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Working Paper

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DIW Discussion Papers, No. 1033

Provided in Cooperation with:
German Institute for Economic Research (DIW Berlin)

Suggested Citation: Percy, Sarah; Shortland, Anja (2010) : The business of piracy in Somalia, DIW Discussion Papers, No. 1033, Deutsches Institut für Wirtschaftsforschung (DIW), Berlin

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The Business of Piracy in Somalia
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The Business of Piracy in Somalia*

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Abstract

This paper argues that contrary to conventional wisdom, Somali piracy is likely to increase if Somalia’s domestic stability is improved, and that naval counter-piracy efforts had limited and unpredicted effects. To make this argument we analyze the underlying factors driving piracy off the coast of Somalia and examine the effectiveness of the international naval anti-piracy mission. We show that while the navies perform well with respect to their declared aims, they failed to resolve the piracy problem through 2009: pirates were not deterred from attacking ships in the Gulf of Aden and have expanded their operations in the Indian Ocean and the Arabian Sea. Evidence from domestic conditions in Somalia suggests that land-based approaches focusing on rebuilding state capabilities may also backfire as economic development and greater stability aid pirates. We examine the incentives of the various interest groups in the Gulf of Aden and conclude that the key players have an interest in the continuation of the piracy off Somalia, as long as violence does not escalate and ransoms remain at their current modest levels.

JEL: K42, O17, F19

Keywords: Piracy, Law enforcement, Informal Economy, Institution Building

* We would like to acknowledge the excellent research assistance from Josiah Kaplan, as well as helpful comments and information from Tilman Brueck, Christine Cheng, Jan Fidrmuc, David Fielding, Diego Gambetta, Olaf de Groot, John Hunter, Andrew Shortland, John Sapsford, Roland Vogler-Wander and seminar participants at DIW Berlin, Oxford, Birkbeck and Brunel Universities as well as the EUSECON workshop in Athens.

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Introduction

Once considered largely an historical and swashbuckling curiosity, the serious international problems posed by piracy are once again at the forefront of international attention. The remarkable growth in piracy off the coast of Somalia, combined with the threat it poses to commercial shipping and a worrying potential association with Islamist terrorism, has put the Somalia problem at the forefront of maritime policymaking around the world and generated increasing grist for the academic mill. ¹ There is a surprising degree of consensus about the best policy for Somali pirates: solve Somalia, and restore its stability, this line of thinking runs, and you will solve the pirate problem and in the meantime counter-piracy naval operations will provide a useful corrective. This piece of policy thinking, stemming both from international navies and academia, is misguided. It is not based on systematic examination of the patterns of Somali piracy and the incentives and disincentives for ending piracy in the region. In fact, the more stable the Somali situation, the better the business of piracy. The impact of naval counter-piracy efforts is also ambiguous: the presence of the world’s navies off the coast of Somalia has slowed the growth rate of attacks in the Gulf of Aden, but has diverted the pirates to new areas which are impossible to control. Finally, in discussing “policy solutions” to Somali piracy, one must note that the

incentives to end it are skewed on all sides. The pirates, local governors, the navies and the insurance industry have an interest in the continuation of piracy, and it may well be that international community has less incentive to stop piracy than it is willing to admit, no matter how serious the problem appears.

There is no doubt that Somali piracy is serious and growing. 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 alone.² Somali piracy threatens commercial shipping and could potentially pose a significant threat to international peace and security. The shipping corridor off the coast of Somalia is strategically crucial and economically important. 7% of the world’s oil supply travels through the Gulf of Aden.³ Several shipping companies are diverting vulnerable ships around the Cape of Good Hope⁴ to avoid the Gulf of Aden altogether.⁵ The additional cost of specialty maritime risk insurance for ships travelling through the region has been estimated at $400 million annually.⁶

More worrying to some observers is the nexus between piracy and Islamist extremism in the region. Piracy “and rising Islamic militancy have intensified US and European diplomatic interest in Somalia”.⁷ Pirate attacks have grown increasingly sophisticated, both in terms of targeted vessel and location of attack. In 2008, pirates hijacked the Ukrainian tanker MV Faina, along with its cargo of battle tanks, artillery shells and grenade launchers.⁸ Pirates are now able to attack vessels more than 1100nm

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² See Diagram 1. The figures include incidents carried out by Somali pirates in the Arabian sea.
⁴ This adds 12 days to the typical oil tanker voyage from the Arabian Gulf to Europe
off the coast of Somalia. This development has required a significant improvement in tactics and equipment.

Understandably, the costs to shipping and the potential security implications of widespread maritime piracy in this region have led to a significant increase in international attention and response. Counter-piracy initiatives off the coast of Somalia represent an unprecedented degree of international cooperation on maritime matters. There are three multinational naval task forces patrolling the region and loosely coordinating protection for shipping: The European Union’s first ever joint naval operation, Operation Atalanta; NATO’s Operation Allied Protector; and the US-led Combined Task Force 151 (CTF-151). Interestingly, this significant naval counter-piracy initiative is accompanied by a wide-spread view that naval action cannot fundamentally alter the Somali pirate situation. US Navy Vice Admiral William E. Gortney, while announcing the creation of CTF-151, stated that “…the problem of piracy is and continues to be a problem that begins ashore”. NATO General William Craddock, asked to analyze the alliance’s counter-piracy initiative, pointed out that “You do not stop piracy on the seas. You stop piracy on the land”. The Ethiopian foreign minister has stated that “The pirates are not fish who just sprang up out of the sea. They came out of Somalia. It is far-fetched to try to clamp down on piracy without first having put the situation in mainland Somalia under control.”

Academic commentators agree. Max Boot argues that the discussion of counter-piracy would be largely superfluous “if only Somalia had a responsible government capable of policing its own

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10 Interview with Admiral Philip Jones and Captain Paul Chivers, London, 15 February 2010.
13 Ibid.
James Kraska and Brian Wilson point out that “any long-term solution to the region’s piracy threat requires addressing lawlessness in Somalia”. Ken Menkhaus argues that “the Somali piracy epidemic is unquestionably an on-shore crisis demanding an on-shore solution”.

Thus, the increase in pirate activity is widely recognized to be a problem with a relatively simple, if difficult to achieve, solution: piracy occurs because the absence of governance in Somalia facilitates pirate attacks. Restoring Somali stability is an implicit or explicit goal of counter-piracy initiatives. However, developing effective central governance in Somalia is widely recognized as a goal so distant that it is effectively impossible, at least in the short-to-medium term. What, then, is the point of naval counter-piracy efforts? Do they make a difference? And, perhaps most importantly, is it really true that the solution to Somalia’s piracy problem lies in restoring order to Somalia? We therefore statistically model piracy off the coast of Somalia to examine the following three main hypotheses:

I. Naval intervention disrupts pirate activity and thereby lowers resources in the piracy business, slowing the growth rate of attacks.

II. Naval intervention raises the perceived risks for pirates and therefore provides a significant deterrent effect.

III. The effects of institutional failure in Somalia are conflicting: on the one hand, state failure allows pirates to conduct their illegal business unchallenged by government forces, but instability and uncertainty also make it more difficult to conduct any form of business.

Our results show that naval counter-piracy initiatives are not a significant deterrent to pirates. 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, geographically limited successes. We find that 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.

Secondly and paradoxically, stability in Somalia is correlated with an increase in pirate attacks. Our results show that pirates benefit from local improvements in governance, which can occur even without the presence of an effective central government.\(^1\) While a substantial gain in centralized stability might well reduce the incidence of piracy, the any short-term gains in local stability during 2000-2009 moved pirates further into their “sweet spot”, while periods of insecurity disrupted their activities. In other words, of the two solutions that international community has proposed (naval intervention and the restoration of order to Somalia) neither at the moment is likely to succeed. Moreover, the underlying lack of incentives to stop piracy – for pirates, for the insurance industry and for international navies - may render most policy solutions useless.

The paper is structured as follows: In the first section, we briefly examine the evolution of state-failure, piracy and counter-piracy operations in Somalia. In the second section, we describe our model, estimation methodology and data. In the third section, we statistically examine the general determinants of Somali piracy. In the fourth section, we examine to what extent the naval counter-piracy initiatives of the EU and NATO can be considered successful. We use a combination of qualitative and quantitative approaches, confirming our statistical findings in interviews with naval officers, those involved in maritime risk services, and commercial shipping.

In the fifth section, we attempt to discover the links, if any, between piracy and the absence of authoritative government and lack of economic opportunities in Somalia. In the final section, we discuss the how our analysis sheds light on the various policy options currently mooted for Somali piracy, the particular pitfalls of the situation, and propose some solutions that reflect the key lessons we argue are visible from the data available on Somali piracy.

I. **The Growth of Somali Piracy**

I.1. **State failure in Somalia**

Somali piracy has emerged from a cocktail of interrelated factors: the background of civil war and violence in the state, the failure of domestic and international efforts to create effective central governance in Somalia; poverty and displacement; and geographic opportunity. The tale of Somalia’s gradual decline from corrupt dictatorship to civil war and so-called state failure, culminating in the UN intervention of the early 1990s, is well-known. Somalia has been, if not in all-out civil war, in periods of substantial unrest for nearly twenty years, leading to a ready supply of small arms and those experienced in their use. The omnipresence of conflict has meant that there are few economic opportunities for Somalis.

Establishing a consensus on power-sharing in Somalia has been the primary stumbling block to state-building efforts. Around 75% of Somalis belong to the six major clan families: the Darod, Digil, Dir, Hawiye, Isaaq and Rahanwein. In the past the Darod clan has been the most influential politically, but its

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dominance is now fiercely resisted. Since 1991, 14 governments “formed in exile have tried and failed to govern Somalia, though the latest one, The Transitional Federal Government [TFG], remains intact”. The TFG managed to meet in Somalia for first time in February 2006. From March to May 2006 fighting erupted between militias loyal to the Union of Islamic Courts (UIC) and the TFG. 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 continued 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. Somalia “still epitomizes the failed state. The TFG has not collected taxes or provided effective social services, established a sound civilian law-enforcement organization enjoying anything like a monopoly on the use of force, or been able to make collective decisions for the populace”. Moreover, it has never been able to extend its authority much beyond Mogadishu. Instead the clans have formed the backbone of governance in Somalia, and have filled the vacuum left by the absence of central authority. Local polities have emerged in which Islamic courts backed by clan elders, business people and Muslim clergy re-established some form of rule of law.

