretation is that pirates need an

⁴⁹ www.faoswalim.org/

⁵⁰ Information reported by SWALIM

infrastructure of some sort to look after hostages, negotiate ransoms and get their own supplies. Similarly civil strife reduces piracy (significant negative coefficient). Again this contradicts the hypothesis that pirates benefit from disorder. Instead it could be argued that with a limited supply of weapons, warlords deploy their armed men either in piracy activities or in battles of resources on land. Alternatively in times of disorder more resources might be tied up in guarding the prey.

These results are robust to the methodology used (OLS / Tobit), the definition of the dependent variable (total number or $\ln(1+\text{total number})$) and the inclusion of additional, insignificant variables. There is no statistically significant evidence for seasonal or weather patterns at the monthly level. Similarly we cannot find any statistically significant effects of any of the naval intervention variables at the aggregate level.

4:2 Monthly observations: Incidents in the Gulf of Aden

Table 3 about here

The models estimated for Aden underline the importance of resources in driving piracy: both the past level of piracy and past successes drive current piracy levels. Again the effect of successes 4 periods ago dominates the immediate effect, giving credence to Bossasso's police chief, Osman Hassan Uke's statement: "Whenever 10 guys get paid ransom money, 20 more pirates are created."⁵¹ The previous result that civil conflict disrupts piracy is also backed up, but the indicator for the contracting environment or the UIC dummy is not statistically significant in this model. This suggests that most of the problems in governance and civil violence are a phenomenon of Southern Somalia. Indeed the (unrecognised) "Republic of Somaliland" which declared its independence from Somalia in 1991 has enjoyed relative stability and was not affected by the 2006 conflict with the UIC. Coalition deterrence events are on the border of statistical significance (12%) – but with an unexpected positive coefficient. It suggests that if anything deterred pirates move on to the next prey, increasing the total number of attacks. We will revisit this issue in the analysis of daily data.

4:3 Monthly observations: Incidents in the Indian Ocean and Arabian Sea

Table 4 about here

In the Indian Ocean we again see persistence in pirate activity from one month to the next. However, in this area we do not have significant effects from past successes. The technological advance of using "motherships", however, seems to have made piracy in this region more feasible. We also find some interesting effects from the naval intervention. The dummy for the presence of EU NAVFOR or (alternatively) the number of deterrence events are significant and reduce the number of attacks in the Indian Ocean *ceteris paribus*. However, it appears that the institution of the transit corridor has increased piracy in the open waters around Somalia and this effect

⁵¹ quoted in *Postcard from Somali pirate capital* <http://news.bbc.co.uk/1/hi/world/africa/8103585.stm>

dominates the deterrence effect from the presence of naval forces. This looks like a classic substitution effect in which pirates (like criminals and terrorists) substitute “soft” targets for the protected prey.

We also get a (less robust) result that rainy months see a decrease in piracy. Perhaps pirates have alternative employment in the agricultural sector or they shun the open seas during this time. The former interpretation is supported by the observation that a “missing rain” increases pirate activity. This result would also support the hypothesis that piracy is to some extent driven by poverty. Finally both increases in civil conflict (non-reporting stations, but in particular the UIC dummy) have a detrimental effect on pirate activity in this region.

4:4 Monthly observations: Change in incidents from month to month

Table 5 about here

In the models looking at the change in piracy from one month to the next, the number of ships through Suez has a positive effect on piracy, but not the value or weight of cargo. This is consistent with reports of ransom payments which are well below the value of the cargo and ships. A success in the previous month reduces incidents in the current period. This may be a sign that pirates are guarding their prey rather than necessarily handing over to land-based teams. Four months after a successful hijack pirate activity again increases significantly. Again, the civil disorder proxy has a negative and significant coefficient and a severe “missing rain” increases the number of attacks in the month, providing support for the poverty hypothesis. There is no statistically significant effect of naval deterrence or rescue activities.

Daily Observations

Table 6 about here

In all the short-term models we now observe clear effects of deterrence events. A deterred attack on the previous day lowers the probability of an attack today, but after two days the attack probability is higher again. Pirates seem to lie low or change position and then attack again. After an unsuccessful attempt another attack tends to follow the next day. After two days the probability is reduced in Aden suggesting that a significant proportion of the pirate boats only equipped for short outings. In the Indian Ocean the attack probability remains significantly higher for four days.

