Terrorism and the Invisible Hook

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JEL Codes: H1, H5, H8

Keywords: Growth, Terrorism, Political Economy

December 28, 2020

*We thank Sam Blomberg, Michael Carroll, Mercedes Kastner, Tina Nguyen, Claire Peterson, Sage Piersel, and Samuel Stone for their excellent research assistance. The paper was originally prepared for the Conference on Terrorism and Policy sponsored by the Center for Global Collective Action (Director: Todd Sandler), University of Texas at Dallas. This is the peer reviewed version of the following article: Blomberg, S. B., R. T. Fernholz, and J. Levin (April 2013). Terrorism and the Invisible Hook. *Southern Economic Journal* 79(4), p. 849–863, which has been published in final form at doi.org/10.4284/0038-4038-2012.290. Address correspondence to S. Brock Blomberg, Dean and Peter K. Barker Professor of Economics & George R. Roberts Fellow, Robert Day School of Economics and Finance, Claremont McKenna College, 500 E 9th St, Claremont, CA 91711.E-mail: bblomberg@cmc.edu, tel: (909) 607-2654, fax: (909) 621-8249 (fax). Data replication: The dataset and do-files for the empirical analysis in this article can be found at http://www.cmc.edu/rdschool/faculty-research/.

Terrorism and the Invisible Hook

Abstract

This paper investigates and compares the root causes of transnational terrorism and piracy. In order to accomplish this, we construct a novel data set that catalogues terrorist activity and piracy over the years 1992–2008, paying particular attention to the Arabian Sea and Indian Ocean since 1991. These data are then merged with other information detailing the economic, political, and security posture of each organization during the same time period so that we can examine the relationship between economic prosperity, security, terrorism and piracy. The main conclusion is that terrorism is mostly unrelated to economic conditions, while piracy responds to both economic payoffs and military deterrents.

1. Introduction

Transnational terrorism is arguably the greatest security challenge facing our world today. Increased globalization means that terrorism's effects are amplified across borders and oceans, allowing it to ravage both the economic and political stability of its victims. Although terrorism and maritime piracy are often seen as separate phenomena, they share a fundamental link. Namely, they seek to maximize the economic impact of their attacks, and in so doing, gain leverage against the world community.

Both terrorism and piracy can sow widespread economic uncertainty, and both can prompt governments to change their policies. Incidents of terrorism such as the September 11 attacks, the Madrid train bombings, the London 7/7 bombings, and the Mumbai attacks of 2008 have all been intended to spread fear far beyond the targets themselves. The vividness and seeming randomness of the violence can affect the behavior of hundreds of millions of people. Similarly, pirate attacks on maritime shipping can have vastly disproportionate economic and political impact. Although the odds of a ship being hijacked even in the most dangerous waters are extremely low, the possibility of an attack drives up insurance premiums for all shipowners.

The surge in attacks by Somali pirates since 2008 has endangered the Gulf of Aden, a strategically vital conduit for much of the Middle East's oil as well as trade between Europe and Asia via the Suez Canal. The only alternative for ships is rounding the southern tip of Africa, which drives up fuel costs and causes long delays. So far in 2012, there have been 286 attacks worldwide and 71 reported for Somalia (*International Chamber of*

Commerce 2012). If pirates were to hijack a major ship and disrupt the delivery of key resources, the effect on oil prices and other commodities could be significant. It is these risks that lead to the payment of ever higher ransoms.

In this paper, we explore the relationship between terrorism, piracy and economic prosperity in an attempt to better understand the operation of these transnational organizations, their effects on the economy, and the success of various deterrents. We construct a novel data set documenting piracy and terrorist activity over the years 1992-2008 in order to examine these questions. The main findings are that terrorism is mostly unrelated to economic conditions while piracy does respond noticeably to economic payoffs. In particular, the data indicates that ships from higher income countries with little to no military deterrent are most likely to be attacked by pirates.[1]

Terrorism and Economy

The relationship between terrorism and economic performance is the subject of extensive research and debate. One prominent view is that transnational terrorism is largely the consequence of underdevelopment and poverty (Johnston 2001; Tyson 2001), and this view is supported by the findings that democratic institutions, higher income, and openness all reduce conflict (Blomberg and Rosendorff 2006) and that countries with less economic freedom are more likely to have more terrorism (Edwards 1993; Gassebner and Luechinger 2011). It has also been shown that countries with more economic inequality tend to have more terrorism than egalitarian societies (Frankel and Romer 1999; Li and Schaub 2004; Lai 2007) and that underdeveloped economies are more likely to harbor terrorists while de-

veloped economies are more likely to be the targets of terrorists (Blomberg and Hess 2006; Krueger and Laitin 2008). There is disagreement about the true connection between terrorism and income, however. In particular, Krueger and Laitin (2008) argue that civil liberties rather than GDP per capita predict participation in terrorism, while both Kurrild-Klitgaard, Justesen, and Klemmensen (2006) and Krueger (2007) emphasize that much of terrorism is unrelated to education or poverty and is instead about influencing political outcomes.

