National Security Program

Foreign Policy Project

The Price of Inaction: Analysis of Energy and Economic Effects of a Nuclear Iran

Bipartisan Policy Center Report
on Iranian Nuclear Development

Senator Charles S. Robb and
General (ret.) Charles Wald, Co-Chairs

October 2012

BIPARTISAN POLICY CENTER

ACKNOWLEDGMENTS

We gratefully acknowledge the assistance of the Review Board, outside experts who examined the methodological foundations of this study and provided feedback on our research. A bipartisan array of former government and military officials from the United States and other countries also contributed comments and suggestions, but cannot be acknowledged by name either because of their current positions or because they requested anonymity. Finally, we thank BPC intern David Beardwood for his contribution.

DISCLAIMER

Letter from the Co-Chairs

As former political and military leaders, we recognize and embrace the importance of analyzing every side of an issue, especially when it is as complex and consequential as the challenge posed by Iran's nuclear program. In previous reports, we have called for a vibrant public debate about the threat posed by a nuclear Iran. Understandably, much public discussion about Iran's nuclear ambition has focused on the potential for military conflict.

Though there are many unknowns with the use of force, it is certainly easier to assess the likely economic impact of military action than it is to evaluate the costs of inaction. This paper takes on the harder analytical task of exploring the economic consequences of choosing to live with and contain a nuclear Iran. It does so by examining how energy markets might respond if Iran is believed to have acquired a nuclear weapon and what the economic ramifications of that response could be.

Our bipartisan task force comprises a diverse group of experts—former elected officials, military leaders, diplomats, policy makers, energy analysts, and economists. We have been further assisted in our effort by an independent non-partisan review board of energy-market experts and economists, using an established economic model.

The scenario-driven approach we employ is commonly used to assess complex interactions. By design, these exercises are imprecise but illuminating. We have sought to make our assumptions detailed and explicit in order to enable readers to reach their own judgments.

We hope this paper proves informative and enriches debate among the public and policy makers.

Sincerely,

Senator Charles S. Robb

General (ret.) Charles Wald

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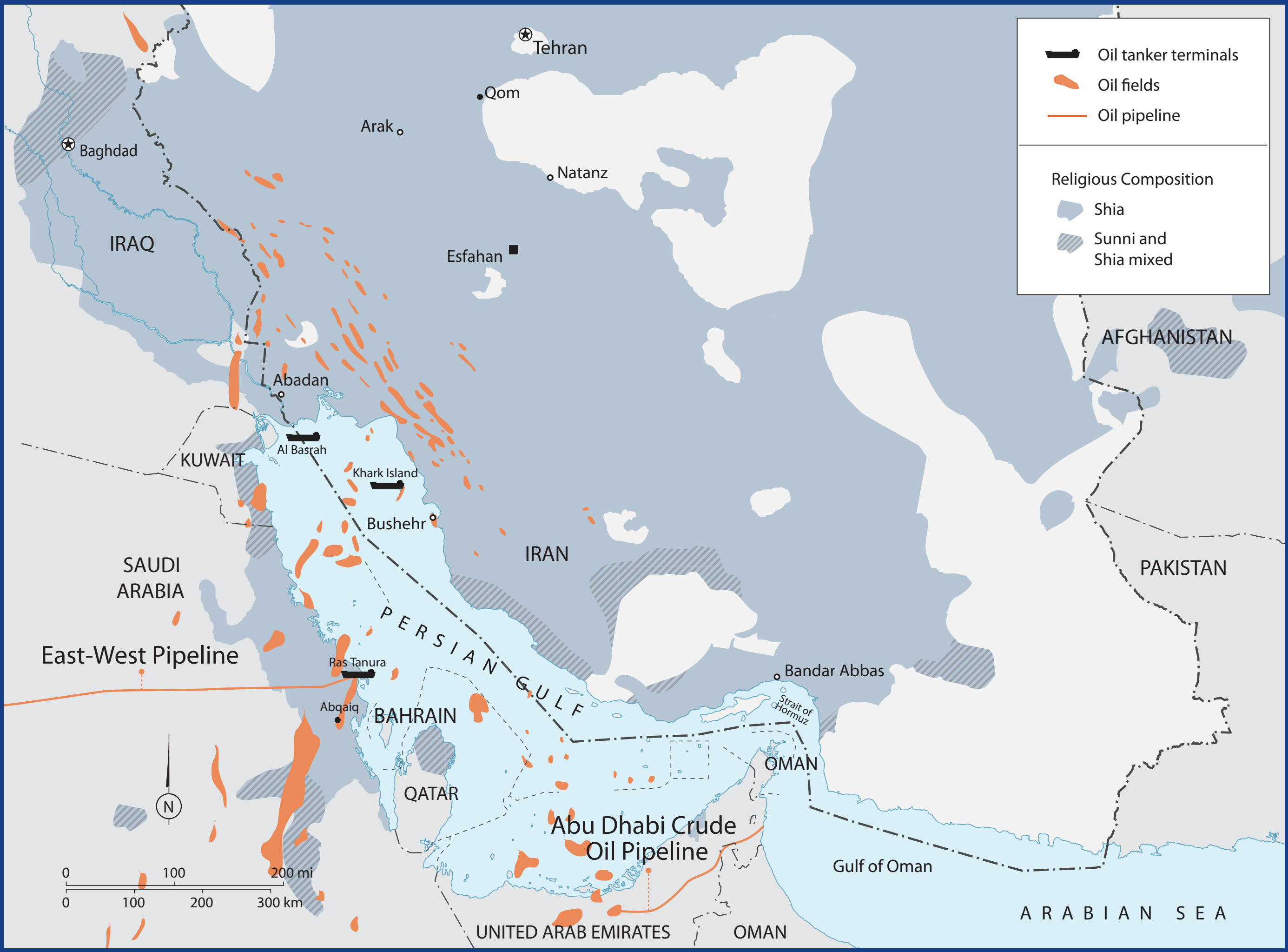
Table of Contents


Oil tanker terminals
Oil fields
Oil pipeline
Religious Composition
Shia
Sunni and Shia mixed
Tehran
Qom
Arak
Baghdad
Natanz
IRAQ
Esfahan
AFGHANISTAN
Abadan
Al Basrah
KUWAIT
Khark Island
Bushehr
IRAN
PAKISTAN
SAUDI ARABIA
P E R S I A N G U L F
East-West Pipeline
Ras Tanura
Bandar Abbas
Strait of Hormuz
Abqaiq
BAHRAIN
OMAN
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0 100 200 mi
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A R A B I A N S E A
UNITED ARAB EMIRATES
OMAN

Executive Summary

There is overwhelming, bipartisan support in Washington, from both presidential candidates, and across the country for preventing a nuclear Iran. However, our political leaders must conduct a robust public discussion that thoroughly explores the nature of the Iranian threat, the different policy options available, and their consequences.

Iran's nuclear ambitions create enormously challenging issues with no easy solutions. In the public debate during the last year, a recurring concern has been the economic risks posed by the available means for preventing a nuclear Iran, whether tough sanctions or military action. Such economic risks are a legitimate concern. They deserve to be discussed and understood. However, to make an informed judgment about which policy to pursue, our public discussion must consider not just the costs of stopping Iran's nuclear ambitions, but also the costs of failing to do so.

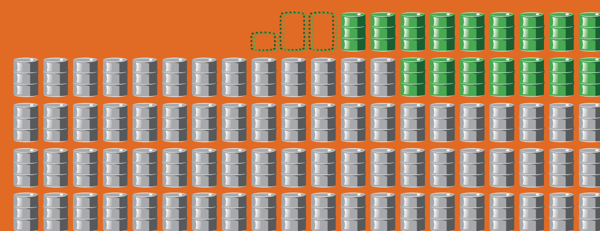
Inaction, too, exposes the United States to economic risks. This paper aims to give them substance and describe what they might be. Its purpose is to imagine the world with a nuclear Iran and examine just one dimension of the consequences: the impact on global oil prices and the resulting effect on the U.S. economy.

Our Task Force is not suggesting that these will be the only costs the United States would bear if confronted with a nuclear Iran. There would be myriad consequences, direct and indirect, only some of which can be foreseen and quantified. As President Obama observed recently at the United Nations, "a nuclear-armed Iran is not a challenge that can be contained. It would threaten the elimination of Israel, the security of Gulf nations, and the stability of the global economy. It risks triggering a nuclear-arms race in the region and the unraveling of the non-proliferation treaty."[1] In addition to those mentioned by Obama, there are many other costs of a nuclear Iran we do not consider in this paper, including: greater Iranian influence in the region; emboldened Iranian-sponsored terrorist groups, such as Hezbollah; the further spread of radical Islamism and anti-Americanism in an already tumultuous region; the reduced chance for Arab-Israeli peace; and greater military deployments to the region that American taxpayers will need to fund to try to deter Iranian aggression. Moreover, we do not seek to imply that economic considerations, by themselves, are a justification for military action or tougher sanctions against Iran.

Tehran crossing the nuclear threshold is unlikely to cause an immediate disruption in the flow of oil. It would, however, significantly alter the geopolitical and strategic landscape of the Middle East, raising the likelihood of instability, terrorism, or conflict that could interrupt the region's oil exports. If any such disruption did occur, it would have a significant effect on the supply and price of oil.

Middle East oil is critical to the global economy. Exports from the region—more than half of which come from Saudi Arabia—fulfill nearly 20 percent of global daily oil demand, and 35 percent of all seaborne-traded oil passes through the Strait of Hormuz. The Persian Gulf—Saudi Arabia in particular—also is home to nearly all the world's spare production capacity; if oil production or exports from the region are interrupted, the rest of the world would have an extremely difficult time replacing those supplies.

16 MILLION BARRELS
per day come from the Persian Gulf.

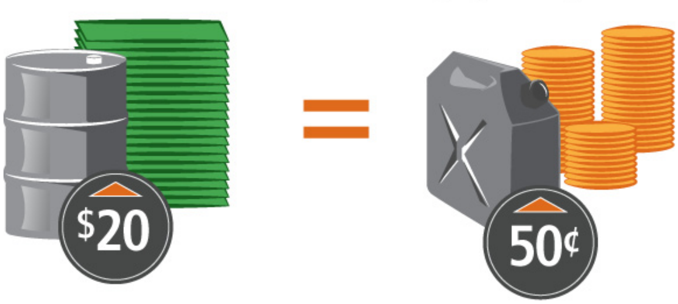


18% of global daily oil demand comes from the Middle East - most of it through the narrow Strait of Hormuz. And all of the world's spare production capacity is in the Persian Gulf.

But a supply disruption is not the only way a nuclear Iran could impact energy prices. Oil markets respond to perceptions of future risks to supply and demand.[2] Our analysis suggests that a nuclear Iran would heighten expectation of potential future disruptions, which should translate, if understood properly, into an increased risk premium added onto oil prices for as long as the concerns and tensions remain. In other words, anticipation of future energy disruption would be priced into the market, leading to higher oil and gasoline prices.

