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Protecting “The Prize”: Oil and the U.S. National Interest

EUGENE GHOLZ AND DARYL G. PRESS

American national security policy is based on a misunderstanding about U.S. oil interests. Although oil is a vital commodity, potential supply disruptions are less worrisome than scholars, politicians, and pundits presume. This article identifies four adaptive mechanisms that together can compensate for almost all oil shocks, meaning that continuous supply to consumers will limit scarcity-induced price increases. The adaptive mechanisms are not particularly fragile and do not require tremendous foresight by either governments or economic actors. We illustrate these mechanisms at work using evidence from every major oil disruption since 1973. We then identify the small subset of disruptive events that would overwhelm these adaptive mechanisms and therefore seriously harm the United States. Finally, we analyze the utility of U.S. foreign military policy tools in addressing these threats. Our findings suggest that the United States can defend its key interests in the Persian Gulf—the world’s most important oil-producing region—with a less-intrusive, “over the horizon” posture.

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Oil is a vital commodity, and the Persian Gulf is the world's essential oil-producing region.¹ A broad consensus among national security experts holds that wars and other forms of instability near the Gulf threaten access to oil and therefore jeopardize core U.S. national interests. As a result, the region has been a focus of U.S. military policy for decades.² Since the end of the 1991 Persian Gulf War, the United States has maintained substantial military power in the area to deter conflicts and protect energy assets. But U.S. political and military engagement in the Persian Gulf region has been costly: U.S. forces have come under terrorist attack, and Washington's close military relationship with Riyadh contributed to the rationale for the September 11th attacks. Nevertheless, the global economy's reliance on oil seems to make the current American force posture essential.

In this paper, we assess this key plank of U.S. national security policy. We use simple economic theory to explain oil-market reaction to major supply disruptions—that is, how does the market adapt? We then evaluate the argument using evidence from every major oil shock since 1973, when OPEC became a major player. Finally, we explore the types of plausible political shocks in the Persian Gulf that would exceed the market's adaptive capacity and government energy policies. Once we have isolated the key threats, we assess requirements for the deployment and use of U.S. military forces in the Persian Gulf region.

We find that the policy consensus for an active and forward-deployed U.S. military presence in the Persian Gulf is built on excessive fears about

¹ The Persian Gulf is home to four of the ten leading oil producers: Saudi Arabia, Iran, the United Arab Emirates, and Kuwait. In normal times, Iraq would be on the top-ten list as well. The region is also unusually important because Gulf oil producers are the world's biggest exporters and because these countries typically hold the most spare capacity at any given time. U.S. Department of Energy, Energy Information Administration (henceforth cited as EIA) publishes data on production levels at <http://www.eia.doe.gov>.

² Council on Foreign Relations, Independent Task Force Report no. 58, *National Security Consequences of U.S. Oil Dependency* (Washington, DC: Brookings Institution Press, October 2006), 48–49, 53, 56–59; Keith Crane, Andreas Goldthau, Michael Toman, Stuart E. Johnson, Alireza Nader, Angel Rabasa, and Harun Dogo, *Imported Oil and U.S. National Security* (Santa Monica: RAND Corporation, 2009). President Clinton's statements of the U.S. National Security Strategy were explicit about a military commitment to protect oil interests by providing stability in the Persian Gulf. *A National Security Strategy for a New Century* (Washington, DC: The White House, October, 1998), 6, 12–13, 32–33, 52, 54. Subsequent Bush administration documents are less explicit about oil interests, but few people would argue that the Bush administration was uninterested in oil. Joe Barnes, Amy Jaffe, and Edward L. Morse, "The New Geopolitics of Oil," *The National Interest*, Energy Supplement, November, 2004; Ian Rutledge, *Addicted to Oil: America's Relentless Drive for Energy Security* (London: I.B. Taurus, 2005), 7, 132, 197–98. The general public, policy analysts, and mainstream academic international relations specialists all accept this conventional wisdom. For a discussion, see Michael T. Klare, *Blood and Oil: The Dangers and Consequences of America's Growing Dependence on Imported Petroleum* (New York: Metropolitan Books, 2004); Robert Art, *A Grand Strategy for America* (Ithaca: Cornell University Press, 2003); Steve A. Yetiv, *Crude Awakenings: Global Oil Security and American Foreign Policy* (Ithaca: Cornell University Press, 2004).

the consequences of regional instability.³ The fears are rooted in an unrealistic, static conceptual model of markets in which shocks to one part of an industry—for example, interference with tanker traffic—do not trigger compensating adaptations elsewhere. In reality, the oil market, like most others, rapidly adjusts to shocks through a variety of mechanisms. Most of these adaptations do not require careful coordination, unusually wise stewardship, or benign motives: individuals' drive for profit triggers most adaptation. These adaptations keep oil flowing, and shortages are short-lived.⁴

This understanding of market adaptation implies that only three types of disruptions are likely to impose significant costs on the United States. First, the consolidation of major Persian Gulf oil reserves (for example, via cross-border invasion) might allow a single country to dominate the region and act as a monopolist—raising prices and wielding coercive leverage. Even partial consolidation of Gulf oil might help the OPEC cartel raise prices and enforce quota discipline, thereby hurting major consumers like the United States. Second, domestic instability in Saudi Arabia could reduce oil output far beyond levels that other producers could replace in the short- or medium-term. Third, a successful harassment campaign against shipping through the Strait of Hormuz, the only waterway out of the Persian Gulf, could deny global markets too much oil to permit quick and low-cost adjustment.

Finally, we argue that a forward U.S. military presence in the Persian Gulf region is not needed to address these three threats to oil access—and it might exacerbate them.⁵ No regional power is in a position to bid for hegemony, and the U.S. military could thwart a regional aggressor without a peacetime U.S. military presence in the Gulf states. Furthermore, adversaries would struggle to interdict tankers through the Strait of Hormuz, and peacetime presence would contribute little to the U.S. military's ability to counter an antishipping harassment campaign. Saudi instability is the greatest danger to oil supplies, but the United States does not have good military options for preventing or mitigating civil unrest in the Kingdom. The best strategy for dealing with potential Saudi instability is to minimize the probability that this scenario

³ For a related policy analysis, see Philip E. Auerswald, "The Irrelevance of the Middle East," *The American Interest* 2, no. 5 (May-June 2007): 19–37.

⁴ For a related, broader argument about the global economy's adaptations in response to political-military shocks, see Eugene Gholz and Daryl G. Press, "The Effects of Wars on Neutral Countries: Why It Doesn't Pay to Preserve the Peace," *Security Studies* 10, no. 4 (Summer 2001): 1–57.

⁵ In other words, U.S. oil interests do not require the peacetime deployment of air or ground combat units in the region, the home-porting of naval units (the current U.S. arrangement with Bahrain) or the presence of military headquarters (the CENTCOM command facilities in Qatar). For previous descriptions of a minimalist approach to securing U.S. oil interests in the Gulf, see Kenneth M. Pollack, "Securing the Gulf," *Foreign Affairs*, 82, no. 4 (July/August 2003): 3–4; Eugene Gholz, Daryl G. Press, and Harvey M. Sapolsky, "Come Home America: The Strategy of Restraint in the Face of Temptation," *International Security* 21, no. 4 (Spring 1997): 25–29. For a related argument that the challenges that the Soviet (or a Soviet proxy) military would have faced in the Persian Gulf limited the need for an activist, forward U.S. military presence there in the latter stages of the Cold War, see Robert H. Johnson, "The Persian Gulf in U.S. Strategy: A Skeptical View," *International Security* 14, no. 1 (Summer 1989): 122–60.

will arise, yet U.S. military presence in the region strengthens those Muslim fundamentalists who oppose the Gulf monarchies. In short, the United States has important interests in the Persian Gulf, but using its military to protect those interests is counterproductive.

To be clear, the United States has other serious energy concerns that this article does not address. For example, global energy consumption has soared in the past decades and will probably do so again when the global economy recovers from the 2008 financial crisis. As a result, oil prices may reach or exceed the heights seen in the summer of 2008. And if “peak oil” theorists are correct and the world is nearing the point of maximum oil production, future prices will be higher still.⁶ Furthermore, continuing use of fossil fuels may threaten serious consequences from climate change in the coming decades, resulting in possible changes to the preferred American energy policy.

This paper does not assess the challenges of finding cleaner, cheaper energy sources for the future.⁷ Instead, it focuses on critical questions for U.S. national security policy: how vulnerable is the global economy’s access to Persian Gulf oil, and how active must U.S. foreign military policy be to mitigate any vulnerabilities? On those two important questions, we offer good news: Gulf oil is not particularly vulnerable, and the requirements for the U.S. military on a day-to-day basis are minimal.

The rest of this paper is divided into three main sections. First, we describe the mechanisms by which the oil sector adapts to shocks: three market mechanisms and one important tool controlled by consumer governments. Second, we look at every major oil shock since 1973—during the modern era of OPEC-dominated oil markets—to see if the mechanisms worked as expected and mitigated the shock. Third, we assess the role and effectiveness of U.S. military power to respond to the few oil-related vulnerabilities that the United States faces today.

⁶ The “peak oil” theory claims that the world has already reached—or soon will reach—the global maximum rate of oil production, implying that prices will increase dramatically in the near future given constant or progressively greater demand. Critics counter that distinguishing production peaks from temporary plateaus is only possible long after the fact. We take no position on the peak oil debate, which is about future supply and the long-term base price of oil. Our argument here is about sudden supply disruptions (variation in supply) and market adaptability. Markets (and governments that hold stockpiles) will be able to adjust to disruptions whether or not the peak oil theorists are right. On this point, see also note 19 below. On peak oil, see Kjell Aleklett and Colin Campbell, “The Peak and Decline of World Oil and Gas Production,” *Minerals and Energy* 18, no. 1 (2003): 5–20; Matthew R. Simmons, *Twilight in the Desert: The Coming Saudi Oil Shock and the World Economy* (New York: Wiley, 2005). For critics, read Leonardo Maugeri, “Oil: Never Cry Wolf—Why the Petroleum Age Is Far from Over,” *Science* 304 (21 May 2004): 1114–15; Michael C. Lynch, “Crop Circles in the Desert: The Strange Controversy over Saudi Oil Production,” Occasional Paper Series no. 40 (Boulder: International Research Center for Energy and Economic Development, 2006), [http://www.gasresources.net/LynchM%2006%20\(Crop%20Circles\).pdf](http://www.gasresources.net/LynchM%2006%20(Crop%20Circles).pdf).

⁷ The U.S. military is unlikely to be a useful policy tool in addressing these challenges.

HOW MARKETS RESPOND TO SHOCKS

Each day, twenty-four million barrels of crude are pumped from the Persian Gulf region, most of which are loaded onto supertankers to feed refineries around the world.⁸ The immediate effect of a major supply disruption in the Gulf would leave one or more consumers wondering where their next expected oil delivery will come from. But the oil market, like most others, adjusts to shocks via a variety of mechanisms. These adaptations do not require careful coordination, unusually wise stewardship, or benign motives. Individuals' drive for profit triggers most of them.

The details of each oil shock are unique, so each crisis triggers a different mix of adaptations. Some adjustments would begin within hours of a disruption; others would take weeks or longer to implement. Similarly, some could only supply the market for short periods of time, and others could be sustained indefinitely. But the net result of the adaptations softens the disruptions' effects on consumers.