Pirates are significantly less likely to attack on any given day during the Southwest and Northeast Monsoon seasons. When we split the sample into Somalia and Aden, both monsoon seasons matter in Aden, but for Somalia it is only the Southwest monsoon which matters (barely significant at the 10% level). As we do not observe this monsoonal pattern in the monthly figures, presumably pirates do attack on the more clement days within the monsoon season. With more precise wind-speed data we could probably get better explanatory power here. Ramadan and clear full moons increase the probability of attacks occurring.

A success on the previous day increases the probability of attack in Aden. This could either be an “encouragement effect” (if pirates communicate with each other) or reflect that successes tend to occur in particularly pirate-friendly conditions. Finally, there seem to be complementarities between the two locations – attacks in Aden are positive and significant in Somalia and vice versa: this may reflect common weather patterns or simply the rise of piracy in Somalia since 2007.

5: Conclusions

There are a number of clear messages from the data analysis above. Firstly, piracy appears to have increased over time as pirates demonstrated the potentially huge rewards from hijack and ransom. Profits appear to be (at least partially) re-invested and new people are attracted into the “business”. Given the apparent importance of successes / ransoms in fuelling piracy perhaps there is a policy implication about not negotiating ransoms or at least keeping them to a minimum.⁵²

Secondly, the way in which the naval forces operated until June 2009 did not deter pirates from operating in the region. Instead we find that when pirates are deflected from specific ships they simply lie low and attack another ship when the naval vessels have disappeared. Efforts to secure specific shipping lanes have not reduced the number of attacks in the Gulf of Aden, but have increased the number of incidents in the open seas. These areas are nearly impossible to patrol.

Thirdly, we can link piracy to developments within Somalia. Pirates appear to benefit from political stability and improved governance, as long as the authority (which may be fairly local) is tolerant of pirate activity. Anecdotal evidence suggests that clan elders receive a significant proportion of the ransoms.⁵³ This suggests that a land-based approach to resolving the pirate problem would need to do more than establish a government in Mogadishu, as the regions have a serious incentive to resist central anti-piracy measures. Given the evidence for links between poverty and piracy, any intervention would also have to ensure that reasonably lucrative alternative occupations would need to be provided for former (and aspiring) pirates.

Future work in this area will focus on improving the proxies for the naval efforts at deterring pirates in the long term through arrests and destruction / confiscation of equipment. In particular the question we would like to know whether being tried for piracy in a Western court might be an attraction in itself. Another fruitful research question would be to analyse the role of the Somali diaspora in financing pirate activity, and their role in the intermediation / safeguarding of profits arising from piracy. Finally, it may be possible to predict probability of attack occurring on a given day quite precisely with detailed wind-speed and weather data.

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⁵² As ransoms have been much less than the value of the cargo and hull and companies need to staff their ships, ship owners are likely to resist such policies.