A nuclear Iran could lead to a:

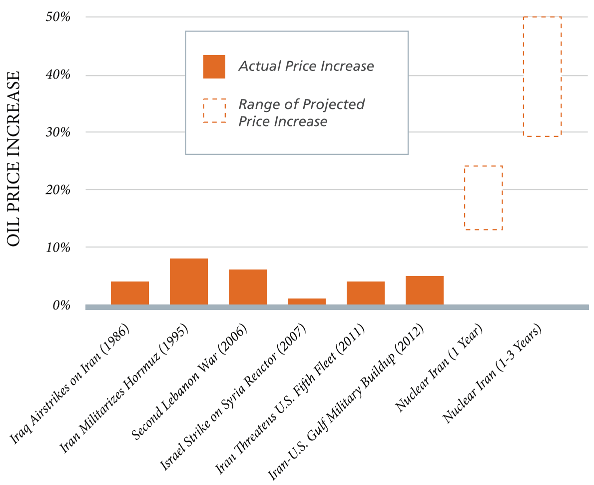
$20 INCREASE in the price of a barrel of oil = **50¢ MORE** per gallon of gasoline



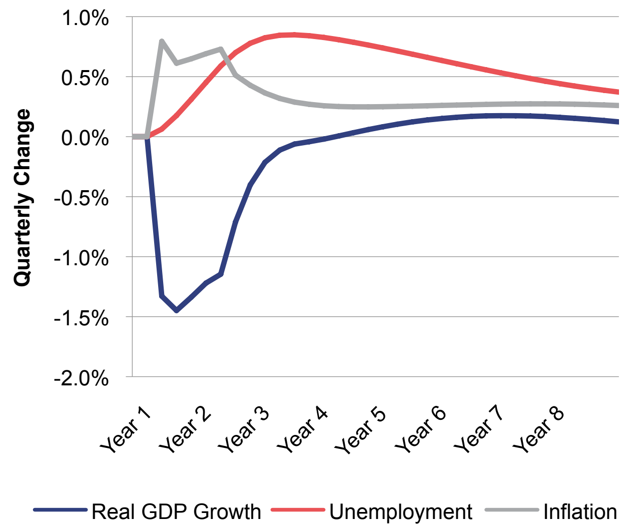
Source: IMF

To analyze the consequences of the increased expectation of disruptions and the possible occurrences of such disruptions that would result from a nuclear Iran, our study employs an analytic approach developed in consultation with oil market analysts. First, we developed five possible scenarios—each analyzed individually—that could impact the flow of oil through the Persian Gulf based on a range of political, diplomatic, and military repercussions of a nuclear Iran. Second, we examined how much of the world's oil supply each scenario could disrupt and assessed the effect on prices were such a disruption to occur. Third, the members of this Task Force as well as outside experts contributed their informed judgments about the probability that each of the scenarios will occur within three time horizons: the current status quo, within one year of Iran crossing the nuclear threshold, and in the following two years.[3] Fourth, using the anticipated increase in the likelihood of disruptions, we modeled the change in risk premium—the value added to the price due to the expectation of disruption—that would result from a nuclear Iran.[4] Finally, using established macroeconomic models, we modeled the impact of each of these possible oil price

OIL PRICES REACT TO INSTABILITY



Macroeconomic Effects of Nuclear Iran: No Reserve Release

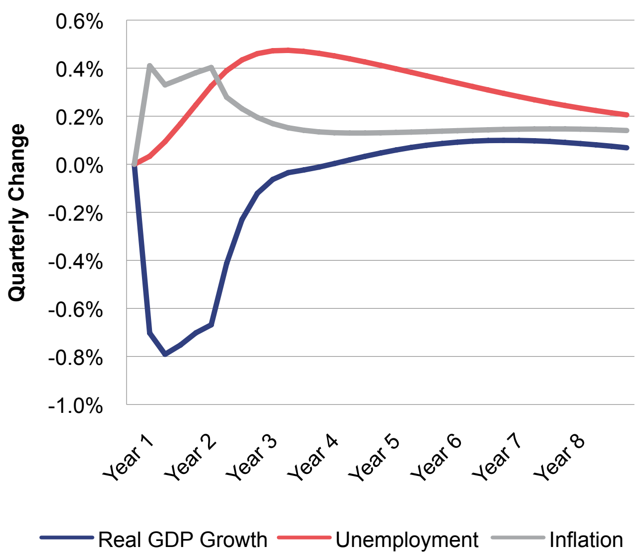


changes on the U.S. economy in terms of a range of macroeconomic indicators, including: gasoline prices, Gross Domestic Product (GDP), inflation, and unemployment.[5]

Our analysis indicates that the expectation of instability and conflict that a nuclear Iran could generate in global energy markets could roughly increase the price of oil by between 10 and 25 percent, which, given current international oil prices, would result in prices $11 to $27 higher per barrel. As instability and tensions remain high, so will prices, even rising, during the next several years, reaching levels of as much as 30 to 50 percent, or $30 to $55 per barrel, higher. Within three years, U.S. gasoline prices could increase by over 30 percent, which equates to roughly paying an additional $1.40 per gallon at the pump. At that level of increase, both inflation and unemployment would be projected to rise by 1 percent, which equates to a loss of more than one million jobs. Meanwhile, GDP could drop by more than 1 percent, or almost $220 billion.[6]

If any of the conflicts or energy disruptions that become more likely from a nuclear Iran actually occur, the energy impact and economic consequences would be more severe. For example, in the case of significant instability in Saudi Arabia or a Saudi-Iran nuclear exchange, oil prices could double; gasoline prices could increase by more than 70 percent, adding $2.75 at the pump; GDP could plummet by as much as 8 percent in the first year, or $1.2 trillion, sending the nation into a severe recession; inflation could skyrocket to almost 5 percent; and unemployment could increase by almost 4 percent, translating into more than five million more people out of work. Of course, even the most sophisticated models are ill-equipped to predict how the world would react to a nuclear exchange. And, if such a horrible tragedy did occur, the human and strategic costs would be far greater than the economic impacts evaluated here.

Macroeconomic Effects of Nuclear Iran: Reserve Release



We realize that any attempt to quantify possible future events and their effects must be approached carefully and with humility. This analysis, like all scenario exercises, involves as much art as science. Its value lies in its ability to illustrate the range of impacts that could occur, not from predicting any precise outcome. Thus, the analysis that follows does not seek to describe what *will* happen the day after Iran becomes a nuclear power, but provides our best insight of what *might* occur in an effort to lay the foundation for a more informed public discussion.

Percent Change in Major Economic Indicators by Scenario

	Nuclear Iran				Saudi Instability		Saudi Facilities Damaged		Sanctions Lapse	Iran-Saudi Nuclear Exchange		Iran-Israel Nuclear Exchange	
	Year 1		Year 3										
	Reserve Release	No Release	Reserve Release	No Release	Reserve Release	No Release	Reserve Release	No Release				Reserve Release	No Release
Oil Price	12.90%	24.20%	29.00%	50.20%	22.50%	56.80%	3.70%	9.30%	-22.20%	100.00%		46.60%	100.00%
Gasoline Price	9.10%	17.06%	20.45%	35.40%	15.87%	40.05%	2.61%	6.56%	-15.65%	70.51%		32.90%	70.51%
GDP	-0.74%	-1.33%	-0.36%	-0.62%	-1.17%	-2.96%	-0.11%	-0.27%		-8.16%	-5.73%	-1.94%	-4.51%
Unemployment	0.25%	0.45%	0.46%	0.83%	0.49%	1.25%	0.04%	0.11%		3.50%	2.44%	0.82%	1.91%
Inflation	0.38%	0.69%	0.13%	0.26%	0.59%	1.58%	0.05%	0.13%		4.61%	3.19%	1.02%	2.48%

	PROBABILITY OF OCCURRENCE			**SCENARIO % PRICE CHANGE FROM BASELINE**	
	Baseline: Pre-Nuclear Iran	**Nuclear Iran**			
		1 year	*3 years*	*No Release*	*Reserves Released*
A. Iran-Saudi Nuclear Exchange	0%	5%	15%	100.0%	100.0%
B. Iran-Israel Nuclear Exchange	0%	20%	20%	100.0%	46.6%
C. Strike on Iranian Nuclear Facilities	35%	15%	10%		
D. Domestic Instability in Saudi Arabia	20%	25%	40%	56.8%	22.5%
E. Saudi Facilities Destroyed	15%	25%	35%	9.3%	3.7%
F. Sanctions Lapse	10%	20%	35%	-22.2%	-22.2%

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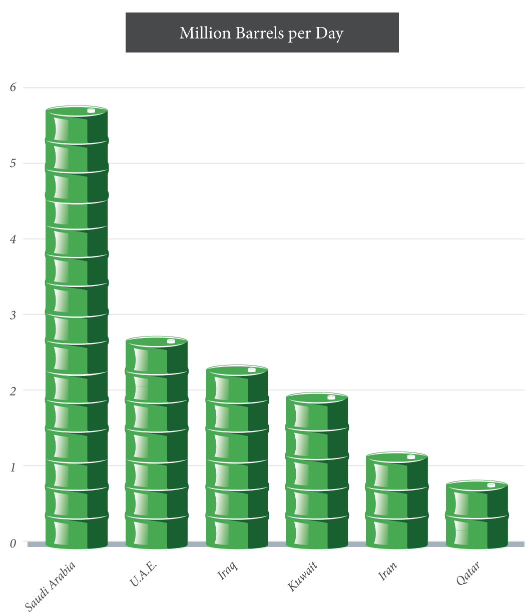
Scenarios & Consequences

If Iran achieves nuclear weapons capability, widespread instability could aggravate uncertainty about the security of energy production and transport, raising oil prices for the long term and negatively impacting the U.S. economy. It would also increase the likelihood of disruptions to the flow of oil, having a material negative impact on the U.S. economy.

Oil Disruptions and the Middle East

Middle East oil is critical to the global economy. Exports from the region—more than half of which come from Saudi Arabia—fulfill nearly 20 percent of global daily oil demand, and 35 percent of all seaborne-traded oil passes through the Strait of Hormuz. The Persian Gulf—Saudi Arabia in particular—is also home to nearly all the world's spare production capacity. If oil production or exports from the region are interrupted, the rest of the world would have a difficult time replacing those supplies, driving prices up.

OIL FLOWS FROM PERSIAN GULF COUNTRIES THROUGH STRAIT OF HORMUZ



Such oil-supply disruptions—and their attendant price spike—have occurred periodically during the last half-century. Military conflict blocked vital oil chokepoints during the Suez Crisis (1956–1957), contributing directly to a price jump of 9 percent during the conflict. Other conflicts have damaged major oilfields and facilities, or cut them off from world markets, as during the Iranian general strike and Revolution (1978–1979), Iraq's invasion of Iran's oil-producing regions (1980), Iraq's invasion of Kuwait (1990), and the opening phase of the Iraq War (2003).