Increased Production

Any event that reduces oil supply—for example, a fire at a pumping station in Kuwait or a labor strike in Venezuela—will spur other producers around the world to increase output. Disruptions draw new oil into the market through two distinct mechanisms. First, producers not part of the OPEC cartel (including major players such as Russia, the United States, and Canada) increase output to respond to short-term price spikes. Firms in these countries typically produce as much oil as they can, as long as the expected price exceeds their costs.⁹ They will see an opportunity to profit from the higher price during a spike, and so after a disruption, they pump more than they did before. In most cases, these non-OPEC countries have only modest amounts of ready-to-pump "spare capacity," but their additional output can

⁸ EIA, "Production: Monthly and Quarterly," <http://www.eia.doe.gov/emeu/international/contents.html> (accessed 24 May 2010). Even though most Gulf oil exports go to consumers in Asia and Europe, the United States depends on Gulf exports just as much as Asia and Europe do: if Persian Gulf oil were unavailable, consumers who had previously been importing it would try to buy the remaining oil on the global market, bidding against American consumers and driving up the price. See, for example, Stephen P. A. Brown and Hillard G. Huntington, "Reassessing the Oil Security Premium," RFF Discussion Paper DP 10-05 (Washington, DC: Resources for the Future, February 2010).

⁹ Firms in these countries act as a competitive fringe around the cartel. They are simply price-takers acting as if they were participating in a normal, competitive market, albeit one with unusual complexity due to technical uncertainties—not knowing exactly where to find more oil or how much oil any given underground pool can produce, at what price and what rate—and due to high capital costs. Paul Stevens, "The Determination of Oil Prices 1945–95," *Energy Policy* 23, no. 10 (1995): 863–64; Eugene Gholz and Daryl G. Press, "Energy Alarmism: The Myths that Make Americans Worry about Oil," *Cato Policy Analysis* 589 (5 April 2007): 3–5. The market share of OPEC's core members has been a reasonably good predictor of oil prices, confirming the applicability of the leader-fringe model. David L. Greene, Donald W. Jones, and Paul N. Leiby, "The Outlook for US Oil Dependence," *Energy Policy* 26, no. 1 (1998): 58–59.

help eliminate temporary shortages.¹⁰ The second mechanism is based on politics rather than economics: oil market shocks tend to disrupt delicate cartel agreements, leading to increased global production.¹¹

The purpose of cartels like OPEC is to limit the total amount of product on the market. Members of a cartel agree to produce less than they otherwise would, thereby raising the price. Not surprisingly, cartels rarely function smoothly: billions of dollars are at stake as members squabble over total cartel output and the size of each country's assigned quota.¹² Furthermore, whatever the cartel decides, every member has a short-term incentive to cheat (and an even stronger incentive to suspect everyone else of cheating).¹³ Although successful cartels can reduce output and enrich their members, the process is often acrimonious, and disputes among members are common.

The international negotiations among cartel members facilitate adaptation to oil supply shocks for three reasons. The first is simply the *raison d'être* of any cartel: when members produce less than they could, they create spare capacity. Cartel members can turn on that slack relatively quickly in response to a supply disruption elsewhere. Second, because cartel members always have an incentive to cheat by exceeding their output quota,

¹⁰ The International Energy Agency defines "spare capacity" as the additional oil that can be brought into the market within thirty days and sustained for at least ninety. Unfortunately, data on spare capacity in the oil industry are notoriously unreliable, so it is difficult to test hypotheses about spare capacity directly or to adjust foreign-policy decisions in response to the amount of spare capacity. Slack production capacity is sometimes reported as a static figure—for example, 2 mb/d—but any reasonable measure must report the amount of extra oil that could be brought online in a given period of time and at what cost. Such details, unfortunately, are closely guarded secrets. Although industry observers can make reasonable estimates of current production levels—for example, by counting the number and size of the tankers that dock at a given oil terminal—they cannot tell how full producers' inventories are or how aggressively the producers are drawing oil out of underground reservoirs. And only the producers can do the advanced scientific tests to try to determine the maximum flow rate that a given field can support using current technology. Norman J. Hyne, *Nontechnical Guide to Petroleum Geology, Exploration, Drilling, and Production*, 2nd ed. (Norman, OK: Penn Well Corp., 2001).

¹¹ Oil economists debate the extent to which OPEC actually exercises market power, but the cartel theory—or the closely related leader/competitive-fringe model—is the mainstream view. M. A. Adelman, *The Genie Out of the Bottle: World Oil since 1970* (Cambridge, MA: MIT Press, 1995); M. A. Adelman, "World Oil Production and Prices 1947–2000," *Quarterly Review of Economics and Finance* 42 (Summer 2002): 169–91. For tests of alternative hypotheses, see James L. Smith, "Inscrutable OPEC? Behavioral Tests of the Cartel Hypothesis," *Energy Journal* 26, no. 1 (2005): 51–82; A. F. Alhajji and David Huettnew, "OPEC and World Crude Oil Markets from 1973 to 1994: Cartel, Oligopoly, or Competitive?" *The Energy Journal* 21, no. 3 (2000): 31–60; James M. Griffin and Weiwen Xiong, "The Incentive to Cheat: An Empirical Analysis of OPEC," *Journal of Law and Economics* 40, no. 2 (October 1997): 289–316. For a recent study critical of the cartel hypothesis (but more open to the leader-fringe model), see James D. Hamilton, "Understanding Crude Oil Prices," NBER Working Paper 14492 (Cambridge, MA: National Bureau of Economic Research, November 2008).

¹² Adelman, "World Oil Production," 177; James M. Griffin and William S. Neilson, "The 1985–86 Oil Price Collapse and Afterwards: What Does Game Theory Add?" *Economic Inquiry* 32 (October 1994): 544–45, 548–49, 556–58.

¹³ Simon J. Evenett, Margaret C. Levenstein, and Valerie Y. Suslow, "International Cartel Enforcement: Lessons from the 1990s," *The World Economy* 24, no. 9 (September 2001): 1223; Adelman, *The Genie Out of the Bottle*, 4–5, 30; Griffin and Neilson, "The 1985–86 Oil Price Collapse," 545, 557–58.

cartel leaders like Saudi Arabia in OPEC usually maintain significant slack capacity to discipline wayward members: too much cheating may arouse the leader to flood the market, driving down prices for everyone.¹⁴ The cartel leader's spare capacity is available to replace barrels of supply lost in a disruption.

Finally, oil shocks impede smooth cartel management.¹⁵ Global production has dropped, so someone ought to replace it, but who? Each member will want a share. When supply conditions change substantially, the cartel must reopen its delicate, zero-sum negotiations, dividing shares among its members. Every reallocation is an opportunity for disputes, and while the negotiations proceed (often slowly), many members will act on their incentive to exceed their pre-shock production quota. Furthermore, if the disruption is caused by infighting among cartel members—as it was during the Iran-Iraq War and after Iraq's invasion of Kuwait—the odds of a smooth, coordinated cartel response are slim.¹⁶ Because OPEC cartel members tend to possess most of the world's spare capacity, the breakdown of cartel discipline in the wake of a shock can trigger major increases in global oil production.¹⁷

Of course, increased production alone is no panacea for consumers. Spare capacity cannot be tapped instantly, and in rare circumstances, the world's producers max out their pumping capacity, leaving little slack for

¹⁴ Debora L. Spar, *The Cooperative Edge: The Internal Politics of International Cartels* (Ithaca: Cornell University Press, 1994), 15–20, 24–26; Evenett, Levenstein, and Suslow, "International Cartel Enforcement," 1224; Griffin and Xiong, "The Incentive to Cheat," 307–8. Cartel leaders are big enough participants in cartel bargaining that they have selective incentives to provide some level of public goods (or club goods) within the cartel. See Theodore H. Moran, "Managing an Oligopoly of Would-Be Sovereigns: The Dynamics of Joint Control and Self-Control in the International Oil Industry Past, Present, and Future," *International Organization* 41, no. 4 (Autumn 1987): 604–6; Ethan B. Kapstein, *The Insecure Alliance: Energy Crises and Western Politics since 1944* (New York: Oxford University Press, 1990). Saudi Arabia has used spare production capacity to enforce OPEC discipline in the past. John S. Duffield, "Oil and the Iraq War: How the United States Could Have Expected to Benefit, and Might Still," *Middle East Review of International Affairs* 9, no. 2 (June 2005): 122–23.

¹⁵ Griffin and Xiong, "The Incentive to Cheat," 299; Evenett, Levenstein, and Suslow, "International Cartel Enforcement," 1224; Douglas R. Bohi and William B. Quandt, *Energy Security in the 1980s: Economic and Political Perspectives* (Washington, DC: Brookings Institution, 1984): 2–3, 18.

¹⁶ Philip K. Verleger, Jr., "OPEC after the War: A New Alliance between the U.S. and Big Gulf Producers Weakens the Cartel," *Institutional Investor* 25, no. 4 (April, 1991): E17. This discussion of cartel management has presumed rational behavior on the part of all cartel members, but personalities, egos, and domestic politics are likely to play a role in the idiosyncratic bargaining relationships within the cartel. Deviations from rational decision making are likely to increase the chance of wartime overproduction still further. Cool-headed decisions that put the long-term health of the cartel ahead of short-term profits are probably less likely during the chaos of wars, so overproduction is likely.

¹⁷ This does not suggest that oil consumers would necessarily benefit from greater instability and conflict in oil-producing regions. Conflicts can increase prices by triggering panics or hoarding, as described below. But the consequences of oil shocks are mitigated because shocks often disrupt cartel management, bringing some of the cartel's spare capacity on line.

crises.¹⁸ But market incentives and the political challenges of cartel management mitigate the consequences of most disruptions.¹⁹

Private Inventories

Commercial firms hold large private inventories of oil, which help shield global markets from supply shocks.²⁰ The amount of oil in commercial stockpiles varies with market conditions, but commercial stocks in the United States alone often hold between one and two billion barrels—that is, they are roughly twice as large as U.S. government stockpiles (described below).²¹

In normal times, companies use their private stocks to smooth out the day-to-day fluctuation in oil deliveries and to account for routine delays caused by weather, small-scale accidents, labor unrest, or political disruptions.²² But the private inventories, held by companies as part of their prudent normal operations, also provide a valuable buffer for the global economy. Much like oil exporters, inventory holders are potential suppliers in the market. They are just suppliers who pump oil out of storage tanks rather than out of geologically determined underground reservoirs. For example, a flare-up of violence in Nigeria could remove up to two million barrels a day from global markets. In such a contingency, prices would rise, and firms would have an incentive to tap their inventories. The inventory holders might consume oil directly from their own stocks, or they might sell oil from their stocks to other consumers. Either way, they would in essence put oil back on the market, compensating for the disruption.

The existence of privately owned storage space does not always mitigate short-term disruptions. If buyers expect conditions to worsen after an

¹⁸ For example, OPEC leaders may have exhausted their spare capacity briefly around the time oil reached its peak price in 2008. Joe Barnes and Amy Myers Jaffe, "The Persian Gulf and the Geopolitics of Oil," *Survival* 48, no. 1 (Spring 2006): 144–46.

¹⁹ Analysts who believe that global production has reached its peak may wonder whether future spare capacity will be sufficient to cover supply disruptions. But whether or not one subscribes to "peak oil" theory—which tells us that "normal" daily production will decline—we should expect some of the major oil producers to retain significant spare capacity. Cartels exist to keep capacity off-line, and cartel leaders use spare capacity to discipline member states. As long as OPEC exists, there will be slack. Peak oil theory implies that total daily production will decline, not that producers will eschew the value of keeping some spare capacity. Indeed, if the peak oil leads to increasing geographic concentration of oil supplies in OPEC producers, as many proponents of the theory predict, then we might expect that OPEC will become more rather than less important in the future oil market. That outcome could even increase the normal level of spare production capacity in the global oil market. For the argument that future oil output will concentrate in OPEC members, see Klare, "Blood and Oil." See also oil market forecasts, EIA, *International Energy Outlook 2009*, table G1, <http://www.eia.doe.gov/oiaf/ieo/ieopol.html>.