⁵³ <http://news.bbc.co.uk/1/hi/world/africa/8061535.stm>

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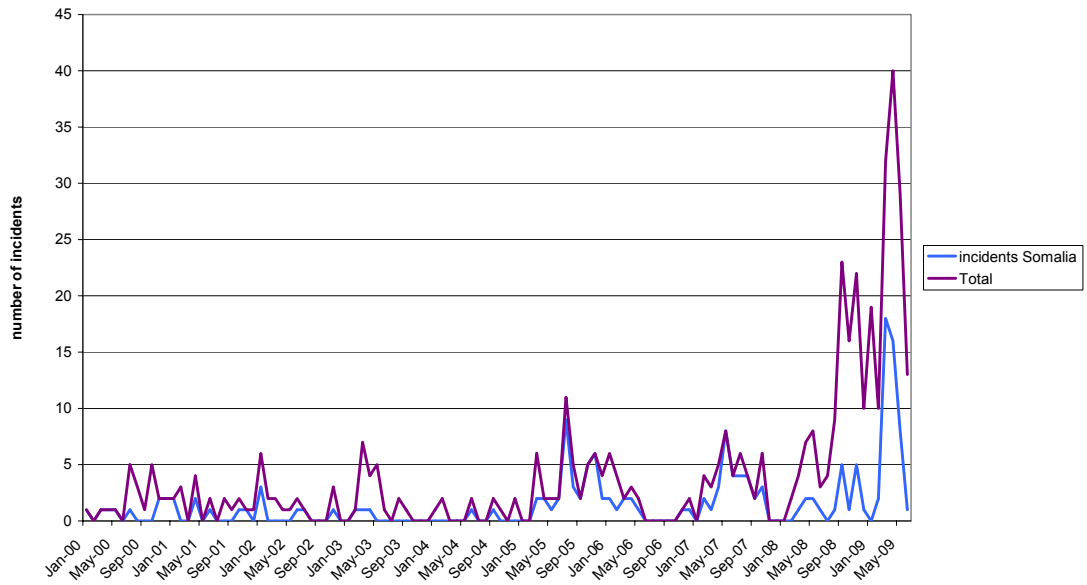
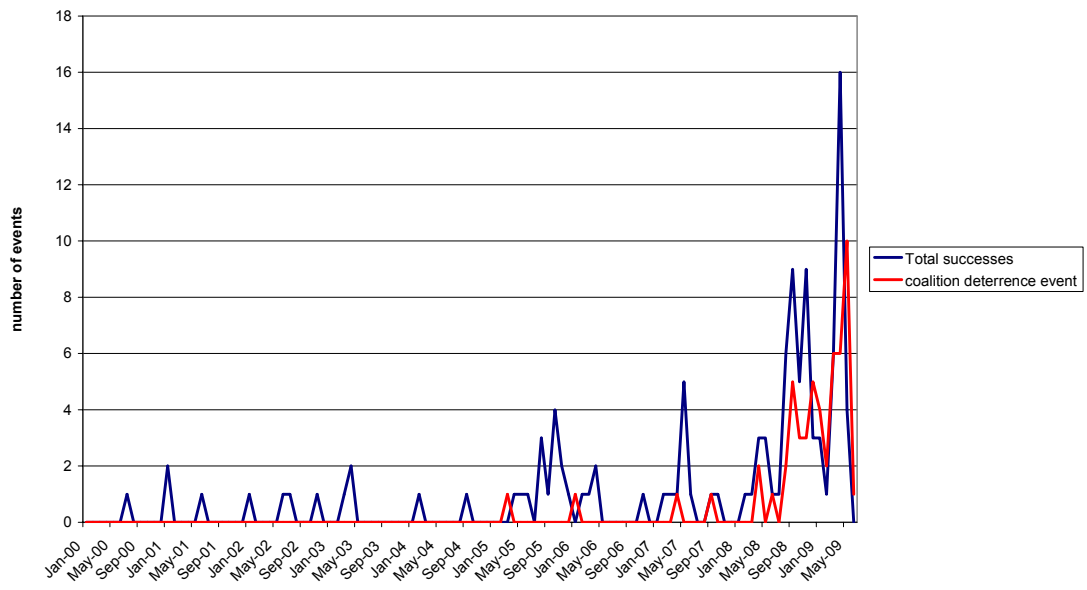