Methodology

The scenarios presented below are the result of consensus among our Task Force on plausible threats to oil supplies in the Persian Gulf. We chose these scenarios because they are plausible geopolitical reactions to a nuclear Iran that could spark a range of possible energy disruptions.

To account for the duration and dynamism of each scenario—as some oil production is restored or bypass export routes are activated over time—the Task Force worked with oil analysts and regional experts to express the magnitude of each disruption in terms of the average daily oil-supply loss during the period of a year. This approach allowed factoring in the potential impact of petroleum stored in global public stocks, such as the U.S. Strategic Petroleum Reserve,[7] which could be released in an emergency by coordinated action of the International Energy Agency (IEA).[8] For each scenario, the Task Force offers a range of possible disruption amounts—and their impacts—based on whether these reserves are released or not.

It is important to note that at the beginning of any disruption, the market would not know the magnitude and duration of the disruption and so its immediate reaction might not reflect the true nature of the event—the market could either spike higher than the facts would merit or not react as strongly as the disruption would suggest. However, we do not seek to account for such market behavior in our study, focusing instead on annual prices.

Next, Task Force members assessed the likelihood of each scenario occurring in the current status quo, within one year of Iran acquiring nuclear weapons capability, and in the following two years. We averaged the results to arrive at an informed estimate of the probabilities that any of the five scenarios would occur.

Finally, we used an established macroeconomic model to calculate the impact each scenario could have, were it to occur, on the U.S. economy in the form of gasoline prices, GDP, unemployment, and inflation.[9] For certain scenarios, the consequences of their occurrence would be so tragic in humanitarian terms and so unprecedented in economic dislocation that we undertook only the simplest analysis, since even the most sophisticated models cannot predict how the world would react to such devastation.

Scenarios

Below, we consider five scenarios that might unfold in the Middle East, causing disruptions to the supply of oil. We examine the dynamics that might drive the occurrences of these scenarios and imagine how they would play out. We also evaluate the probability of their taking place, the magnitude and duration of the supply disruptions they would cause, and the economic impact the scenarios would have if they did occur. Again, we recognize that there are many unknowns and much no one can foresee. Still, we believe these scenarios to be credible and illustrative.

Scenario #1: Domestic Instability in Saudi Arabia

Saudi Arabia, a close U.S. ally, could face a leadership transition in the coming years as the aging generation of top officials, who are sons of the country's founder, gives way to a new generation of successors.[10] This uncertain process could be triggered, or at least aggravated, by the unrest already sweeping through the region, independent of Iran's pursuit of nuclear weapons. But an emboldened nuclear Iran could instigate or exacerbate an uprising in Saudi Arabia's Shiite-majority Eastern Province, the nerve center of Saudi oil exports. These developments would create significant and long-lasting export disruptions from the kingdom.

The monarchy has been able to stave off the massive demonstrations that have swept through the rest of the region through co-optation, primarily in the form of tens of billions of dollars in housing, employment, and other subsidies. Nonetheless, Riyadh remains wary of the large number of disaffected Saudi youth and the rumblings of sectarian discontent in the Eastern Province, especially with Shiite unrest in neighboring Bahrain.[11]

These developments could occur independently of a nuclear Iran. Regardless, once Iran gains a nuclear deterrent, its leaders are likely to feel emboldened to expand their power and influence across the region. Memories of the great Persian empires that spanned from Europe to Asia and lasted centuries still resonate in Iran. And the theocratic ideology of *velayat-e faqih* that fueled the 1979 Revolution and brought Ayatollah Ruhollah Khomeini to power is not conscribed by national boundaries; its ambition extends to leading the Muslim world. This imperial nostalgia and religious expansionism, combined with Tehran's statements about eliminating the state of Israel, has led Iran to consistently subvert neighboring governments, sponsor terrorist groups, and exacerbate sectarian tensions throughout the region. For example, Tehran has supported and trained militias and religious movements in Iraq and Lebanon, was likely involved in a 1981 Shiite coup attempt against the Sunni monarchy in Bahrain, and just recently backed a terrorist attack that killed five Israeli tourists in Bulgaria.[12]

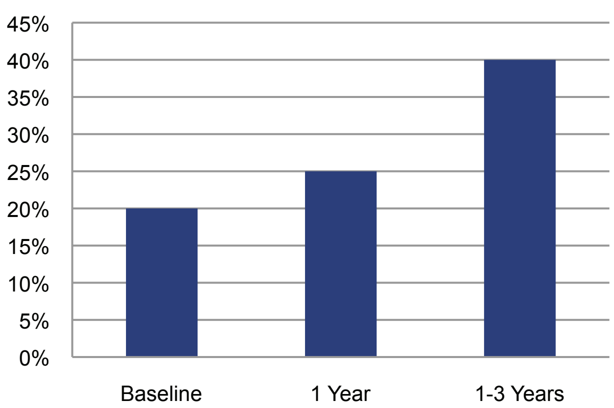
Saudi Arabia would present an inviting target for a nuclear Iran. Unrest there could help Iran drive up the price of oil. The Eastern Province accounts for as much as 80 percent of Saudi oil exports (roughly 8 percent of global daily oil consumption), and the Eastern Province-based Saudi Arabian Oil Company relies heavily on Saudi Shiite labor.[13] An uprising there could disrupt production, driving up prices and helping Iran make up revenue lost from exports driven lower by both declining production and sanctions. An added incentive for Tehran is that it could attempt this without threatening the Strait of Hormuz, a move that would shut Iran's own oil exports out of the market and heighten direct confrontation with the United States.

Whether peaceful or not, political upheaval in oil-producing countries often disrupts the energy sector for a significant duration, as evidenced by rough transition periods in Iran (1978–1980), Russia (1990s), Iraq (2000s), and Libya (2011–2012). In each case, oil exports dropped dramatically for months or years.[14] Sustained sectarian unrest in the Eastern Province could physically disrupt oil infrastructure. Given Riyadh's sense of the vulnerability of its oil infrastructure to Iranian meddling, it could prompt a government crackdown that would compound instability.[15]

Consequences

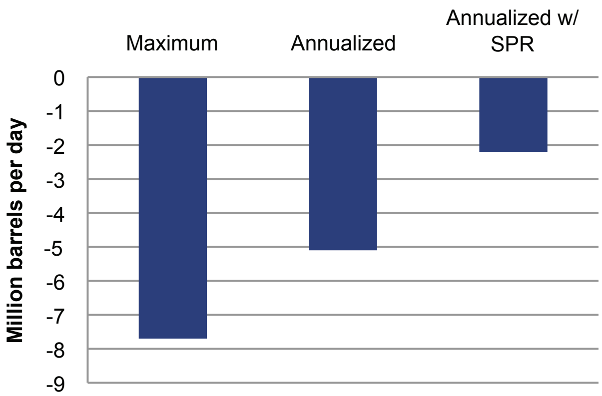
We judge the current probability of such Saudi instability to be 20 percent. In the event of a nuclear-capable Iran, we estimate the probability to rise to 25 percent within one year and to 40 percent in the following two years.

Domestic Instability in Saudi Arabia: Probability of Occurrence



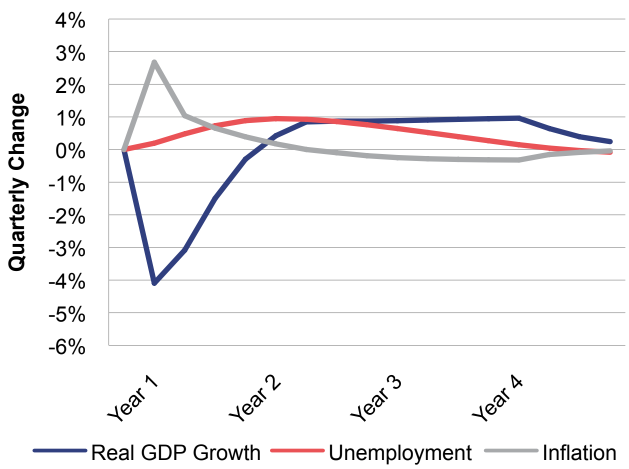
We estimate the maximum export disruption would be 7.7 million barrels per day (mbpd). We estimate that a near-total loss of Saudi exports could last for approximately six months after the onset of widespread internal upheaval, followed by a gradual but steady return to pre-conflict export levels over the succeeding five months. This would result in an annualized disruption of 5.1 mbpd. If we assume a global strategic reserve release rate of 7.0 and 4.0 mbpd in the first and second four-month periods after the onset of upheaval, respectively, the annualized disruption falls to 2.2 mbpd.

Domestic Instability in Saudi Arabia: Oil Disruption

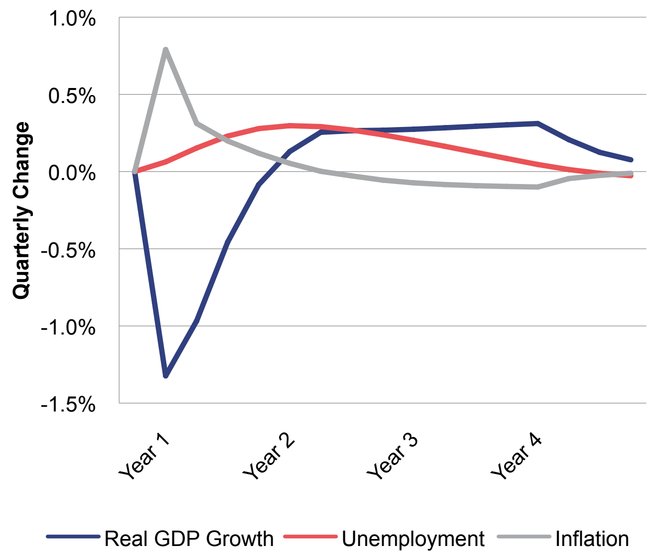


Were this scenario to occur, our model suggests the price of oil would increase by 25 to 55 percent above the current baseline, which could mean oil prices $25 to $60 higher per barrel. As a result, real GDP could drop by between 2 to 5 percent in the first quarter that supplies are disrupted and 1 to 3 percent in the first year, but then gradually improve. Gasoline prices could cost about 60 cents to $1.50 per gallon more at the pump. Inflation could surge by over one percent and between 750,000, and 1.9 million more people could lose their jobs.