²⁰ Jerry Taylor and Peter Van Doren, "The Case against the Strategic Petroleum Reserve," Policy Analysis No. 555 (Washington, DC: Cato Institute, 21 November 2005).

²¹ Eugene Gholz and Daryl G. Press, "All the Oil We Need," *New York Times*, 20 August 2008.

²² Philip K. Verleger, "Explaining the Unexplainable: Crude Oil Prices—A Review of Theoretical Hypotheses, 1950–2006, and Empirical Evidence," *Petroleum Economics Monthly* (November 2006), <http://www.pkverlegerllc.com/PEM-WEB.PDF>; Hamilton, "Understanding Crude Oil Prices," 5–7.

initial shock, they may react by increasing their holdings or hoarding, rather than by selling from inventory.²³ Consequently, global demand for oil may sometimes increase in the middle of a crisis, sharply driving up prices. Some of this hoarding behavior may be irrational, based on unfounded fears, but when buyers calculate that a shock presages a higher rate of disruptions in the future, some of that behavior is rational. Hoarding can even benefit consumers: if the hoarders are right and the supply shocks recur, that hoarded oil will be available, allowing those with large stocks to use them or sell them, putting oil back on the market.

Overall, shortages and increased prices tend to draw stockpiled inventories into the market. As a result, the massive private inventories act as shock absorbers for the companies holding them, and they also smooth the ride for the global economy.

Government-Controlled Inventories

Many countries maintain strategic petroleum stockpiles under the direct control of the government to ensure access to oil during supply shocks.²⁴ For example, the United States holds approximately seven hundred million barrels of crude in strategic reserves; the European members of the International Energy Agency hold approximately four hundred million barrels, half as crude oil and half as refined product stocks. In East Asia, Japan, China, and South Korea hold large reserves. In other words, the United States and its closest allies control more than 1.4 billion barrels of ready-to-deploy oil. Consumer governments make the decision on whether to release this oil, and the first barrels could be auctioned and pumped into the market in a matter of days.

Analysts often criticize these stockpiles—too harshly.²⁵ At first glance, these stocks appear woefully inadequate. For example, the United States consumes roughly nineteen million barrels of oil per day (mb/d), so a seven hundred million barrel reserve would last less than six weeks. Furthermore, the maximum flow rate of oil out of the U.S. Strategic Petroleum Reserve is far lower than 19 mb/d. This criticism, however, misses the mark because there is no plausible scenario in which the U.S. petroleum reserve would have to replace all nineteen million barrels of oil the United States consumes.

²³ Crane et al., *Imported Oil*, 21, 79; Michael Lynch, "Blood or Gold? Politics, Economics, and Energy Security" (paper presented at the MIT Security Studies Program Seminar, Boston, MA, March 2003), 19, 22, 24.

²⁴ Amy Myers Jaffe and Ronald Soligo, "The Role of Inventories in Oil Market Stability," *Quarterly Review of Economics and Finance* 42 (2002): 401–15.

²⁵ Much of the criticism of the size of the reserves is journalistic. For criticism of the management of the SPR, see David G. Victor and Sarah Eskreis-Winkler, "In the Tank: Making the Most of Strategic Oil Reserves," *Foreign Affairs* 87, no. 4 (July/August 2008): 70–83; Crane et al., *Imported Oil*, 79–80.

A better benchmark for these reserves would compare the size of the stockpile to the size of plausible disruptions. If, for example, the largest plausible disruption (after factoring in the other adaptations listed in this section) would leave the world 3 mb/d short, then the United States alone could replace every lost barrel for many months. The combined stockpiles of U.S. and allied governments could replace lost oil from most plausible disruptions, barrel-for-barrel, for well over a year.

Governments that hold large strategic petroleum stockpiles try to avoid tapping them as a response to fluctuations in oil prices; their reserves can respond to temporary supply shocks but cannot change the long-term trends in global oil supply and demand.²⁶ Government stockpiles were not an antidote to the high oil prices of 2007–08, nor will they insulate the global economy if commodity prices rise sharply when the global economy recovers from the current recession. But if a fire, labor unrest, or a series of attacks on oil tankers reduces access to oil, governments can sell stocks to quickly add millions of barrels of oil to global markets.

Re-routing Transportation

Seaborne transportation is the most rapidly adaptable part of the energy industry. Oil tankers can change routes to avoid troubled waters (for example, war zones and pirates), and in some cases, oil exporters can offset reduced tanker traffic by increasing the flow through pipelines or offset pipeline disruptions through increased tanker traffic.

Maps of peacetime shipping routes create the illusion of energy vulnerability: the global economy appears to hinge on keeping the shipping arteries clear of disruptions. But this vulnerability is an illusion. Shipping patterns are chosen because they are the most efficient routes in normal circumstances; when threats arise, shippers compare their normal patterns to their next best alternative and pick the best option. The global energy transport industry is not like a body's circulatory system. It is more like the World Wide Web where packets are re-routed around blockages to get to their final addresses.

This simple point is often overlooked when analysts talk about threats to shipping. For example, many analysts worry about threats to tanker traffic through the Strait of Malacca, a popular route for ships traveling between the Middle East and East Asia. But if tanker traffic were harassed there, captains could simply sail through the Straits of Lombok and Makassar instead—a minor diversion.²⁷

²⁶ Even political leaders who do not understand the market quite this clearly fear criticism for “politicizing” a strategic asset, so they hesitate to release oil from reserves in any scenario that does not follow a crystal-clear, short-term shock like a major political-military crisis or a specific extreme weather event.

²⁷ Sailing through the Straits of Lombok and Makassar instead of Malacca would add approximately 10 percent to the shipping time from the Persian Gulf to East Asia. Because shipping costs constitute less

The implication is not that oil transport is immune to disruption; in fact, a few key waterways are particularly important because alternative routes add significant time and expense. If the Suez Canal were blocked, the best shipping route from the Middle East to Europe would pass all the way around the southern tip of Africa. Similarly, the Strait of Hormuz—arguably the world's only true chokepoint—is the only sea passage out of the Persian Gulf. The key point is that disruptions to the transportation network trigger rapid adjustments: tankers re-route and pipelines max-out, getting oil back on the market.

Summarizing the Four Mechanisms

Every shock will trigger a different mix of specific responses, but the overall effect will tend to restore (or exceed) the pre-shock level of supply, mitigating the post-shock price increase. Short-term disruptions encourage producers with spare capacity to bring extra oil into the market, firms holding large inventories to draw from their stocks, cartel members to squabble over who gets to replace the lost oil, and tanker masters to reroute to avoid trouble. They all see opportunity to increase profit or avoid a potential loss. Very large shocks also lead governments to tap their vast petroleum reserves.

MARKET ADAPTATION IN HISTORY

Since the post-1973 creation of the modern oil market, six major supply disruptions show the various adaptation mechanisms in action: (1) Iranian oil industry strikes in 1978; (2) the collapse of the Iranian oil industry in 1979; (3) the start of the Iran-Iraq War; (4) the "Tanker War" phase of the Iran-Iraq War; (5) the 1990 Iraqi invasion of Kuwait; and (6) the 2002–03 strikes in the Venezuelan oil fields.²⁸ In five of these cases, adaptation rapidly replaced the missing barrels on the supply side of the market. The purpose of the six case studies is not merely to see if oil prices rose and fell in a way consistent with the patterns we expect but also to see whether the mechanisms of the theory are borne out.

Several factors make these cases particularly useful for evaluating the extent of oil market flexibility. In each case, the supply disruption resulted from a political shock (unrest or military attacks). Second, the volume of oil

than 10 percent of oil costs at the refinery, the net cost of the extra transportation time would be small. On sea routes and alternatives, see John H. Noer, *Chokepoints: Maritime Economic Concerns in Southeast Asia*, with David Gregory (Washington, DC: National Defense University, 1996).

²⁸ All data on oil production levels and prices are from EIA. Prices reflect the refiner acquisition cost of oil and are quoted in U.S. dollars for 2000. The price data series is available at http://tonto.eia.doe.gov/dnav/pet/hist/r1300_____3m.htm.

denied to world markets was substantial. In the least serious case, Venezuelan strikes reduced that country's production by 2.3 million barrels per day, a 3 percent drop in world production. In the most serious instance, the 5.3 mb/d of Iraqi and Kuwaiti oil lost in 1990 was 9 percent of world production. Finally, to varying degrees, each event surprised world markets, so the disruption and adjustment can be observed using aggregate data on oil production and price. In contrast, the 2003 U.S. invasion of Iraq was widely anticipated, so markets gradually adjusted, beginning before the conflict. Sudden, major supply disruptions are the ones that most stress the adaptation mechanisms, so if the mechanisms work in those cases, they should likely work even better in more stable times.

Iranian Oil Strikes and Unrest, 1978–79

In 1978 opponents of the Shah began to organize strikes in Iran that specifically targeted the oil industry. The strikes took a heavy toll on Iranian oil production. In October 1978 Iran had been the second biggest oil producer in OPEC, pumping 5.5 mb/d. But the strikes and the chaos that erupted after the Shah left the country in January sent output into freefall. By January 1979 Iranian production had dropped to only seven hundred thousand barrels of oil per day.²⁹

Although Iranian supply plummeted, other producers increased output to compensate, mitigating the effect on global markets. In fact, other oil producers, aware of the growing civil conflict in Iran, were already expanding their output when Iran began to contract. By January, when Iran's production was at its nadir (down 4.8 mb/d), other country's increases meant that the world was short only 2.8 mb/d. World production increased slightly in February, cutting the net loss in world supply to 2.4 million barrels. In March the Iranian oil industry began to recover, and by April total world supply had recovered entirely.

Surprisingly, oil prices did not increase much in response to the disruptions in Iran. Prices remained at their pre-revolution level of \$27 per barrel through December, then climbed to \$28 and remained there through March (these and other figures expressed in year 2000 dollars). Oil prices did begin to climb in April 1979, but this was after world supply had fully rebounded from the fall 1978 disruptions. The spring 1979 uptick began when markets realized that future shortages were likely because the new Iranian regime would not cooperate with the major oil companies; this was the preliminary to the much more dramatic oil crisis of fall 1979.

²⁹ John D. Stempel, *Inside the Iranian Revolution* (Bloomington: Indiana University Press, 1981), 155; Kamran Mofid, *The Economic Consequences of the Gulf War* (London: Routledge, 1990), 9–10.

Khomeini and the Decay in Iranian Production, October 1979–August 1980

In February 1979 the Ayatollah Khomeini returned to Iran from exile. Khomeini and his supporters spent the next few months consolidating political power, including control of the oil industry. Iran's new leaders were deeply ambivalent about Iran's role as an oil exporter. They understood that in the short-term Iran could only pump significant quantities by cooperating closely with the western oil companies. But this cooperation, they believed, corrupted the Islamic Republic, and those same corporations had supported the Shah. Through 1979 the new Iranian government increasingly distanced itself from the western oil majors.³⁰ As cooperation deteriorated, so did Iranian oil production.³¹ In October 1979, eight months after Khomeini came to power, Iran still produced 4 mb/d, but by February 1980 Iranian output was only 2.8 mb/d. By May it dropped to 1.5 million.

