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Enduring Resilience: How Oil Markets Handle Disruptions

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Plentiful spare capacity persists in the oil production and tanker industries, contrary to Michael Levi's contention in his response to our earlier article, "Protecting 'The Prize.'" OPEC leaders retain excess capacity to minimize cartel members' cheating, and tanker companies retain considerable flexibility that allows them to adapt to political-military and other fluctuations in the market. Oil supplies are not on a knife-edge; exaggerated claims of energy vulnerability distort U.S. national security policy.

We appreciate Michael Levi's response to our article and the serious questions he raises about our analysis. Levi shares our conviction that U.S. policies toward the Persian Gulf region and other policies aimed at protecting the United States from shocks to global oil supply should be grounded in a clear understanding of how oil markets work. Though we disagree with Levi's critiques, we welcome his introduction of new evidence and the opportunity to engage in constructive debate.

In "Protecting 'The Prize': Oil and the U.S. National Interest," we argued that oil markets are far more capable of rapidly adjusting to shocks than most foreign policy analysts recognize.[1] We supported our claim with fine-grained evidence on monthly production levels and prices during the

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[1] Eugene Gholz and Daryl G. Press, "Protecting 'The Prize': Oil and the U.S. National Interest," *Security Studies* 19, no. 3 (August 2010): 453–485. Other scholars also highlight various sources of adaptability in oil markets, including Philip E. Auerswald, "The Irrelevance of the Middle East," *American Interest* 2, no. 5 (May-June 2007): 19–37; Amy Myers Jaffe and Ronald Soligo, "The Role of Inventories in Oil Market Stability," *Quarterly Review of Economics and Finance* 42, no. 2 (2002): 401–15; Douglas Bohi, *Energy Price Shocks and Macroeconomic Performance* (Washington, DC: Resources for the Future, 1989); Keith Crane, Andreas Goldthau, Michael Toman, Thomas Light, Stuart E. Johnson, Alireza Nader, Angela

major oil shocks of the past three decades. We also argued that the current, forward-deployed U.S. military posture in the Gulf is ill-suited or perhaps even counterproductive for dealing with the actual threats to Gulf energy supplies. We called for an "over-the-horizon" U.S. approach to the Persian Gulf region.

In response, Levi made two major points: (1) the global oil market is much less resilient than we claim because spare capacity to pump oil out of the ground is scarcer now than it was in the past, and (2) spare capacity in the global tanker fleet would be overwhelmed by disruptions in the sea-lanes, so circumventing the trouble would cause soaring consumer prices for products derived from oil.

Further inspection of the recent history of spare capacity in both oil supply and oil transportation favors our interpretation. In fact, much of the evidence that Levi cites actually reveals oil and tanker markets working exactly as our theory predicts. In short, the world's access to oil does not depend on U.S. military presence throughout the Persian Gulf region, nor do potential blockages in the sea-lanes (assuming tanker traffic can in fact be choked off) present much threat of consumer price spikes. Normal day-to-day market responses dampen the need for energy alarmism.

SPARE CAPACITY TO PUMP OIL

Cartels like OPEC create incentives for their members to keep untapped supply off the market; cartel leaders in particular enforce discipline by keeping pumping capacity in reserve and threatening to flood the market if cartel members greatly exceed their quotas. The result, as history repeatedly shows, is that when oil disruptions occur, ample spare capacity is available to fill the shortfall, and the lure of profit draws that spare capacity onto the market.[2] In addition, many of the world's major oil-consuming countries hold large government-controlled stockpiles, and private companies keep large inventories that they can tap in a crisis (to make money).[3] The world is not perched on an energy precipice; plenty of oil is available to rapidly respond to disruptions.

Rabasa, and Harun Dogo, *Imported Oil and US National Security* (Santa Monica: RAND Corporation, 2009); Steve A. Yetiv, *Crude Awakenings: Global Oil Security and American Foreign Policy* (Ithaca, NY: Cornell University Press, 2004).

[2] "Protecting 'The Prize' " evaluates six major supply disruptions since the post-1973 creation of the modern oil market: (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 2002–2003 strikes in the Venezuelan oil fields. See 464–74.

[3] The governments of major oil importers hold approximately 1.4 billion barrels of oil; private inventories fluctuate but often exceed even the vast government stocks.