The presence of violence and the absence of centralized authority is a combination that easily encourages illicit activity. Piracy is fuelled by the extensive quantities of small arms (including guns and rocket-propelled grenade launchers) and the large number of people with experience using them, facilitated by the absence of any kind of government both willing and able to bring the phenomenon

22 Stevenson, “Jihad”, p.28.
23 Stevenson, “Jihad”, p. 32.
24 Menkhaus, “Governance Without Government”.
under control. There is no question that Somalia’s dire economic situation and geographic location make piracy a desirable and plausible occupation. 2.87 million Somalis received food aid in 2009, and its GDP per capita was estimated at $291. A single pirate hijack can result in a ransom ranging from USD $500,000 to USD $3 million, with individual pirates’ profits estimated at about USD $10-15,000. The Gulf of Aden is a busy shipping route offering a tempting series of targets. Somalia then represents a perfect collision of means (extensive small arms), motive (poverty) and opportunity (lack of governmental authority and proximity to shipping) for effective pirate operations.

I.2. History and Characteristics of Somali Piracy

Somali piracy began in the early 1990s when local fishermen tried to push back foreign fishing trawlers. Local resistance evolved into an extortion racket that saw local militias extracting money from foreign fishing vessels for ‘licenses’; those who did not pay faced the threat of capture and kidnapping. Gradually, maritime extortion became more organized and more frequent and transformed into piracy; Kraska and Wilson argue that 2005 represented a watershed year for pirate activity. It is estimated that as many as 5000 Somali men are working as pirates, divided into five large groups.

Somali piracy is a relatively uncomplicated and low-technology business. Pirates, armed with AK-47s and rocket propelled grenade launchers, “use small speedboats to capture a dhow or fishing

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vessel, and then use that as a mothership to ply waters far from shore in search of unguarded, lightly manned, slow-moving cargo ships”.31 The use of motherships extends the radius of operations well beyond the coastal waters of 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 either ransomed or abandoned when the stores run out or the vessel’s use as a mothership is suspected by the naval forces.32

Hijacked ships are anchored in territorial waters near the pirate strongholds in the villages of Eyl, Hobyo and Gharardeere until ransom negotiations are concluded.33 There are no harbours which could accommodate a modern tanker or bulk carrier or a land-side infrastructure which would allow pirates to move cargo off the ships and sell it on in regional markets.34 Nor can Somali pirates credibly threaten to give a ship a new identity and sell it off. Somali piracy is therefore a hijack and ransom business in which the focus of the bargaining process is the life and well-being of the hostages. This lack of infrastructure explains the surprisingly low ransoms relative to the value of the cargo.35 Around USD $20-$40 million was paid in ransom for approximately 60 ships in 2008.36 It also explains why Somali piracy is unlike the form of piracy common in the Straits of Malacca through the 1990s, where pirates typically killed the crew and sold off the ships and their cargos.37

Another striking feature of Somali piracy is its relative non-violence. Somali pirates rarely harm or kill their hostages, even though their treatment might be unpleasant. When ships are taken there is

35 For example the value of the cargo of the oil tanker Sirius Star hijacked in November 2008 was estimated to be in the region of US$100mn, while the ransom was 3mn.
an understanding that all parties will behave in a certain pattern: the pirates will threaten the ship, and
the crew will give themselves up rather than actively defend the ship. 38 Some news articles claim that no
hostages have ever been harmed by pirates.39 However, the International Maritime Bureau reports that
in the 217 incidents involving Somali pirates in 2009 (during which 867 hostages were taken) 10 crew
members wounded and 4 were killed. 40 On closer inspection it appears that Western hostages receive
the best treatment, as they command the highest ransoms.41 Western casualties seem to have occurred
only accidentally, due to indiscriminate firing during the boarding of ships or during rescue attempts42,
though rough treatment may be used to create pressure when negotiations are stalled.43

There also seem to be relatively few incidents of pirate-against-pirate violence, instigated by,
for example, one pirate group kidnapping the hostages of another.44 The idea that there is some
knowledge of a pirate ‘code of conduct’ or that all parties follow the rules of the game, which largely
excludes violence, came up repeatedly during our interviews.45 Captured pirates have apparently
referred to a written code of conduct that bans mistreatment of (Western) hostages.46 Pirates have also
claimed in interviews with Western media that they do not harm or mistreat hostages.47 The main
reason for the relative non-violence of Somali piracy is likely to be that it is a ransom-based business. In

38 Interview with risk analyst and tanker captain / Marine Superintendent
39 David Williams, “Somali Pirates Are Treating Us Well, Says British Hostage on Hijacked Supertanker,” Mail Online,
November 25, 2008 ; Jay Bahadur, “I’m Not a Pirate, I’m the Saviour of the Sea,” Times Online, April 16, 2009,
http://www.timesonline.co.uk/tol/news/world/africa/article6100783.ece.
40 IMB Piracy report 2009
43 Shactman, “Exclusive Interview”; David Jones, “My Rape Terror at Hands of Somalia Pirates,” Mail Online,
March 10, 2010.
44 In August 2009, a gun battle between pirate gangs apparently killed 17; interestingly, the battle appears to have
been fought “over land and a girl who was raped in the forest” rather than hostages. The pirates were concerned
that the fight would damage their pirate activities. “Clashes Rock Somali Pirate Port,” BBC News, August 8, 2009.
45 Interviews with Capt Farrington, Capt Chivers, Adm. Jones.
A copy of such a manual was apparently found by French police on a released yacht. Kim Hampton, “Le Ponant
47 Manon Querouil, “As Brigands Hold the Sirus Star Supertanker to Ransom, We Go Inside the Somali Pirate’s
Lair,” Mail Online, November 23, 2008; Andrew Cawthorne, “Witness: ‘Hi, Is That the Somali Pirates?’,” Reuters,
April 12, 2009.
the Straits of Malacca, pirates have little incentive to keep the crews alive because they are interested in ships and cargo. In Somalia, focus on ransoming hostages means that piracy is less violent.

I.3. Counter-piracy and Pirate Response

There are now three multinational naval operations working to control piracy off the coast of Somalia. The European Union launched its first ever joint naval operation, Operation Atalanta, in November 2008, with the aim of protecting shipping in the region and ensuring that the vessels of the World Food Program (WFP) are able to deliver aid to Somalia. NATO has sent Operation Allied Protector, which began in October 2008 and was replaced with Operation Allied Provider in March 2009. NATO’s operations began with a similar mandate to protect WFP aid delivery and have now been extended to include general counter-piracy. Under the auspices of the Combined Maritime Forces, based with the US Fifth Fleet in Bahrain, Combined Task Force 151 (CTF-151), a multinational counter-piracy force, was set up in January 2009 to “deter, disrupt, and criminally prosecute those involved in piracy”. CTF-151 includes a variety of nations, including Turkey, Australia, Denmark, the Netherlands, and France. In addition, a number of navies patrol the area protecting shipping that originates from their home countries, such as Russia, India and China. These multinational naval initiatives are backed up with the authority of a series of UN Security Council resolutions.

Somali piracy has not altered substantially since its emergence, despite the presence of international navies. It has, however, become more ambitious, which has required more sophisticated tactics. Pirates appear to reinvest their profits in the business and acquire better technology (cell phones, satellite phones, GPS, outboard motors and weaponry). One noticeable difference beginning in 2009 has been the willingness and ability of pirates to attack far off the shores of Somalia, well into the

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48 Raymond, “Piracy and Armed Robbery”
49 Kraska and Wilson, “The Pirates of the Gulf of Aden”, p. 244. CTF-151 replaced an earlier task force that was focused more broadly on maritime terrorism.
50 UN SC Resolutions 1816, 1838, 1846 (2008).
Indian Ocean. Attacking this far off-shore requires considerably more sophistication than previously associated with Somali pirates. The Royal Navy has noted the use of larger and better equipped motherships, which supply smaller vessels operating at some distance from shore, connected by satellite phones and GPS. These smaller vessels wait near known shipping routes, sometimes for days, to attack vessels. These attacks are better planned and less opportunistic than those immediately off Somalia’s coast.51 There has been some suggestion that pirates are capturing the Automatic Identification System (AIS)52 along with vessels, and using it to locate ships on the high seas. However, Royal Naval officers serving with Operation Atalanta have not seen evidence of the use of AIS53 and point out that it is actually unnecessary, given the fact that ships traverse predictable routes through the Indian Ocean.54

II Model, Data and Methodology

What drives pirates to enter the business of piracy? Do pirate successes fuel further acts of piracy? How successful are naval counter-piracy efforts? What links are there between stability and piracy? To answer these questions we model the drivers of piracy in the Gulf of Aden and off the coast of Somalia statistically.

51 Interviews with Capt. Farrington, Captain Chivers, and Admiral Jones.
52 AIS is a system that provides real-time data about the position of ships.
53 Interviews with Adm. Jones and Capt. Chivers.
54 Interview with Capt. Farrington.
II.1 Potential Determinants of Somali Piracy

The model is loosely based on the “reasons for piracy” outlined in Murphy (2007).\textsuperscript{55} A number of the factors are, however, time invariant in Somalia and we therefore focus on those variables where we see variation over time. 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 and local political developments to shed light on our research hypotheses. We model piracy off the coast of Somalia from January 2002 to June 2009. Our initial hypotheses are the following:

a) Piracy is a function of risk: piracy will be lower during monsoon seasons and when there is greater law enforcement through international naval forces.

b) Piracy is a function of institutions: State weakness is needed for pirates to conduct their illegal business, but may also make it more difficult to conduct any form of economic activity.

c) Piracy is a function of resources: The more and better quality equipment can be funded and the more advanced pirate technology, the higher the incidence of piracy.

d) Piracy is a function of poverty: If conditions in the Somali economy significantly worsen more men may be attracted to piracy.

e) Piracy is a function of opportunity: the more shipping traffic there is and the easier it is to attack, the higher the number of pirate attacks.

We test a number of models, taking a general to specific approach to modelling. We begin by using a wide set of variables, 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 that were

\textsuperscript{55} Legal and jurisdictional weakness, favourable geography, conflict and disorder, under-funded law enforcement, permissive cultural environment and promise of rewards.
eliminated. We use a number of different geographical aggregations to shed light on the connections between piracy and its potential determinants.