The 1979–80 collapse of the Iranian oil industry is the only case where the global response does not fit the expected pattern. Other oil producers did not increase their output. To the contrary, in 1980 the Saudis led OPEC in production cutbacks. By the end of the summer, Iranian production was down by over 2 mb/d (compared to the summer of 1979³²), and non-Iranian production was down by an additional 1.8 million barrels.

Not surprisingly, prices surged dramatically. In fact, soon after Khomeini took power (and eight months before the Iranian oil industry's actual collapse), oil wholesalers recognized the potential for trouble ahead and began to fill stockpiles. As demand (from wholesalers) increased, prices began to rise steadily starting in April 1979, six months before the Iranian production shortfall. When the Iranian oil industry finally imploded in the fall, oil prices rose higher, causing wholesalers to panic and increase their stocks further to shield themselves from even higher future prices. Their panic buying created a self-fulfilling prophecy.³³ The net effect of the two Iranian oil disruptions (1978 and 1979) was to double prices, from about \$27 per barrel in the fall of 1978 to about \$53 in the summer of 1980.³⁴ Oil prices stabilized briefly

³⁰ Stempel, *Inside the Iranian Revolution*, 159.

³¹ Daniel Yergin, *The Prize: The Epic Quest for Oil, Money, and Power* (New York: Simon & Schuster, 1991), 685.

³² The summer 1979 is a good baseline because by then production had stabilized from the earlier (1978) Iranian oil strikes.

³³ Yergin, *The Prize*, 685. Note that this case shows both the rational and the irrational sides of hoarding: early increases in private inventories show a helpful adaptation mechanism in action, and post-spike panic buying temporarily exaggerated the effect of the supply disruption.

³⁴ During this crisis, the U.S. Strategic Petroleum Reserve was still in its infancy, only filled with fewer than 250 million barrels of oil. President Jimmy Carter temporarily suspended purchases of additional oil for the reserve, in effect putting some oil back on the market compared to the planned trajectory of steady government purchases, but he did not release oil that had already been stockpiled. This policy choice should count as a partial success for SPR-based adaptation during an oil crisis. For a detailed history, see

at \$53 per barrel in the late summer/early fall 1980, just in time for Iraq to invade Iran.

One of the big puzzles for oil economists is why OPEC reduced output in the face of falling Iranian oil production. If the cartel had felt in early 1978 that the prevailing price was far too low, it could have reduced production to boost prices, but it did not do this. On the other hand, if the major OPEC members were satisfied with 1978 prices, they should have increased production throughout 1980 to counteract soaring oil prices. So why did the cartel members prefer to sell oil at about \$27 per barrel in 1978 then suddenly change their minds and sell at \$53 in late-1979?

One plausible hypothesis is that the Gulf monarchs were stunned by the Iranian revolution, and increased concern about their own domestic stability made them—particularly the Saudis—susceptible to pressure from Islamic fundamentalists or Palestinian groups to punish the West by raising oil prices.³⁵ Unfortunately, this hypothesis cannot be confirmed without detailed evidence on internal Saudi decision making, evidence that is unlikely to ever become available due to understandable Saudi secrecy. But even though we have a reasonable, ad hoc hypothesis to explain the surprising lack of adaptation in this case, the oil-market outcome in 1980 should somewhat reduce our confidence that adaptation mechanisms will generally insulate the United States from oil supply disruptions.

Outbreak of the Iran-Iraq War

In September 1980 Iraq invaded Iran. The belligerents attacked each other's oil facilities with devastating effect. After one month of fighting, Iraqi oil production had plummeted from approximately 3.3 million barrels per day to one hundred forty thousand.³⁶ For Iran, the fighting began in the midst of Tehran's post-revolution production collapse (described above). In the year prior to the outbreak of war, Iranian oil output had already tumbled by 63 percent, and it was still falling when Iraq attacked.³⁷ But the war exacerbated Iran's oil troubles. After one month of fighting, Iranian production was down from 1.5 million to 500,000 barrels per day.³⁸

Not surprisingly, the supply interruption triggered a surge in oil prices. The month before the war erupted, a barrel of oil sold for \$53. By January 1981 crude sold for \$62, and average prices hit their peak of nearly \$66 per barrel in February.

Bruce A. Beaubouef, *The Strategic Petroleum Reserve: U.S. Energy Security and Oil Politics, 1975–2005* (College Station: Texas A&M University Press, 2007), chap. 3.

³⁵ William B. Quandt, *Saudi Arabia in the 1980s: Foreign Policy, Security, and Oil* (Washington, DC: Brookings, 1981), 130–32; Yergin, *The Prize*, 704.

³⁶ Mofid, *Economic Consequences*, 38.

³⁷ These figures compare Iranian production in October 1979 and August 1980.

³⁸ Yergin, *The Prize*, 711.

In response, the world's oil producers—including the belligerents—quickly increased production. Iran and Iraq badly needed oil revenue for their life-or-death struggle. Iran's production increased from five hundred thousand barrels in October to about 1.5 million in December, matching pre-war output. Iranian production leveled off there for nearly a year. Iraq also struggled to repair its oil facilities, slowly increasing output for six months to 1.0 mb/d in March 1981, well below its pre-war level.³⁹

Meanwhile, other exporters moved quickly to reap the benefits of higher prices.⁴⁰ Non-belligerent oil producers increased output by nearly 1 mb/d in October, increased again in November to 1.3 mb/d over pre-war levels, and again in December to 1.9 mb/d above peacetime production. In other words, after only two months of response, the world had replaced nearly all of the missing oil, leaving a net shortfall of only two hundred thousand barrels per day out of sixty million. Total world production fluctuated near pre-war levels through the spring of 1981.

As oil supplies rebounded, prices dropped, albeit more slowly. Prices fell gradually through 1981 from February's \$66 peak to \$60 by June and \$57 by December. Oil prices finally dropped below pre-war levels in March 1982, a year and a half after the war began.

The Iran-Iraq War and the rapid fluctuation in oil supplies made cartel management harder.⁴¹ When oil prices began to fall in 1981, Saudi Arabia tried to lead an OPEC production cut. Despite repeated Saudi cuts, other suppliers overproduced, enriching themselves at the cartel's expense. The utter breakdown in cartel discipline is reflected in the dramatic shift in output within OPEC from 1981 through 1985. In August 1981 the Saudis produced 49 percent of OPEC's output. After five years of one-sided cuts, Saudi production only accounted for 16 percent of OPEC output. In 1985 the Saudis decided they had suffered enough for their uncooperative cartel partners: they opened the spigots and within four months doubled their daily production, driving oil prices into the sand.⁴² As predicted, disruptions and price spikes are bad for cartel management. The result in this case was a decade of falling oil prices.⁴³

In sum, the outbreak of the Iran-Iraq War was a disaster for Iranian and Iraqi oil revenues. But the world oil industry adjusted rapidly: within three months oil production had returned approximately to pre-war levels. Prices remained above their pre-war levels for longer (eighteen months), but the war coincided with dissent in the cartel and a steady drop in prices.

³⁹ Mofid, *Economic Consequences*, 16.

⁴⁰ Yergin, *The Prize*, 713.

⁴¹ Avshalom Rubin, "The Double-Edged Crisis: OPEC and the Outbreak of the Iran-Iraq War," *Middle East Review of International Affairs* 7, no. 4 (December 2003): 1–14.

⁴² Yergin, *The Prize*, 748.

⁴³ Oil prices hovered around \$50 per barrel through 1982 and declined through the \$40s in 1983 and 1984. After the Saudis increased production in 1985, prices plummeted below \$20 per barrel.

The Tanker War

As the Iran-Iraq War dragged on, Iraq sought to compensate for military setbacks by attacking Iranian oil ports and shipping. In March 1984 Iraq escalated its attacks by using advanced fighter aircraft and modern Exocet cruise missiles against oil tankers. Iran counterattacked tankers and cargo ships, punishing Iraq and also the Gulf monarchies that were providing financial support to Iraq.⁴⁴ Even in this case—high-tech attacks against commercial oil traffic in the most vital oil-producing region—the oil market adapted.⁴⁵

Data on oil production and prices demonstrate that the attacks on shipping did not disrupt oil markets. Had the attacks significantly reduced Iran's or Iraq's ability to export oil, production in those countries would have declined. To the contrary, oil production by the belligerents appears unaffected by Iranian and Iraqi attacks on tankers. In March and April, the first months of the Tanker War, total production by belligerents increased slightly (by approximately 200,000 b/d). It fell in May by 400,000 b/d but was back up in June. The tanker attacks did not disrupt exports enough to stem production. Nor did they affect prices.⁴⁶ The price of oil dropped steadily throughout the Tanker War. Increased cheating throughout the cartel explains the general trend, but no discernible blip in 1984 coincides with the attacks on tankers.

The Tanker War's negligible economic consequences are easy to explain. First, the Gulf producers adapted. With oil as their vital export, both belligerents took extraordinary steps to get the oil to market. Iraq built major new pipelines to the Mediterranean Sea through Turkey and to the Red Sea through Saudi Arabia and expanded its port facilities as far as possible from Iraqi bases.⁴⁷ To expand its market share, Iran lowered prices and even offered low-premium insurance to international merchants willing to serve its frequently targeted oil terminals.

Second, the volume of oil-related shipping in the Persian Gulf was so high in the 1980s that the missile, bomber, and mine attacks were unable to significantly reduce the supply of Persian Gulf oil. Less than one percent of Gulf tanker movements were attacked even when the belligerents intensively tried to disrupt the oil trade.⁴⁸ Flexible tanker captains also varied their routes through the Gulf rather than always remaining in the traditional shipping channels, making target location and identification more difficult for attackers. And shipping companies, led by the National Iranian Tanker

⁴⁴ Martin S. Navias and E. R. Hooton, *Tanker Wars: The Assault on Merchant Shipping during the Iran-Iraq Crisis, 1980–1988* (London: Tauris Academic Studies, 1996), 70–72, 112, 130–31. Initially most of Iran's attacks on ships used machine guns and Hellfire antitank missiles, but toward the end of the war, the Iranians fired quite a few Chinese-made antiship cruise missiles.

⁴⁵ Yergin, *The Prize*, 743.

⁴⁶ Nadia El-Sayed El-Shazly, *The Gulf Tanker War: Iran and Iraq's Maritime Swordplay* (New York: St. Martin's Press, 1998), 307.

⁴⁷ Navias and Hooton, *Tanker Wars*, 89, 177, 179; Mofid, *Economic Consequences*, 124–25.

⁴⁸ Navias and Hooton, *Tanker Wars*, 98, 130.

Company, adapted the mix of tankers they sent into the danger zone, shuttling the oil out on relatively low-value vessels and then transferring it to other tankers for the long transit to consumer ports.⁴⁹ Overall, the pattern of tanker traffic simply adjusted to the new conditions, and oil trade continued.

For years, Iran and Iraq attacked each other's oil industries, but a global production glut drove the world price of oil steadily downward.⁵⁰

1990–91 Persian Gulf War

On 2 August 1990, Iraq conquered Kuwait. Within days of the invasion, the United Nations enacted an embargo, and the world market suddenly lost access to 5.3 mb/d of Iraqi and Kuwaiti production. Oil prices spiked. A month before the invasion, a barrel of crude cost slightly less than \$20. In August the average price jumped to \$29. It jumped again to \$37 in September and to \$40 in October.

The disruption quickly triggered countervailing responses. Some analysts have criticized President George H.W. Bush for not immediately releasing a large quantity of oil from the U.S. Strategic Petroleum Reserve.⁵¹ But such a release was not necessary, although it might have calmed some fears and accelerated a return to pre-invasion price levels. Other oil producers increased their production to offset the disappearance of Iraqi and Kuwaiti oil from world markets. By September—only one month after the invasion—net world production was only down 1 mb/d, and by November global production had recovered completely. Total production hovered at or above pre-war production levels throughout the war, which ended in February 1991.