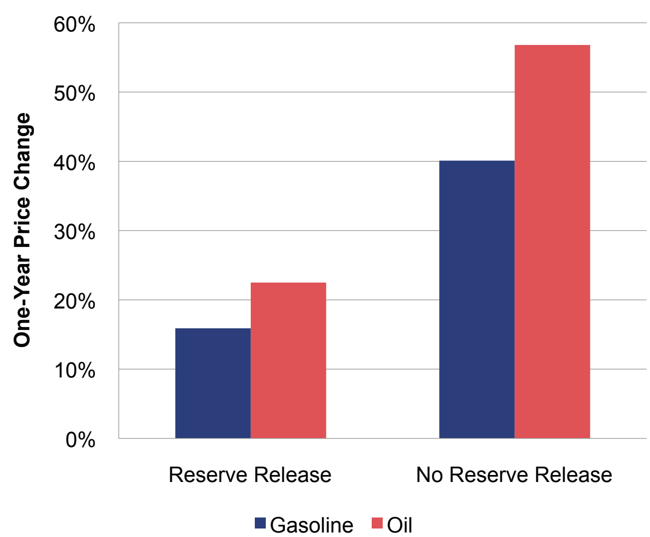
Macroeconomic Effects of Domestic Instability in Saudi Arabia: No Reserve Release



Macroeconomic Effects of Domestic Instability in Saudi Arabia: Reserve Release



Effects of Domestic Instability in Saudi Arabia on U.S. Oil and Gasoline Prices



Scenario #2: Saudi Facilities Destroyed

Saudi Arabia's primary oil facilities are grouped closely together in the Eastern Province. All of the kingdom's Hormuz-bound exports—three-quarters of the Saudi total—are processed here, making them an attractive target for anyone seeking to harm Riyadh. Major damage to, and therefore disruptions at, these facilities would generate significant, medium-term disruptions to regional oil exports.

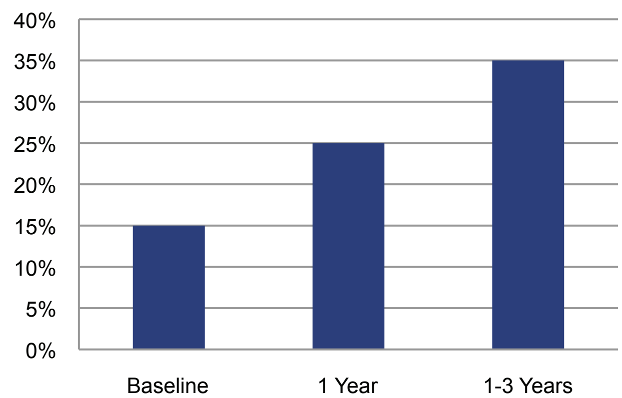
A nuclear Iran would upset the current balance with Saudi Arabia and cast doubt on U.S. security guarantees to Gulf Arab countries. Iran could be emboldened to sabotage or attack, whether directly or via proxy, Saudi oil facilities in order to decrease oil supply and drive up prices on Iranian petroleum exports.

Iran could attempt to overwhelm Saudi Arabia's advanced U.S.-made ballistic missile-defense systems with its large arsenal of short-range ballistic missiles. It could also use its extensive cruise missile and attack-craft capabilities to assault Saudi Arabia's massive offshore loading facilities in the Gulf.[16] Terrorist groups or opponents of the Saudi regime, Iran-backed or otherwise, could also attempt to sabotage the facilities using vehicle-borne improvised explosive devices, other explosives, insider attacks, or more covert forms of sabotage.

Consequences

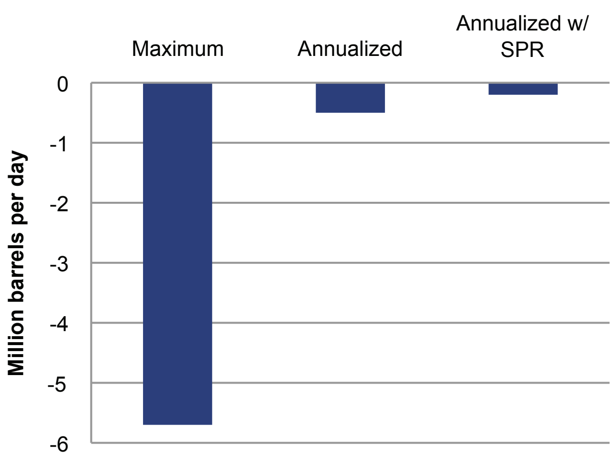
The probability of such an attack would be higher once Iran obtained a nuclear umbrella against Saudi or U.S. retaliation—although the probability would still be significant prior to an Iranian nuclear capability. We judge the probability of such an event to be approximately 15 percent currently, rising to 25 percent in the first year after Iran acquires a nuclear capability, and to 35 percent in the following two years.

Saudi Facilities Destroyed: Probability of Occurrence



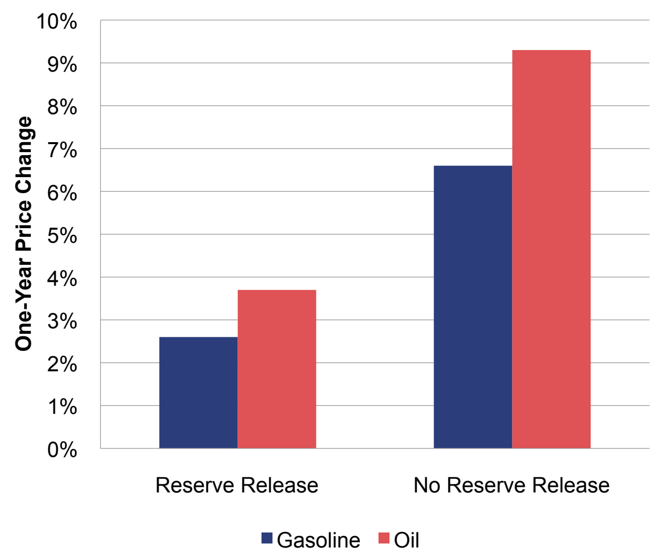
The maximum export disruption would be 5.7 mbpd, equivalent to the country's current Gulf exports. We assume Saudi Arabia would re-route these supplies through its Red Sea bypasses after one month, resulting in an annualized disruption of 0.5 mbpd. If we also assume a release rate of global petroleum reserves of 4.0 mbpd in the first month after an incident, the annualized disruption falls to 0.2 mbpd. We estimate the duration of any disruption to Saudi Gulf facilities to be six months, assuming a projected high amount of physical destruction to the facilities and the extensive reconstruction needed to bring them back to normal levels. Regardless of the particular duration, we assume Riyadh would be able to resume pre-incident export levels using its bypasses after one month.

Saudi Facilities Destroyed: Oil Disruption

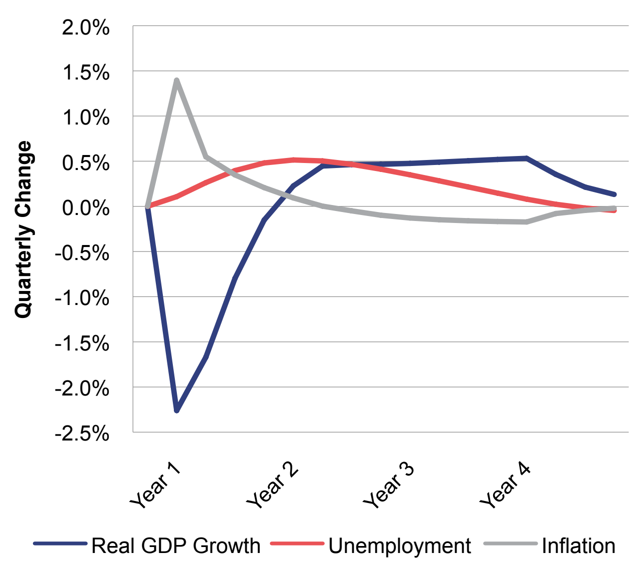


Because of the ability to re-route much of Saudi production through existing pipelines, our model suggests the price of oil would increase by only between 4 and 10 percent above the current baseline in this scenario, which could mean oil prices $4 to $10 higher per barrel. As a result, real GDP could drop by 0.2 to 0.5 percent in the first quarter that supplies are disrupted and 0.1 to 0.3 percent in the first year, but then gradually improve. Gasoline prices could go up by 3 to 7 percent, translating to paying 10 to 30 cents per gallon more at the pump. Inflation could tick up about two-tenths of 1 percent, and more than 100,000 people could lose their jobs.

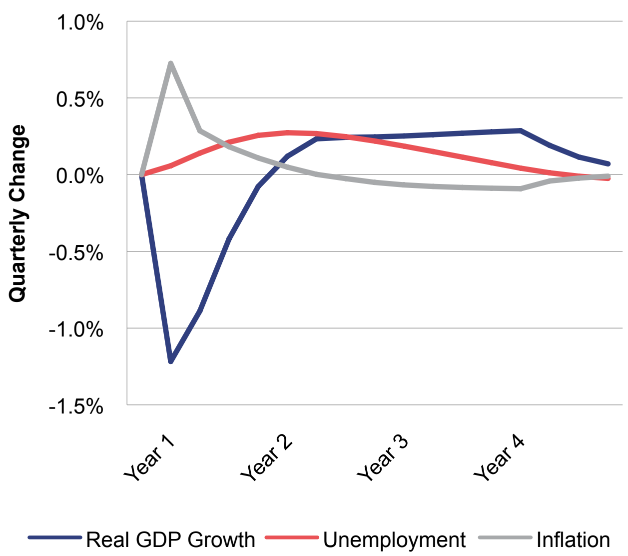
Effects of Saudi Facility Destruction on U.S. Oil and Gasoline Prices



Macroeconomic Effects of Saudi Facility Destruction: No Reserve Release



Macroeconomic Effects of Saudi Facility Destruction: Reserve Release



Scenario #3: Sanctions Lapse

Paradoxically, a nuclear Iran could potentially increase oil exports from the Middle East, assuming Saudi production remains the same. The international sanctions regime against Iran's oil sector—intended to force Tehran to negotiate over its nuclear weapons program—could eventually disintegrate if the goal of preventing a nuclear Iran becomes moot.

Iranian exports of crude oil have fallen since the announcement at the end of 2011 of U.S. and E.U. sanctions, from roughly 2.2 mbpd in 2011 to slightly less than 1.0 mbpd in August 2012. The E.U. oil embargo accounts for half of this 1.2 mbpd, with the rest resulting from reduced purchases by Iran's largest buyers—all of whom are in East and South Asia.[17] Arab OPEC producers have been using spare capacity to offset concerns about tightened global supplies; however, concern persists among Asian buyers about sufficient availability of oil supplies for their growing needs. Thus, Iran's largest buyers—all in Asia—might be likely to increase purchases if the raison d'être of the sanctions evaporates.

