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## **Modern Maritime Piracy**

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## **Modern Maritime Piracy**

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by

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*Abstract:* This essay provides an economic analysis of the problem of modern-day maritime piracy. The essay first reviews the current scope of the problem, and then develops an economic model of piracy that emphasizes the strategic interaction between the efforts of pirates to locate potential targets, and shippers to avoid contact. The model provides the basis for deriving an optimal enforcement policy, which is then compared to actual enforcement efforts, which, for a variety of reasons, have largely been ineffectual. The essay concludes by reviewing the law of maritime piracy and by offering some proposals for improving enforcement.

Key words: International law, law enforcement, piracy

*JEL* codes: K14, K33

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# **Modern Maritime Piracy**

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This essay develops an economic approach to the problem of modern-day maritime piracy with the goal of assessing the effectiveness of remedies aimed at reducing the incidence of piracy. To date, these efforts have been largely ineffectual for several reasons, including gaps in domestic laws, reluctance of countries to bear the expense of imprisoning pirates, and the general lack of an effective international legal framework for coordinating and carrying out enforcement efforts. Indeed, it is the absence of such a framework that bedevils international public law as a whole, not just in the area of maritime piracy.

The theoretical framework is based on a standard Becker-type model of law enforcement (Becker 1968; Polinsky and Shavell 2000), extended to consider the effort level of pirates to locate and attack target vessels, and of shippers to invest in precautions to avoid contact. The model provides the basis for prescribing an optimal enforcement policy whose goal is to minimize the cost of piracy to international shipping. It also serves as a benchmark for evaluating actual enforcement efforts within the context of international law (such as it exists). The essay concludes with several proposals aimed at improving enforcement.

## *Modern Day Maritime Piracy*

Modern day maritime piracy is a world-wide phenomenon. Over 2,600 attacks, actual or attempted, were reported over the period 2004-2011, but with some recent decline due to the effort of naval task forces as well as a very large increase in the use of on-board armed guards. For example, the most recent data shows that in the first 11 months of 2013 there were 234

boardings worldwide, with 30 in Nigerian waters and 13 in Somali waters. Many incidents have also been reported in Southeast Asia, especially off Indonesia.

Somali pirates principally operate a capture-to-ransom model, with ransoms of up to \$5.5 million per incident being collected. Elsewhere in the world robbery is the main motive. The overall economic cost of maritime piracy in 2012 was estimated at \$6 billion, down from \$7 billion the year before and as much as \$16 billion a few years earlier. Spending on on-board security equipment and armed guards increased from about \$1 billion to \$2 billion between 2011 and 2012. Other economic costs include additional travel days as a consequence of re-routing of ships; increased insurance costs of as much as \$20,000 per trip; increased charter rates, as longer time at sea reduces the availability of tankers; the cost of faster steaming through pirate affected seas; and greater inventory financing costs for cargoes that remain longer at sea (Bowden 2010). Also, according to Bensassi and Martínez-Zarzoso (2010), an additional 10 attacks are associated with an 11% decrease in exports between Asia and Europe at an estimated cost of \$28 billion.

With regard to anti-piracy efforts, Anderson (1995) notes that there are economies of scale in this activity. When trade on a given shipping route is sparse, individual merchant ships have to arm themselves, thereby duplicating investment. However, with greater amounts of trade, several shipping companies may reduce costs by hiring armed ships for their protection as they sail in convoy. And with still greater shipping traffic, the least cost protection method has turned out to be patrolling of large areas of ocean space by warships. Today all three methods are used.

Not surprisingly, the efficiency of the pirate organization contributes to its success, both historically and in modern times (Leeson 2007; Psarros et al. 2011). Accordingly, present-day Somali pirates have developed supportive “social” organizations that aid them on land and at sea

(Bahadur 2011). Pirate leaders often require new recruits to swear allegiance to the organization and its leaders until death; many Somali pirates are ex-coast guardsmen or ex-militiamen, and share a common background and training; there is a common belief that ransoms are like a tax on foreigners who are overfishing Somali waters; and there is even the use of stock exchanges to finance operations.

### *An Economic Model of Piracy*

This section develops a simple model of maritime piracy that focuses on its harmful effects on shipping (Guha and Guha 2010; Hallwood and Miceli 2013). The model accounts for both the efforts of pirates to locate potential target ships, and of shippers to avoid contact with pirates. In this sense, the model extends the standard economic model of crime to account for precautionary behavior of potential victims (Shavell 1991; Hylton 1996). After deriving the equilibrium of the model, we examine optimal enforcement policies.