The effect of terrorism on economic growth is another important topic. Not surprisingly, many studies have established that terrorism has a negative effect on economic growth (Blomberg, Hess, and Orphanides 2004; Gaibulloev and Sandler 2009, 2011). This decrease in growth is often the result of a decline in tourism and exports (Enders and Sandler 1991; Drakos 2004) as well as a decline in domestic consumption and savings (Fielding 2003). In addition, Blomberg, Hess, and Orphanides (2004) and Eckstein and Tsiddon (2004) both document that terrorist activities decrease investment, destroy resources and inputs, and divert government spending from economic production and growth to national security. The increasing globalization and interconnectedness of the modern world economy introduces an extra set of threats from terrorism. Indeed, according to Blomberg and Hess (2008), the reduction of international borders makes it easier for terrorists to target and harm large numbers of people. The globalized nature of the world economy also means that terrorist activities often disrupt large pieces of the international economy (Matthew and Shambaugh 1998).

The economy in Africa is particularly susceptible to the threat of terrorism. According to Blomberg, Broussard, and Hess (2011), the economies of African countries appear to be less resilient to terrorist attacks than elsewhere. In fact, these authors show that the economic impact of terrorism is around two times as great in Africa than in other regions of the world. Since terrorist attacks often lead to greater government spending on security and less spending on investment and economic activity (Blomberg, Hess, and Orphanides 2004), one possible explanation for this finding is that many African countries' governments do not have the resources to simultaneously pursue both counterterrorist policies and policies that foster economic growth.

Piracy and Economy

Although the roots of piracy are frequently debated, it is difficult to argue with the economic payoffs of the Somali pirate business. Indeed, the average Somali pirate makes $10,000 in a single hijacking, while standard ransom payments have risen from $1 million to $5.4 million (Carney 2009). Somalia is a war-torn country that is dangerous and poor, which makes piracy even more attractive.[2] Not surprisingly, citizens with lower income all over the world are more likely to commit property crimes, of which piracy is an extreme example (Freeman 1996; Piehl 1998).

In an economic sense, piracy is a rational act as it seeks to maximize profit while minimizing risk, a point that is demonstrated in clear detail by Leeson (2009a) and Leeson (2009b), both of which provide the inspiration for this paper's title. This rational aspect of piracy has also been examined by Leeson (2007a) and Shortland and Vothknecht

(2011). The average pirate group has two main strategies: to keep costs low and to maintain efficiency (Hansen 2003). The modern pirates of today share much in common with the well-known pirates of centuries ago, including the central aim of capturing ships and cargo. There are also, however, a number of important contrasts between today's pirates and yesterday's pirates, one of the most important being the lucrative modern pirate tactic of capturing human hostages for ransom (Leeson 2010a). Pirates have made this tactic particularly effective by building their reputation and hence raising the cost of resistance while simultaneously raising the benefit of surrender (Leeson 2010b).

One single pirate attack can affect the economy in many different ways. For example, a hostage crisis caused by pirates often affects the origin state of the vessel, the people aboard the vessel, the destination state of the vessel, the sources involved, and the future costs of cargo. Furthermore, because nearly 12% of the world's oil goes through the Gulf of Aden (National Security Council 2008), global fuel prices can be affected if the transportation of oil is disrupted in any significant way.

Terrorism and Piracy

The increase in piracy over the past decade can be partially explained by some of the similarities that exist between piracy and terrorism. Both pirates and terrorists do not fight for a specific country, but instead fight for themselves as part of a particular religious, political or economic cause. Both pirates and terrorists have intelligent leaders that command extreme allegiance from their followers, forming a tight-knit, mutually supportive group (Puchala 2005). Both pirates and terrorists are willing to sacrifice to achieve their

aims. In addition, pirates have created the impression of a "devil-may-care" attitude of extreme recklessness that is reflected in various terrorist organizations around the world as well (Leeson 2010b).

Enders and Sandler (2002) remark that studies on terrorism have written about the three main elements of terrorism: (a) extreme violence, (b) the "underground" nature of terrorist acts, individuals and organizations and (c) publicity, i.e., the intended effect on a broad audience. These three aspects of a typical terrorist organization are directly comparable to most pirate organizations.

Like terrorists, pirates do not and cannot act alone. Both piracy—particularly in the Gulf of Aden—and terrorism affect multiple international actors at once, presenting various diplomatic and jurisdictional challenges. The global community is still searching for a solution to terrorism, and it is important that we recognize the difficulty in finding a solution to piracy as well. Many investors, officials, boats, weapons, GPS devices, and allies are necessary for the success of pirates (Puchala 2005; Leeson and Rogers 2012). It is a complicated global industry that takes advantage of corrupt police and legal institutions. Pirates and terrorists blend into the local population, making it very difficult for authorities and outside actors to track down the culprits (Liss 2007).