Levi argues that we overstate the flexibility of oil markets. Although he concedes that OPEC has functioned as we claim for several decades,[4] he worries that the future will be radically different, specifically that the cartel has recently discovered a way to restrain output without maintaining spare capacity. Levi suggests that cartel members now restrict their output by simply under-investing in pumping infrastructure rather than building capacity that they plan not to use. Levi supports his contention by noting the drop in OPEC's spare capacity starting in the middle of the past decade. Furthermore, he suggests three other factors that might contribute to declining spare capacity: the rising cost of finding new oil fields (i.e., a version of the "peak oil" argument), a decline in Saudi Arabia's "desire to be seen as a responsible contributor to the international economic order," and a "fraying" U.S.-Saudi relationship.

We disagree with Levi's critique for both theoretical and empirical reasons. First, his claim that OPEC no longer needs spare capacity contradicts the fundamentals of cartel mechanics. Cartels still face a collective action problem: members benefit if others stick to their quotas, but each member can increase its own profits by cheating. Levi claims that this perennial problem of cartel management is no longer a concern for OPEC, because most of its members are already producing at maximum capacity and therefore physically cannot cheat. But Levi is making a logical leap: even if many OPEC members are producing flat out, one cannot assume that they are respecting their quotas. Cartel members do not typically announce when they cheat, and publicly available production data are not a good guide to cheating in the cartel. Furthermore, if cartel leaders do not maintain sufficient spare capacity to punish cheating, why will members refrain from building extra capacity to allow them to cheat in the future? The point is that cheating is a major concern for OPEC's leaders, as it always has been. Cartel leaders therefore still need spare capacity, just as they have in the past.[5]

Nor does the empirical evidence support Levi's claims that depletion, or some policy shift, has caused OPEC to abandon its long-term policy of maintaining spare capacity. Spare capacity is difficult to measure, because countries (and privately held companies) guard information about their reserves and investments zealously. Nevertheless, Figure 1 shows two sets of estimates of spare capacity held by OPEC countries since 1994, produced

[4] Robert McNally and Michael Levi, "Crude Predicament," *Foreign Affairs* (July/August 2011): 101–111, paragraphs 7–8.

[5] Given the difficulty of arguing (as Levi does) that the OPEC cartel has found a way to coordinate collective action without enforcement mechanisms, critics might take a different tack: that a lack of spare pumping capacity shows that OPEC does not in practice restrict output at all below the perfectly competitive level—that OPEC is a sham. Levi does not seem to believe that alternative explanation, and neither do we; for evidence against the "perfectly competitive oil market hypothesis," see fn 11 in "Protecting 'The Prize,'" 458. We also show specific estimates of OPEC spare capacity below and in Figure 1.

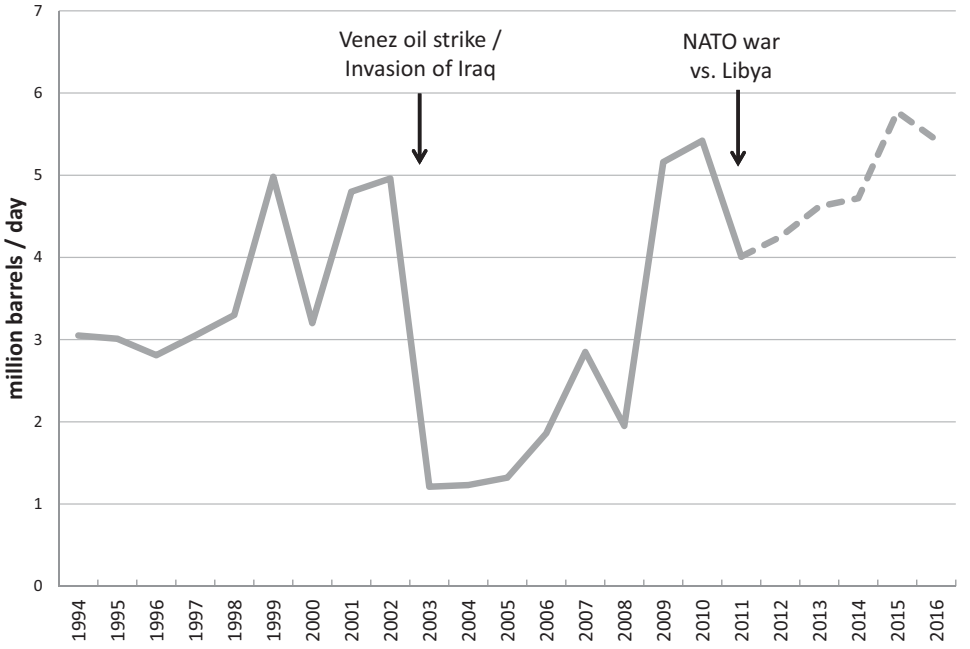

FIGURE 1 OPEC spare pumping capacity; annual mid-year averages.