The model focuses on a representative pirate and a representative shipper who traverse the same geographic area over a fixed period of time. The pirate devotes effort  $x$  (measured in dollars) to locate a target vessel, and the shipper invests precaution  $y$  (also in dollars) to avoid contact. The pirate's effort represents the amount of time at sea and/or the number of boats, while shipper's avoidance can represent the use of alternate (more expensive) routes, less frequent or fewer voyages, or the use of armed escorts. Let  $q(x,y)$  denote the probability of a contact over a given time period, where  $q_x > 0$ ,  $q_{xx} < 0$ ,  $q_y < 0$ , and  $q_{yy} > 0$ . Thus, pirate effort increases the chances of an encounter, while shipper precaution reduces the chances, both at decreasing rates. The cross partial,  $q_{xy}$  may be positive or negative, as discussed in more detail below. (A common formulation is  $q(x,y) = x/(x+y)$ .)

The benefit to the pirate from an encounter is the loot, which can take the form of confiscated cargo, ransom of passengers, or both. Let  $G$  be the gross expected gain from an encounter. The net gain, however, must account for the possibility of capture and punishment. Let  $p$  be the probability of capture, and  $s$  the (dollar) sanction upon conviction, both of which the pirate takes as given. Thus, the net gain per encounter is  $G-ps$ , which we will assume is positive. (This will necessarily be true if  $G > \bar{s}$ , where  $\bar{s}$  is the maximal sanction. We discuss the nature of  $s$  in greater detail in the section on enforcement below.) At the time it makes its choice of effort, the pirate's expected gain is therefore

$$q(x,y)(G-ps) - x. \quad (1)$$

The pirate chooses  $x$  to maximize this expression, taking as given  $y$ ,  $p$ , and  $s$ . The resulting first-order condition is

$$q_x(G-ps) - 1 = 0, \quad (2)$$

which defines the pirate's reaction function,  $\hat{x}(y, ps)$ .

The shipper expects to earn gross profit of  $\pi$ , which will be reduced by any expected costs associated with the threat of piracy. These costs include the losses inflicted directly by the pirate, denoted  $h$  (including the loss of cargo as well as damage to the ship and harm to crew members), plus the cost of avoidance actions,  $y$ . The net expected return to the shipper is therefore

$$\pi - q(x,y)h - y. \quad (3)$$

The shipper chooses  $y$  to maximize (3), taking  $x$  as given. This yields the first-order condition

$$q_y h + 1 = 0, \quad (4)$$

which defines the shipper's reaction function,  $\hat{y}(x)$ .

The Nash equilibrium occurs at the point where the reaction functions intersect.

Differentiating (2) yields the slope of the pirate's reaction function

$$\frac{\partial \hat{x}}{\partial y} = \frac{-q_{xy}}{q_{xx}}, \quad (5)$$

which has the sign of  $q_{xy}$  given  $q_{xx} < 0$ , while differentiating (4) yields the slope of the shipper's reaction function

$$\frac{\partial \hat{y}}{\partial x} = \frac{-q_{xy}}{q_{yy}}, \quad (6)$$

which has the opposite sign of  $q_{xy}$  given  $q_{yy} > 0$ . The equilibrium, which we assume exists and is unique, is shown graphically in Figure 1.

[Figure 1 here]

### *The Impact of Anti-piracy Laws*

Enforcement laws against piracy involve efforts to capture and punish pirates. Below we discuss the implementation of these laws in practice; here we examine their impact in theory, given the preceding equilibrium.

Law enforcement directly affects the behavior of pirates through the expected punishment term,  $ps$ , while it indirectly affects shipper behavior through their response to the resulting change in pirate behavior. Consider first the effect of changes in  $ps$  on the behavior of pirates. (Note that, given risk neutrality, it does not matter whether this is due to a change in  $p$ ,  $s$ , or both.) Differentiating (2) yields

$$\frac{\partial \hat{x}}{\partial ps} = \frac{q_x}{q_{xx}(G-ps)} < 0, \quad (7)$$

given  $G-ps > 0$ . Thus, an increase in the expected sanction for piracy reduces the pirate's investment in effort for any  $y$ . In Figure 1, this results in a leftward shift of the pirate's reaction curve. The new equilibrium involves an unambiguous reduction in the pirate's equilibrium level

of effort, but the effect on the shipper's investment in avoidance is ambiguous. As drawn,  $\hat{y}$  goes up, but it should be apparent that it could also go down, depending on the location of the initial equilibrium and the amount that the pirate's reaction function shifts. The intuitive reason for these effects is as follows.