As world oil production returned to pre-war levels, the price began to drop. The price peaked in October 1990 at \$40 a barrel. By December it was down to \$32, and by February it had fallen to \$23. In the first month after the war, March 1991, the average price for crude oil was \$21.

Skeptics might wonder whether the surge in oil production in 1990 occurred because of the normal adaptation mechanisms or whether U.S. Persian Gulf allies pumped more as a quid pro quo for U.S. protection from Iraq. The United States pressured Saudi Arabia to increase oil production, but the market mechanisms were clearly at work, too: the price spike motivated oil producers to increase output. For example, Iran, the country in the Persian Gulf least beholden to the United States, increased production by 10 percent in response to the war-induced oil shock. Libya, in no danger from Iraq and

⁴⁹ See Eugene Gholz and the IJ School Hormuz Working Group, "Threats to Oil Flows through the Strait of Hormuz" (unpublished manuscript, March 2010).

⁵⁰ Eliyahu Kanovsky, "Economic Implications for the Region and World Oil Market," in *The Iran-Iraq War: Impact and Implications*, ed. Efraim Karsh (London: Macmillan, 1989).

⁵¹ Victor and Eskreis-Winkler, "In the Tank."

unlikely to receive military help from America, increased production by 15 percent. Indonesia, Algeria, and Nigeria, none of whom were threatened by Iraq, all increased production. Saudi Arabia accounted for most of the adjustment but only because it had more slack capacity than other OPEC members. The bottom line is that oil producers responded to the 1990 oil shock exactly as predicted: they replaced the lost Iraqi and Kuwaiti oil as quickly as possible.

Venezuelan Oil Strike, 2002–03

In early December 2002 strikes crippled the Venezuelan oil industry.⁵² Prior to the strikes, Venezuela had produced 3 mb/d, the third highest in OPEC; in December production plummeted 66 percent. January was even worse with Venezuela's total production falling to 630,000 barrels. The massive production shortfall by OPEC's third-biggest producer triggered steep price increases. The average price in November (before the strike) was \$25 per barrel. By December prices climbed to \$27 and the kept climbing, averaging \$30 per barrel in January 2003.

The oil industry responded almost immediately to the unexpected loss of Venezuelan oil from world markets. By January 2003, only one month into the strike, other oil producers had stepped into the market void, replacing 1.5 mb/d of the 2.3 mb/d Venezuelan shortfall. By February the world had entirely replaced lost Venezuelan oil and even overshot pre-crisis output. The Venezuelan government sent troops and other government workers into the oil fields to get the badly needed oil revenue flowing again, but the country's production was still down by 1.5 mb/d in February. Non-Venezuelan production, however, was up by 2.2 mb/d, meaning that total world supply was seven hundred thousand barrels per day higher than it had been before the strike. Global oil production continued to rise; Venezuelan output improved, and other producers kept their taps wide open. By March world production was 1.2 mb/d above pre-strike levels. The glut, and the fall in prices it triggered, came to an end in April, as oil producers around the world trimmed excess production to revert to pre-strike levels.⁵³

Not only did production levels adjust, so did oil prices. Prices lagged slightly behind the recovery in oil production, peaking in February (averaging \$33 per barrel) but falling sharply in March. By April, the Venezuelan oil shock was over.

⁵² Daniel Yergin, "Ensuring Energy Security," *Foreign Affairs* 85, no. 2 (March/April 2006): 73.

⁵³ As in the 1990 Gulf War case, economic adjustment rather than political pressure from Washington caused the increased oil production. By February 2003 America's friends—Saudi Arabia and Kuwait—had increased their oil production by 10 percent and 6 percent, respectively. But OPEC producers without close political ties to the United States had also increased production: by February Iran had increased by 6 percent, Libya by 4 percent, and Nigeria by 10 percent.

Summary of the Cases

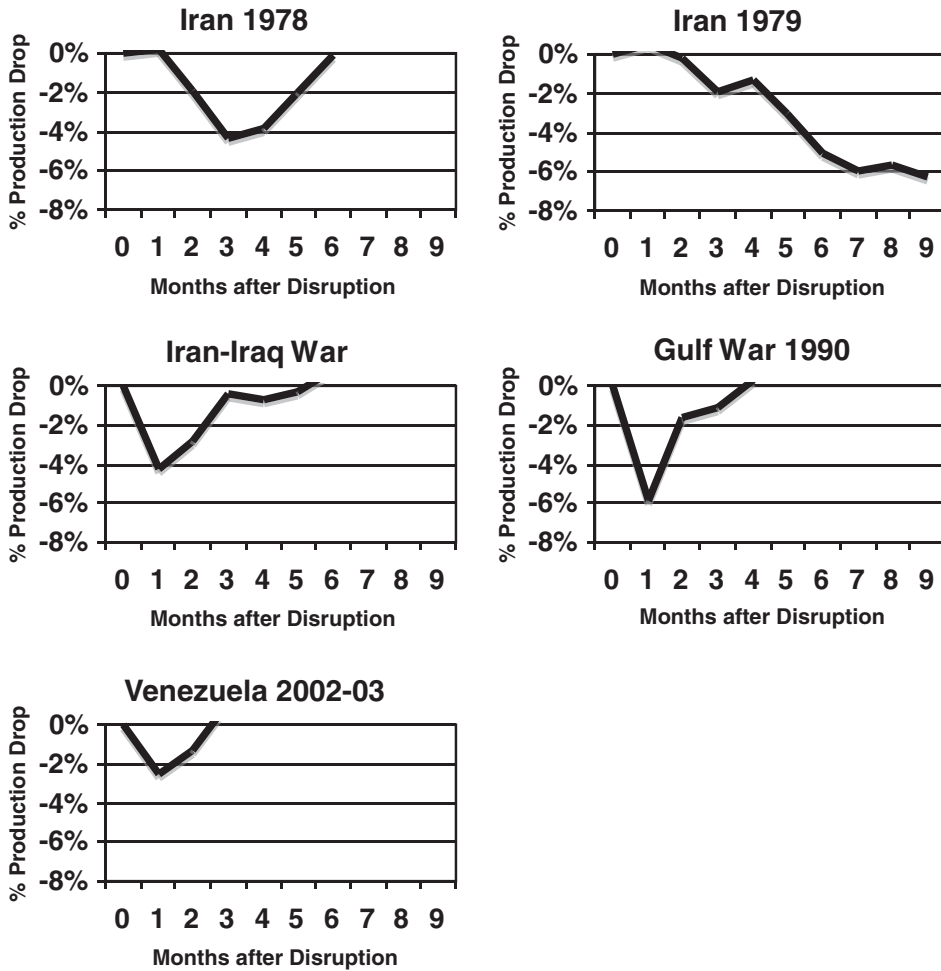
The evidence from these oil disruption cases generally confirms our expectations of market adaptation. The cases reveal four key findings. First, in five of the six cases (the exception is the 1979 Iran disruption), major reductions in any country's oil production quickly triggered compensating increases elsewhere. The 1978 disruption in Iran (nearly 5 mb/d lost) was replaced in six months. The outbreak of the Iran-Iraq War (3 mb/d lost) was fully replaced in five months. The 5 mb/d shortfall after Iraq's invasion of Kuwait was replaced even faster, in only four months. And it only took three months in 2003 to replace the 2.3 mb/d of Venezuelan production disrupted by strikes. Figure 1 tracks the decline and recovery of oil production in these cases.⁵⁴

Second, in five of six cases (with the same exception) oil prices either remained nearly constant or quickly returned to pre-disruption levels. The 1978 Iranian oil strikes did not have a significant effect on prices—they remained at the \$27–28 per barrel level until the disruption was resolved. Although the outbreak of the Iran-Iraq War triggered a jump, oil prices returned to pre-war levels in about eighteen months. Iranian and Iraqi attacks on shipping during the Tanker War had no discernible effect on global supply or prices. Even after the Iraqi invasion of Kuwait and the subsequent UN embargo, oil prices dropped to pre-war levels in eight months. The Venezuelan oil strikes also caused only a brief spike in oil prices; within five months prices were back to their pre-war level. Figure 2 shows the increase in oil prices after each of these disruptions and their recovery over time.

Third, international oil markets appear increasingly efficient at replacing disrupted oil supplies, thereby reducing the duration of price spikes. Figures 1 and 2 show that the three most recent disruptions required the least time for markets to adapt, even though one of these three (the 1990 Gulf War) involved the greatest immediate shortfall. This finding is consistent with the argument that the invention of new international financial and investment tools since the 1970s has enabled sophisticated spot and futures markets for oil, facilitating quick market adjustments and allowing producers, wholesalers, refiners, and major consumers to smooth risks.

Finally, the Iran-Iraq War case provides excellent evidence about the intra-cartel bargaining problems that price spikes trigger. From 1981 to 1985 Saudi Arabia tried in vain to reestablish cartel discipline, but high and volatile oil prices encouraged cartel members to overproduce. As war raged in the Gulf, as the belligerents pumped oil as quickly as possible, and as the other OPEC members chose sides, finding OPEC agreements that the cartel members

⁵⁴ Note that one of the six case studies—the 1984 intensification of the Iran-Iraq War's attacks on oil shipments—does not appear in the figure because it never caused a significant reduction in global oil supply.



Source: U.S. Department of Energy's Energy Information Agency.

FIGURE 1 World Oil Production after Major Disruptions.

would keep became impossible. The West enjoyed the benefits of these disputes in the form of several years of cheap oil.

The Oil Market and the 2003 Iraq War

Critics of our interpretation of oil market adaptation might note that the 2003 war in Iraq coincided with an enormous increase in oil prices. In February 2003, the month before the U.S. invasion, a barrel of crude sold for \$32; by July 2008 the price had soared to \$128.⁵⁵ The war's effect on prices could

⁵⁵ Monthly average prices in current year (rather than constant) dollars.

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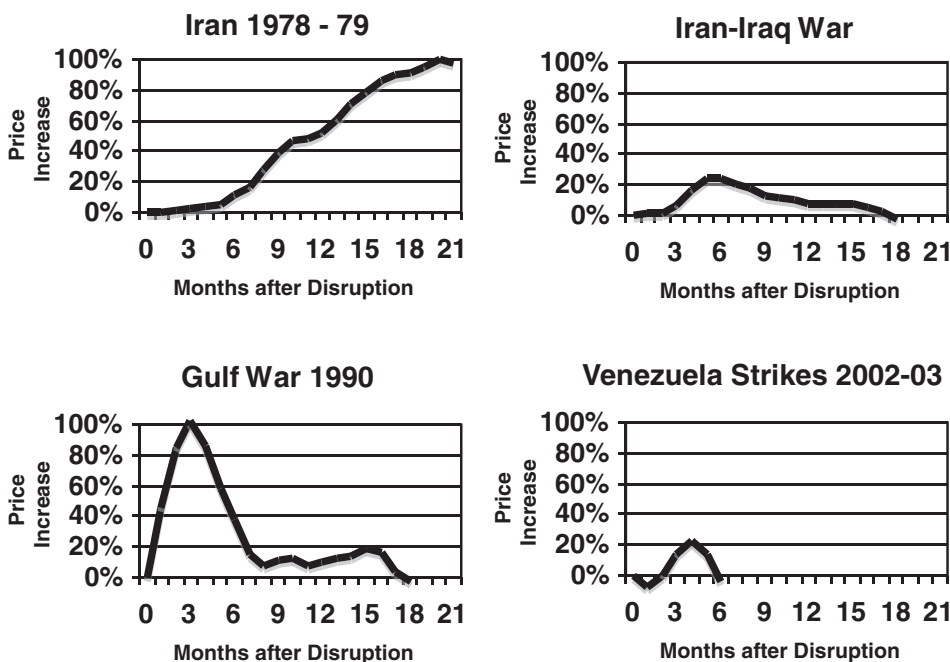


FIGURE 2 Price Shocks and Recovery after Major Disruptions.

be even greater: some of the war's price increase may have occurred before February 2003 as oil wholesalers increased their stores to hedge against disruptions. Critics may wonder why adaptation did not increase production enough to return prices to pre-war levels.