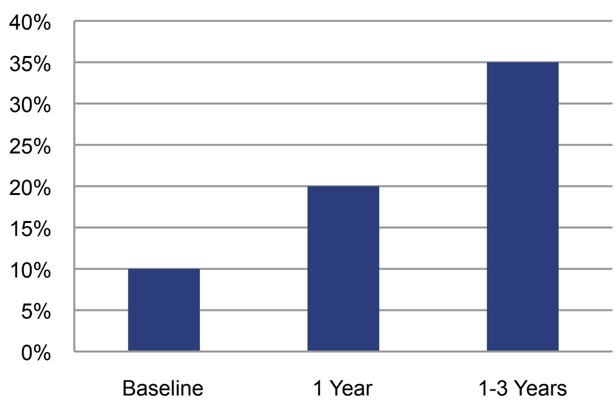
Currently, major Iranian customers—including India, Japan, and South Korea—maintain tenuous compliance with a U.S. law enacted in 2011, which requires the Obama administration to impose financial sanctions unless the president is able to certify semi-annually that these countries significantly reduced purchases of Iranian oil below pre-2012 levels. China, which is Iran's largest purchaser, received waivers despite its minimal compliance.[18] These and other non-E.U. consumers could feel less compelled by fear of U.S. penalties if Tehran was allowed to cross the nuclear threshold. As a result, these countries would likely try to rebalance their importation of Gulf oil by increasing purchases from Iran, while decreasing their relative dependence on Arab OPEC exporters. Over the longer term, previous major E.U. purchasers of Iranian crude—all hard-hit economies in southern Europe—would face similar temptations to resume imports from Iran. Of course, new purchases of Iranian supply might not change the global supply/demand balance if the Saudis decide to scale back their oil output to keep prices level.

On the other hand, were Iran to become a nuclear power, this blatant violation of the international nonproliferation regime might cause many members of the international community to come together and increase punitive measures against Iran. However, given that the enforceability of sanctions diminishes over time and that national interest soon trumps collective action, even increased application of sanctions would likely lapse as Iran's transgressions fade from memory.

Consequences

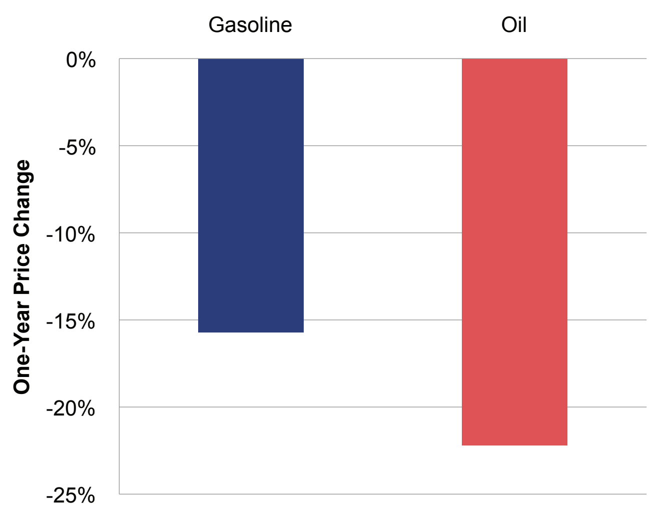
Given the existing discontent among Asian consumers with U.S. extraterritorial sanctions against Iran's oil exports, we judge there is a 10 percent probability of a global resumption of Iranian oil imports under the status quo. In the event of a nuclear Iran, we estimate the probability to rise to 20 percent within one year, rising to 35 percent in the following two years.

Sanctions Lapse: Probability of Occurrence



We estimate that this scenario could actually add 1.2 mbpd to world oil supplies. This reflects the difference between Iran's current 1.0 mbpd export level and its pre-sanctions level of 2.2 mbpd, at which it exported for several years prior. Given robust global demand, poor compliance with non-E.U. sanctions, and strong incentive by Tehran to maximize its oil revenue, we assume Iran would ramp back up to its 2.2 mbpd export level within two months of sanctions lapsing. Were this scenario to occur, our model suggests the price of oil would actually fall by about 20 percent from the current baseline. Although this could have positive economic effects, because we consider it likely that Saudi Arabia might scale back its own production in the event of this scenario, we did not calculate its economic impact.

Effects of Sanctions Lapse on U.S. Oil and Gasoline Prices: No Reserve Release



Scenario #4: Iran-Saudi Nuclear Exchange

Saudi Arabia would be very likely to try to follow Iran across the nuclear threshold. Should it do so, the world would face the possibility of an Iran-Saudi nuclear exchange—a catastrophic humanitarian event that would threaten the entirety of Gulf oil exports for an extended period of time.

In early 2008, the Senate Foreign Relations Committee concluded: "If Iran obtains a nuclear weapon, it will place tremendous pressure on Saudi Arabia to follow suit."[19] By 2012, some experts believe it has already begun to do so. Two main factors could drive Saudi Arabia to pursue a nuclear weapon: (1) a decades-long Saudi-Iran cold war waged along sectarian, religious, ethnic, and geopolitical lines and (2) a deep-seated competition over the energy policies that form the lifeblood of both regimes.

The Sunni Saudi monarchy and Shiite Iranian theocracy each claim leadership of the Islamic world. This sectarian competition for primacy is reinforced by ethnic differences: Saudi Arabia is the largest and most populous Arab country astride the Gulf, but it is dwarfed by Iran's much larger Persian-majority population. These competing claims have pitted the two countries in an enduring cold war and proxy conflict spanning from Lebanon to Iraq and the Arabian Peninsula. Iran—under both the Shah and the ayatollahs—has routinely sought to use its conventional military capabilities, large population, geostrategic position, expansive resources, and ties to armed groups to shift the balance of power in the Persian Gulf in its favor and at the expense of its Sunni Arab neighbors.[20]

As a result, Saudi Arabia has made it clear it views a nuclear-capable Iran as an existential threat. In 2008, King Abdullah urged the United States to "cut off the head of the snake," one instance of his "frequent exhortations [to] the United States to attack Iran to put an end to its nuclear weapons program," according to U.S. diplomatic cables revealed by Wikileaks.[21] With uncertain prospects for a halt to Iran's nuclear program—peaceful or otherwise—in 2009, the King informed a senior American official, "If [Iran] gets nuclear weapons, we will get nuclear weapons." This year, senior Saudi officials reiterated that "it would be completely unacceptable to have Iran with a nuclear capability and not the kingdom [of Saudi Arabia]."[22]

Rather than lose time developing an indigenous nuclear program, it is likely the Saudi kingdom would seek to obtain a nuclear warhead from Pakistan ready to mount on its CSS-2 ballistic missiles. Close Saudi-Pakistani security ties date back to shared Cold War–era interests, and it is widely believed that Riyadh bankrolled Islamabad's nuclear weapons program with the stipulation that Pakistan would sell nuclear devices to Saudi Arabia in an emergency; in the words of a senior Saudi official, "within weeks."[23] Pakistan would benefit by receiving much-needed cash and could demand in return dual-key authority over missile launches, both to control Saudi policy and to bolster its own second-strike capability against India.

At best, this would create a nuclear-armed standoff between the two most powerful and mutually antagonistic countries in the Persian Gulf. At worst, it could devolve into atomic warfare. Iran's and Saudi Arabia's small arsenals, lack of durable communication channels, poor civilian oversight of command-and-control systems, erratic intelligence, proximity to each other, religious ardor, and sectarian divide would all distinguish this scenario from the Cold War balance between the United States and the Soviet Union.

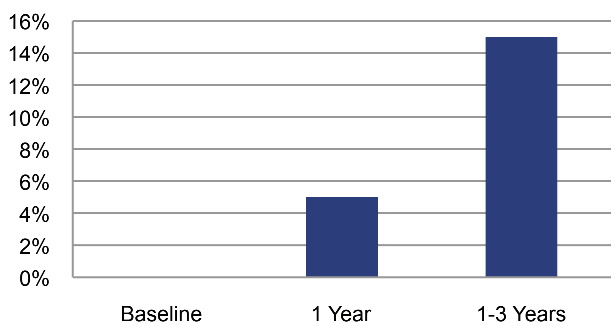
Any such conflict would likely be extremely devastating. Each country would have natural incentives to cripple its opponent's oil facilities in any nuclear conflict. Crude-oil exports are both regimes' political and economic lifeblood, and thus the basis for their military power. Also, each country's oil infrastructure and export terminals are concentrated along the Gulf, within range of the other's nuclear-weapons delivery vehicles. Moreover, a nuclear war in this region would likely not only destroy a large portion of the Gulf's oil infrastructure but also render the entire Gulf unavailable to shipping for some period of time. This could come directly through radioactive fallout, atmospheric pollution, and environmental destruction, or indirectly through prohibitively high insurance rates and other risk factors for tankers transiting the region.[24] Therefore, even if a nuclear exchange did not spread into a region-wide war, the transit of Hormuz-bound oil exports would be halted by such a conflict.

However, while any coastal inhabited areas and facilities not destroyed in such an exchange could be contaminated with fallout, killing some of the population from radiation sickness in the short term, and increasing late radiation damage in the long term, ocean travel through the Gulf could become possible within a matter of months. Fallout ash would settle on the water and be carried out to sea, where it could disperse more quickly than on land. Those countries and facilities not directly damaged by the nuclear conflict could, depending on prevailing wind conditions and how the fallout is dispersed, resume oil exports through the Gulf within six months.[25]

Consequences

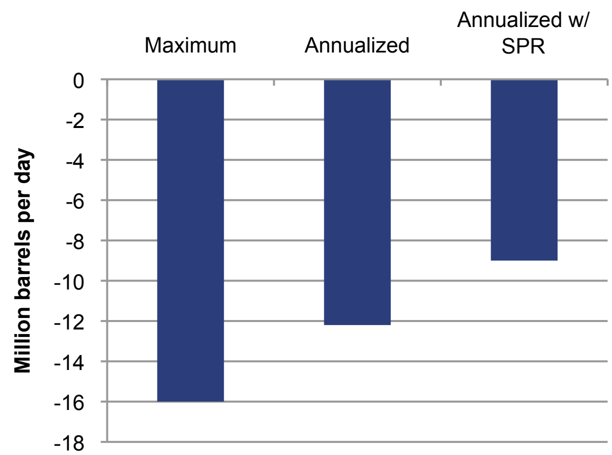
Given that neither country currently possesses nuclear weapons, the potential for such a nuclear exchange now is zero. However, we judge the probability of such an event in response to a nuclear-capable Iran to be 5 percent within the first year, tripling to 15 percent in the following two years—still low, but not insignificant.

Iran-Saudi Nuclear Exchange: Probability of Occurrence



The maximum export disruption would be 16 mbpd: the sum of the 8.7 mbpd lost as result of the absolute damage to Saudi (7.7) and Iranian (1.0) export capacity, plus the ensuing cutoff of Iraqi (2.2), Kuwaiti (1.9), Qatari (0.6), and Emirati (2.6) oil exports via Hormuz. We assume the Abu Dhabi Crude Oil Pipeline would ramp to full capacity (1.5 mbpd) one month after an exchange, followed by a return of pre-conflict Iraqi, Kuwaiti, Qatari, and Emirati exports via Hormuz after six months. This would result in an annualized disruption of 12.2 mbpd.