II.2 Dependent variable

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).\textsuperscript{56} 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 (diagrams 1 and 2). The latter includes incidents of various degrees of severity ranging from suspicious (unidentifiable) vessels spotted by radar\textsuperscript{57} to actual attempts where shots were fired and boarding was attempted. The dependent variable is a count of the number of all the reported incidents in the relevant month.

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). There is no obvious impact from the naval counter-piracy missions building up through 2008 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.

We note that it is likely that the dependent variable is measured inaccurately. Attempted piracy is often not reported, because it is thought to reflect badly on shipping companies.\textsuperscript{58} Additionally, ship owners may be deterred from reporting incidents of successful boarding because doing so may lead to

\begin{flushleft}
\textsuperscript{56} All data are described in Table 1  \\
\textsuperscript{57} E.g. 13.06.2009 “Two skiffs were detected on radar by the tanker underway. Tanker made evasive manoeuvres; increased speed warned other ships...”  \\
\textsuperscript{58} M. Murphy, Contemporary Piracy and Maritime Terrorism: The Threat to International Security; IS Adelphi Paper No. 388.
\end{flushleft}
lengthy forensic investigations during which the ship will be confined to harbor.\textsuperscript{59} 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.\textsuperscript{60} 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.

\textbf{II.3 Estimation Methodology}

We examine the monthly number of incidents of piracy from January 2002 to June 2009. We model three series: 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 Somali Basin (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 factors explaining piracy vary between the two regions and whether pirates substitute between areas in response to naval patrols.

The dependent variable is a “count variable”, with just under a third of total observations being zero observations- i.e. no attack took place. Diagram 3 shows the distribution of the variable, which is not in the classic shape of count data, due to a large number of zero observations and some observations with an unusually large number of events (i.e. the series exhibits zero inflation and over-dispersion compared to the classic Poisson distribution). It is therefore not clear what the preferred


\textsuperscript{60} See footnote 57 above: Tuna and dolphin congregate in the pressure wave and other fish mass in the air-rich wake of large ships passing through fishing grounds. The “suspicious” skiffs following large vessels may therefore have been either fishing boats or pirate vessels.
estimation method should be and we use a series of estimation methods to check the robustness of our results.

We start with a basic **OLS regression**. Given our concern about the measurement error, especially over-reporting in the latter part of the period, 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.

There is a clear time trend in the data with overall piracy around Somalia and Aden and its volatility increasing over time (diagram 1). We therefore include a lagged dependent variable in the model and we use robust standard errors to correct for heteroskedasticity. We check that the residuals do not exhibit a time trend and are normally distributed.\(^{61}\)

Second, we employ a time series **Tobit** to take into account that all observations are positive and a significant proportion are zero. In the censored regression (or Tobit) model the observed variable takes the form

\[
Y_j = \max (Y_j^*, 0)
\]

The latent variable \(Y_j^*\) is only observed when \(Y_j^* > 0\). \(Y_j^*\) is generated by the classic linear regression

\[
Y_j^* = \beta X_j^* + \varepsilon_j
\]

Where \(X_j^*\) is a vector of regressors and \(\beta\) the corresponding vector of parameters. If we assume that the same process governs whether or not there is an attack and how many attacks occur when there is

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\(^{61}\) As an additional robustness check we also modelled 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. The results are very similar to the ones reported below and are available on request.
pirate activity, Tobit analysis is appropriate. Once again we used both raw data and a logarithmic transformation and report the results of the econometrically preferred logarithmic model below.

Third, we use two estimation methods developed specifically for **count data**. These are characterised by a prevalence of zeros and small values of the dependent variable, which is also clearly discrete. By taking these characteristics into account we are likely to improve on the linear model. Also, the zero observations are treated as a discrete choice, which is different from the positive number of decisions an individual makes once he has decided to carry out a specific activity. We first use the **Poisson regression model**, which has been widely used to study such data, using maximum likelihood. However, its drawback in this context is that it assumes that the observations are drawn from a Poisson distribution, where the variance equals the mean. In the actual distribution the mean exceeds the variance. We therefore also use the **negative binomial model** for count data as an alternative. This introduces an additional individual unobserved effect into the conditional mean.

**II. 4 Independent variables**

**II. 4. a) 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 small vessels in rough seas and encountering a naval patrol. Given that pirates operate mainly from open skiffs, high waves with a short wave-length present a considerable problem to pirates. Such a pattern of waves are set up in the Gulf of Aden and

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62 e.g. being a pirate or being a fisherman. Modern pirate activity requires very different equipment from fishing. Even though captured pirates mostly claim to be innocent fishermen, their captors generally do not find any evidence of fishing equipment.

63 Risks vary greatly depending on the nationality of the naval vessel encountered. OPERATION ATALANTA patrols interview suspected pirates (after a medical and a meal) and release them with enough food, water and fuel to get them home. Pirates are passive on being arrested, minimizing risk of injury. They only lose the incriminating equipment they throw overboard on being approached, which may or may not be a significant problem for them on their return home. The Chinese take a more “robust” approach with suspected pirates and indeed Chinese flagged vessels have a lower risk of being attacked (interview with naval officer).
off the coast of Somalia when high winds interact with the strong coastal currents.\textsuperscript{64} The pirate-deterring wave-pattern is most likely to occur during the North-East and Southwest Monsoon seasons from \textit{December-March} and \textit{June-August} respectively. However, plain Monsoon dummies for the two periods are mostly not statistically significant. This is because the actual monsoon periods tend to be shorter than the time window indicated above and pirates are particularly active just before and after the build-up of the waves. Due to climate fluctuations we cannot be more precise about the actual timing of the monsoons, which move within and occasionally even outside the traditional window.\textsuperscript{65}

- **RoughseasNE and RoughseasSW**: to pinpoint the precise timing of past rough seas we construct two dummy variables in which we interact the two monsoon dummies with a dummy for months in which the average wind-speed in the Gulf of Aden exceeded 6 on the Beaufort scale.\textsuperscript{66}

Because of endogeneity issues we cannot use the presence of naval forces in the region as an explanatory variable in the model: the navies are present because of the piracy problem, not the other way round. The various naval forces do not publish consolidated accounts of how many pirates they have arrested or for how long they were held and we therefore rely on the IMB for data on disrupted attacks. We therefore do not have information on arrests which were not linked to a specific attempt at piracy.\textsuperscript{67} We use the following variables to capture opportunities and risks for pirates:

- **Disruption**: we class a disruption 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

\textsuperscript{64} Interview with Fregattenkapitaen Vogler-Wander
\textsuperscript{65} Interview with Captain Farrington
\textsuperscript{66} i.e. a combination of high wind-speed and a wind direction which creates high waves in the currents.
\textsuperscript{67} However, criminal proceedings are only possible where pirates are caught in the act, so any additional events would only be “catch and release” incidents.
incidents in which it is clear that the naval forces appeared well after the attempt had been abandoned. 68 We use a count of the number of disruption events in the month. 69

- **Transit corridor:** We enter a dummy variable from February 2009 when the naval forces advised shipping to use Internationally Recommended Transit Corridor (IRTC) through the Gulf of Aden and began to operate a formal system of “area protection” along the corridor using naval vessels.

**II. 4. b) Political Stability and Business Environment**

Throughout the period under investigation, Somalia has lacked an effective central government and experienced varying degrees of civil conflict. Unfortunately the intensity of violent conflict in Somalia is not well documented. The PRIO dataset on civil war is extremely vague on the total number of annual 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. 70 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 influencing piracy is during the brief period during which the UIC replaced the transitional government in Mogadishu in 2006. 71 The UIC

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68 No additional explanatory power is derived from rescues, i.e. incidents in which the pirates boarded a ship but the ship was then taken over by security forces and the hostages were released without ransom. However, these events are probably too rare to have a (statistical) impact.

69 In 2008 there were 50 incidents where the arrival of naval forces prevented an attack or where ships were freed by naval forces. 48 of these incidents occurred in the Gulf of Aden.


71 While Mogadishu saw relative stability and an improvement in public order under UIC rule in 2006, the rest of the country suffered instability as the UIC expanded its range of influence into Southern Somalia and towards Puntland. Melissa Simpson, “An Islamic Solution to State Failure in Somalia?,” *Geopolitics of the Middle East*, Vol.2, No.3 (July-Sept 2009), pp. 31-49.
conquered the ports of Hobyo and Gharardeere in late 2006 and took drastic and highly visible measures against pirates.  

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 success of trust-based money transfer companies in Somalia shows.

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 the Somalia Water and Land Information management agency (SWALIM). 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 organization 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

74 Somalia Water and Land Information Management (SWALIM), www.faoswalim.org.
situation – i.e. staff cannot leave their homes or have fled the area because of territorial disputes. 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.

- **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.

- **Civil conflict:** We use the number of contracted stations which are not reporting rainfall data as a (rough) proxy for the intensity of civil conflict.

- **UIC dummy:** We also use a dummy for the period of the UIC control in Mogadishu from June to December 2006.

In Appendix 1 we present OLS results showing the relationship between the three institutional quality proxies above and a variable which arguably serves as a proxy for economic activity. The variable is based on data reported by the Food Security Analysis Unit in Somalia, which tracks the prices of commodities traded in 18 regional centers in Somalia. Depending on time and location 14, 15 or 16 commodity prices are tracked on a monthly basis. As with the rainfall data, the price records are very patchy with trading in specific commodities suspended and entire markets closed over significant periods. So for each month we counted the number of available prices and divided this by the total number of prices tracked.

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75 Information reported by SWALIM
76 The contract environment variable produces a much better fit than a simple time trend in the model, so we are not simply picking up a spurious relationship between two variables which are trending upward.
The regressions show clearly that improvements in the contracting environment are associated with an increase in trading activity, while our instability proxy was associated with a reduction in the selection of goods on offer in local markets. The UIC period in addition saw significantly reduced trading. While the coefficient on the instability variable is now lower, it is still statistically significant, indicating that the variables are complementary and not substitutes. We are therefore reasonably confident that our unconventional proxies allow us to get a handle on variations in institutional quality and stability in Somalia over time. We use both raw variables and a squared term of the contractual environment and instability variables to explore possible non-linear effects, as there is a possibility that improvements up to a certain threshold benefit piracy, while further improvements in institutional quality begin to disrupt pirate activities.