On careful examination, though, it is hard to attribute the oil price increase to the Iraq War. In fact, the fighting in Iraq had only a minimal, short-lived effect on global oil production. Prior to the war (in 2002), Iraq produced on average 2 mb/d. Iraq's production fell to 1.3 mb/d in 2003, but it had recovered by 2004 and has hovered around 1.9 mb/d in subsequent years. Other oil producers increased production to compensate for the short-term Iraqi shortfalls. In fact, global output in 2003 was 2.3 mb/d higher than in 2002. Global production increased by another 3.3 mb/d in 2004 and again by 1 mb/d in 2005, as we would expect in response to any increase in the price of oil (whether due to a politically induced supply disruption or some other cause). Net world production, therefore, was 6.7 mb/d higher in 2005 than in 2002, so the temporary supply disruption due to fighting in Iraq cannot be the principal cause of the recent higher prices.

Instead, the dominant cause of the price spike appears to be the steady increase in global demand.⁵⁶ Between 2002 and the 2008 financial crisis,

⁵⁶ Other factors clearly contributed as well. Yergin, "Ensuring Energy Security"; Suzanne Maloney, "The Gulf's Renewed Oil Wealth: Getting It Right This Time?" *Survival* 50, no. 6 (December 2008): 131-33.

demand significantly increased, most notably in China, India, and the United States. The global market response was predictable: rising prices caused oil production to increase by 10 percent from 2002 to 2005.

Baseline oil prices, driven by supply and demand (and modified by cartel bargaining), are not a national security problem for the United States. The U.S. military is not tasked with keeping oil prices below a certain threshold and lacks the tools to do so if it were. Rather, U.S. national security policy aims to prevent market disruptions—actions that could prevent producers from selling their petroleum to consumers. The case studies in this paper show that markets restore oil supply rapidly after disruptions, and the price surge during the Iraq conflict offers no evidence to question that finding.

DEFENDING OIL: WHAT SHOULD BE DONE?

Oil markets adjust to shocks, mitigating the duration and cost of disruptions. In three specific situations, however, these adjustments would be particularly painful. First, large-scale conquest in the Persian Gulf would limit adaptation because a regional empire could provide strong cartel leadership and because other oil producers would not have enough capacity to compensate for a reduction in the empire's output. Second, adjustment would be difficult if the Strait of Hormuz were blocked because non-Gulf suppliers would be unable to fully replace the bottled-up oil. Third, a major civil war in Saudi Arabia could disrupt enough of the world's oil supply that other producers would have difficulty expanding output to make up for the disrupted Saudi share.

U.S. military planning should focus on preventing those three specific disruptions. In other oft-cited scenarios—such as international wars between oil producers and interference with sea lanes other than the Strait of Hormuz—normal market adaptation would be swift, and no military action would be needed to protect U.S. oil interests. And even in the three worrisome scenarios, peacetime forward presence is not the best military strategy to protect American oil interests.⁵⁷

Preventing Conquest in the Persian Gulf Region

The majority of the world's oil reserves appear to be located in the Persian Gulf, close enough together that a regional empire could seize most of them. The good news is that the risk of major conquest in the Persian Gulf is at its lowest point in decades. This contingency does not present a demanding

⁵⁷ For a policy analysis comparing forward presence to an over-the-horizon force posture, see Eugene Gholz and Daryl G. Press, "Footprints in the Sand," *The American Interest* 5, no. 4 (March/April 2010): 59–67.

TABLE 1 Indicators of the Balance of Power in the Persian Gulf Region

	GDP (billion)	GDP per capita (thousand)	Mil. Spend (billion)	Pop (million)	Men 18–22 (million)
Iran	359	5	9.6	66	4.4
Iraq	76	3	n/a	29	1.6
S. Arabia	410	14	41.2	29	1.6

Source: IISS, *The Military Balance, 2010* (London: Routledge, February 2010).

Note: GDP and military spending data are for 2009, except Iran's defense spending, which is for 2008. Reliable figures for Iraq's military spending are not available. Shading indicates that a country scores particularly well in that category, relative to others in the region.

mission for the United States military, nor does it require any peacetime military presence in the region.

Economic and demographic factors suggest that only three countries—Iran, Iraq, and Saudi Arabia—could potentially dominate large swathes of the Persian Gulf region by force.⁵⁸ However, each has important gaps in national power that limit its offensive capabilities, now and into the foreseeable future (see Table 1). For example, Saudi Arabia has the region's highest GDP and spends nearly three times as much on defense as any other country in the region.⁵⁹ The Saudi population, however, is less than half of Iran's sixty-six million, and the Kingdom faces the possibility of domestic instability from both Sunni reformers and the Shiite minority.⁶⁰ Furthermore, the Saudi military is notorious for having modern equipment but poorly trained and unmotivated soldiers.⁶¹

Iran is the mirror image of Saudi Arabia. Iran has more than twice the Kingdom's population, but its GDP is substantially lower. On a per capita basis, Iran's GDP is only \$5,400, just over a third of the level in Saudi Arabia. Therefore, Iran does not have much money to spend on its military, explaining its paltry \$9.6 billion per year defense budget (Saudi spends \$41 billion). Since the 1979 Iranian revolution, Iran has relied on a large, poorly trained military that Iranian leaders hope has sufficient zeal to defend the country. The equation worked—barely—in the 1980s when Iraq invaded Iran.⁶² But the Iranian military has essentially none of the modern weapons and

⁵⁸ This discussion applies the material sources for national military power identified in John J. Mearsheimer, *The Tragedy of Great Power Politics* (New York: W.W. Norton, 2001), 60–67.

⁵⁹ Figures cited throughout this section for GDP, defense spending, and population are drawn from International Institute for Strategic Studies (IISS), *The Military Balance, 2010* (London: Routledge, 2010).

⁶⁰ Yetiv, *Crude Awakenings*, 46–48. The Saudi Shiites predominantly live in the oil-rich Eastern Province.

⁶¹ Kenneth M. Pollack, *Arabs at War: Military Effectiveness, 1948–1991* (Lincoln: University of Nebraska Press, 2002).

⁶² Kenneth M. Pollack, *The Persian Puzzle: The Conflict between Iran and America* (New York: Random House, 2004), 191, 194–95, 220, 228–33.

advanced training required to pose a serious offensive military threat to Iran's neighbors.⁶³

Iraq was once the most powerful country along the Persian Gulf littoral. It boasted the region's second-biggest population, annual oil income that rivaled Iran, and a military that was unmatched in the region. But two disastrous wars, thirteen years of sanctions, and seven years of insurgency have crippled the country: it will have virtually no offensive military power for the foreseeable future. Iraq seems more likely to roil markets because of its weakness (which allegedly invites predation from its neighbors) than because it might launch a bid for hegemony.

A U.S. military policy of over-the-horizon deterrence could ensure that Gulf oil is secure from military conquest.⁶⁴ First, the United States can (and should) issue a clear deterrent threat to any aspiring regional hegemon: if you try to conquer your neighbor's oil, the United States will make sure you fail. This U.S. threat should be very credible because the United States has a powerful interest in keeping Persian Gulf oil divided, and that interest is evident to regional actors.⁶⁵ Second, if deterrence fails, the U.S. military could halt an offensive quickly, even if the United States had no peacetime forces in the region. Decimating armies on the move is one of the things that the U.S. armed forces do best.⁶⁶ An Iraqi army advancing down the Saudi coastal highway would be highly vulnerable to U.S. carrier-based airpower and long-range bombers. Iraqi forces advancing into Iran or Iranian forces invading Iraq would be nearly as vulnerable. If necessary, American ground forces could reverse any gains that an adversary made, and the prospect of that reversal would deter attacks even if U.S. ground forces maintained no local deployment during peacetime.

Protecting Sea Lanes

Most oil exports are carried by tankers that sail through narrow sea lanes. Tankers traveling from the Persian Gulf to East Asia pass through the Straits

⁶³ IJSS, *The Military Balance*, 242–44.

⁶⁴ Yetiv argues that the U.S. military presence in the Persian Gulf region encouraged "oil stability." He skillfully documents the steady increase in U.S. military access and presence during the 1980s and 1990s, but he merely assumes that this increased presence stabilized oil markets. He also does not explain which essential military missions in the Gulf require forward U.S. military presence. Yetiv, *Crude Awakenings*, 59ff.

⁶⁵ The bias in the region tends to explain most U.S. actions as attempts to secure (or steal) Gulf oil, so it should be easy to convince would-be aggressors that the United States would fight to maintain the current division of oil reserves.

⁶⁶ Barry R. Posen, "Command of the Commons: The Military Foundation of U.S. Hegemony," *International Security* 28, no. 1 (Summer 2003): 5–46. Even analyses highlighting the limitations of U.S. airpower agree that American airpower can utterly destroy ground forces advancing in the open. See, for example, Daryl G. Press, "The Myth of Airpower in the Persian Gulf War and the Future of Warfare," *International Security* 26, no. 2 (Fall 2001): 9, 12, 40.

of Malacca and near the contested Spratly Islands. Similarly, most exports from the Gulf to Europe pass through the Suez Canal. And all the oil that is loaded on tankers in the Persian Gulf is carried through the Strait of Hormuz, the narrow waterway that divides Oman from Iran. Many analysts worry that disruptions in these waterways could stop the flow of oil, force tankers to take much longer (more expensive) routes, or drive up shipping-insurance costs, substantially increasing the price of oil.⁶⁷ However, few straits are really chokepoints; military campaigns to close straits are actually quite difficult operations beyond the capabilities of potential adversaries; and an over-the-horizon American force posture would deal as well with the threat as peacetime forward deployment.

Threats emanating from these strategic chokepoints are greatly exaggerated because the market can adapt to disruption: low-cost alternative routes are available for all of the straits except one. For example, if tankers traveling from the Persian Gulf to East Asia bypassed the Straits of Malacca entirely, oil prices in Japan would increase by less than half a percent.⁶⁸ Similarly, even though tankers' peacetime routes pass near the Spratly Islands, avoiding the South China Sea entirely would have a trivial effect on shipping time or oil prices.⁶⁹

The world's most significant oil chokepoint is the Strait of Hormuz, the only sea passage that connects the Persian Gulf to the rest of the world. Eighty-eight percent of Gulf oil exports travel through the strait, some seventeen million barrels per day. The pipelines that carry the remainder of Gulf exports do not have enough slack capacity to compensate if the strait were closed.⁷⁰ Even worse, many of the countries that typically retain the greatest slack capacity to extract oil from the ground—for example, Saudi Arabia and Kuwait—would be bottled up if the strait were blocked, meaning that the adaptation to disruption there would have to come from second-tier oil producers outside the region. The adaptation mechanisms would still work: non-Gulf oil producers would increase production; firms holding private inventories would consider tapping them; and countries could access their strategic stockpiles. Fully replacing the lost oil, however, would be very

⁶⁷ Yergin, "Ensuring Energy Security," 78; Carola Hoyos and Gareth Smyth, "Iran Weapons Test Drives Up Oil Prices," *Financial Times*, 4 April 2006.