Iran-Saudi Nuclear Exchange: Oil Disruption



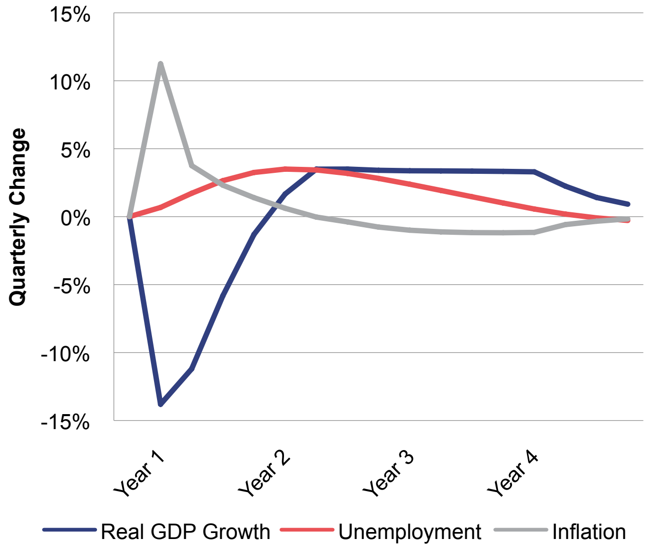
If we also assume a release rate of global petroleum reserves of 7.0, 4.0, and 1.0 mbpd in the first, second, and third quarters after an exchange, respectively, the annualized disruption falls to 9.0 mbpd. (We caution against the pegging of the precise release rate of the international strategic reserves. Such a level of release would be unprecedented, and experts sharply differ about what level is practical.) We judge the total duration of this disruption to be one year—longer than any previous major disruption in history—as a result of the catastrophic nature and scope of the damage caused by such a conflict.

Of course, crude oil is not the only energy source transiting the Strait of Hormuz. Refined petroleum products and liquefied natural gas (LNG) also travel these waters. Any scenario, such as this one, which closes the strait to tanker traffic would certainly impact the flow of these other fuels. However, assessing these disruptions lies outside the scope of this study.

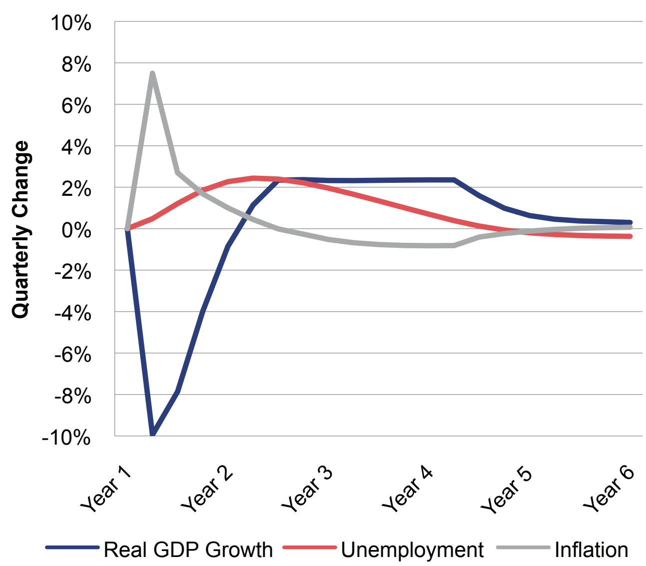
Were this scenario to actually occur, the resulting humanitarian costs and physical devastation would be unimaginable. The economic costs pale in comparison and appear almost inconsequential. Nevertheless, they would be substantial. Assessing the resulting economic dislocations is particularly difficult, because the world has never experienced an oil-supply disruption of this magnitude, and current modeling tools are inadequate. Although current demand for oil is relatively independent of price, scarcity of oil would force energy consumers—whether private individuals, enterprises, or governments—to cut back their use of oil-based products, and the market would be incentivized to develop under-utilized or new alternative-energy sources, as neither global spare capacity nor strategic reserves would suffice to mitigate the resulting supply loss. Given time, therefore, supply and demand for oil would reach equilibrium.

For these reasons, we have capped the price spike that would result from a nuclear exchange between Iran and Saudi Arabia at 100 percent, effectively doubling current prices in the immediate aftermath, meaning as much $110 more per barrel of oil at current international prices. In the immediate aftermath of this scenario, our model suggests real GDP would drop by roughly 10 to 14 percent, but then improve gradually, with the economy slowing by 6 to 8 percent in the first year. After that, the GDP impact could actually become positive—as the immense amount of excess productive capacity reaccelerates the economy and makes up for some of the initial loss in growth—before reaching equilibrium. Gasoline prices could go up by as much as 70 percent, translating to paying an additional $2.75 per gallon at the pump. The inflation rate might also spike by 7 to 11 percent in the first quarter of this scenario, but then quickly decline and actually turn downward after the first year, because the economic depression also depresses broader inflation. Unemployment would go up by between 2 and 4 percent over the first year, meaning an additional three to five million people could lose their jobs, with the effects lasting for more than three years after the start of the scenario.

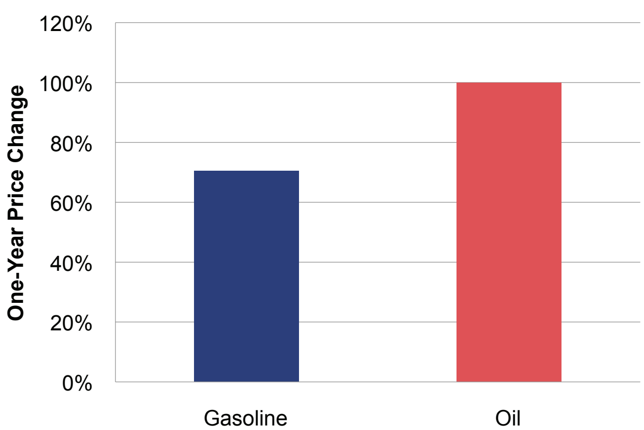
Macroeconomic Effects of Iran-Saudi Nuclear Exchange: No Reserve Release



Macroeconomic Effects of Iran-Saudi Nuclear Exchange: Reserve Release



Effects of Iran-Saudi Nuclear Exchange on U.S. Oil and Gasoline Prices



Scenario #5: Iran-Israel Nuclear Exchange

A nuclear Iran would immediately encounter another nuclear state—even if an undeclared one—in the region: Israel. Compared with the relative stability of the Cold War, an initial stalemate between Israel and Iran would be highly precarious at best and would also threaten the entirety of Gulf exports, although for a more limited duration.

Were Iran to become nuclear, the frequency of crises and proxy conflicts between Iran and Israel would likely increase, as would the probability of such confrontations spiraling into a nuclear exchange, with horrendous humanitarian consequences. There could be an Israeli-Iranian nuclear exchange through miscalculation and/or miscommunication. There could also be a calculated nuclear exchange, as the Israeli and Iranian sides would each have incentives to strike the other first.

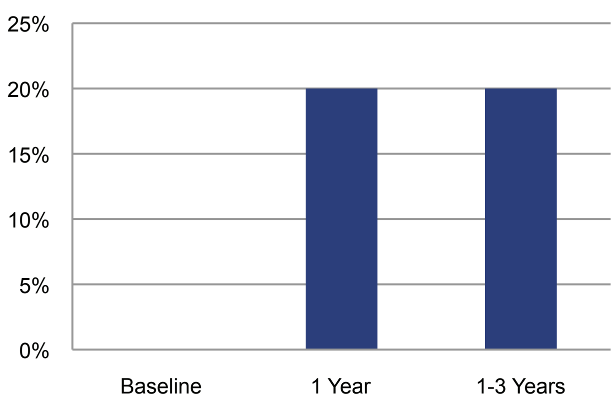
Tehran would likely have the ability to produce only a small handful of weapons, whereas Israel is already estimated to possess more than 100 devices, including thermonuclear warheads far beyond the destructive power of any Iranian fission weapon. Under such circumstances, Iran's vulnerability to a bolt-from-the-blue Israeli nuclear strike would actually *increase* its incentive to launch its own nuclear attack, lest its arsenal be obliterated. Israel's small territorial size reduces the survivability of its second-strike capability and, more importantly, the survivability of the country itself, despite its vastly larger and more advanced arsenal. Thus, Israeli leaders might feel the need to act preventatively to eliminate the Iranian arsenal before it can be used against them, just as American military planners contemplated taking out the fledgling Soviet arsenal early in the Cold War, except that as a much smaller country Israel has far less room for maneuver.[26]

An Israel-Iranian nuclear conflict would be highly detrimental to regional oil exports. The physical destruction and radioactive fallout would render the geographically confined spaces of the Persian Gulf inhospitable, at least in the immediate aftermath of a strike. However, this disruption would not be as permanent as an Iranian-Saudi exchange. Riyadh's export facilities would not have to be rebuilt, nor would its spare production capacity be destroyed. Additionally, an Iranian nuclear attack on Israel itself would not disrupt the flow of oil exports, despite the potential for such a strike to annihilate the entire country. Finally, the physical impact on oil shipping lanes would likely be smaller, since the nexus of an Iran-Israel nuclear conflict would be oriented away from the heart of the Gulf.

Consequences

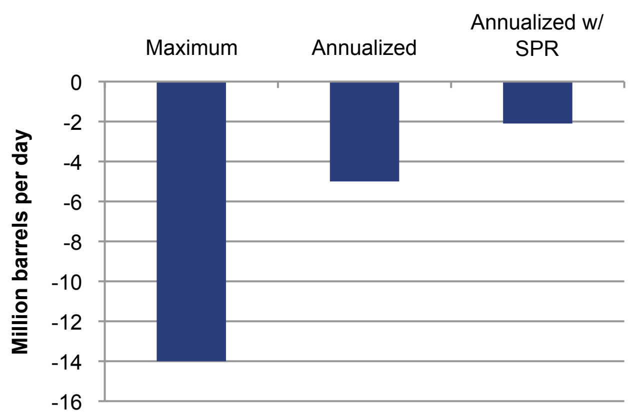
While Israel could choose to use its nuclear arsenal to prevent Tehran from attaining nuclear weapons capability, we believe the probability of such an Israeli nuclear attack to be exceptionally low at present. However, given the chance for miscalculation and incentives on both sides for first-strikes, we judge the probability of such an Iranian-Israeli nuclear exchange to rise precipitously in response to a nuclear-capable Iran, reaching and remaining at 20 percent for three years.