II. 4. c) Resources and technology

The lagged dependent variable and past successes broadly capture the amount of resources available for pirate activity. Unfortunately we have not been able to find data on transfers from the Somali expatriate community to Somalia, which may or may not have provided additional funds. The “mothership” (dummy) variable indicates a technological development which greatly increased the range of pirate attacks.

- **Lagged dependent variable:** This is a proxy for the level of resources and expertise accumulated in previous periods.

- **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.

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78 This backs up the assertion above that the UIC period was not one of effective administration and stability, but instead a period of uncertainty and instability for many part of Somalia.
• **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.

II. 4. d) 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...”\(^79\) 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 and goats.\(^80\) 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.\(^81\)

• **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

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\(^79\) IMF (2009)  
\(^80\) “Somalia”, CIA World Factbook (2010), 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 Hassan Seikh and Sally Healy, “Somalia’s Missing Million: The Somali Diaspora and its Role in Development”, UNDP, March, 2009, http://www.qaranimo.com/2009/nov/undp_report_onSomali_Diaspora.pdf 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.  
\(^81\) SWALIM Streamflow data are not yet available
We constructed: average rainfall per month, difference from long run monthly average (1997-2008), monsoon dummies for average rainfall exceeding 20 for a month, and a “wet” dummy for months in which there was any rainfall. However, the only significant effect was found when using a “missing rain” dummy for periods when there was a shortfall of rain compared to the long run average by 30mm. This would be a good predictor of a poor harvest.

II. 4. c) Opportunity

Pirates in the Somali Basin and the Gulf of Aden spend most of their time waiting for a suitable target coming into their direct vicinity. More ships not only mean more potential targets but crowded shipping lanes force ships to slow down, making boarding easier.

- **Suez shipping:** We have collected data from 2002-2009 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.

III. General determinants of piracy

Despite the difficulty of settling on the most appropriate estimation strategy the results are extremely robust to the actual methodology employed. While the coefficients are not directly comparable across the different methodologies (we are using a log transformation for the OLS and Tobit models of piracy in the Somali basin.

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82 Data provided by Somalia Water and Land Information management agency (SWALIM) for Beletweyne, Bulo Burti and Jowhar. Jowhar data are missing from September to December 2004 and have been estimated based on rainfall in the other stations.
83 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.
84 Interviews with Captain Farrington and other naval officers
85 It is likely to be less good as a proxy for shipping along the coast of Southern Somalia and is not included in the models of piracy in the Somali basin.
regressions and raw data for the Poisson and negative binomial regressions), there is little variation in which variables are statistically significant. Given our awareness that the coefficients may be biased we comment mostly on the signs and significance levels in the discussion below. 86

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 and expertise suitable for piracy they are likely to continue in the business.

In the overall model (table 2) and the Gulf of Aden model (table 3) there is robust evidence that a success four months ago increases current piracy levels. This makes perfect sense given that it generally takes around two to three months to negotiate a ransom and then presumably some time for the new equipment to arrive. The result suggests that piracy is a lucrative business in which profits are reinvested to fund additional equipment and gives credence to Bossasso’s police chief, Osman Hassan Uke’s statement: "Whenever 10 guys get paid ransom money, 20 more pirates are created." 87 Given the attractiveness of the piracy business the question of what constrains entry is interesting in a country where the main equipment (weapons and fishing boats) would appear to be in plentiful supply. The answer seems to be the cost of the two 100 bhp outboard motors each skiff needs in order to catch up with the prey. These cost in the region of 6-12,000 US$ each, a figure that tallies well with the estimated return of US$10-15,000 for a successful pirate. There is also some (weak) evidence that a success in the previous month increases pirate effort (small positive coefficient), but this is often not significant.

In the Indian Ocean we do not have significant effects from past successes (table 4). Instead we have a positive association between piracy in the Somali Basin and in Aden: as piracy increases in the

86 All our variables are measured with error or are imperfect proxies. For this reason it could be misleading to use the coefficients for forecasting or to make policy conclusions.
Gulf of Aden, additional attacks are launched elsewhere. This is an interesting result as it suggests that the profitability of piracy in Aden declines with the number of boats and that someone is controlling entry into this profitable business area. The technological advance of using “motherships” also seems to have made piracy in the Somali Basin more feasible. We also get a (less robust) result that pirates volunteers are drawn from the agricultural sector. A severe “missing rain” (which is a predictor of a failed harvest) increases pirate activity in the Somali Basin. This result supports the hypothesis that piracy is to some extent driven by poverty.

We also find clear evidence for a seasonal pattern of piracy. Neither a dummy for high winds nor dummies for the traditional monsoon seasons are statistically significant, but the interaction terms capturing the rough seas caused by high winds from the South West and the North East significantly reduce piracy in the relevant periods in Aden and in the Somali Basin respectively. Interestingly the effects are not significant in the overall count of piracy data, suggesting that there is sufficient substitution between the two locations to offset the seasonal effects overall. There were no significant effects from the volume of shipping through the Suez Canal.

IV. The success of naval counter-piracy initiatives

The rapid growth in pirate activity off the coast of Somalia poses the key question: does current counter-piracy policy have an impact on pirate behaviour? Analyzing this question is important not only because of the strategic and commercial impact of piracy, but because of the nature of the naval

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88 In some specifications past successes in Aden enter with a positive and borderline significant coefficient, suggesting that successful pirates invest in additional capacity in the open seas. While the result is not very robust, it fits in well with the business model of piracy developed here.

89 Individual pirates would ignore the negative externality their presence in Aden confers on other pirate crews in the area and fail to co-ordinate.

90 There is also anecdotal evidence from EU Atalanta officers observing pirate crews moving to the Somali Basin during the 2009 South West Monsoon.
missions themselves. The EU has not had much success in military cooperation, and the quick development of Operation Atalanta might demonstrate a significant move forward for European military cooperation. The multinational naval cooperation in the Gulf of Aden may represent the future for navies, both because it overcomes the problem of ‘sea-blindness’ (the current focus of most Western militaries on ground troops\textsuperscript{91}), and because of the high degree of international cooperation and coordination the naval missions represent.

In this section, we probe the success of counter-piracy in two steps. First, we undertake a brief qualitative assessment of counter-piracy. Are navies achieving the goals they set out for themselves? Second, we confirm the insights of this assessment through quantitative analysis of the data available on piracy.

**IV. 1. Qualitative assessment of counter-piracy**

One way to assess the success of counter-piracy is to examine is to use the criteria of the naval operations themselves. The EU naval mission, Operation Atalanta, has three main goals: 1) “the protection of vessels of the World Food Program (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.\textsuperscript{92}


In relation to the first aim, delivery of food aid, the naval mission appears to be an unqualified success. Somalia has perhaps 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 Program aims to support 3.64 million people suffering malnutrition because of conflict, displacement and drought. 90% of the food aid is transported by sea. 93 After attacks on a number of WFP deliveries all captains of large cargo ships bringing in food supplies have requested protection. 94 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 2007 to 35,000MT in 2008 and an estimated 50,000MT in 2009. 95 There is therefore no doubt about the success of the naval mission in this respect. 96

To achieve the second aim of protecting vulnerable shipping naval forces use a variety of tactics. The first is to advise ship-owners about security measures to minimize the risk of attacks such as speed and route of travel, evasive actions and securing decks, based on detailed analysis of past attacks. 97 For example, ship owners are encouraged to secure their ships with barbed wire. If a pirate attack can be resisted by a ship for just twenty minutes, naval forces will generally be able to come to their assistance. 98 Second, ships are advised to travel through the Gulf of Aden in a specific transit corridor, the Internationally Recommended Transit Corridor (IRTC). Ships contact Operation Atalanta and are given a recommended time to enter the transit corridor, and a recommended speed at which to travel

96 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.
98 Interview with Captain Richard Farrington, Portsmouth, 12 February 2010.
through. Naval vessels patrol the area. The IRTC is not a traditional convoy system; ships from the various multinational groups do not escort vessels through the corridor, rather they are spaced out along the corridor in such a way that they are always relatively close to commercial shipping. There is also the option of joining a group transit based on ship speed. 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 generally do not intervene to avoid risking the lives of the crew or endangering the cargo. As discussed above, ransoms have so far been very much lower than the combined value of cargo and ships. Naval vessels therefore only monitor the progress of hijacked vessel and sometimes render assistance after a vessel is ransomed.

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. Senior Royal Navy officers involved with Operation Atalanta assert that there have been only three attacks on ships using the transit corridor as advised by Atalanta officials and that preventive measures put in place by ship owners do deter attacks of piracy. Of these ships, two missed convoys, so technically were not protected by the IRTC. Naval officials argue that attacks have occurred on ships that

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100 The only exceptions occur where the entire crew retreats to a strong room within the ship, meaning rescuers know that anyone visible on board is a pirate. BBC News, Sept 18, 2008, and Sörenson, “State Failure”.
102 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 the period at anchorage.
103 Of these ships, two missed convoys, so technically were not protected by the IRTC. Interview with Capt. Farrington.
choose not to use the transit corridor system and do not make the alterations recommended. The main problem with the transit corridor, according to naval officials, is that many ship owners do not wish to delay the progress of their ships by waiting for an approved time to move through the transit corridor.