The negative effect of greater enforcement on the pirate's effort reflects the standard deterrence argument—a higher expected sanction lowers the marginal benefit of criminal activity. The ambiguous effect of enforcement on the shipper's precaution hinges on the sign of  $q_{xy}$ . For the case shown in Figure 1,  $q_{xy}>0$ , so as the pirate's effort declines, the marginal benefit of shipper precaution increases (i.e.,  $q_y$  becomes more negative), causing an increase in  $y$ . In this case, enforcement of laws against piracy and shipper precaution are complementary. However, the reverse would be true if  $q_{xy}<0$ , for in that case, greater law enforcement efforts, by lowering  $x$ , would substitute for, or “crowd out,” shipper precaution. The actual outcome is therefore an empirical question.

Given the preceding effects of increased enforcement, we now turn to the derivation of the optimal enforcement policy, which involves the enforcement authority (whoever that may be) choosing the probability of apprehension,  $p$ , and the sanction,  $s$ , to maximize social welfare. An important question here concerns whether or not to count the pirate's gains as part of welfare. The convention in the economics of crime literature has been to count the offender's gains, but there are differing views on this issue (Polinsky and Shavell 2000, p. 48). In the case of pure theft, the value of the loot is simply a transfer payment, and thus would drop out of welfare if the thief's gains are counted (Shavell 1991). However, if the gains and losses differ, the possibility arises that the transfer could actually be value-enhancing—an “efficient theft”—which most people would find objectionable, especially in the piracy context. Thus, although we will follow

the standard convention and count the pirate's gains in welfare, we will assume that the loss suffered by the shipper exceeds the pirate's gains—that is,  $h > G$ . Consequently, any act of piracy is necessarily inefficient. This could reflect damages or harm to victims on top of the simple transfer of wealth, as well as any fear or “pain and suffering” incurred by victims of piracy and their sympathizers.

Based on these considerations, we write social welfare as

$$W = \pi - q(\hat{x}(ps), \hat{y}(ps))(h - G + p\beta s) - \hat{x}(ps) - \hat{y}(ps) - c(p), \quad (8)$$

where  $\hat{x}(ps)$  and  $\hat{y}(ps)$  are the equilibrium levels of pirate effort and shipper precaution, which depend on  $ps$  in the manner described above. The total expected enforcement costs are  $c(p) + q(\hat{x}(ps), \hat{y}(ps))p\beta s$ , where  $c(p)$  is the cost of deploying more ships ( $c' > 0$ ,  $c'' \geq 0$ ), and  $\beta$  is the unit cost of increasing  $s$ . The enforcement problem is to choose  $p$  and  $s$  to maximize (8), subject to  $p \in [0, 1]$  and  $s \in [0, \bar{s}]$ , where  $\bar{s}$  is the maximal sanction. The possible interpretations of  $\bar{s}$  are (i) the maximum prison term the offender could serve (for example, life); (ii) a death sentence; or (iii) the harshest punishment that the country charged with carrying out the punishment is willing to impose (as discussed further below).

We begin by deriving a standard result in the law enforcement literature—namely, that  $s^* = \bar{s}$ , or the optimal sanction is maximal (Polinsky and Shavell 2000). To see why, suppose that  $s^* < \bar{s}$  and  $p > 0$ . Now raise  $s$  and lower  $p$  so as to hold  $ps$  fixed. As a result, all of the terms in (8) that depend on  $ps$  remain unaffected, but  $c(p)$  falls, thus raising welfare. This proves that  $s^* < \bar{s}$  could not have been optimal. The intuition for this result is that the cost of  $s$  is only incurred if a pirate is actually captured, so overall costs are lowered by capturing only a few offenders and punishing them harshly.