Iran-Israel Nuclear Exchange: Probability of Occurrence



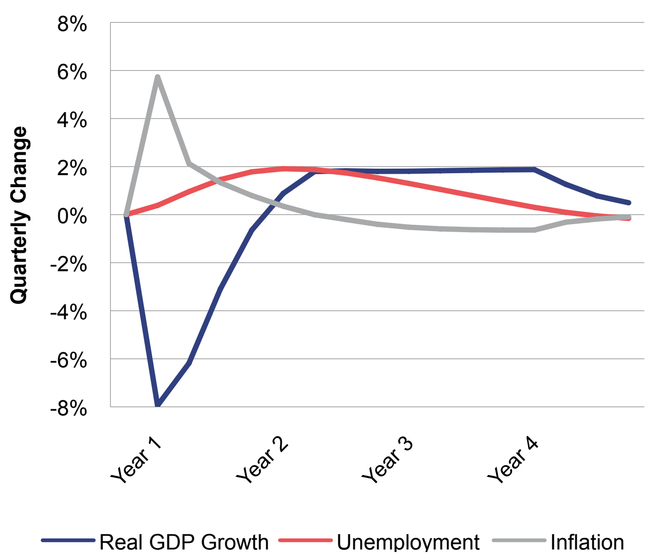
The maximum export disruption for this scenario would be 14.0 mbpd. This is the sum of the 8.7 mbpd lost as a result of the absolute damage to Iranian (1.0) export capacity plus the ensuing cutoff of Saudi (5.7), Iraqi (2.2), Kuwaiti (1.9), Qatari (0.6), and Emirati (2.1) oil exports via Hormuz. We assume the Abu Dhabi Crude Oil Pipeline would ramp to full capacity (1.5 mbpd) one month after an exchange. As an Iran-Israel exchange would not likely physically damage Saudi infrastructure, we also assume Riyadh would be able to re-route its 5.7 mbpd of Gulf exports to the Red Sea within the same period. Pre-conflict Iraqi, Kuwaiti, Qatari, and Emirati exports via Hormuz would resume in full after six months. This would result in an annualized disruption of 5.0 mbpd. If we also assume an IEA-led strategic petroleum release rate of 7.0 and 4.0 mbpd in the first and second four-month periods after an exchange, respectively, the annualized disruption falls to 2.1 mbpd. We judge the total duration of this disruption to be one year.

Iran-Israel Nuclear Exchange: Oil Disruption

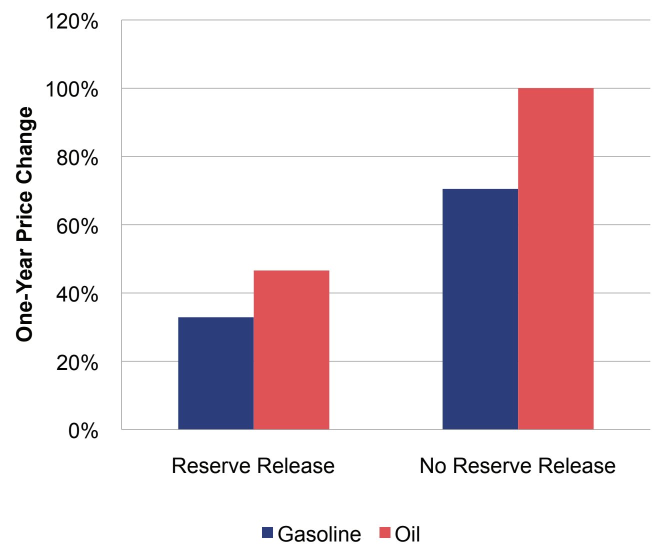


Were this harrowing scenario to occur, the human cost would be bewildering. The scale of destruction would be devastating, obviously dwarfing the resulting economic costs. Nevertheless, the economic costs would be significant. Given the large amount of oil that would be removed from the market in the immediate aftermath of such an exchange, our model suggests the price of oil would increase by between approximately 50 and 100 percent, which could mean oil prices $50 to $110 higher per barrel. As a result, real GDP could drop by 3 to 8 percent in the first quarter that supplies are disrupted, but then gradually improve, with an annual drop of 2 to 5 percent in the first year. Gasoline prices could go up by 30 to 70 percent, translating to paying $1.30 to $2.75 per gallon more at the pump. Inflation could increase 1 to 3 percent in the first year, and between 1.2 and 2.9 million more people could lose their jobs.

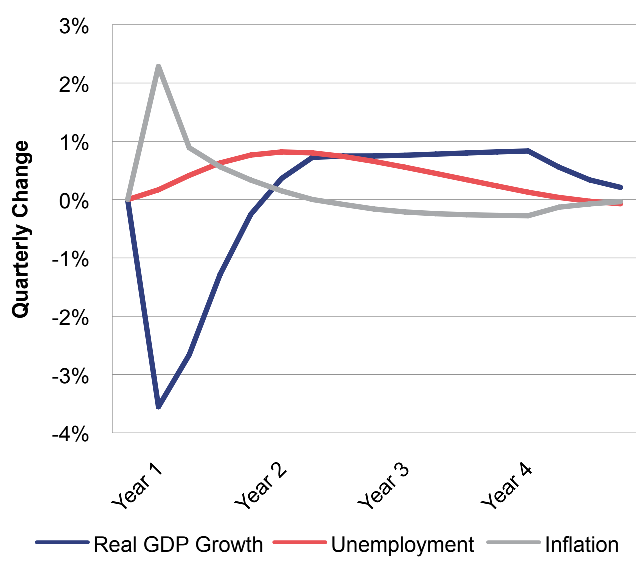
Macroeconomic Effects of Iran-Israel Nuclear Exchange: No Reserve Release



Effects of Iran-Israel Nuclear Exchange on U.S. Oil and Gasoline Prices



Macroeconomic Effects of Iran-Israel Nuclear Exchange: Reserve Release



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Risk Premium

Tehran crossing the nuclear threshold might not immediately precipitate a conflict or cause a disruption in the flow of oil. It would, however, further significantly destabilize an already tumultuous region. Evaluating the repercussions of a nuclear Iran thus requires quantifying the price effects of instability: accounting for the resulting relative adjustments in the likelihood of various disruptions taking place and, then, calculating how global markets will price such geopolitical events.

Methodology

To arrive at a figure for the risk premium that would be added to the price of oil the day after Iran became a nuclear power, we used two main figures: the weighted sum of the amount of oil that could potentially be disrupted, expressed as a percent of total global oil demand, and the price elasticity of oil demand.

First, we translated the five scenarios we developed into a range of different-sized disruptions (expressed as annualized disruption magnitudes) that could occur, and we assessed the likelihood of each taking place. In order to ensure that we arrived at a plausible baseline risk premium, from which to calculate the price change that a nuclear Iran could cause, we had to consider an additional scenario: a military strike on Iranian nuclear facilities. While military action is not the focus of our study, it is one of the most significant risks priced into oil markets today. We do not, however, consider the effects of a strike, although several financial firms have conducted such analyses.[27]

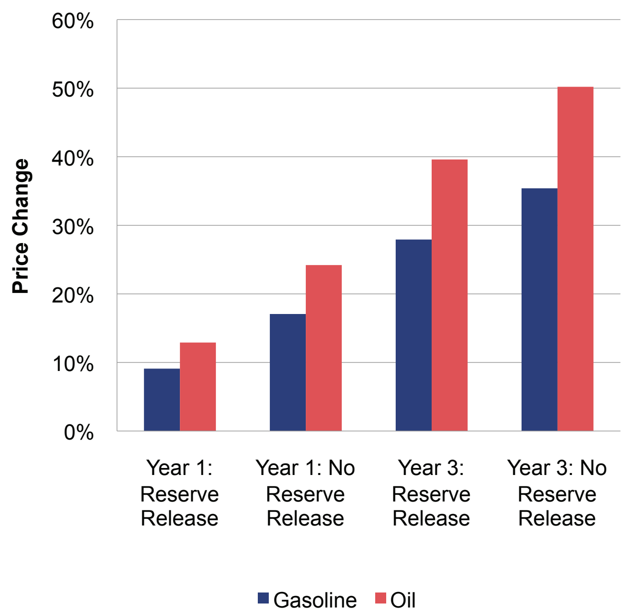
Second, for each time horizon—status quo, the first year of a nuclear Iran, and the following two years—we assessed the potential oil-supply disruption as a percent of the total global oil demand. To do so, we calculated the probability-weighted sum of the amount of oil that could be disrupted in each scenario (the probability of each disruption occurring multiplied by the amount of oil that would be disrupted, summed for all disruptions) and divided this figure by total demand for oil. We assumed global oil demand will remain relatively flat over the foreseeable future and used 2012 projected levels of 90 mbpd for this calculation.[28]

Next, we used the equation for the price elasticity of demand for oil—the change in demand for oil as a result of the change in price—to calculate the change in price that would result from the reductions to global oil supply caused by each scenario.[29] By dividing the total potential disruption as percent of global oil demand by the price elasticity of oil, we arrived at the likely change in price that would occur from the market factoring in the risks contained in our scenarios. The resulting price-change figure for the status quo should reflect the risk premium currently placed on oil, whereas the figure for a nuclear Iran represents how much higher that premium could rise once Iran becomes a nuclear power. For each period, we produced a range of price-change estimates based on whether global strategic petroleum reserves are released (the low case) or not (the high case).

Consequences

Just the expectation of potential future disruptions that a nuclear Iran would introduce into global energy markets would have a significant effect on oil prices and, by extension, the U.S. economy. Our analysis indicates that the expectation of instability and conflict that a nuclear Iran could generate in global energy markets could roughly increase the price of oil by between 10 and 25 percent, which, given current international oil prices, would result in prices \$11 to \$27 higher per barrel. As instability and tensions remain high, so will prices, even rising during the next several years, reaching levels as much as 30 to 50 percent, or \$30 to \$55 per barrel, higher. Within three years, U.S. gasoline prices could increase by over 30 percent, equating to roughly paying an additional \$1.40 per gallon at the pump. At that level of increase, both inflation and unemployment would be projected to rise by 1 percent, which equates to a loss of more than one million jobs. Meanwhile, GDP could drop by more than 1 percent, or almost $220 billion.[30]

Effects of Nuclear Iran on U.S. Oil and Gasoline Prices



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Appendices

I. Energy Market Dynamics

Assessing the impact of a nuclear Iran on global oil prices requires understanding the factors that contribute to the price of oil and the dynamics that can send those prices soaring.

A. The Sources of Oil Prices

Most fundamentally, the price of oil is driven by supply and demand. Broadly speaking, the more oil is available, the lower the price will be, while increasing consumption of oil will drive prices up. Because oil is basically fungible—where one barrel of oil is roughly similar to another, with some differences in weight, sulfur content, and viscosity—this supply/demand dynamic is global. In other words, it is not the production and consumption of oil in the United States, but worldwide, that determines U.S. prices.

Precisely because crude oil is consumed worldwide, other factors also contribute to the price of oil—namely, the costs of extracting the oil, of transporting it, of insuring it while in route, and the value of the currency (usually the dollar, though less so than in previous decades) upon which its price is based. Finally, expectations of potential supply disruptions are also priced in, adding a risk premium on top of the more tangible factors that determine the cost of petroleum. This is because industries that rely on petroleum, whether for manufacturing purposes or for resale, such as refineries, are likely to build their inventories of oil now if they foresee the possibility of future shortages. By buying up extra oil, they drive up current demand and increase prices.