The naval mission’s third aim is to bring Somali piracy to an end. Three main tactics have been used in pursuit of this goal: the detention and trial of pirates caught in the act of piracy; the use of naval vessels to aid attacked ships; and the confiscation of pirates’ equipment. Due to the operation of forces from different nationalities it is difficult to collate data on the number and timing of events when pirates are intercepted, detained and tried. However, there are several reasons why the detention and trial of captured pirates is fraught with problems. Firstly, successfully arresting pirates may remove them from the scene of the crime, but given the lack of economic opportunity in Somalia, the potential rewards of pirate activity, and the lack of specialist skills required, there is unlikely to be a shortage of recruits to replace any arrested pirates. Secondly, Western powers share a concern that detained pirates will seek political asylum (either immediately or after serving a prison sentence), making the prospect of capture more enticing than frightening. Indeed, the British Foreign Office allegedly advised naval authorities that seeking political asylum was a distinct and concerning possibility. Thirdly, local trials in Somalia are impossible due to the fear of corruption or human rights concerns. The international community has therefore asked neighboring countries like Kenya to pick up the burden. While Kenya’s justice system is more robust, it does not have the same capacity as a Western justice system,
and pirate trials have been slow.\textsuperscript{110} Fourthly, the burden of proof required for a conviction is high and the shipping industry is reluctant to produce witnesses because of the cost of doing so in an industry where ‘time is money’.\textsuperscript{111} Therefore several trials have collapsed or have resulted in the release of suspects.\textsuperscript{112} For this reason most suspected pirates are now released immediately after capture and this aspect of the naval counter-piracy missions has been widely and derisively referred to as ‘catch and release’.\textsuperscript{113} In some incidents, ‘release’ has taken a more sinister form, although in an ad hoc fashion. A Russian destroyer captured pirates off the Somali coast, and rather than turning the pirates over to regional authorities, set them adrift in a small inflatable boat a great distance from shore. The pirates have not been seen since.\textsuperscript{114} Interviews with Atalanta officials suggest that while arrests are still deemed to be important, it is widely recognized that arresting and trying pirates is unlikely to have a significant deterrent impact on Somali piracy.\textsuperscript{115} However, the loss of equipment (jettisoned before arrest) will have an effect on subsequent pirate activities to the extent that arms and GPS equipment represent a significant capital outlay for pirate groups. The policy would be more effective if on release the skiffs' high powered outboard motors were routinely replaced with motors less suited to high speed chases.

Similarly the institution of the transit corridor is not likely to bring Somali piracy to an end; nor, it must be pointed out, is it designed to do so. Rather, the use of the transit corridor is meant to deter pirate activity by making it substantially more difficult to successfully attack the shipping passing through the region and aid navies in catching pirates. What can the data about pirate activity in Somalia tell us

\textsuperscript{110} Capt. Chivers states that the judicial process typically takes two years.
\textsuperscript{111} Interview with Capt. Chivers. See also EU force frees Somali 'pirates' http://news.bbc.co.uk/1/hi/8586729.stm
\textsuperscript{112} 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.
\textsuperscript{114} http://www.slate.com/id/2254114/
\textsuperscript{115} Interviews with Capt. Farrington, Capt. Chivers, and Adm. Jones.
about whether or not counter-piracy operations are successful? Can we find evidence that there were fewer attacks because of naval disruption events or the institution of the transit corridor?

IV. 2. Quantitative assessment of counter-piracy

IV. 2. a) Overall Pattern of Piracy

In the overall model of Somali piracy the econometrically preferred model specification excludes variables for the IRTC or disruption events: neither makes a statistically significant difference (table 2). Thus the effect of the counter-piracy operation in the Gulf of Aden has purely been to deny pirates a number of successful hijacks, i.e. some attacks would have been successful if it had not been for the timely arrival of assistance. These successful hijacks would have fed into a further increase in piracy after a suitable lag. However, there has not been an additional deterrent effect. There are two possible interpretations of this result: 1) being chased off or captured by the navies is not perceived as a significant risk by pirates or 2) we see substitution between the protected area in the Gulf of Aden and the Somali Basin. To examine this in more detail we now assess the success of counter-piracy operations in the Gulf of Aden and the Somali Basin separately.

IV. 2. b) Gulf of Aden Piracy

Again, we do not find a statistically significant deterrent effect of disrupted attacks and the implementation of the Internationally Recommended Transit Corridor (IRTC) in the Gulf of Aden (table 3). This is a surprising result, given the emphasis and faith of the international navies in this particular measure.\textsuperscript{116} It is, however, possible that the deterrent effect of the transit corridor has been insignificant, because the transit corridor makes piracy simultaneously harder and easier. On the one hand, the transit corridor raises the risk of disruption by naval forces. But on the other hand, the efficiency of pirates in locating suitable targets has improved as ships have been using the narrow transit

\textsuperscript{116} Interview with Captain Farrington, interview with Admiral Jones and Captain Chivers.
corridor rather than picking their own route through the Gulf of Aden. Pirates in skiffs rely on line-of-sight technology to identify suitable target vessels, with a radius of around 6 nautical miles. In addition they need to keep a low profile and conserve fuel, and accordingly they move relatively slowly. Pirates therefore spend much of their time simply waiting for a suitable target. However, since February 2009 pirates have been able to use the IRTC to minimise the search time for their targets, as this is where ships will be concentrated.

Lagged coalition disruption events are on the border of statistical significance in a minority of regression specifications – but with an unexpected positive coefficient. This suggests that pirates who are driven away from one attack, but are not arrested may move on to the next prey, increasing the total number of attacks. Pirates who are arrested and prosecuted on the other hand may simply be replaced by new pirate crews.

IV.2. c) Somali Basin Piracy

In the Somali Basin the coefficient of the dummy for the institution of the IRTC in February 2009 is large, positive and highly significant (table 4). After implementation of the IRTC piracy in the Somali Basin appears to have greatly increased. The most likely explanation is that there was a significant substitution effect. To the extent that pirates are concerned about being chased off their targets or arrested during attacks in Aden they substitute “soft” targets for the protected prey. This result mirrors classic results in the terrorism literature, which shows that policies designed to reduce one type of attack may affect other types of attacks. Carrying out each type of attack has a “price” in terms of time, resources and risks. Governments can raise the risk of a specific activity through security

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117 Slow-moving ships with low freeboards and a crew that does not appear to be alert. Some of the targets then turn out to be not suitable after all – see for example the attack on the German naval supply ship Spessart, bristling with armed guards. “Seven Pirates in Custody After Attacking EU Vessel”, EU NAVFOR Public Affairs Office (March 30, 2009), http://www.eunavfor.eu/2009/03/seven-pirates-in-custody-after-attacking-eu-vessel/.

118 If in addition the corridor is crowded, making evasive manoeuvres might be more difficult.

measures, thereby leading to a diversion to other types of activity. For example the installation of metal
detectors reduced skyjackings, but increased other types of hostage-taking, e.g. kidnappings.\textsuperscript{120}

The result suggests that the IRTC in the Gulf of Aden may have had a deterrent effect after all,
with some pirates choosing to relocate to the Somali Basin instead.\textsuperscript{121} Our interviews with naval officials
confirm this view. Captain Paul Chivers argues that piracy has increased markedly in the Indian Ocean
because of the difficulties of attacking in the Gulf of Aden, and that moreover Indian Ocean piracy has
forced significant innovation among the pirates. It is so much harder to find ships in the open sea that
pirates are increasingly using more sophisticated communications and motherships, which allow pirates
to lurk in hunting grounds in the open seas of the Indian Ocean for days on end. In the absence of the
naval forces the “explosion” of pirate activity would most likely have occurred in the Gulf of Aden.
Therefore we provide some evidence for the view that the Gulf of Aden transit corridor may be
deterring piracy \textit{in that area} even if it is not deterring piracy overall.

The number of disrupted attacks, or (alternatively) a dummy for the presence of Operation
Atalanta additionally have a significant effect: they reduce the number of attacks in the Indian Ocean
\textit{ceteris paribus}. However, given that the disruptions primarily occur in Aden (where they have no effect)
their significant effect in the Indian Ocean is a counter-intuitive result.\textsuperscript{122} A possible explanation is that
a significant number of disruptions result in the loss of piracy equipment and the arrest and detention of
pirates. The managers of a diversified piracy business with crews in Aden and the Somali Basin could be
calling in crews from the low profitability area (i.e. the open seas) and redeploy them in the high

\textsuperscript{120} Todd Sandler and Walter Enders “The Effectiveness of Antiterrorism Policies: A Vector-Autoregression-
Intervention Analysis” American Political Science Review Vol 87 No 4 pp 829-844;
\textsuperscript{121} The fact that this substitution has not resulted in a significant reduction in piracy in the Gulf of Aden would then
be due to the gain in efficiency of the remaining pirate crews who can use the corridor to locate their targets.
\textsuperscript{122} Only 2 of 50 disrupted attacks in 2008 and the first half of 2009 were reported for the coast of Somalia
profitability area (the Gulf of Aden). This interpretation ties in perfectly with the observations above that a) piracy in Aden (or overall) is not affected by naval disruption efforts and b) that piracy in the Somali Basin rises with (successful) attacks in Aden.

V Stability and Piracy

The prevalent opinion is that piracy thrives on lawlessness and disorder. 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, our results suggest that pirates benefit from improvements in the contracting environment (shown by the positive coefficient on the contracting proxy variable in the overall and the Aden model in tables 2 and 3). This contradicts the common assertion that pirates thrive on domestic chaos. Instead the suggested interpretation is that pirates need an 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 over resources on land. Alternatively in times of disorder more resources might be tied up in guarding the hostages. In the model of piracy in the Somali Basin it is the UIC indicator which has the greatest explanatory power (table 4). During the UIC period piracy was banned under sharia law. There were threats that any captured ships would be freed and traditional pirate ports were invaded by UIC militias. Unsurprisingly during this period of turmoil, unrest and uncertainty pirates had no guarantee that they would see any gains from successful hijacks and piracy stopped for a number of months.

123 While the types of boats used in Aden are very different from those used in the open seas, there is good evidence that many pirates do not own their ships but have hired them (possibly with a fisherman as skipper). In that case it is very easy to redeploy arms and crew.

124 Murphy, “Combating Piracy”
We argue, therefore, that on a continuum between highly unstable (war and conflict) and very stable (a fully functional state) there is a large ‘sweet spot’ where piracy can flourish. As we did not get any significant effects for the quadratic forms of the contracting and stability proxies in the model, we conclude that even at its most stable Somalia never reached a point where pirates experienced any disbenefit from improvements in law and order. Piracy is a business, an economic activity that requires a basic degree of stability in order to operate. 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.

Moreover, the pirate business is based on contracting. The crew that takes the hostages usually contracts out every other aspect of the operation, from hostage food and protection to ransom negotiation.\(^{125}\) Such contracting behavior requires a minimum degree of order. We thus argue that incremental gains in stability may actually *improve* the prospects for piracy by reducing uncertainty in the contracting environment. When pirates do not have to worry about their hostages being taken by competitor pirates, and when they know that their ransom request will be made by an experienced negotiator and that all parties will get their shares, then the business works better. It goes without saying that if the political situation deteriorates into violence and extreme instability pirates will be too busy either acting as land-based militia, or protecting themselves and their families, to continue pirate activities. Thus, it should be clear that total disorder is bad for piracy, and that moderate order is better than moderate disorder for the pirate business.