This article relates economic prosperity, security, terrorism and piracy with the goal of determining efficient counter-strategies to piracy and terrorism.[3] Using a new data set, we find that the probability of a pirate attack against a particular ship increases with the income of the ship's flag state and decreases when there are counter-piracy activities run

by the ship's flag state. We do not, however, find such a strong empirical link between terrorism and economic payoffs. These results suggest that terrorism may be driven by non-economic factors and hence may respond noticeably to changes in non-economic payoffs.

2. The Data

We use data from four main sources: the Penn World Table, ITERATE, Gurr, SIPRI and the Piracy Reporting Centre. We include these various data sets to study the interaction between terrorism, piracy and the economy, allowing for the ability to control for external and internal conflict. As the first three data sources have been described in previous work (see, for example, Blomberg, Hess, and Orphanides 2004), most of this discussion will be centered on describing the piracy data. The Penn World Table, constructed by Summers and Heston in 1991, provides "economic data to calculate the annual per-capita GDP growth rates and related variables in PPP adjusted for exchange rates from 1968 to 2000" (Blomberg, Hess, and Orphanides 2004). ITERATE (Mickolus et al. 2012) uses data from 1968 to 2011 to report characteristics and actions of transnational terrorist groups (incidence characteristics, terrorist characteristics, victim characteristics and losses). Gurr (2003)'s data on internal conflict is grouped into four categories: ethnic conflict, genocide, revolutionary conflict and regime change. SIPRI provides the military expenditure data.

The piracy data comes courtesy of the International Maritime Bureau's Piracy Reporting Centre. The International Maritime Bureau (IMB) is a specialized division of the International Chamber of Commerce, established in 1981 to serve as a focal point for ef-

forts to stamp out maritime crime. In 1992, spurred by alarming growth in piracy, the IMB created the Piracy Reporting Centre (PRC), funded by contributions from shippers and maritime insurers.

The PRC gathers data on pirate attacks and attempted attacks from many sources, including the shipping industry, coalition navies, and NGOs. Since 1992, it has created and promulgated an annual report on all known and suspected incidents of piracy worldwide. This information has become increasingly detailed over the years, and now most entries have around a dozen categories of information including the location of the attack, weapons used, countermeasures deployed, and flag of registry.

We hypothesize that the flag states of victim ships might rationally influence pirates' actions as it provides pirates with information about both the likelihood of receiving a large ransom and the likelihood of military retaliation. For example, both the United States and NATO more generally have been known to react with significant military force when their ships are hijacked. By contrast, smaller nations and flag states of convenience—those countries that draw shipowners to register in order to take advantage of lax safety and labor laws—lack the resources to forcefully defend sailors on ships flying their flags. As this pattern becomes clear to pirates, they have an incentive to target ships flying vulnerable flags, while avoiding ships flying flags of NATO countries.

There are some notable weaknesses in the data. First, earlier reports do not contain data that is as rich as data from more recent reporting years. As such, many of the values we use in our modeling remain unknown for attacks in the first several years of the

data set. Second, incident reports for a given attack do not necessarily include all the relevant information. Thus, it might appear that for two similar attacks, only one ship has taken a particular countermeasure, when in reality the other ship simply did not mention that countermeasure in its incident report. Particularly with regard to hostage and ransom data, early years are lacking. Another issue with the data is the inherent uncertainty of ransoms. Ransom payments are almost never formally reported, and while the estimated ransoms are likely to be accurate in some cases, in other cases there is a wide disparity between competing estimates. Pirates have a known tendency to exaggerate the ransoms they receive in order to drive up the reported averages, and thereby induce future victims to pay larger ransoms. Meanwhile, shipowners and hostages' families may have an incentive to understate, or even deny ransom payments, for fear of prosecution under anti-ransom statutes.

3. Preliminary Data Analysis

World piracy has had several hotspots in the time the IMB Piracy Reporting Centre has been in operation. By far the most serious piracy epidemic, and that which forms the focus of this paper, has its origins in Somalia, where much of the country has lacked a functioning government for two decades. Since pirates face little to no land-based interference on the wild and rugged coastline of Somalia, this area has become a hub for piracy. This situation has allowed for pirates to grow in organization, sophistication, and boldness and has led to an influx of foreign investment and ransom payments that total several

hundred million dollars.

The northern coast of Somalia lies on the Gulf of Aden, a strategically vital waterway that forms the eastern entrance to the Red Sea. Virtually all shipping that uses the Suez Canal between the Mediterranean and the Indian Ocean must pass through this narrow area of sea. Between the crude oil that comes from the Persian Gulf and the trade between Asia and Europe, this amounts to many billions of dollars. Over the years, an increase in the frequency of attacks in the Gulf of Aden has prompted the world's navies to send considerable forces there to address the problem. Today, however, the area threatened by pirates is too wide to control effectively as pirates' reach has been greatly extended by the use of motherships—captured and converted vessels which can carry their small, fast attack boats over a thousand miles away from shore.