Diagram 2

Pirate successes and failures



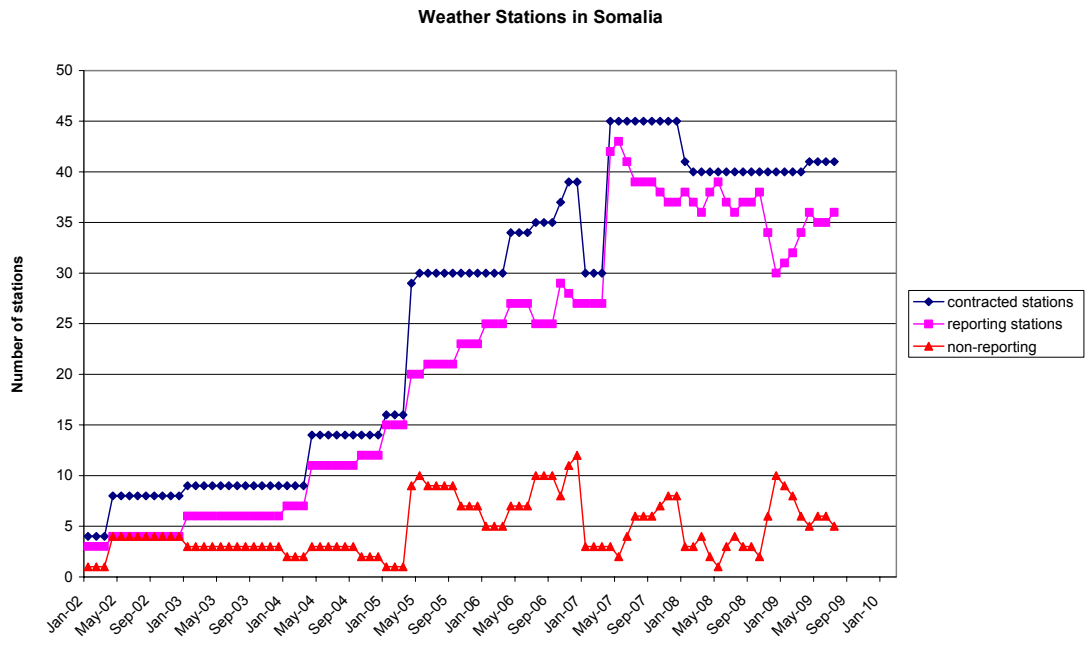
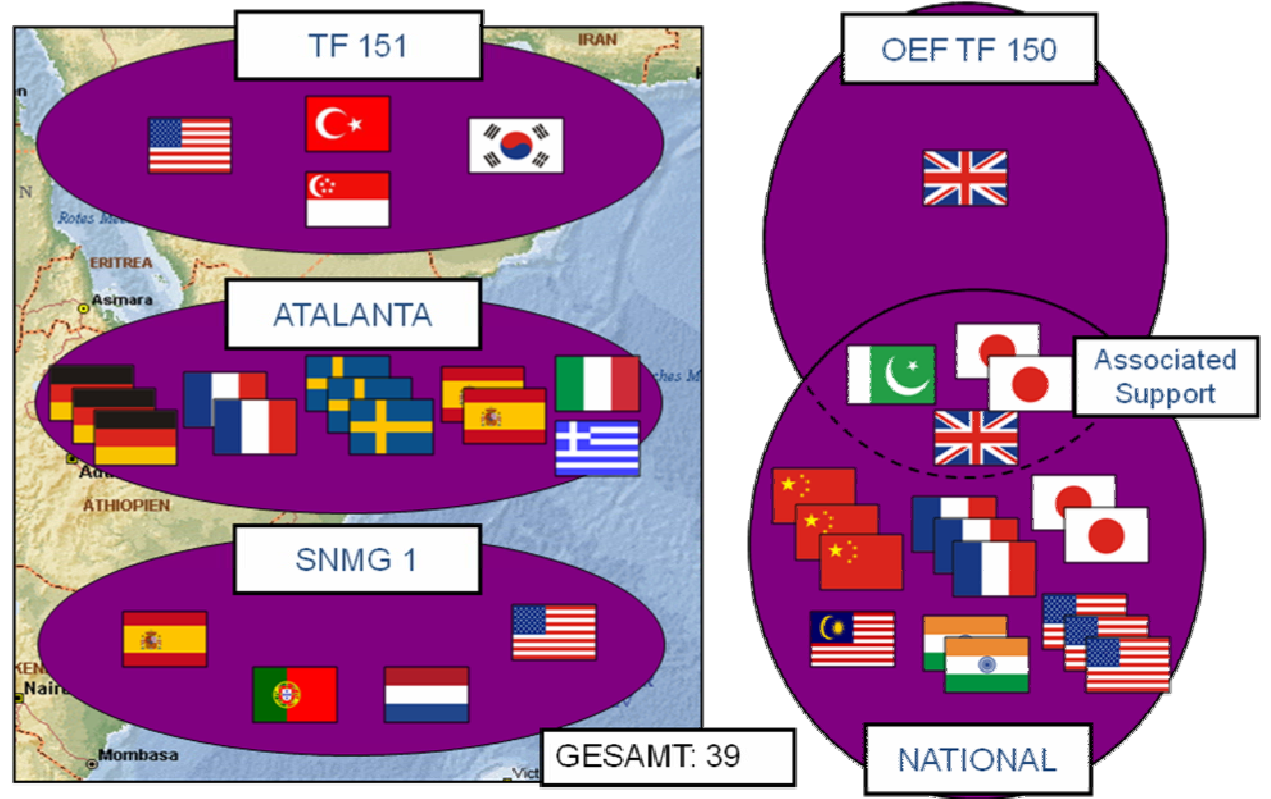