There are two pieces of tangential evidence confirming the fact that Somali piracy is a business: its relative bloodlessness and the ability of Somali pirates to innovate. The non-violent behavior of

\(^{125}\) Interview with Captain Farrington, interview with Captain Chivers, interview with Admiral Jones.
Somali pirates suggests that the business of piracy is not anarchic, but well-organized and relatively well-controlled. Furthermore, the evidence that pirates have a ‘code of conduct’ suggests that there are clear views about how the business ought to be run. The notion that Somali piracy is a business is also supported by the ability of Somali pirates to innovate when facing potential problems. The creation of the transit corridor, for example, led to a change in practice and the development of more sophisticated tactics, just as any other business.

**VI. Implications for piracy policy**

If counter-piracy operations are currently only moderately successful, and the conventional wisdom that achieving stability in Somalia is the solution to the piracy problem needs to be refined, what should the direction of policy on piracy be? Clearly, counter-piracy operations and stability in Somalia are linked, given the widespread belief that ending Somali piracy requires fixing the broken Somali state. However, one of the main obstacles standing in the way of ending or even diminishing piracy is that there are very few incentives to do so for any of the parties involved. More effective counter-piracy policy thus requires attention on two fronts: attention to the fact that stability may actually increase piracy, and attention to the way incentives to stop piracy are skewed. This section will address both these issues in turn.

**VI. 1. The reality of building a more stable Somalia**

A very substantial increase in stability would no doubt bring piracy to an end. A fully functional Somali state would have the capacity to bring pirate areas under control. One of the key differences between piracy in Somalia and piracy in the Straits of Malacca is the strength of governance in both areas. Straits of Malacca piracy has been dramatically reduced because governments in the region
combine the will and the capacity to bring it under control. However, the gap between the sort of governance which might actually encourage piracy in Somalia and the sort of governance that would end it is huge. A state that looked like the United States would obviously have considerably less difficulty stamping out piracy (although the inability of even a very strong state to stamp out other forms of organized crime demonstrates how difficult doing so is even under the best of circumstances). A state like Indonesia already has greater difficulty in achieving the same goal: in the Straits of Malacca Indonesia required support from its more strongly centralized neighbours, Singapore and Malaysia. Somalia’s neighbors may be more effectively organized than Somalia (not that the benchmark is especially high) but states like Kenya and Ethiopia, and even more so Djibouti and Yemen, may not have the capacity to assist their neighbor.

The sort of stability that Somalia would require to bring piracy under control may be a very distant goal. Given that Somalia has been effectively ungoverned since 1991, it goes without saying that building a strong, centralized state – even if it is possible to do so – will take many years. The process of state-building itself may facilitate piracy by increasing stability on a regional basis. One of the proposed routes to building statehood in Somalia is the “intuitively attractive ‘building block’ approach” whereby Somali regional entities like Puntland and Somaliland “would be politically and economically induced to improve governance and then form a coalition”. However, this solution is dismissed as being against the interests of the international community, particularly by the UN, which prefers to deal with unitary states.

Our data about the relationship between stability and piracy points in the direction of another potential problem. A stable Somalia (or stable regions within Somalia) might have the capacity but not

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126 Michael Schuman, “How to Defeat Pirates: Success in the Strait”, *Times*, April 22, 2009; Zara Raymond, “Piracy and Armed Robbery”.
the will to bring piracy under control. Regional leaders may have very few incentives to stop piracy and in fact be keen to allow the process to continue, particularly if it helps rather than hinders their power. Menkhaus argues that “the fact that ransom money touches so many hands in northeastern and central Somalia creates a serious disincentive on the part of leaders of those regions to address the problem...the autonomous state of Puntland in northeast Somalia is becoming a pirate version of a narco-state”. There are numerous examples of organized crime existing symbiotically with local leaders, as the presence of mafias around the world demonstrates. Christine Cheng argues that extralegal groups, like pirates, will have a significant impact on peace-building processes as they get further tied in to local governance networks. It might be that local stability makes piracy even more successful by formalizing ties between local leaders and pirates.

Incremental gains in stability, which are the most likely scenario in rebuilding any troubled state, may well improve the prospects for piracy. As the business environment becomes more stable, the pirate business will be easier to run, and in turn, piracy is likely to become more entrenched by involving local officials. Efforts to stabilize could have a noticeably double-edged effect. Menkhaus points out that “as long as criminality is much more lucrative and lower risk in Somalia then law enforcement efforts to strengthen local police and security capacity run the risk of strengthening the criminals instead”.

Another question looming in the background is what form a very stable Somalia might take, and whether or not this sort of state is really desirable. The most significant moves towards order in Somalia have been provided by Islamist organizations, either the UIC or Al-Shabaab. The latter has reigned largely through terror, and neither would form the sort of government that would allow leaders of

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Western states to sleep easily at night. The potential political cost of stability in Somalia might therefore outweigh the benefits from ending piracy.

Finally, the most obvious obstacle to imposing a ‘land-based’ solution in Somalia is that someone must be willing to impose it, and it may well be the case that doing so requires substantial military assistance. While aid initiatives will help, Somalia still faces a number of military problems, not least of which is the Islamist militia Al-Shabaab. It is unlikely that Western powers, particularly the United States, have any enthusiasm for committing troops to Somalia. The United States is working to assist TFG authorities in their fight against Al-Shabaab,133 but not with any significant commitment of troops. The African Union has 8,000 troops in the region, but these have “no realistic chance of controlling a factionalised, heavily armed Somali population”.134

VI. 2 Incentives and disincentives

Counter-piracy operations are hindered by the reality that there are few incentives for anyone involved in any aspect of piracy – whether perpetrating it or attempting to control it – to alter what they are doing. The idea that only repairing Somalia will solve the Somali pirate problem contributes substantially to many of these difficulties. This section addresses how incentives for multinational naval forces, the shipping industry, pirates, and local governments all work against potentially effective solutions for counter-piracy.

VI. 2 a) Multinational naval forces

The stakes for success in counter-piracy are high for many of the world’s navies. Naval officials point out that counter-piracy work is an excellent way of overcoming ‘sea blindness’.135 In recent years

the public profile of land forces has greatly superseded that of naval forces, assisted by the fact that both Iraq and Afghanistan have been land-based operations not requiring much naval expertise. Success for the world’s navies in Somalia demonstrates their continued importance and hence the importance of continued naval funding.

For Operation Atalanta, the stakes of success are perhaps the highest. Military cooperation within the EU has been an oft-repeated and never achieved goal of the organization. Atalanta represents a singular success.¹³⁶ Nicolas Sarkozy, during France’s presidency of the EU, was one of Atalanta’s main advocates and it seems certain that EU support for the mission will continue.

Navies, then, have a large incentive to undertake counter-piracy operations. However, it could be argued that navies have defined counter-piracy missions in such a way that ‘success’ is inevitable and significant change unlikely to result. If navies repeatedly argue that they can control or limit Somali piracy, but cannot end it because it is ultimately a land-based problem, then all navies have to do to show that they are successful is hinder rather than end piracy. If piracy continues, navies will be able to say that they do not have the resources to end the Somalia problem, and that the failure is then not the failure of naval missions, but the failure of broader policy. Commodore Simon Williams of the UK Ministry of Defense argues that “because piracy is rather similar to any form of crime, getting to zero is a very, very difficult thing to do. Getting to a minimum acceptable level is probably the closest that one can get”.¹³⁷

It is likewise important to note that if this logic is correct, it makes much less sense to actually attempt to create a land-based solution, by force, via aid, or otherwise. Put simply, it seems quite likely that any attempts to build a more effective Somali state will either fail entirely or take many years to come to fruition. Navies need counter-piracy to be successful and the European Union needs to

¹³⁶ Interview with Adm. Jones.
¹³⁷ “Combating Piracy off Somalia” Strategic Comments 15L1, 1-2.
demonstrate continued success in military cooperation. Broadening counter-piracy to include rebuilding Somalia would be very likely lead to failure. Navies and their governments may be advocating the idea that piracy has a land-based solution not because it is true, but because it tightly limits the definition of ‘success’. If piracy can only be stopped by fixing Somalia and Somalia is an unfixable problem, than navies need only diminish pirate attacks to be successful.

Some commentators suggest that a more forceful military solution might bring an end to Somali piracy. Some EU member states likewise would be keen for more aggressive action against pirates. Chasing pirates to their strongholds, this argument runs, would provide a much more significant deterrent. There are two problems with this approach. First, it is not clear that the international community would support repeated incursions into Somali territory to deal with pirates. Second, Somali piracy is relatively bloodless. All parties involved know the rules of the game, and violence is not commonly used. A more violent approach dealing with pirates may make pirates more violent in dealing with hostages.

VI 2.b) Shipping industry

The shipping industry represents perhaps the largest obstacle to ending piracy. There are not enough incentives for shipping companies to alter their practices in a way that would end piracy. Piracy simply does not affect enough ships in the region to convince ship owners that it is economically viable to institute even the cheapest of changes across the board.

It is important to remember that piracy only affects a tiny percentage of shipping through Somalia’s coastal waters and the Indian Ocean. Of an estimated 30,000 ships transiting the Gulf of Aden in 2009, 116 were attacked, less than one in 250. Moreover, the final ransoms are still only a small

138 Interview with Capt. Chivers.
fraction of the overall value of the ship, crew and cargo. Ship-owners have chosen, essentially, to play the odds: it is cheaper to take out insurance than to pay for the type of safeguards advocated by multinational naval missions. Atalanta officials estimate that 80% of ships choose to use the IRTC. The remaining 20% are reluctant to slow down their journey and wait for an approved time and prefer to take their chances. Many ship owners are choosing not to spend the money to institute even the cheapest of practices recommended by the navy, like putting barbed wire on ships.