In general, pirates are most likely to attack ships registered to flag states of convenience because these represent the largest proportion of the world's shipping tonnage. Furthermore, a string of successful military operations in the Indian Ocean may also have increased pirates' incentive to attack ships flying flags of convenience. The United States has responded with overwhelming force when ships flying the Stars and Stripes have come under attack, and European nations have often done the same. Pirates surely know that every time they hijack a Western ship or kidnap Western sailors, they increase political support in the West for swift and severe military retaliation. At the same time, pirates have found it difficult to extract large ransoms from poorer countries like Bangladesh and the Philippines. Thus, they must walk a tightrope—hoping to maximize profits, while mini-

mizing the provocation they cause to the powerful naval forces in the region.

Table I provides a few key summary statistics reported both by region and income group in our sample for 1992-2008. The table provides the average annual income per capita (INCOME), the average annual growth in income per capita (GROWTH), military spending as a percentage of GDP (DEFENSE), the average annual number of pirate attacks (PIRACY), the average annual number of terrorist attacks (TERRORISM), the average annual sum of regime changes, genocides, revolutions, and ethnic wars (CIVIL WAR) and the 1-7 average index of executive and legislative competition, with higher numbers corresponding to greater competition (DEMOCRACY). Note that all of these data are from the point of view of the victim country, so that, for example, PIRACY reports the average number of pirate attacks against a particular world region or income group.

The table highlights several interesting characteristics of the data. First, the table clearly demonstrates the improvement in economic and political progress globally, as all but two regions (Middle East and South Asia) have an index of democracy below 5.5. Table I also highlights this economic progress with impressive growth rates in Eastern Europe (4.2 percent) and South Asia (3.5 percent), while only one region experienced sub-par growth—Sub-Saharan Africa (1.7 percent). Second, the table shows that the victims of conflict—civil war, piracy and terrorism—appear to be quite different. The only regions that have had much experience in civil war are South Asia and Sub-Saharan Africa. However, terrorism and piracy are more evenly distributed around the globe. Most victims of

terrorism appear to be in the Middle East and South Asia—very different from the victims of piracy, which appear to be mostly in East Asia and Western Europe.

The table also shows that the countries most frequently targeted by pirates are the Upper-Middle-Income and High-Income countries, particularly those that are non-OECD. On the other hand, terrorism appears to be less sensitive to income. The countries most frequently targeted by terrorists are also High-Income OECD countries, but the incidence is not markedly different from Lower-Middle or even Low-Income countries.[4]

4. The Empirical Results

In this section, we describe our empirical results. The methodology follows Blomberg, Hess, and Orphanides (2004), and a more detailed explanation can be found there. In doing these exercises, we are examining the probability of an act of terrorism or piracy for a country in a given year. We first provide estimates of a joint process involving these probabilities and the probability of an economic expansion or contraction. We next provide estimates from a reduced form probability model to test the implications of our theory.

We begin by estimating Markov models of the joint probability of conflict and peace. Consider that a country is in either one of two states: conflict or peace. This applies to conflict as it relates to attacks on either the economy or government from either pirates or terrorists. As these are mutually exclusive, for any country i, denote X_{t-1} to be a conflict in period $t-1$ and X^p_{t-1} to be peace in period $t-1$. The 2×2 transition probability matrix

from period $t-1$ to period t is:

$$\begin{bmatrix} P(X_t|X_{t-1}) & P(X_t^p|X_{t-1}) \\ P(X_t|X_{t-1}^p) & P(X_t^p|X_{t-1}^p) \end{bmatrix} \tag{1}$$

We consider the cases for conflict from pirates ($X = \pi$), terrorism ($X = T$) or for economies in expansion ($X = E$). We also consider cases for peace from pirates ($X^p = \pi$), peace from terrorism ($X^p = T$) or for economies in contraction ($X^p = E^p$).

Table II reports the results from this exercise. The first column provides the statistic employed or the probability of each form of X being examined. The second column provides the probability of the cases when the current period is one characterized by conflict from pirates ($X = \pi$), terrorism ($X = T$) or for economies in expansion ($X = E$). The third column provides the probability of the cases when the current period is characterized by peace from pirates ($X^p = \pi$), peace from terrorism ($X^p = T$) or for economies in contraction ($X^p = E^p$). The rows describe the given state of nature. Hence, the row labeled as $P([.]|T_{t-1})$ describes the countries that experienced a terrorist attack last period whereas $P([.]|T_{t-1}^p)$ describes the countries that experienced peace from terrorism last period. The way to read Table II is that the first number in the first row and column is $P(T_t|T_{t-1})$ and the number in the next column is $P(X_t^p|X_{t-1})$. The first number in the second row and first column is $P(T_t^p|T_{t-1})$ and the number in the next column is $P(X_t^p|X_{t-1}^p)$. These notational conventions are repeated for piracy and the economy.