by the U.S. Department of Energy and by the International Energy Agency. The figure reveals that spare capacity did not gradually decline over the past decade as one might expect if the decline were the result of gradual geological depletion (i.e., peak oil) or fraying of U.S.-Saudi relations. Rather, it plummeted in 2002–2003 when two major disruptions caused OPEC producers to tap their spare capacity: OPEC replaced the oil disrupted by Venezuela's oil strikes (2002–2003) and by the invasion of Iraq (2003). The lesson of 2002–2003 is not that spare capacity is disappearing. The lesson is that spare capacity was used to respond to supply disruptions—exactly as our theory predicts.

In the years that followed, the global economy grew rapidly, so demand for oil soared in the United States, China, India, and other major economies. OPEC's slack capacity stayed relatively low for several years because even as OPEC members developed new capacity to recreate their normal buffer, economic growth kept shifting the goalposts. And the fear among OPEC members that some of the rapid demand growth was actually a bubble—fear that turned out to be well-founded—constrained the pace of OPEC members'

oil infrastructure investments. Naturally, when the bubble popped with the 2008 financial crisis, spare capacity suddenly returned to the oil market.

More disruptions have occurred since 2002–2003, and each time oil markets responded as our theory suggests: by tapping spare capacity to replace lost oil. The civil war in Libya denied world markets roughly 1.5 million barrels of oil per day. OPEC responded rapidly by turning spare capacity into actual production, replacing the Libyan oil almost immediately. What is perhaps most striking about oil supplies and spare capacity over the past decade is that despite the ongoing use of what would otherwise be millions of barrels per day of "spare capacity"—to make up for Iraq's depressed oil production and to replace Libyan exports—the United States and its oil allies are still sufficiently confident that there is ample spare capacity to try to cut off Iran's oil exports.

What of the future? Neither the U.S. Department of Energy nor the International Energy Agency agree with Levi that spare capacity is drying up.[6] In fact, some analysts hope that Iraq, infused with new investment, will see its oil production soar, and Libyan production may soon rebound. Today, without access to much Iraqi or Libyan oil, there is plenty of capacity; if their oil industries recover, the world will truly be awash in spare oil capacity.

The bottom line from the data is that the fluctuation in spare capacity over the past decade—which Levi uses to refute our claims—actually provides the strongest possible support for our argument. Spare capacity has dipped repeatedly—but not because of peak oil or because OPEC is no longer concerned with cheating. Rather, spare capacity has repeatedly dipped in the past decade because oil markets turned spare capacity into active capacity whenever disruptions occurred.

To be clear, we do not argue that spare capacity to pump oil will always be high. It will vary according to economic conditions and the level of trust among cartel members. Nor do we put too much stock in the exact estimates of spare capacity that Levi cites—or that we use in Figure 1—because, as we noted above, oil-producing states and firms hide the truth. But the data reveal the general pattern if not precise details. And Levi and we rely on the same data, and they support our theory and undermine his critique. The broader point for U.S. foreign policy is that given the 1.4 billion barrels of oil in U.S. and allied government-controlled stockpiles, given the huge commercial stocks in storage tanks around the world, and given OPEC's spare capacity, it is hard to justify a large forward military presence in the Persian Gulf on the basis of the erroneous notion that the world's energy supplies are balanced on a knife's edge.

[6] Each publishes a chart projecting spare capacity five years into the future.

ADJUSTMENT IN THE TANKER MARKET

In "Protecting 'the Prize'" we argued that threats to oil tankers and naval chokepoints are typically exaggerated, because key waterways could be readily avoided (with the exception of the Strait of Hormuz). Rerouting around disruptions would add some additional shipping time and cost, requiring more ton-miles of shipping to deliver the same amount of oil, but transport costs comprise a small percentage of the price of oil, so prices for consumers would not need to rise much.

Levi argues that we are overly sanguine about the consequences of disruptions in the world's major sea-lanes, especially in the Strait of Malacca, but he makes three dubious claims: that the total capacity of the global tanker fleet is essentially fixed in the short term, that the global fleet often includes little spare capacity, and that blockage in the Strait of Malacca would increase demand for ton-miles far beyond the normal level of spare capacity. Levi concludes that the sea-lanes need more protection than our analysis suggests.