The low probability of a pirate attack, combined with the willingness of ship owners to gamble that they will not be attacked, partially explains why ships do not arm themselves to defend against pirates. In addition, having armed security guards on a ship is costly, and has potential legal ramifications (guards would have to declare their weapons at every port of call, where they may be impounded). Arming the crew is another possibility. However, a risk analyst who deals with Somali pirates drew the analogy that arming the crew would be like arming bank tellers in response to armed robbery, placing the responsibility on the crew. Moreover, he argues that as many ships carry volatile cargoes, it would be like arming bank tellers and getting them to sit on explosives: it would be exceptionally dangerous for a crew of an oil tanker to be hit by a rocket-propelled grenade launcher. Given that piracy is currently not particularly violent, most crew (particularly when hired on short contracts and on low pay) would prefer to give themselves up and wait for a ransom to be paid rather than take the risk of firing on pirates.

There are two policy solutions that might persuade the shipping industry to alter its practices. The first is to encourage insurance companies to significantly raise their premiums, making the cost of insurance prohibitive. This would force ship owners to alter their practices, which in turn might affect

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139 With the slowdown in world trade during the financial crisis of 2008 and 2009 the losses due to having a ship out of commission for a few months have also fallen.
140 Interview with Capt. Chivers.
141 Crews are aware that pirates reward compliant crews with better treatment. Interview with tanker captain
piracy. Using insurance to affect behavior has been done in other scenarios. In the private security sector in the UK, the insurance industry is not prepared to offer cover “unless recognizable and enforceable standards are instituted upon the basis of which insurers can assess risk and set premiums”. 142 Similar standard setting, which would include taking counter-piracy measures, could be set up for the shipping industry.

Insurance companies, although they have to pay out ransoms, also make considerable profits because of their ability to raise premiums for piracy, which is still very rare. It is therefore not in their interest for piracy to stop altogether. So-called risk analysts, and companies that provide services in ransom negotiation, also do very well out of Somali piracy. As one senior naval officer remarked, “this is a business where everyone makes money” – not just pirates. The cost of the ransom is in the region of only a fifth of the total costs arising from the average successful hijack.143 Piracy is therefore not just profitable in Somalia, but creates opportunities for businesses around the world; thereby further reducing incentives to bring piracy to an end.144

Another potential solution is to make the paying of ransoms illegal. This would require coordinated international legal action, but could potentially ruin the pirate business. It is not clear, however, that it would be possible to create or enforce such a law internationally. Currently, ransom negotiators evade British regulations by conducting the ransom negotiations abroad.

143 Interview with Captain Farrington
VI.2. c) Local communities

Unlike other types of organized crime, which prey on members of the community in order to make a profit, piracy’s victims are all external to Somalia. Piracy harms outsiders, not insiders. Moreover, piracy is profitable for many in pirate regions.\textsuperscript{145} There have been some complaints that piracy is flooding communities in Puntland with US dollars, affecting the local economy. Local elders are concerned about drugs and the lifestyle of pirates.\textsuperscript{146} By and large, however, piracy is a business that does not harm local people and provides much needed financial benefits. Accordingly, there is little incentive for local Somalis to end piracy.

If stability in Somalia improves business for pirates, then this logic might continue, it can lead to symbiotic relationships between local leaders and pirates. Once again, there is no reason that an effectively governed Somalia (or an effectively governed Puntland) could not include tacit support for piracy.

VI.2.d) Pirates

Pirates themselves obviously have no incentive to end what is a lucrative, and, importantly, a relatively safe business. The possibility of arrest is both unlikely and potentially desirable, as it might carry with it a ticket out of Somalia.\textsuperscript{147} The use of violence is rare, meaning that pirates do not take significant personal risks compared to those encountered daily when living in Somalia. The financial rewards are significant. Ending piracy in Somalia, then, faces the crucial obstacle of finding alternative forms of employment for the 5,000 or so Somalis directly employed in the pirate business as well as those who rely upon them.

\textsuperscript{145} Times Online, December 12, 2008.
\textsuperscript{146} Interview with Captain Chivers. See also BBC News, June 16, 2009.
\textsuperscript{147} For Example: “Seeraeuber in Hamburg vor Gericht” Spiegel Online June 11 2010
The issue that so many in the coastal community rely on business generated by piracy, means that another potential policy avenue is fraught with problems. It has been suggested that training could be provided for local Somalis to form the nucleus of a coast guard, and then extend training to other Somalis. France has come out very strongly in favor of these proposals, but Britain and Germany remain concerned that this option requires certainty about the loyalty of the Somali coast guard. As it would not provide jobs for the rest of the coastal community there is a high risks that the policy could simply create better trained, and therefore more effective, pirates, thereby improving the pirate business.

The fact that piracy “works” for the local community and the difficulty of otherwise employing pirates is therefore an important stumbling block to building the kind of significant stability in Somalia that would allow the state to end piracy. Somalia is a long way away from being able to produce a similarly lucrative legitimate industry. If piracy were a symptom of instability, we would imagine that these incentives would be very different. This demonstrates further that a Somali state (or local state) with the capability to end piracy may nonetheless not wish to end piracy.

VII. Conclusion

At the moment, piracy is contained at a level where it is more of an economic nuisance than a significant economic threat. It is piracy’s potential political and security implications, as well as the opportunity it affords for navies from around the world to make their mark, which explains the heightened international interest in the issue.

148 Stevenson, “Jihad”, p. 34.
Examining the data available about Somali piracy leads to two important conclusions. Firstly, counter-piracy efforts by international navies are not especially successful. While naval disruptions deprive pirates of additional resources for re-investment on those specific occasions, pirates are not deterred from trying their luck again. Indeed, naval efforts to control piracy may well have encouraged the pirates to innovate and move their operations away from the Gulf of Aden, where they are harder than ever to control. Navies are impeded by their unwillingness to harm hostages, but also by an intransigent commercial sector that refuses to spend the necessary – and minimal – amount to put in place deterrents or wait for naval protection, given that the risks to ship, crew, and cargo remain low. Increasing the strength of the military response runs the risk of making piracy more violent, and the human cost of turning a relatively non-violent situation into a violent one may be too much to bear.

Secondly, the conventional wisdom on Somalia’s pirate problem is incorrect. Solving the ‘Somalia problem’ by bringing stability to Somalia, is not the route to ending Somali piracy. Indeed, it may well improve prospects for pirates, who are running a successful business venture. Moreover, the forces within Somalia which might bring effective central government to Somalia may destabilize the entire region or pose a security threat to the rest of the world.

The difficulty for devising effective counter-piracy policy is that none of the key players has much incentive to alter the status quo. Piracy in Somalia is not only a business, it is the only lucrative business in an impoverished country, it is not costly enough for shipping companies to force change and it is not violent enough to encourage a robust military response.

The solution to Somali piracy lies in altering these incentives so that change can occur. There are two ongoing processes which may serve undermine the current “rules of the game”. Firstly, ransoms are rising over time and increasing ransoms could alter the prices charged by insurance companies and hence the incentives of the private sector. In future work we will examine whether the current relatively
low ransoms are in fact an equilibrium outcome or whether the pirates are learning from the bargaining process leading to an escalation of ransoms over time. Secondly, not all of the navies in the region are committed to operating with regard to international human rights regulations and violence might escalate in this way.\textsuperscript{151}

There is also an option for artificially changing incentives. It should be possible to buy off pirates and the local population by providing secure and well-paid alternative employment based around enforcement of fishing rights, fishing and food processing. Well incentivized and equipped Somali coastguards would represent a credible threat to would-be pirates and could enforce the law within territorial waters. The cost of turning pirates into coastguards and establishing alternative employment would have to be borne by the international community. However, as noted above, this is not risk-free: unless it is done properly it may lead simply to coast guards becoming better trained pirates. On the other hand, given that at the moment only a fraction of the total financial flows generated by Somali piracy actually ends up in Somalia, even a solution that would make Somalis considerably better off would be cheaper than the status quo.

In spite of this, a classic collective action problem will probably prevent such a solution. Piracy generates a transfer from the many (consumers, taxpayers and sailors) to the few (pirates, insurers, ransom negotiators, navies and the defense and security industry). The current beneficiaries of piracy have to do nothing different to ensure the continuation of this profitable line of business, while the many would have to find an international consensus to resolve the problem of piracy in Somalia.

Diagram 1

Somali Piracy in Aden and Indian Ocean

Diagram 2

Pirate and Naval Successes
Diagram 3

Data points illustrating the density of total incidents.

Diagram 4

Graph showing the number of weather stations in Somalia, with data points for contracted, reporting, and non-reporting stations from Jan-02 to Jan-10.
<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Source</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incidents</td>
<td>International Maritime Bureau Piracy reports</td>
<td>Number of incidents reported in relevant region</td>
</tr>
<tr>
<td>Success</td>
<td>International Maritime Bureau Piracy reports</td>
<td>Incidents which result in a successful hijacking and no subsequent rescue attempt is made</td>
</tr>
<tr>
<td>Attempt</td>
<td>International Maritime Bureau Piracy reports</td>
<td>Incidents in which the boarding was successfully prevented</td>
</tr>
<tr>
<td>Rescue</td>
<td>International Maritime Bureau Piracy reports</td>
<td>Hijackings which were ended by security or naval force interventions</td>
</tr>
<tr>
<td>Disruption events</td>
<td>International Maritime Bureau Piracy reports</td>
<td>Incidents in which naval vessels successfully prevented boarding</td>
</tr>
<tr>
<td>% pre-war stations contracted</td>
<td>SWALIM Hydromet data inventory</td>
<td>Number of stations under contract compared to pre-war total of 52</td>
</tr>
<tr>
<td>Non-reporting stations</td>
<td>SWALIM Regional rainfall reports</td>
<td>Number of stations under contract which are not reporting</td>
</tr>
<tr>
<td>UIC</td>
<td>BBC news timeline of Somalia</td>
<td>Dummy from June-December 2006</td>
</tr>
<tr>
<td>EU NAVFOR</td>
<td>EU NAVFOR website</td>
<td>Dummy from December 2008</td>
</tr>
<tr>
<td>Transit Corridor</td>
<td><a href="http://www.mschoa.eu/">http://www.mschoa.eu/</a></td>
<td>Dummy from February 2009</td>
</tr>
<tr>
<td>Motherships</td>
<td>International Maritime Bureau Piracy reports</td>
<td>Dummy from January 2005 when motherships are first mentioned in the context of Somalia</td>
</tr>
<tr>
<td>Suezshipping</td>
<td><a href="http://www.suezchannel.gov.eg/">http://www.suezchannel.gov.eg/</a> TRstat.aspx?reportId=1</td>
<td>Number of vessels going through Suez in a month</td>
</tr>
<tr>
<td>Missing rain</td>
<td>SWALIM Regional rainfall reports</td>
<td>Actual rainfall average compared to long term monthly average (1997-2008). Dummy for months in which rainfall was lower than l-t average by more than 30mm.</td>
</tr>
<tr>
<td>Commodities traded in regional centres</td>
<td>Food Security Analysis Unit Somalia</td>
<td>Number of commodities for which market price data are available / total number of commodities tracked</td>
</tr>
<tr>
<td>Windspeed</td>
<td>ICOADS <a href="http://dss.ucar.edu">http://dss.ucar.edu</a></td>
<td>Average wind-speed for</td>
</tr>
<tr>
<td>Weather System</td>
<td>Location and Notes</td>
<td>Season</td>
</tr>
<tr>
<td>--------------------------</td>
<td>------------------------------------------------------------------------------------</td>
<td>--------------</td>
</tr>
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</table>
Table 2
Monthly observations: total incidents
The dependent variable is ln(1+ total number of incidents in Aden and Somalia)