According to the table, there is persistence in both conflict and peace but only per-

sistence in expansions and not in recessions. In other words, the likelihood of remaining in a state of piracy or terrorism given being in a state of conflict last period is greater than 0.5. And the likelihood of remaining in a state of peace from piracy or terrorism given being in a state of peace last period is greater than 0.5. However, the likelihood of remaining in a state of contraction given being in a state of contraction last period is less than 0.5, even though the likelihood of remaining in a state of expansion given being in a state of expansion last period is greater than 0.5. To see this, consider that the likelihood of remaining at peace from terrorism is 0.888, whereas the likelihood of remaining at conflict with terrorists is 0.634. The probabilities associated with piracy are similar to those associated with terrorism. The likelihood of remaining at peace from piracy is 0.905, whereas the likelihood of remaining at conflict with terrorists is 0.704.

While the likelihood of remaining in expansion is similar to the other probabilities at 0.799, the likelihood of remaining in contraction is very different from the other examples at 0.409. This may mean that there is a tendency for conflict and peace to be persistent whereas economies are less likely to remain mired in recession due to countercyclical policy initiatives, among other things.

Table III extends the analysis to examining the 4x4 Markov process. In this case, we are still examining the likelihood of conflict and peace from terrorism and piracy but consider it during various economic transitions. In this way, we are providing a crude test of our theory. In the previous section, we showed that terrorism is less sensitive to the economy than is piracy. The 4x4 Markov model allows us to see if a transition to a better eco-

nomic situation increases the probability of a transition from a state of peace to conflict and vice-versa. It can also allow us to see if the transition impacts the persistence of peace and conflict.

The first column provides the statistic employed or the probability of each form of peace and conflict being examined. The second column provides the probability of the cases in which the current period is one characterized by conflict from terrorism (T) and the third column provides the probability of the cases in which the current period is one characterized by peace from terrorism (T^p). Columns four and five provide analogous probabilities for conflict and peace from piracy. The rows describe the given state of nature of the economy. The first and third rows show the state of nature when the economy was in expansion last period and the second and fourth rows show the state of nature when the economy was in contraction last period. The first panel describes the transition probabilities (P_{ij}), which is when countries transition from peace to conflict, whereas the second panel describes the own probabilities (P_{ii}), which is when countries remain in peace or conflict.

The way to read Table III is that the first number in the first row and column is $P(T_t|T_{t-1}, E_{t-1})$, and the number in the next column is $P(X_t^p|X_{t-1}, E_{t-1})$. The first number in the second row and first column is $P(T_t^p|T_{t-1}, E_{t-1}^p)$, and the number in the next column is $P(X_t^p|X_{t-1}, E_{t-1}^p)$. These notational conventions are repeated for own probabilities and piracy.

Table III shows that the probability of transitioning into a state of terrorism from

peace during previous periods of expansion is 0.109. The table shows that the transition probability into terrorism is slightly higher during contractions at 0.122. Hence, worsening economic conditions increase the likelihood of terrorist attacks which is consistent with Blomberg, Hess, and Orphanides (2004). Table III also shows that the probability of transitioning into a state of piracy from peace during previous periods of expansion is 0.098. The table shows that the transition probability into piracy is slightly lower during contractions at 0.084, indicating that improved economic payoffs increase the likelihood of pirate attacks.

Table III shows that there is not a qualitative difference between piracy and terrorism when considering own probability of conflict or transition probability into peace. The likelihood of remaining in conflict during good economic times is lower (0.621, 0.700) than during bad economic times (0.675, 0.721). The likelihood of transitioning into peace during good economic times is higher (0.379, 0.300) than during bad economic times (0.325, 0.279).

Tables IV-V provide further tests of our theory. These tables provide results from estimating probability models of conflict for piracy and terrorism. In these tables, the underlying regression is

$$P_{it} = f(P_{it-1}, X, Z),$$

where the probability of attack P is a function of past attacks in country i in year t and includes a vector of control variables X and a vector of conflict variables Z. The control variables are growth, ΔY, log of income, $\ln Y$, index of democracy, Dem, and a dummy

for landlocked, Landlock. The conflict variables are lagged other conflict, (T, π), lagged internal conflict, I, lagged military spending as a percentage of GDP, Def, a dummy variable for countries with maritime presence and NATO agreement, NATO, and NATO interacted with $\ln Y$. We estimate various versions of the equation as a linear probability model, PROBIT, as random effects estimator, and with and without time dummies.