Diagram 4

Number and nationality of Naval forces present off Somalia in June 2009



Source: EU NAVFOR

Table 1
Variable Definitions and Sources

Variable Name	Source	Definition
Incidents	International Maritime Bureau Piracy reports	Number of incidents reported in relevant region
Success	International Maritime Bureau Piracy reports	Incidents which result in a successful hijacking and no subsequent rescue attempt is made
Attempt	International Maritime Bureau Piracy reports	Incidents in which the crews successfully prevented boarding
Rescue	International Maritime Bureau Piracy reports	Hijackings which were ended by security or naval force interventions
Deterrence events	International Maritime Bureau Piracy reports	Incidents in which naval vessels successfully prevented boarding
% pre-war stations contracted	SWALIM Hydromet data inventory	Number of stations under contract compared to pre-war total of 52
Non-reporting stations	SWALIM Regional rainfall reports	Number of stations under contract which are not reporting
UIC	BBC news timeline of Somalia	Dummy from June-December 2006
EU NAVFOR	EU NAVFOR website	Dummy from December 2008
Transit Corridor	http://www.mschoa.eu/	Dummy from January 2009
Motherships	International Maritime Bureau Piracy reports	Dummy from January 2005 when motherships are first mentioned in the context of Somalia
Rainy Months	SWALIM Regional rainfall reports	Months during which there is rainfall reported in the three stations for which data (mostly) exists from 1997
Missing rain	SWALIM Regional rainfall reports	Actual rainfall average compared to long term monthly average (1997-2008). Dummy

		for months in which rainfall was lower than 1-t average by more than 30mm.
Clearfullmoon	SWALIM rainfall reports Afgoi	5 days centred on full moon interacted with dummy of whether or not there was rain recorded at Afgoi weather station.
Suezshipping	http://www.suezcanal.gov.eg/TRstat.aspx?reportId=1	Number of vessels going through Suez in a give month
Ramadan		Dates of Ramadan
Northeast monsoon	http://www.nrlmry.navy.mil/sat_training/world_wind_regimes/GulfOfAden/fall_transition/index.html	January-March
Southwest monsoon	http://www.nrlmry.navy.mil/sat_training/world_wind_regimes/GulfOfAden/SW_Monsoon/index.html	June-August.

Table 2

Monthly observations: total incidents

The dependent variable is $\ln(1 + \text{total number of incidents in Aden and Somalia})$

	Model 4:1	Model 4:2
# of incidents in previous month	0.384*** (0.101)	0.537*** (0.150)
Previous success	0.082** (0.0332)	0.066 (0.053)
Success 4 periods ago	0.134*** (0.042)	0.137** (0.060)
% pre-war stations contracted	0.008 *** (0.008)	0.009** (0.004)
Non-reporting stations	-0.064** (0.028)	-0.071* (0.039)
constant	0.380** (0.169)	0.0255 (0.227)
Observations	90	90
R-squared / pseudo R ²	0.6118	0.246
Method	OLS Robust SE	Tobit

* denotes significance at the 10% level. ** denotes significance at the 5% level. *** denotes significance at the 1% level.

Table 3**Monthly observations: Incidents in the Gulf of Aden**The dependent variable is $\ln(1 + \text{total number of incidents in Aden})$

	Model 1	Model 2	Model 3
# of incidents in previous month	0.362*** (0.106)	0.504*** (0.172)	0.357*** (0.111)
Previous period successes	0.111*** (0.035)	0.122** (0.059)	0.073** (0.342)
Successes 4 periods ago	0.171*** (0.038)	0.240*** (0.072)	0.128*** (0.039)
Non-reporting stations	-0.066*** (0.23)	-0.130*** (0.048)	
Deterrence events			0.12 (0.077)
Transit Corridor			-0.318 (0.319)
constant	0.490*** (0.142)	0.210 (0.250)	0.200*** (0.066)
Observations	90	90	110
R-squared / pseudo R ²	0.5772	0.2305	0.589
Method	OLS Robust SE	Tobit	OLS Robust SE

* denotes significance at the 10% level. ** denotes significance at the 5% level. *** denotes significance at the 1% level.