Levi says that tanker capacity is "roughly static in the short term" because ships take years to build. In reality, ship owners have great flexibility regarding the number of ton-miles they squeeze out of their fleets. When demand increases—e.g., because the global economy starts expanding or because a disruption in the sea-lanes requires ships to take longer routes—tankers sail faster and delay routine maintenance, and shippers put additional tankers to sea that at lower levels of demand are used for floating storage or otherwise are held idle. The length of time it takes to build a ship is a red herring; shipping supply constantly adapts to market conditions.

Levi recognizes that underutilization of ships creates a reserve of unused shipping supply, but his measure of tanker spare capacity only counts idle tankers and hence vastly understates the actual spare capacity in the tanker fleet. Levi relies on UN data that purports to show an average spare capacity of only 3 percent in the tanker market from 2000–2005 and only 1 percent in 2004. But the tables from which he draws this data—which in Levi's defense are poorly labeled in the UN report—only count idle shipping and therefore overlook most of the spare capacity in the fleet.[7]

[7] Levi cites *Review of Maritime Transport [RMT] 2006* (Geneva: United Nations Conference on Trade and Development, 2006), 46, Table 28, and draws the figures he cites from the row for "Total Tanker Fleet Surplus." That table, unfortunately, does not explain how the data are calculated. Because the numbers cited by Levi from Table 28 differ so dramatically from what industry sources say about spare tanker capacity, we contacted the lead authors of the *RMT*, one of whom confirmed to us by email that "only truly 'idle' ships are included" and specifically that the figure did not count slow-steaming, waiting time in ports, and other factors that owners could adjust rapidly. The *RMT* author promised to clarify this table in future editions of *RMT*. The number that Levi uses to estimate spare capacity in the 1990s also appears to only count idle ships and not slow-steaming ships. See John H. Noer and David Gregory, *Chokepoints: Maritime Economic Concerns in Southeast Asia* (Washington, DC: National Defense University Press, 1996), 41.

Precisely measuring the underutilization of ships is difficult, but one metric—which understates the amount of spare capacity in the global fleet—shows that total spare tanker capacity is far higher than Levi reports. The UN publishes yearly data on fleet productivity—namely the tons of cargo carried per deadweight ton (DWT) of tanker in the fleet.[8] Because global tanker routes do not change much from one year to the next, years of peak productivity can be used to estimate how much additional cargo could have been carried in the surrounding years had the fleet remained at the highest observed rate of activity. This measure reveals the importance of counting underused capacity as well as idle tankers: in 2010 only 2 percent of tanker capacity was idle, but counting underused capacity (principally from slow-steaming) drives the number to 27 percent.[9] For the years that Levi reports: from 2000–2005 there was at least 10 percent spare capacity (Levi reports only 3 percent) and in 2004 there was at least 12 percent (compared with Levi's 1 percent).

It is essential to emphasize that our metric for estimating spare capacity systematically understates actual spare capacity and may do so substantially.[10] The key takeaway points are (1) that Levi was misled by a poorly marked Table in the UN publication, and (2) that the actual spare capacity is many times higher than the figures Levi reports. Conservative lower-bound estimates put the average at 13 percent spare capacity throughout the past decade.

The final question in the debate about the threat to sea lanes is how much shipping demand would spike if key sea-lanes were blocked. In "Protecting 'The Prize'" we argue that the Strait of Hormuz is unique (all other sea lanes have affordable alternatives), and to illustrate we focused on what many analysts suggest is—after Hormuz—the world's most vital chokepoint, the Strait of Malacca. Levi uses tables from the book *Chokepoints* that seem to suggest that avoiding Malacca would increase global demand for ton-miles by 13 percent and that if tankers had to avoid both Malacca and the South China Sea, tanker demand would increase by 23 percent.[11]

[8] One might also measure productivity as ton-miles per DWT, but the UN only published data on that measure for some of the years from 2000–2010.

[9] To check the plausibility of this metric, we corresponded with tanker industry analysts, one of whom put the current spare capacity in the tanker fleet at 25–35 percent, consistent with our argument that our metric is roughly capturing yet understating the actual spare capacity.