We hypothesize that piracy is more likely than terrorism to be targeted at higher income countries. Hence, we expect the coefficient associated with $\ln Y_{t-1}$ to be positive and statistically significant in the pirate equation and insignificant in the terrorism equation. We also hypothesize that rich countries with higher counter-terrorism and counter-piracy measures should face a lower probability of terrorism or piracy. Again, this effect should be stronger in the piracy equation so that we would expect the coefficient for NATO$\times \ln Y_{t-1}$ to be negative and statistically significant in the piracy equation and possibly insignificant in the terrorism equation. Table IV provides the results from estimating these coefficients. The first column displays the variables included in the regression, and the second column provides the estimates from a linear probability model. The third column provides estimates from the model for a sub-sample of 2005-8 and the fourth column provides estimates of the sub-sample employing an alternative definition for piracy only available for this sub-sample of 2005-8. The alternative definition for piracy employed in the fourth column uses data based on who owns the ship and cargo as opposed to the country flag flown on the vessel, which is employed in all other columns.[5] Columns five through nine provide the estimates from a probit model. The sixth column includes conflict control variables.

Column 7 estimates the model using random effects. Column 8 includes time dummies and column 9 estimates the model using random effects and time dummies. All results are reported as marginal effects at the mean.

Table IV provides results that are consistent with our hypotheses. The coefficients associated with lagged income are positive in each model and statistically significant in each case. This means that pirates tend to target flags from richer countries.[6,7] These results hold when employing alternative definitions for piracy and during the alternative time periods, although the magnitudes are smaller. The coefficients associated with NATO $\times \ln Y_{it-1}$ are negative and statistically significant, which indicates that rich countries with stronger counter piracy capabilities are less likely to be attacked. Interestingly, the coefficient on NATO without the interaction term is positive. This may be due to the fact that strategic partnerships may not reduce piracy once income differences are considered. The results on the control variables are also consistent with our hypotheses. Lagged conflict has a positive relationship, and being landlocked decreases the probability of an attack. Finally, lagged internal conflict tends to raise the probability of piracy which is consistent with the idea that pirates would look to outside options for profits when there is internal strife in their country.

Table V provides the results from estimating the terrorism model. The first column displays the variables included in the regression, the second column provides the estimates from a linear probability model, and the third through seventh columns provide the estimates from a probit model. The fourth column includes conflict control variables. Col-

umn 5 estimates the model using random effects. Column 6 includes time dummies, and column 7 estimates the model using random effects and time dummies. All results are reported as marginal effects at the mean. Table V is also consistent with our hypotheses. In this case, the impact of income or income from countries using stronger counter-conflict measures has no statistical impact on terrorism. Instead, terrorism appears to be largely due to lagged terrorism, being landlocked and being subject to internal conflicts. The result that internal conflicts may trigger terrorism is consistent with results from Blomberg, Hess, and Orphanides (2004). There are some estimates in which decreases in the growth rate of GDP appear to increase the probability of terrorism, but these results are not robust across each specification. Finding a slight sensitivity of terrorism to the business cycle was first shown in Blomberg, Hess, and Orphanides (2004).

5. Conclusion

This paper performs several empirical tests in order to improve our understanding of the root causes of transnational terrorism and piracy and compare some of their key characteristics. We accomplish these empirical tests by constructing a new database on piracy and connecting it to existing economic, political and conflict databases. Our main hypothesis is that flag ship influences the actions of pirates in that pirates are more likely to target ships from wealthier countries with weak counter-piracy measures.

Consistent with this hypothesis, we find that empirically the hotbeds for conflict—civil war, piracy and terrorism—appear to be quite different. In particular, upper-middle

income and high income countries are more likely to be targeted by pirates, but there is almost no relationship between a country's income and its likelihood of being targeted by terrorists. We also find that rich countries with stronger counter-piracy capabilities are less likely to be targeted by pirates, which suggests that pirates look to other options to achieve profits in these cases.

Our results point to several promising avenues for further research. For example, much still remains unknown about both the detailed workings of ransom payments and the full extent to which lawlessness and poverty in Somalia have contributed to the rapid rise in piracy. While these questions are beyond the scope of this paper and would require more data to address, it is likely that their answers could yield important policy insights.

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Notes

[1]In a working paper version of this paper (Blomberg, Fernholz, and Levin 2012), we demonstrate that these empirical results are consistent with the predictions of a model that extends the setup of Grossman (1991) to include the option of piracy among the population.

[2]While there is no doubt that Somalia is a dangerous country, there is evidence both that the lack of a strong state in Somalia has not in fact made it more dangerous (Leeson 2007b) and that Somalia is less dangerous than many of its neighbors that have stronger states (Powell, Ford, and Nowrasteh 2008).

[3]For a discussion of the connection between pirates and terror groups explicitly see Marshall (2008).