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>Model 1:1</th>
<th>Model 1:2</th>
<th>Model 1:3</th>
<th>Model 1:4</th>
</tr>
</thead>
<tbody>
<tr>
<td># of incidents in</td>
<td>0.419***</td>
<td>0.575***</td>
<td>.057***</td>
<td>0.049**</td>
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<tr>
<td>previous month152</td>
<td>(0.094)</td>
<td>(0.146)</td>
<td>(008)</td>
<td>(0.023)</td>
</tr>
<tr>
<td>Previous success</td>
<td>0.075**</td>
<td>0.059</td>
<td>-0.012</td>
<td>0.069</td>
</tr>
<tr>
<td>Success 4 periods</td>
<td>0.128***</td>
<td>0.129**</td>
<td>0.193***</td>
<td>0.166***</td>
</tr>
<tr>
<td>ago</td>
<td>(0.043)</td>
<td>(0.059)</td>
<td>(0.022)</td>
<td>(0.073)</td>
</tr>
<tr>
<td>% pre-war stations</td>
<td>0.007**</td>
<td>0.008*</td>
<td>0.017***</td>
<td>0.014***</td>
</tr>
<tr>
<td>contracted</td>
<td>(0.003)</td>
<td>(0.004)</td>
<td>(0.003)</td>
<td>(0.005)</td>
</tr>
<tr>
<td>Non-reporting</td>
<td>-0.06**</td>
<td>-0.068*</td>
<td>-0.118***</td>
<td>-0.081**</td>
</tr>
<tr>
<td>stations</td>
<td>(0.029)</td>
<td>(0.039)</td>
<td>(0.023)</td>
<td>(0.040)</td>
</tr>
<tr>
<td>constant</td>
<td>0.397**</td>
<td>0.086</td>
<td>0.346**</td>
<td>0.260</td>
</tr>
<tr>
<td></td>
<td>(0.169)</td>
<td>(0.224)</td>
<td>(0.174)</td>
<td>(0.248)</td>
</tr>
<tr>
<td>Observations</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>90</td>
</tr>
<tr>
<td>R-squared /</td>
<td>0.604</td>
<td>0.245</td>
<td>0.507</td>
<td>0.143</td>
</tr>
<tr>
<td>pseudo R²</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Method</td>
<td>OLS</td>
<td>Tobit</td>
<td>Poisson</td>
<td>Negative</td>
</tr>
<tr>
<td></td>
<td>Robust SE</td>
<td></td>
<td></td>
<td>Binomial</td>
</tr>
</tbody>
</table>

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

152 lagged ln (1+incidents) in models 1 and 2
### Table 3

**Monthly observations: Incidents in the Gulf of Aden**

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

<table>
<thead>
<tr>
<th></th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 4</th>
<th>Model 5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dependent variable</strong></td>
<td>Ln (1+ incidents)</td>
<td>Ln (1+ incidents)</td>
<td>Raw count</td>
<td>Raw count</td>
</tr>
<tr>
<td><strong># of incidents in previous month</strong></td>
<td>0.348*** (0.106)</td>
<td>0.481*** (0.168)</td>
<td>0.073*** (0.017)</td>
<td>0.106*** (0.043)</td>
</tr>
<tr>
<td><strong>Previous period successes</strong></td>
<td>0.101*** (0.033)</td>
<td>0.100* (0.059)</td>
<td>0.050* (0.027)</td>
<td>0.070 (0.091)</td>
</tr>
<tr>
<td><strong>Successes 4 periods ago</strong></td>
<td>0.160*** (0.041)</td>
<td>0.218*** (0.071)</td>
<td>0.251*** (0.030)</td>
<td>0.282*** (0.073)</td>
</tr>
<tr>
<td><strong>Roughseas SW</strong></td>
<td>-0.237* (0.137)</td>
<td>-0.517* (0.291)</td>
<td>-0.526** (0.257)</td>
<td>-0.549 (0.369)</td>
</tr>
<tr>
<td><strong>Non-reporting stations</strong></td>
<td>-0.077*** (0.028)</td>
<td>-0.148*** (0.050)</td>
<td>-0.212*** (0.034)</td>
<td>-0.260*** (0.064)</td>
</tr>
<tr>
<td><strong>% pre-war stations contracted</strong></td>
<td>0.004 (0.003)</td>
<td>0.007 (0.005)</td>
<td>0.015*** (0.004)</td>
<td>0.012** (0.006)</td>
</tr>
<tr>
<td><strong>constant</strong></td>
<td>0.447*** (0.151)</td>
<td>0.143 (0.269)</td>
<td>0.176 (0.229)</td>
<td>0.283 (0.309)</td>
</tr>
<tr>
<td><strong>Observations</strong></td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>90</td>
</tr>
<tr>
<td><strong>R-squared / pseudo R(^2)</strong></td>
<td>0.6358</td>
<td>0.2492</td>
<td>0.5175</td>
<td>0.1901</td>
</tr>
<tr>
<td><strong>Method</strong></td>
<td>OLS Robust SE</td>
<td>Tobit</td>
<td>Poisson</td>
<td>Negative Binomial</td>
</tr>
</tbody>
</table>

* 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+ total number of incidents in the Indian Ocean)

<table>
<thead>
<tr>
<th></th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dependent variable</td>
<td>Ln (1+ incidents)</td>
<td>Ln (1+ incidents)</td>
<td>Raw count</td>
<td>Raw count</td>
</tr>
<tr>
<td># of incidents in previous month</td>
<td>0.358*** (0.076)</td>
<td>0.506*** (0.141)</td>
<td>0.051** (0.025)</td>
<td>0.063* (0.035)</td>
</tr>
<tr>
<td>Ln (1+Incidents in Aden)</td>
<td>0.209*** (0.083)</td>
<td>0.325** (0.118)</td>
<td>0.183 (0.117)</td>
<td>0.217 (0.140)</td>
</tr>
<tr>
<td>Roughseas NE</td>
<td>-0.249*** (0.1)</td>
<td>-0.419** (0.183)</td>
<td>-0.547** (0.243)</td>
<td>-0.570** (0.277)</td>
</tr>
<tr>
<td>Motherships</td>
<td>0.478*** (0.127)</td>
<td>0.709*** (0.197)</td>
<td>1.570*** (0.233)</td>
<td>1.518*** (0.259)</td>
</tr>
<tr>
<td>Deterrence events (lagged)</td>
<td>-0.221*** (0.048)</td>
<td>-0.296*** (0.089)</td>
<td>-0.328*** (0.083)</td>
<td>-0.304*** (0.099)</td>
</tr>
<tr>
<td>Transit corridor</td>
<td>1.498*** (0.309)</td>
<td>1.681*** (0.518)</td>
<td>2.419*** (0.406)</td>
<td>2.148*** (0.513)</td>
</tr>
<tr>
<td>UIC</td>
<td>-0.477** (0.178)</td>
<td>-0.746** (0.382)</td>
<td>-1.921*** (0.725)</td>
<td>-1.856*** (0.752)</td>
</tr>
<tr>
<td>Missing rain</td>
<td>0.222 (0.221)</td>
<td>0.229 (0.267)</td>
<td>0.583*** (0.236)</td>
<td>0.588** (0.299)</td>
</tr>
<tr>
<td>constant</td>
<td>0.141*** (0.064)</td>
<td>-0.345** (0.151)</td>
<td>-0.865*** (0.211)</td>
<td>-0.873*** (0.225)</td>
</tr>
<tr>
<td>Observations</td>
<td>113</td>
<td>113</td>
<td>113</td>
<td>113</td>
</tr>
<tr>
<td>R-squared / pseudo R2</td>
<td>0.5733</td>
<td>0.2664</td>
<td>0.4149</td>
<td>0.2141</td>
</tr>
<tr>
<td>Method</td>
<td>OLS Robust SE</td>
<td>Tobit</td>
<td>Poisson</td>
<td>Negative Binomial</td>
</tr>
</tbody>
</table>

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

Relationship between commodities traded / total commodities tracked in regional centres and the proxies for institutional quality based on presence / absence of rainfall data.

<table>
<thead>
<tr>
<th></th>
<th>Commodities traded in regional centres</th>
<th>Commodities traded in regional centres</th>
</tr>
</thead>
<tbody>
<tr>
<td>% pre-war stations</td>
<td>0.0586***</td>
<td>0.0339***</td>
</tr>
<tr>
<td>contracted</td>
<td>(0.0098)</td>
<td>(0.007)</td>
</tr>
<tr>
<td>Non-reporting stations</td>
<td>-0.231**</td>
<td>-0.480**</td>
</tr>
<tr>
<td></td>
<td>(0.0965)</td>
<td>(0.199)</td>
</tr>
<tr>
<td>UIC period</td>
<td>-4.6387**</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(2.1922)</td>
<td></td>
</tr>
<tr>
<td>constant</td>
<td>14.5191***</td>
<td>15.175***</td>
</tr>
<tr>
<td></td>
<td>(0.4675)</td>
<td>(0.697)</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.354</td>
<td>0.1941</td>
</tr>
<tr>
<td>Observations</td>
<td>91</td>
<td>91</td>
</tr>
</tbody>
</table>

Robust standard errors in parenthesis. * denotes significance at the 10% level. ** denotes significance at the 5% level. *** denotes significance at the 1% level.