With  $s^* = \bar{s}$ , we differentiate (8) with respect to  $p$  and, after cancelling terms using (2) and (4), obtain the following first-order condition for  $p^*$

$$-q_x \frac{\partial \hat{x}}{\partial p} (h + p\beta \bar{s}) + q_y \frac{\partial \hat{y}}{\partial p} (G - p\beta \bar{s}) = c' + q\beta \bar{s}. \quad (9)$$

The left-hand side is the marginal benefit of increased enforcement, while the right-hand side is the marginal cost. The first term on the left-hand side, which is positive, is the saved costs (victim harm plus punishment costs) as pirates reduce their efforts in response to an increase in the probability of apprehension. This is the direct gain from deterrence. The second term, which is ambiguous in sign, reflects the uncertain effect of an increase in  $p$  on shipper effort. Suppose  $\partial \hat{y} / \partial p > 0$  (as is the case in Figure 1), indicating that shippers increase their precaution in response to greater  $p$  (i.e., public enforcement and private precaution are complements). Let us also suppose that the term  $(G - p\beta \bar{s})$  is negative, as would be true if pirate gains are not counted in welfare. In that case, the overall term is positive (given  $q_y < 0$ ), thus amplifying the marginal benefit of enforcement. Intuitively, when public enforcement elicits increased private precautions,  $p$  should be raised, all else equal to encourage such precaution. Conversely, if  $\partial \hat{y} / \partial p < 0$ , the case of crowding out, the second term on the left-hand side is negative, which works in the direction of reducing  $p$  so as not to overly discourage private precaution by potential victims.

### *Enforcement Problems*

The preceding represents the optimal enforcement policy in an ideal setting where there exists a single enforcement authority (or a unified coalition of enforcers), possessing both the will and the resources to carry out the policies implied by (9). While this may represent a reasonable assumption in many law enforcement contexts, enforcement of international laws

against piracy is undertaken by multiple countries with varying degrees of interest in devoting resources to the effort. As a result, enforcement involves a problem of collective action, which may lead to several departures from the prescribed policy.

First, the gains from deterring piracy are enjoyed by all countries who make use of the shipping lanes threatened by pirate attacks. Thus, each country has an interest in reducing piracy in proportion to its expected losses. At the same time, however, deterrence of pirate attacks is a public good in the sense that actions by any one country to invest in enforcement will benefit all countries. Thus, each country has an incentive to free ride on the enforcement effort of others. Absent some form of credible commitment, therefore, those countries with the largest stake (e.g., the highest value of shipping in the affected area) will undertake the bulk of the enforcement, and all other countries will free ride on that effort. Actual enforcement will therefore be less than the efficient level.

A second factor discouraging enforcement efforts concerns the expected cost of imposing punishment once a pirate is apprehended. If this cost is borne entirely by the country that first apprehends the pirate, then enforcers will likely underinvest in an effort to reduce their probability of incurring that cost. This represents a kind of “reverse rent-seeking” problem in which individual countries underinvest in order to lower the chances that they will be the first to catch the pirate. Note that both of the above problems, which arise from the collective nature of enforcement of piracy laws, will arise in any law enforcement context involving overlapping or undefined jurisdictional boundaries. For example, similar problems plague the enforcement of laws against international drug trafficking (Naranjo 2010) and prosecution of the global war on terror.

A third enforcement problem concerns the credibility of threats to actually impose any punishment at all on a band of pirates once they are captured. Since the pirates' harmful acts are sunk by the time they are apprehended, enforcers may lack adequate incentives to incur the high costs of detention, trial, and final punishment. Although there may be incapacitative benefits of detention, the probability of any particular pirate committing further harmful acts is small compared to the high cost of punishment. As a result, it may be optimal (in a time-consistent sense) simply to release him. This issue is largely ignored in the economics of crime literature, where it is generally assumed that threats to prosecute and punish criminals are taken as given. The issue is amplified in the piracy context because of the absence of a well-established international tribunal that can develop a reputation over time for carrying out threatened sanctions.

A final problem concerns the choice of the sanction  $s$ . As the model showed, the optimal sanction is maximal, but countries may interpret this prescription differently based on constitutional or other considerations, or they may set  $s$  based on criteria that differ from that described above (which, if they sympathize with the pirates, could involve setting no punishment at all). As a result, pirates will not be able to predict with any accuracy the actual penalty upon conviction, thereby diluting the deterrent effect of greater enforcement. Countries may also differ in their criminal procedures and evidentiary standards. Although countries can theoretically agree by treaty to uniform standards on these matters, philosophical differences regarding appropriate measures (based, for example, on disagreements over the appropriateness of the death penalty, or sympathies for pirates) will make this difficult in practice.

This section evaluates the efficacy of international law in light of the preceding analysis.