[4]More detailed information about our data is available in an online appendix. In particular, this online appendix includes a list of the summary statistics from Table I for each individual country. It also includes a list of correlations across all the variables that we construct from our data. Among the more notable, we find that the correlation coefficient between income per capita and piracy and the lags is 0.11 - 0.12 and statistically significant at the 0.05 level. There is less correlation between growth and piracy and their lags. The lack of a relationship between economic growth and piracy likely reflects two factors. First, it is unlikely that targeting ships from countries with high economic growth (as opposed to high economic development) would yield high payoffs for pirates. Second, it is unlikely that Somali pirates know the exact growth rates of countries around the world and hence can use this information when choosing which ships to target. With regards to terrorism, we find that there is a negative correlation between terrorism and either income or income growth when considering specific lag lengths.

[5]It turns out that there appears to be a strong correlation between these two measures ($\rho = 0.35$) and the qualitative results when employing the alternative measures are similar.

[6]For this argument to hold, pirates must be at least somewhat aware of which countries' ships they are targeting. Our results show a revealed preference by pirates to attack ships from richer countries with little to no counter-piracy operations, which suggests that pirates are aware of who they are attacking and what the payoffs to these attacks are likely to be.

[7]One possible explanation for this result is that ships registered with richer countries make up the bulk of commercial maritime activity. In this case, the targeting of flags from these countries would be a simple consequence of there being more of these ships to target. However, according to data from Hoffman, Sanchez, and Talley (2005), the countries of registry that make up the bulk of commercial maritime activity are not the richest countries. For example, the top five countries of registry in terms of gross tonnage in 2003 were Panama, Liberia, Bahamas, Greece and Malta, none of which is among even the twenty richest countries in our sample.

Table I: Basic Statistics By Region
Average Annual Values 1992-2008

REGION	INCOME	GROWTH	DEFENSE	PIRACY	TERRORISM	CIVILWAR	DEM
East Asia	12919	0.0283	2.172	2.439	0.618	0.160	5.9
Eastern Europe	8070	0.0424	2.233	0.267	0.639	0.139	6.4
Latin America/Carribean	9579	0.0236	1.340	1.903	0.827	0.0603	6.7
Middle-East	17442	0.0235	5.058	1.067	2.571	0.171	4.4
North America	35265	0.0204	2.526	1.471	1.588	0	7
South Asia	1960	0.0355	2.601	1.478	2.287	0.816	4.8
Sub-Saharan Africa	2222	0.0174	2.608	0.414	0.618	0.344	5.5
Western Europe	32580	0.0210	1.647	2.202	1.263	0	7
High-Income, OECD	32057	0.0210	1.690	1.507	1.222	0	7
High-Income, Non-OECD	33812	0.0296	4.714	4.878	0.571	0.0756	5.0
Low-Income	1393	0.0196	2.478	0.642	1.064	0.401	5.4
Lower-Middle-Income	5337	0.0314	2.217	0.545	1.234	0.175	6.0
Upper-Middle-Income	13058	0.0289	3.033	1.931	0.645	0.0569	6.1
Total	11054	0.0256	2.508	1.274	1.022	0.197	5.9

Table II: Estimates of 2x2 Markov processes for Economy, Piracy and Terrorism

Statistic	$P(X_{it}\|[.])$	$P(X^p_{it}\|[.])$
$P(\ [.]\|T_{it-1})$	0.634***	0.366***
	[0.013]	[0.013]
$P(\ [.]\|T^p_{it-1})$	0.112***	0.888***
	[0.008]	[0.008]
$P(\ [.]\|\pi_{it-1})$	0.704***	0.296***
	[0.013]	[0.013]
$P(\ [.]\|\pi^p_{it-1})$	0.095***	0.905***
	[0.007]	[0.007]
$P(\ [.]\|E_{it-1})$	0.799***	0.201***
	[0.009]	[0.009]
$P(\ [.]\|E^p_{it-1})$	0.591***	0.409***
	[0.016]	[0.016]
Observations	3,105	3,105

Notes: Clustered standard errors are presented in parentheses when appropriate. $*$, $**$, and $***$ represent statistical significance at the 0.10, 0.05 and 0.01 levels, respectively. Regressions include individuals surveyed in countries for which data are available.

Table III: Estimates of 4x4 Markov processes for Economy, Piracy and Terrorism

Statistic	P(T_{it}|[.])	P(T^p_{it}|[.])	P(π_{it}|[.])	P(π^p_{it}|[.])
		P_{ij}		
P([.]|E_{it-1})	0.109***	0.379***	0.098***	0.300***
	[0.008]	[0.019]	[0.007]	[0.019]
P([.]|E^p_{it-1})	0.122***	0.325***	0.084***	0.279***
	[0.014]	[0.034]	[0.012]	[0.041]
		P_{ii}		
P([.]|E_{it-1})	0.621***	0.891***	0.700***	0.902***
	[0.019]	[0.008]	[0.019]	[0.007]
P([.]|E^p_{it-1})	0.675***	0.878***	0.721***	0.916***
	[0.034]	[0.014]	[0.041]	[0.012]

Notes: Clustered standard errors are presented in parentheses when appropriate. $*$, $**$, and $***$ represent statistical significance at the 0.10, 0.05 and 0.01 levels, respectively. Regressions include individuals surveyed in countries for which data are available.