⁶⁸ Noer, *Chokepoints*, 1–2, 33–35, 41–47, esp. table 16 and 80–81, app. B.

⁶⁹ Even in the very unlikely event that the entire sea lane between Malaysia and Vietnam were blocked, increased shipping costs would only drive up the price of oil in Japan by 0.9 percent. Noer, *Chokepoints*, 46, 80–81.

⁷⁰ Pipeline economics is not like the economics of cartel production. In pipelines, slack capacity represents lost revenue, and pipeline owners need steady revenue to repay their substantial upfront investment. At one point in 2002, Saudi pipelines to the Red Sea had approximately 4.5 mb/d of slack capacity, and Iraqi pipelines had 2–3 mb/d of slack capacity; these pipelines often have less spare capacity than that. EIA, "World Oil Transit Chokepoints," November 2002; EIA, "Persian Gulf Oil and Gas Exports Fact Sheet," April 2003; Jean-Paul Rodrigue, "Straits, Passages and Chokepoints: A Maritime Geostrategy of Petroleum Distribution," *Cahiers de Géographie du Québec* 48, no. 135 (December 2004): 367.

difficult. The United States, therefore, has a significant interest in preventing closure of the Strait of Hormuz.

Thankfully, no country in the Gulf could close the Strait of Hormuz.⁷¹ Iran, the country best positioned geographically to try, could harass shipping and damage some tankers.⁷² It could not, however, close the strait, nor could it seriously disrupt shipping for an extended period of time.⁷³ The mission of creating a prolonged disruption to that much commerce is simply too challenging, especially for a middleweight military power like Iran.

First, even at its narrowest point, the strait is 34 km across, and almost all of that water is deep enough for a laden supertanker to safely pass. Physically blocking the waterway, for instance with scuttled ships, is therefore implausible.⁷⁴

Second, if Iran tried to use antiship missiles to close the strait, it would be constrained by the missiles' limited effectiveness against oil tankers, and the heavy ship traffic through the strait would quickly consume Iran's entire arsenal. Iran's missile stockpile numbers in the hundreds.⁷⁵ Those missiles would be pitted against an average of more than one thousand large commercial ships entering the Gulf each month, including more than two hundred large oil tankers.⁷⁶ Reliably distinguishing between oil tankers and other potential targets would not be simple in the Persian Gulf haze or at night, and during a crisis, shipping would scatter to avoid the missile batteries and complicate targeting.⁷⁷ Moreover, each attack on a tanker (or merchantman misidentified as a tanker) would require several shots. During the Tanker War, many missiles launched at undefended commercial ships failed to function properly or missed their targets. Even when they hit, antiship missiles are not particularly lethal against large commercial ships (in contrast to their high-profile successes against smaller warships like the *HMS Sheffield*, the *USS Stark*, and the *INS Hanit*). The tankers' thick hulls, compartmentalized construction,

⁷¹ For a detailed campaign analysis of Iran's ability to disrupt traffic through the Strait of Hormuz, see Gholz et al., "Hormuz Study."

⁷² Iran abuts the strait and occupies several islands in the Abu Musa archipelago, just inside the mouth of the Gulf. For an example of a warning about Iran's potential threat, see Simon Henderson, "Energy in Danger: Iran, Oil, and the West," Policy Focus No. 83 (Washington, DC: Washington Institute for Near East Policy, June 2008), 1–5.

⁷³ We focus here on the difficulty of blocking the strait and the capacity of oil markets to adjust. Note, though, that Gulf oil producers, including Iran, would only interfere with exports through the strait in exceptional circumstances: they all depend on the strait to get their crude oil to market. Iran also relies on the strait to import refined petroleum products, such as gasoline. Economic considerations do not always dominate strategic decisions, but in a time of conflict, a belligerent would be taking significant additional risk by taking steps that could ruin its own economy. Not surprisingly, even during the bitter Iran-Iraq War, neither Iran nor Iraq attempted to close the Strait of Hormuz.

⁷⁴ Johnson, "Persian Gulf in U.S. Strategy," 145.

⁷⁵ GlobalSecurity.org, "Military—Chinese Missiles," <http://www.globalsecurity.org/military/world/china/c-801.htm>.

⁷⁶ Traffic estimates are based on author interview with expert at Lloyd's MIU, London, February 2008.

⁷⁷ For example, Iraqi pilots' target identification efforts in the Tanker War were generally ineffective. Pollack, *Persian Puzzle*, 197. For evidence on commercial ships' behavior during wartime in the Persian Gulf, see Gholz et al., "Threats to Oil Flows."

fire-inert reservoirs of crude oil, and advanced fire-suppression systems limit damage from missile strikes.⁷⁸

During the Tanker War, several tankers survived five or even six missile hits without sinking.⁷⁹ Missile technology has progressed since the Tanker War, but the new missiles are unlikely to be dramatically more effective against oil tankers.⁸⁰ So to effectively disrupt a single tanker's transit, Iran would have to launch a substantial volley of missiles to account for target misidentification, outright malfunctions and misses, and the need to hit a tanker multiple times to disable it. With its limited arsenal, Iran could not use missiles to close the strait and overwhelm adaptation in the oil market.

Third, Iran could also try to use mines to disrupt traffic in the strait. However, like cruise missiles, mines would only harass shipping rather than close the waterway. Although the strait is too deep and the current through it too strong to use old-fashioned contact mines effectively, Iran has an arsenal of modern Chinese rocket-propelled mines.⁸¹ The higher-tech mines, however, are not simple to operate. Like antiship missiles, advanced mines risk failure in many different ways. For example, they sometimes become stuck in the muck on the bottom or become misaligned by ocean currents.⁸² Roughly ninety-five percent of the advanced mines the Iraqis deployed in 1990–91 were not functional because either their batteries had expired or they had been set incorrectly.⁸³ Moreover, although the Strait of Hormuz is a narrow sea passage compared to the open ocean, it is still very large compared to the area of effect of each advanced mine, meaning that Iran would have to emplace an extremely large number of mines to create a high probability that the minefield would disrupt a tanker's transit.⁸⁴ Iran may not have enough mines, and the other militaries of the world (whether regional

⁷⁸ Michael Eisenstadt, *Iranian Military Power: Capabilities and Intentions* (Washington, DC: Washington Institute for Near East Policy, 1996), 58; Lon Nordeen and Larry Brown, "In Peril on the Sea," *Journal of Electronic Defense* 25, no. 1 (1 January 2002); Navias and Hooton, *Tanker Wars*, 85–88.

⁷⁹ Navias and Hooton, *Tanker Wars*, 133–35 and table 6.1.

⁸⁰ Iran now deploys Chinese-made C-801s and perhaps even Russian-made SS-N-22 Sunburns, which have significantly bigger warheads than the Exocets used during the Tanker War. But even the Sunburn manufacturer's marketing claim is only that 1–5 Sunburn hits would severely damage a twenty-thousand-ton merchantman. *Jane's Naval Weapons Systems* no. 15 (1994). The most common type of tanker in the Persian Gulf displaces more than 200,000 tons, and larger naval targets are much less susceptible to damage. Capt. Wayne P. Hughes Jr. (ret.), *Fleet Tactics and Coastal Combat, Second Edition* (Annapolis: Naval Institute Press, 2000), 157–64.

⁸¹ Massimo Annati, "Naval Mines: The Threat and its Counter," *Naval Forces* 26, no. 3 (January 2005). Note that some analysts also question whether these sophisticated minds would work in the strait.

⁸² Milan Vego, "Mine Warfare: Are We Prepared for the Worst?" *Naval Forces* 26, no. 3 (January 2005).

⁸³ Annati, "Naval Mines."

⁸⁴ A minefield has to cover the entire area, while minesweepers only need to clear a relatively small "safe" channel. See Michael Glosny, "Strangulation from the Sea? A PRC Submarine Blockade of Taiwan," *International Security* 28, no. 4 (Spring 2004): 141, 143. Caitlin Talmadge rightly notes that mine-hunting to clear a channel through a properly seeded minefield is slow and dangerous work, but her analysis skips over the problems that the Iranians would face in laying the initial minefield. See Caitlin Talmadge, "Closing Time: Assessing the Iranian Threat to the Strait of Hormuz," *International Security* 33, no. 1 (Summer 2008): 82–117.

competitors like Saudi Arabia or global oil consumers like the great powers of Europe and Asia and the United States) would not stand idly by while Iran methodically planted mines. Finally, even if mines' primary effect is to generate fear and uncertainty, tanker captains, brokers, and insurers in the past have shown that they are willing to take risks to deliver valuable cargos (like oil).⁸⁵ The markets' resilience would be especially likely as participants came to understand that the real risk of striking a mine in the Strait of Hormuz, even after an extensive Iranian mine-laying campaign, would be quite limited.

The most important point about the strait is that attempts to harass shipping would trigger rapid adaptations that would mitigate the economic consequences. For example, if ongoing attacks reduced throughput by damaging a fraction of the tankers that passed through the strait, wholesalers would face powerful economic incentives to send additional tankers to get more oil to the market.⁸⁶ Attacks would increase shipping insurance premiums, but producers, who need oil export income, would likely bear that cost, as they did during the Tanker War.⁸⁷ Exporters in the Gulf might even repeat Iran's Tanker War strategy, using a shuttle service—perhaps using a high volume of lower-value ships, perhaps even with military crews, to ferry oil to commercial carriers outside the strait. Finally, even if attacks temporarily reduced tanker traffic in the strait by 33 percent, U.S. and European petroleum reserves could be tapped to add several million barrels per day to world markets until Iran ran out of harassment capabilities.⁸⁸

Finally, the U.S. military could respond if Iran harassed tanker traffic in the Gulf, but even strong action would not depend on having a peacetime forward presence in the region. Naval forces operating in the Indian Ocean would be ideally positioned to counter Iranian attacks. Defending shipping in the strait might entail (1) air attacks against antiship missile launchers along the Iranian coast and the Gulf islands; (2) air attacks on Iranian ships suspected of laying mines and Iran's submarine pens; (3) air patrols to protect ships from air attack; and (4) mine sweeping to clear safe channels for tankers. The U.S. Navy is now much better trained and equipped for littoral warfare than the blue water-oriented force that protected Persian Gulf oil convoys briefly in the late-1980s.⁸⁹ The U.S. Navy could prosecute all of these

⁸⁵ For a summary of the history of wartime trade with belligerents, see Gholz and Press, "Effects of Wars."

⁸⁶ Despite the threat during the Tanker War, tanker owners were always willing to send ships into the Gulf. Navias and Hooton, *Tanker Wars*, 126.

⁸⁷ *Ibid.*, 97.

⁸⁸ Gholz and Press, "All the Oil We Need."

⁸⁹ Arthur H. Barber III and Delwyn L. Gilmore, "Maritime Access: Do Defenders Hold All the Cards?" *Defense Horizons* no. 4 (October 2001): 7–8. For focus on the mine threat, see Scott C. Truver, "U.S. Navy MCM Forces," *Naval Forces* 25, no. 3 (January 2004); Massimo Annati, "Mine Hunting and Mine Clearing Revisited," *Military Technology* 27, nos. 8/9 (August 2003). The mission would surely still be difficult,

missions with over-the-horizon forces. Ground-based airpower could also fly to the Gulf in a crisis.