Piracy is a crime under customary international law, and is codified as such in the United Nations *Convention on the Law of the Sea* (UNCLOS) (ratified in 1994). Under this *Convention* states parties agreed to “cooperate” in policing the oceans outside of territorial waters, and to arrest, prosecute, and imprison persons suspected and ultimately found guilty of piracy (Articles 100 to 107). In fact, these articles were taken verbatim from Articles 14 to 21 of the *Convention on the High Seas*, which was put into force in 1962.

The evidence on actual enforcement of international laws against maritime piracy, as defined by UNCLOS, suggests that these laws have largely been ineffective. For example, over the period between August 2008 and September 2009, Combined Task Force 151 and other navies in the Horn of Africa region disarmed and released 343 pirates, while only 212 others were handed over for prosecution (Ungod-Thomas and Woolf 2009). The UN Security Council likewise reports that 90 percent of apprehended Somali pirates were released (UN Security Council 2011).

The discussion in the previous section suggests why this is the case: policing and enforcement is a public good, or at least a mixed good with external benefits for third parties. There are, however, some other considerations as well. The first simply concerns those acts that meet the definition of piracy under the *Convention*. Acts must be for “private ends”, suggesting that they must be motivated by the desire for material gain rather than for political purposes. Thus, terrorist acts would not meet the definition of piracy (Bendall 2010, p. 182), nor would hijacking or acts involving “internal seizure” of a ship by its crew or passengers (mutiny) under the so-called “two-vessel” requirement for piracy (Hong and Ng 2010, pp. 54-55).

A second difficulty, as discussed above, is the overlapping jurisdiction problem. UNCLOS only applies to acts of piracy on the high seas and in the 200-mile exclusive economic zones, and enforcement relies on the cooperation of all member states. Enforcement in the twelve-mile territorial waters is the responsibility of the coastal state, and states vary both in their definitions of piracy, and in the availability of resources or the will to enforce anti-piracy laws (Hong and Ng 2010, p. 55; Dutton 2010). Pirates will therefore naturally gravitate toward those areas where enforcement efforts are low or where anti-piracy laws are weak. Of course, shippers will also avoid those areas (though at a cost of re-routing), so states with weak laws will suffer economic costs. However, because shipping lanes inevitably cross jurisdictional boundaries, some of those costs will be externalized.

A third problem with enforcement of international law, mentioned earlier, is the problem of successfully prosecuting those pirates who have been apprehended. Article 105 permits the apprehending state to prosecute offenders, but this has often been difficult both politically and logistically. For example, Fawcett (2010) notes that problems of transporting defendants as well as evidence gathering are significant impediments.

However, in Southeast Asia there has been some success in cooperation against piracy under the *Regional Cooperation Agreement on Combating Piracy and Armed Robbery against Ships in Asia*, which has been functioning since 2006 and now has seventeen contracting parties (Noakes 2009). Under this agreement, the parties share information and perform anti-piracy patrols, especially in the Straits of Malacca. What may have helped in this instance is that in this region there is relatively little area of high seas (none in the Straits of Malacca), and so policing is largely restricted to waters over which sovereign rights exist. As a result, the benefits of

enforcement against piracy are more concentrated on the enforcing country, and hence there is less of a public good problem.

### *Proposals to Improve Enforcement*

This section offers three proposals to improve the enforcement of anti-piracy laws. The first, suggested by Dutton (2010), involves putting suspected pirates on trial in the International Criminal Court (ICC) rather than in the national court of the apprehending party. The ICC was created by the Rome Statute, which was ratified in 2002 and has 110 signatories, all of whom share in its costs according to an agreed-upon formula (Romano and Ingadottir 2000). However, while the Rome Statute grants the ICC jurisdiction over war crimes, crimes against humanity, genocide, and aggression, at present the ICC has jurisdiction only over the first three of these, and that it will not be until 2017 that it can exercise jurisdiction over the crime of “aggression,” which still has to be defined in law but under which piracy could conceivably be classified. Another difficulty with using the ICC against piracy is that some signatories may decline to finance the Court for this purpose; that is, a states party choosing to free ride under UNCLOS may also wish to do so under a revised Rome Statute.

The second proposal involves extending the *Convention for the Suppression of Unlawful Acts against the Safety of Maritime Navigation* (SUA Convention) to piracy as well as to terrorism. The SUA came into force in 1992 and by 2011 it had 156 signatories and ratifications. This *Convention* is targeted at policing the oceans against criminal activities, though it specifically targets terrorism rather than piracy. The word “terrorism” appears 5 times in SUA, but the term is never defined, leading some to believe that, with appropriate reinterpretation, SUA could be used against maritime pirates (Hong and Ng 2010).