[10] Our metric implicitly assumes that tanker fleets were operating at full capacity in the peak years. In reality, the peak productivity years simply reflect the supply of shipping that the fleet generated based on prevailing demand and price. Therefore, even our metric overlooks some of the actual spare capacity in the fleet. Compounding this problem, the UN (which is the principal source of non-proprietary data on world shipping) changed data sources on fleet productivity in the middle of the 2000s, requiring analysts to treat the two halves of that decade separately. This exacerbates our undercounting of global tanker spare capacity because we must treat 2006 as the baseline (i.e., the year of peak productivity) for the second half of the decade, when in reality there was 10–20 percent spare capacity in that year.

[11] Noer, *Chokepoints*, 42–43.

However, the figures Levi cites seem to reflect the increase in ton-miles needed for tankers on the disrupted routes—not the total increase in global demand.[12] In fact, a disruption in the Strait of Malacca would force tankers headed from the Persian Gulf to the major oil consumers in East Asia to add roughly 15 percent to their sailing distance; avoiding the South China Sea entirely would add 17 percent to the routes, compared to the shortest path through the Strait of Malacca. But the effect on the global demand for tanker ton-miles would only be roughly half that: 7.5 percent to avoid the Strait of Malacca and 8.5 percent to avoid the South China Sea.[13]

In short, even though we use a metric that undercounts spare tanker capacity, posit a disruption in the worst possible location outside of Hormuz, and rely upon data from the mid-2000s (when the global bubble economy strained tanker supply), there still appears to be sufficient spare tanker capacity. Of course, consumers would be better off without any disruptions. But global tanker operations, like oil markets generally, are flexible and rapidly adapt to changing market conditions.

THE BIG PICTURE

Although we have real differences with Levi on details of the oil and shipping industries, all three of us reject, in Levi's words, "the overwrought worries about energy security that are common in academic and policymaking circles." In fact, our primary goals in "Protecting 'The Prize' " were to question the theoretical and empirical bases for those overwrought worries.

[12] Approximate distances for standard tanker routes from the Persian Gulf to East Asia using the Strait of Malacca: Japan (Tokyo), 6,750 miles; China (Shanghai), 6,050 miles; and South Korea (Busan), 6,400 miles. Avoiding the Strait of Malacca and traveling instead through the Straits of Lombok and Makassar would increase the length of those routes by the following percentages: Japan 13 percent; Republic of Korea [ROK] 16 percent; and China 17 percent. Avoiding both the Strait of Malacca and the South China Sea would increase distances compared with the "blocked Strait of Malacca" scenario by the following percentages: Japan 0 percent; ROK 3 percent; and China 4 percent. Different amounts of oil travel along each of these routes (to Tokyo, Shanghai, and Busan); a weighted average of the routes suggests that a "closed Malacca" scenario would increase demand for ton-miles along these routes by15 percent, and the net effect of a "closed Malacca/South China Sea" scenario by 17 percent. These calculations were created using Google Earth to measure distances, and they are confirmed by figures from the United Nations' International Maritime Organization [IMO], which reports that closing the Strait of Malacca would add roughly one thousand miles to a typical Persian Gulf to East Asia tanker route. See International Maritime Organization, "Setting: The Straits of Malaccca and Singapore," Maritime Electronic Highway Project report, last updated September 2012. A copy of the report is available from the authors by request.

[13] EIA reports that 13–14 million barrels of oil transit Malacca each day (http://205.254.135.7/countries/regions-topics.cfm?fips=WOTC), while *RMT* suggests that some 37 million barrels per day is the total amount carried by tankers. Malacca transits might on average involve longer distances than other VLCC transits, so to be conservative we assume that Persian Gulf to East Asia routes employ roughly 50 percent of global tanker ton-miles.

One broader point: Levi's essay argues that spare pumping capacity and spare tanker capacity are both in short supply. We have offered data to contest his claims on both counts. But more broadly, even if they were in short supply, it is a large leap to believe that large-scale land-based U.S. military deployments in the Persian Gulf are the right medicine for those ills. If policymakers are as concerned about spare capacity and tanker routes as Levi—and we would tell them they should not be—then the United States should consider the range of policy options to better insulate the U.S. economy from those energy security demons. If the problem is spare capacity, then perhaps the U.S. government might be better off investing in additional petroleum reserves, laying additional pipelines to circumvent choke points, building a reserve fleet of tankers, or otherwise adding spare capacity rather than trying to fix the intractable political and military conflicts in the Persian Gulf and around the world.