Preventing Civil Unrest

American national interests could be harmed by large-scale instability in Saudi Arabia: civil disorder could trigger strikes in the oil industry or attacks on oil facilities. Intrastate violence in another oil producer might temporarily affect global oil supply, as it did in Venezuela in 2002–03; but, as the Venezuelan case demonstrated, adaptation in the oil market could rapidly make up the gap in output. However, disruption of a big enough component of the world's supply would overwhelm the adaptation mechanisms and impose significant costs on the United States. At present, that criterion makes Saudi Arabia the main country to consider in the civil war scenario.⁹⁰

Unfortunately, American military presence in the Persian Gulf region does not reduce this threat. Except in Iraq, American forces are not tasked with protecting their host governments from internal enemies. With ensuring political stability their highest priority, Gulf monarchies use their own internal security forces for the job. U.S. military forces, even if asked, would not be able to protect Gulf allies from domestic security threats. Rooting out extremists within these societies requires spying on and infiltrating political and religious organizations, very difficult tasks for soldiers who do not blend in with the society and do not understand the local language and its very local dialects.⁹¹

Of course, if Saudi Arabia were to descend into full-blown civil war, the United States would face the difficult decision of whether to intervene. If the United States did intervene, the force would need to be large. Stability forces are typically sized on the basis of the occupied country's population.⁹²

but neither land bases nor pre-positioned forces nor a very fast reaction time would materially change the U.S. forces ability to prosecute the mission. For discussion of the important difficulties, see Talmadge, "Closing Time."

⁹⁰ Russia also produces enough oil that it would be difficult for other producers to provide substitute supply rapidly. If Russia were consumed by civil war that interrupted oil production, the United States and other oil consumers might face a steep and extended price hike. Russia's size and nuclear arsenal would preclude American military intervention in a Russian civil war. The Saudi scenario is more probable and more tractable, making it an appropriate focus for American military planning.

⁹¹ Even local security forces sometimes have trouble adapting to the changing threat, although they have thus far been quite successful in keeping extremist threats below a level at which they threaten core regime stability. Thomas Hegghammer, "Islamist Violence and Regime Stability in Saudi Arabia," *International Affairs* 84, no. 4 (2008): 701–15.

⁹² The seminal works on force sizing for stability operations suggest that ten to twenty soldiers are needed for every thousand civilians who inhabit the conflict zone. See James T. Quinlivan, "Force Requirements for Stability Operations," *Parameters* (Winter 1995): 59–69; John J. McGrath, "Boots on the Ground: Troop Density in Contingency Operations," *Global War on Terrorism Occasional Paper* 16 (Ft. Levenworth: Combat Studies Institute Press, 2006). For careful analyses of the Iraq experience, see McGrath, "Boots on the Ground," 113–45, 193–95; Daniel L. Byman, "An Autopsy of the Iraq Debacle: Policy Failure or Bridge Too Far?" *Security Studies* 17, no. 4 (October 2008): 599–643.

Official (though uncertain) estimates of Saudi Arabia's population suggest it is roughly the size of Iraq. For a country of that size, a sufficiently large intervention force would have to come from bases in the continental United States, Germany, or East Asia, like the forces that fought the 1991 Gulf War and the Iraq War in 2003. Current (or foreseeable) forward deployments would not contribute much to the operation.

In addition to the daunting force requirements, intervening in a Saudi civil war—for example, pacifying the populated areas near key oil facilities—would be very demanding, even given the counterinsurgency skills that the U.S. military has learned in Iraq. Even the basic mission of protecting critical infrastructure requires the intervention force to know who belongs near sensitive sites and what constitutes normal behavior. These things are second nature to locals but are not intuitive to outsiders. The result is that when outsiders try to stabilize a warzone, many of their actions are ineffective if not counterproductive.⁹³ Rebel groups often capitalize on the outsiders' tactical blunders to expand their base of support, and the intervening forces' firepower advantages can prove as much of a liability as an advantage.⁹⁴

In an extreme scenario, the United States could seize Saudi oil fields and facilities, expel all locals from sensitive areas, set up a militarily defensible perimeter to keep locals away, and provide the oil field workers and transportation assets for supplies coming in and oil exports going out.⁹⁵ Such an operation would avoid many of the problems associated with an occupation amidst an unfamiliar local population, but it could be accomplished only at great military, diplomatic, and moral cost. The occupation of Iraq, which did not require U.S. soldiers to evict thousands of locals from their homes and jobs, generated thousands of volunteers from across the Arab and Muslim world to fight against the United States in Iraq. Presumably a U.S. occupation of the "land of the two holy Mosques" would be an even more salient political cause for Muslims around the world. Military operations to unilaterally protect Saudi oil fields during a civil war would be incredibly demanding and of dubious value, only sensible under the most extreme circumstances.

Most importantly, the day-to-day peacetime presence of U.S. military forces in the Persian Gulf region is not merely ineffective; it is probably

⁹³ Daniel L. Byman, *Keeping the Peace: Lasting Solutions to Ethnic Conflicts* (Baltimore: Johns Hopkins University Press, 2002), 187–88, 198–203; Stathis N. Kalyvas, *The Logic of Violence in Civil War* (New York: Cambridge University Press, 2006), esp. 173–81, 209, 346, 376–81.

⁹⁴ Samuel Huntington, "Patterns of Violence in World Politics," in *Changing Patterns of Military Politics*, ed. Samuel Huntington (Glencoe, IL: Free Press of Glencoe, 1962), 17–50; John Nagl, *Counterinsurgency Lessons from Malaya and Vietnam: Learning to Eat Soup with a Knife* (Westport, CT: Praeger Publishers, 2002).

⁹⁵ For the classic analysis of hypothetical operations to seize the Saudi oil fields, see Thomas L. McNaughter, *Arms and Oil: U.S. Military Strategy and the Persian Gulf* (Washington, DC: Brookings Institution, 1985).

counterproductive for protecting U.S. oil interests.⁹⁶ The presence of thousands of American military personnel (and the contractors who support them) in Muslim countries not only infuriates radicals like Osama bin Laden, it also aids their recruitment efforts from the broader population and delegitimizes local leaders.⁹⁷ American military forces deployed in Cold War hot-spots reassured the public because they served as a symbolic tripwire to bolster the credibility of the promise that the Americans would show up in a time of crisis. Today in the Persian Gulf, the people require no reassurance that the United States will fight for oil; the tendency in the region already is to ascribe all U.S. actions to that Western interest. Instead, the presence of U.S. forces reminds even relatively moderate locals that their governments cannot manage the threats and challenges that face them. Radicals promise to eliminate Western military presence, reduce Western influence, and restore national or religious "purity." Their critique resonates with at least a portion of the "Arab street."

Our argument about adaptation in the global oil market suggests that the United States not worry about minor political disruptions in the Persian Gulf region: markets will adjust, and lost barrels will be rapidly replaced. Even for the true nightmare scenario—major disorder in Saudi Arabia—the current U.S. peacetime presence is not a good tonic. Keeping U.S. forces stationed nearby in the Gulf is, on net, bad for political stability in the region. Not only would the current force posture be unhelpful in the event of massive civil unrest, it also may increase the likelihood of that scenario.

THE REAL THREAT TO ENERGY SECURITY

Many analyses exaggerate America's vulnerability to political shocks in the Persian Gulf region because they underestimate the flexibility of the global economy. Producers, wholesalers, shippers, and governments rapidly respond to disruptions, mitigating their effects on consumers. In some respects the cartelized nature of the oil industry facilitates adaptation: cartels seek to preserve spare capacity, and shocks tend to complicate cartel management, leading members to exceed their quotas. These arguments find broad support in our case studies of every major oil shock in the OPEC era.

⁹⁶ After invading Iraq in 2003, the U.S. withdrew almost all of its military presence from Saudi Arabia, where American bases were most controversial among locals. The continuing forward deployment of U.S. forces in the small Gulf monarchies has thus far not generated as much overt hostility, especially in the context of the American occupation of Iraq, which has attracted the bulk of extremists' attention. After the U.S. draws down from Iraq, forward deployment in Bahrain, Kuwait, Qatar, and Oman may become a focus for anti-U.S. extremists. Given that forces in those countries do not contribute to Saudi political stability but may weaken the legitimacy of their host governments, the cost-benefit analysis would suggest a U.S. shift to an over-the-horizon force posture.

⁹⁷ John S. Duffield, *Over a Barrel: The Costs of U.S. Foreign Oil Dependence* (Stanford: Stanford University Press, 2008), 184–96.

Only a few types of disruption threaten to overwhelm the oil market's ability to adjust at reasonable cost: conquest that consolidated Persian Gulf oil reserves, sustained interruption of commerce through the Strait of Hormuz, and civil war in one of the very largest oil producers (notably Saudi Arabia). Contrary to conventional wisdom, however, the U.S. military does not need to be forward-deployed to facilities in the Gulf to protect American oil interests against these threats. Instead of maintaining American forces at bases throughout the region, the United States should issue clear threats to deter conquest, backed by robust naval deployments in nearby waters. Naval patrols could protect freedom of navigation in the strait, but the American military would not require peacetime forward deployment to respond effectively to a harassment campaign.

Perhaps most important is that American military forces in the Persian Gulf cannot protect against the most dangerous disruption, a Saudi civil war. Forward military presence may actually make this scenario more likely, although it contributes essentially nothing to mitigating the consequences of such a disruption. Experts on terrorism and civil wars sometimes wish the U.S. military could leave the Persian Gulf region, but they feel constrained from recommending withdrawal because of oil interests. In fact, the United States is not caught in a dilemma at all: a lower American military profile in the Persian Gulf would serve both local political stability and the U.S. interest in protecting against oil disruptions.

The U.S. military could implement a shift to an over-the-horizon U.S. military posture in the Persian Gulf—one that would conduct fewer day-to-day operations than the current force—in a variety of ways. We advocate such a shift because it would better achieve American goals at the same time it reduced the negative side effects of the current forward deployment. The new policy might also reduce American defense spending, a positive side effect for a change, but saving money in the defense budget is not a primary reason for the strategic adjustment nor would budget cuts be a necessary result.⁹⁸

One deeper implication of this study is that U.S. efforts to guard against energy shocks have identified the wrong threat and hence relied upon the wrong tools. Policy analysts fret about shortages and plan to use military

⁹⁸ Estimating the budgetary cost of American military deployments to protect oil interests in the Persian Gulf is extremely difficult. U.S. conventional forces are also referred to as “general purpose forces,” because the same units and equipment can be used in a whole range of different ways within different scenarios. Taking a particular mission or a particular scenario out of the portfolio may not change the overall cost of training, equipment, or peacetime operations at all. Defense spending might even increase if U.S. forces shifted away from forward deployment in the Gulf, depending on how military planners decided to implement the new policy. For example, if force planners determined that the best way to implement the over-the-horizon approach would involve adding routine patrols in the Indian Ocean by another carrier strike group, defense spending might increase. For careful attempts to estimate the budget cost of the current U.S. efforts to protect Persian Gulf oil, see Duffield, *Over a Barrel*, chap. 6; Crane et al., *Imported Oil*, chap. 5.

power to thwart efforts to seize oil fields or harass transport. But as the case studies show, supply is not much of a problem. Fear is the principal threat. In the majority of the oil shocks since 1973, supply quickly rebounded, but panic kept prices high for several more months. Preventing enemies from sinking oil tankers is a military challenge; calming markets and preventing panic is a problem of a very different nature, calling for a broader range of policy strategies. Submarines and destroyers are probably not the first tools to reach for.

To the extent that the United States faces a national security challenge related to Persian Gulf oil, it is not "how to protect the oil we need" but "how to assure consumers that there is nothing to fear." That is a thorny policy problem, but it does not require large military deployments and costly military operations.