Cognizant of these features Noakes (2009), the chief maritime security officer for the Baltic and International Maritime Council (BIMCO), argued before a US House of Representatives Committee that SUA 1988 can and should be used to combat piracy, and that it is incorrect to view this *Convention* as applying only to maritime terrorism and not maritime piracy. It is certainly true that SUA 1988 uses the word “terrorism” sparingly and this could give the impression that it could be used in the context of maritime piracy. However, SUA 1988 grew out of U.N. General Assembly Resolution 40/61 in 1985, itself being a response to terrorism on the *Achille Lauro*, and Resolution 40/61 is clearly aimed at terrorist acts at sea and not piracy.

Still, Article 3 of SUA defines seven offenses, the first three being described as follows:

Any person commits an offence if that person unlawfully and intentionally: seizes or exercises control over a ship by force or threat thereof or any other form of intimidation; performs an act of violence against a person on board a ship if that act is likely to endanger the safe navigation of that ship; or destroys a ship or causes damage to a ship or to its cargo which is likely to endanger the safe navigation of that ship.

Although an authoritative legal opinion by each signatory states party regarding exactly what crimes at sea the SUA encompasses has yet to be given, the US legislative attorney, R.C. Mason, working for the Congressional Research Service, has suggested, based on Article 3, that the SUA is directed at piracy as well as terrorism at sea (Ploch et al. 2010). However, this is only “guidance” and at present the US position on SUA and piracy remains unresolved.

Kilpatrick (2011) offers a third proposal, arguing that the U.N. Hague Convention (1970) could be extended from international civil aviation to maritime piracy. This Convention has been widely adopted, with 185 signatories as of 2013, and it compels states to either extradite or prosecute airplane hijackers. It also requires signatory states to punish terrorist acts by “severe penalties” through domestic laws. However, it is questionable that countries will move to extend the Hague Convention to maritime piracy. This is true for several reasons. First, while the

United States is of central importance in global civil aviation, it is much less so in international shipping. In civil aviation, U.S. legislation has a significant impact on global regulation because foreign airlines and flights from foreign airports to the United States that do not meet U.S. security standards are effectively prohibited from accessing its lucrative market. Second, countries are probably more strongly motivated to move against aircraft hijackings because each single incident is likely to affect more people, say, two hundred and fifty persons on an airplane versus twenty or so on a ship. Finally, aircraft hijackings seem to be given much more prominence in the media than maritime hijackings.

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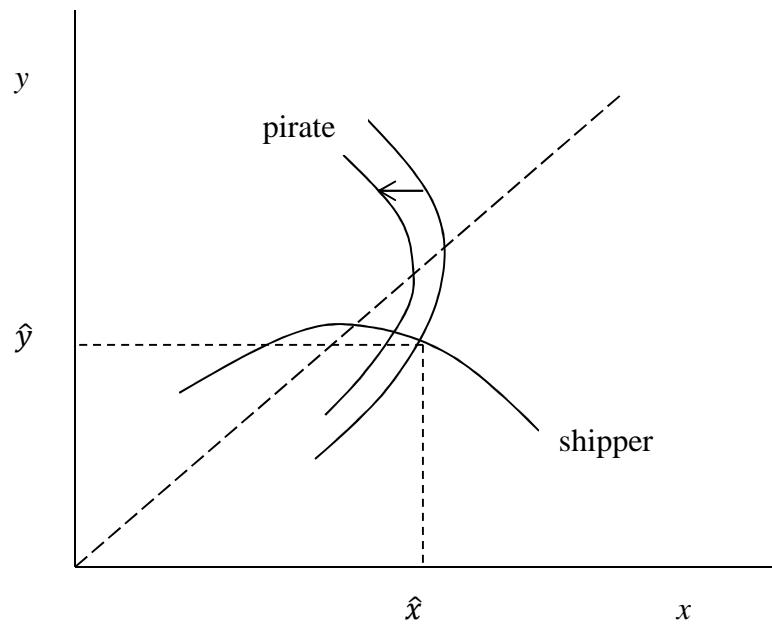
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**Figure 1.** Equilibrium choices of pirate effort ( $x$ ) and shipper avoidance ( $y$ ).