Table IV: Estimates of the Probability of a Pirate Attack
Average Annual Values 1992-2008

VARIABLES	LINEAR	2005-08	2005-08 OWNER	PROBIT	W CONFLICT	R.E.	T.F.E.	R.T.E.
π_{it-1}	0.509***	0.503***	0.428***	0.466***	0.412***	0.184*	0.413***	0.078
	[0.022]	[0.039]	[0.096]	[0.024]	[0.027]	[0.111]	[0.028]	[0.116]
ΔY_{it-1}	-0.113	-0.075	-0.022	-0.128	-0.196	-2.226**	-0.187	-2.178**
	[0.071]	[0.147]	[0.096]	[0.112]	[0.153]	[0.905]	[0.160]	[0.954]
lnY_{it-1}	0.033***	0.028***	0.013***	0.043***	0.057***	0.464***	0.055***	0.478***
	[0.006]	[0.010]	[0.005]	[0.007]	[0.009]	[0.108]	[0.009]	[0.118]
Dem_{it-1}	0.003	0.003	0.00	0.006	0.009	0.088*	0.009	0.078
	[0.004]	[0.008]	[0.004]	[0.005]	[0.007]	[0.051]	[0.006]	[0.053]
Landlock_i	-0.103***	-0.092***	-0.034***	-0.169***	-0.156***	-1.561***	-0.155***	-1.654***
	[0.013]	[0.024]	[0.009]	[0.016]	[0.019]	[0.389]	[0.019]	[0.415]
T_{it-1}					0.021	-0.198*	0.03	-0.128
					[0.021]	[0.111]	[0.022]	[0.119]
I_{it-1}					0.067**	0.338*	0.066**	0.394**
					[0.031]	[0.190]	[0.030]	[0.200]
Def_{it-1}					-0.001	-0.007	-0.001	0.004
					[0.004]	[0.031]	[0.004]	[0.033]
NATO_i					0.368***	2.674**	0.359***	3.184**
					[0.108]	[1.359]	[0.107]	[1.469]
$\text{NATO}_i \times \ln \text{Y}_{it-1}$					-0.033***	-0.227	-0.033***	-0.275*
					[0.011]	[0.139]	[0.011]	[0.150]
Observations	2,552	820	820	2,552	2,156	2,156	2,156	2,156
R-squared	0.338	0.328	0.148					

Notes: Clustered standard errors are presented in parentheses when appropriate. $*$, $**$ and $***$ represent statistical significance at the 0.10, 0.05 and 0.01 levels, respectively. Regressions include individuals surveyed in countries for which data are available.

Table V: Estimates of the Probability of a Terrorist Attack
Average Annual Values 1992-2008

VARIABLES	LINEAR	PROBIT	W CONFLICT	R.E.	T.F.E.	R.T.E.
T_{it-1}	0.466***	1.382***	1.156***	0.794***	1.120***	0.568***
	[0.020]	[0.062]	[0.069]	[0.089]	[0.072]	[0.098]
ΔY_{it-1}	-0.284***	-1.162***	-0.738	-1.003*	0.031	-0.039
	[0.104]	[0.439]	[0.561]	[0.558]	[0.571]	[0.600]
ln Y_{it-1}	-0.006	-0.031	0.012	-0.011	0.01	-0.002
	[0.006]	[0.023]	[0.028]	[0.048]	[0.029]	[0.058]
Dem_{it-1}	-0.009*	-0.035**	-0.01	-0.02	-0.016	-0.01
	[0.005]	[0.018]	[0.022]	[0.030]	[0.023]	[0.034]
$Landlock_i$	-0.097***	-0.468***	-0.525***	-0.703***	-0.524***	-0.767***
	[0.016]	[0.086]	[0.098]	[0.161]	[0.100]	[0.195]
π_{it-1}			0.245***	0.151	0.329***	0.277**
			[0.078]	[0.100]	[0.081]	[0.110]
I_{it-1}			0.745***	0.807***	0.780***	0.812***
			[0.093]	[0.124]	[0.095]	[0.139]
Def_{it-1}			0.028*	0.027	0.022	0.008
			[0.015]	[0.017]	[0.016]	[0.020]
$NATO_i$			0.228*	1.347*	0.216*	1.359
			[0.122]	[0.725]	[0.120]	[0.887]
$NATO_i \times$ ln Y_{it-1}			-0.019	-0.113	-0.018	-0.111
			[0.012]	[0.074]	[0.012]	[0.091]
Observations	2,552	2,552	2,157	2,157	2,153	2,157
R-squared	0.255					

Notes: Clustered standard errors are presented in parentheses when appropriate. $*$, $**$ and $***$ represent statistical significance at the 0.10, 0.05 and 0.01 levels, respectively. Regressions include individuals surveyed in countries for which data are available.