Table 4**Monthly observations: Incidents in the Indian Ocean and Arabian Sea**The dependent variable is $\ln(1 + \text{total number of incidents in the Indian Ocean})$

	Model 1	Model 2	Model 3
# of incidents in previous month	0.388*** (0.078)	0.515*** (0.149)	0.381*** (0.078)
Motherships	0.395*** (0.111)	0.809*** (0.204)	0.396*** (0.110)
EU NAVFOR	-0.752*** (0.137)		-0.652*** (0.132)
Deterrence events (lagged)		-0.167** (0.084)	
Transit corridor	1.461*** (0.390)	1.490*** (0.555)	1.389*** (0.418)
Rainy month	-0.190** (0.108)		

UIC		-0.941*** (0.407)	
Missing rain			0.265* (0.164)
constant	0.221*** (0.066)	-0.347** (0.144)	0.129** (0.062)
Observations	113	113	113
R-squared / pseudo R ²	0.4773	0.2194	0.4756
Method	OLS Robust SE	Tobit	OLS Robust SE

* denotes significance at the 10% level. ** denotes significance at the 5% level. *** denotes significance at the 1% level.

Table 5
Monthly observations: Change in incidents from month to month

	Model 1	Model 2
# ships through Suez	0.004* (0.002)	0.0034* (0.002)
Previous period successes	-0.858*** (0.267)	-0.598 (0.389)
Successes 4 periods ago	1.158* (0.598)	1.306** (0.648)
Non-reporting stations	-0.343* (0.188)	-0.341* (0.187)
Missing rain	2.251* (1.200)	2.169* (1.190)
Rescue (lagged)		0.175 (0.171)
Deterrence (lagged)		-0.631 (0.755)
constant	-4.186 (2.788)	-3.651 (2.645)
Observations	90	90
R-squared / pseudo R ²	0.2438	0.2652
Method	OLS Robust SE	OLS Robust SE

* denotes significance at the 10% level. ** denotes significance at the 5% level. *** denotes significance at the 1% level.

Table 6

The dependent variable is whether or not an attack occurred in Models 1-3 and whether 0, 1 or more than 1 attacks occurred on a given day in Model 4

	Model 1 Total	Model 2 Aden	Model 3 Somalia	Model 4 Total
Previous day's	0.346	0.816**	-1.081*	0.374*

success (in region)	(0.246)	(0.351)	(0.642)	(0.223)
Previous day's Deterrence	-1.273*** (0.445)	-0.794* (0.458)	-1.035* (0.623)	-1.084*** (0.411)
Deterrence 2 days ago	0.710** (0.326)	0.888** (0.451)	0.870** (0.438)	0.728** (0.300)
Previous day's attempt	1.042*** (0.190)	0.911*** (0.222)	1.834*** (0.464)	0.847*** (0.153)
Attempt 2 days ago		-0.369* (0.225)	1.049*** (0.421)	
Attempt 4 days ago			1.314*** (0.419)	
Attack in Aden			0.719** (0.339)	
Attack in Somalia		.751** (0.330)		
Northeast monsoon	-0.769*** (0.290)	-0.785*** (0.257)		-0.735** (0.232)
Southwest monsoon	-0.639*** (0.247)	-0.790*** (0.300)	-0.984 (0.625)	-0.870*** (0.280)
Ramadan	0.781* (0.408)			
Clear full moon	0.489* (0.291)			0.492* (0.274)
constant	-0.105*** (0.179)	-0.112*** (0.174)	-3.026*** (0.267)	
Cut 1				0.968
Cut 2				2.320
Observations	545	545	545	545
Pseudo R ²	0.1209	0.0964	0.1499	0.0890
Method	Logit	Logit	Logit	Ordered logit

* denotes significance at the 10% level. ** denotes significance at the 5% level. *** denotes significance at the 1% level.