B. A History of Oil Price Spikes

As would be expected of a resource beholden to the dynamics of supply and demand, sudden disruptions in the availability of oil can cause its price to spike, though it can regain equilibrium as the disruption is resolved or as spare capacity is brought online to replace lost supply. But loss of supply is not the only cause for price spikes. Changing geopolitical dynamics that introduce new or added instability in oil-producing regions—such as the Middle East—can increase the prospect of a future disruption and inflate the risk premium the market is willing to pay.

i. Supply Disruptions

One source of oil price spikes has been physical disruptions to supplies due to warfare or politically motivated decisions. Military conflict blocked vital oil chokepoints during the Suez Crisis (1956–1957), contributing directly to a price jump of 9 percent during the conflict. Other wars have damaged or cut off major oilfields and facilities from world markets, as during the Iranian general strike and Revolution (1978–1979), Iraq's invasion of Iran's oil-producing regions (1980), Iraq's invasion of Kuwait (1990), and the opening phase of the Iraq War (2003). Oil prices jumped at the outset of these conflicts, including 20 percent in 2003, 45 percent in 1980, 57 percent in 1978, and 90 percent in 1990. Politics played a role (as did obvious economic interests) in Arab OPEC members reducing supply to Western backers of Israel amid and following conflicts involving Israel, including the economically devastating Arab OPEC embargo in 1973–1974, during which prices rose 51 percent. The latter period accelerated a price rise that began earlier and grew over the rest of the decade.[31]

ii. Instability

The underlying potential for instability throughout the Middle East also creates upward pressure on oil prices in the form of a risk premium. Specific examples include: the expansion of the Iran-Iraq War to northern Gulf waters and Kuwait (1982–1988), Iran's militarization of islands near Hormuz (1995), the failed Abqaiq terrorist attack (2006), the Second Lebanon War (2006), Israel's attack on Syria's nuclear reactor (2007), and Tehran's December 2011 verbal threat to close the strait. The costs to global oil markets associated with these events were relatively minor and brief, in large part because none of them represented a credible or sustainable threat to the vitality of Gulf production and exports. Prices either jumped less than 10 percent overnight before decreasing steadily (1986, 2007, 2011) or rose slightly for a longer period of time: as much as 8 percent over the course of a month in 1995 and nearly 4 percent for a month during the Second Lebanon War. More recently, oil prices went up 5 percent on July 3, 2012, following Iranian military exercises, and 3 percent on July 19, 2012, after Israel accused Iran of responsibility for a terrorist attack that killed Israeli tourists in Bulgaria. "Oil isn't trading on fundamentals the way some other commodities are because of the fact you have massive geopolitical concerns about the disruption of supply," according to Ruchir Kadakia, director of global oil fundamentals for IHS Cambridge Energy Research Associates.[32]

iii. Effects of Military Strike on Oil Prices

In addition to the potential disruptions resulting from scenarios involving a nuclear-capable Iran, there are several estimates of the effects on oil prices resulting from a military strike on Iran's nuclear program before it acquires nuclear capability. According to an April 2012 report by the Rapidan Group, an Israeli attack—coupled with Iranian retaliation against Israeli targets—is projected to create a $7 per barrel premium in the first month after the outbreak of conflict, even though no oil disruption is expected to result from this scenario. If such a conflict expanded to drag in the United States and disrupt the flow of oil through Hormuz for three weeks, a maximum disruption of 17 mbpd, the premium would be $29 per barrel if IEA strategic petroleum reserves were released at a rate of 7.5 mbpd. This figure would shoot up to $47 per barrel if no strategic stocks were used.[33]

On the other hand, analysts at the investment bank J.P. Morgan have written that the consensus view of a price spike following an Israeli military strike is "naïve." Their analysis points "more to changes in oil price volatility than spot oil prices as the primary risk factor for global markets" following a strike.[34] This suggests that although prices may shoot up in the immediate aftermath of such an event, they would not remain elevated and return to pre-strike levels quickly.

C. Oil Exports From the Persian Gulf

The Strait of Hormuz is a narrow passage connecting the Persian Gulf with the open ocean via the Gulf of Oman. As the primary route for Middle East oil exports to Asia, it is the world's most vital energy-transit chokepoint. Roughly 14 mbpd of crude oil flow through the strait, almost one-fifth of the global oil trade and one-third of oil delivered by tanker.[35] Five of the world's ten biggest exporters send the majority of their output via the strait, with most of it headed to five of the world's seven biggest importers (China, India, Japan, South Korea, and the United States).

The large amounts of oil that flow through the Strait of Hormuz are processed and loaded at a few of the world's largest export facilities.

i. Saudi Arabia

Saudi Arabia, at 7.7 mbpd—the world's biggest exporter in 2011—loads all of its 5.7 mbpd of Gulf exports at two facilities in the Eastern Province near its major producing fields. Most of these are processed at the Ras Tanura complex, the 6.0 mbpd capacity of which makes it the largest offshore oil loading facility in the world. It currently operates at near-capacity. The remainder of Saudi Gulf exports is delivered through nearby Ras al-Ju'aymah, which currently operates significantly below its 3.5 mbpd capacity. Although Saudi Arabia's remaining 2.0 mbpd of exports bypass the strait (via the Red Sea), they are first processed at the Abqaiq facility in the Eastern Province, nearby Ras Tanura, and slightly inland from the Gulf.[36]

In addition to accounting for 40 percent of all oil transiting Hormuz, Saudi Arabia also possesses 1.5 to 2.0 mbpd of the world's approximately 2.4 mbpd of spare production capacity (the rest is held by its Arab Gulf allies).[37] This allows Riyadh to balance the global oil market and drive down prices, as it is uniquely able to pick up the slack caused by export disruptions elsewhere. Most recently, it has boosted production to assuage concerns about lost Iranian exports resulting from sanctions. Any closure of the strait could thus have a price impact beyond the volume disrupted, since the market could not count on its swing producer to compensate for the reduction in Hormuz-bound exports. Indeed, this scenario would force Riyadh to divert existing exports through its Red Sea bypasses and loading facilities, which currently could not handle additional supplies. Domestic instability in the kingdom would have a similar effect, because the world's other major exporters are already producing at or near-capacity (namely, Russia) and, in some cases, are experiencing declining production levels.

ii. Iran

Iran's 5.0 mbpd-capacity terminal at Kharg Island in the northern Persian Gulf is the region's second-largest facility. It is also home to 90 percent of Iran's onshore storage tanks, which have filled to the brim as sanctions caused Tehran's primary customers to look elsewhere for supplies. While it processes roughly 98 percent of Iranian exports, throughput has decreased as sanctions reduced Tehran's exports from 2.2 mbpd in the first half of 2011 to 1.7 mbpd in the first half of 2012. This figure continues to dwindle, falling slightly below 1.0 mbpd in August 2012. Iran also maintains several, much smaller loading ports in the southern Gulf near the strait. The sharp drop-off in exports due to sanctions prompted Iran to divert as much as one-third of daily oil exports into temporary storage. By mid-2012 this amounted to 25 million barrels in onshore storage tanks at Kharg Island and another 42 million barrels in floating storage.[38]

iii. Iraq

Like Saudi Arabia and Iran, Iraq's sizable Gulf exports are concentrated at one major facility near its main producing fields. The 3.0 mbpd-capacity offshore terminal near Basra in the south of Iraq handles most of that country's roughly 2.2 mbpd in Gulf-bound exports, with the nearby Khor al-Amaya facility handling the rest. Both ports are situated several kilometers off Iraq's coastline at the Gulf's northern apex next to Iran, leaving it vulnerable to mining, blockade, or being cut off overland. Unlike Iran, Iraq is not entirely dependent on the Gulf for its exports, as it sends approximately 0.4 mbpd from its northern fields to the Mediterranean via pipeline through Turkey.[39]

iv. Other Gulf Countries

To Iraq's immediate southwest, Kuwait's 1.9 mbpd of exports are channeled through several Gulf facilities. All of these ports are close to the Iranian border with Iraq, as well as to several islands near Iraq's loading facilities that are contested by the three countries—Iraq, Iran, and Kuwait. Farther south, the United Arab Emirates' 2.6 mbpd in Gulf exports are sent through a half-dozen facilities along its coastline. A large percentage of Emirati production occurs at offshore fields, not far from an archipelago that is the subject of dispute between Iran and the Emirates. These islands—Abu Musa and the Tunbs—sit astride the sea lanes connecting the Gulf to the strait and are home to Iranian military installations used by Tehran to attack Emirati energy targets during the Iran-Iraq War. Based on these considerations, the Emirates are building a pipeline to link their Persian Gulf oilfields directly to the country's coastline on the Gulf of Oman. Finally, Qatar's approximately 0.6 mbpd in Gulf exports are loaded at three ports on the small peninsula's eastern shore, alongside its massive natural-gas export terminals and less than 100 miles east of Saudi Arabia's primary oil-processing complex.[40]

D. Alternative Export Routes

There are two immediate bypass options for routing crude-oil exports around the Persian Gulf and the Strait of Hormuz. The first is a set of pipelines (the Petroline or East-West Pipeline) from Saudi Arabia's Eastern Province to its ports on the Red Sea. Currently, all of Riyadh's non-Gulf oil exports (2.0 mbpd) flow through this route. In 2012, Riyadh converted a natural-gas pipeline on this route to carry crude oil, thereby allowing it to divert up to 5.0 additional mbpd (mainly Gulf-bound exports to Asia) in an emergency, assuming the upstream infrastructure remains functional. Tankers leaving the Red Sea for Asia would have to travel longer distances, thus raising transit costs. Through the use of chemicals called "drag reducing agents" to reduce friction and boost throughput in the pipelines, Saudi Arabia could increase the capacity of this bypass route by an additional 1.0 mbpd.[41]

The United Arab Emirates' Abu Dhabi Crude Oil Pipeline (1.5 mbpd) cuts directly from the country's Gulf-side oilfields to its export terminal at Fujairah on the Gulf of Oman. Currently, it is only capable of handling 0.5 mbpd, but it is expected to reach maximum capacity in 2012.[42]

There are two additional bypass options that could become available over the longer term. The first is the Iraq Pipeline through Saudi Arabia (IPSA; 1.65 mbpd), built during the Iran-Iraq War to allow Iraqi oil to bypass the Gulf and the strait by sending it to the Red Sea near Yanbu. IPSA has been closed since Iraq's invasion of Kuwait, but Riyadh has begun reconditioning its portion of the pipeline to allow it to divert additional Gulf-bound exports. The final bypass option is the Iraq-Turkey pipeline, which, if connected to Iraq's major producing fields along the Persian Gulf rim, could divert an additional 0.9 mbpd from the Gulf to the Mediterranean.

E. Oil Prices and U.S. Economy

Fluctuations in the price of oil translate directly into impacts on the U.S. economy because of the reliance on petroleum-based products by the U.S. government, businesses, and individuals.[43] That reliance, what economists call the energy intensity of the economy, has actually been reduced over the last several decades. In 1975, the United States was using 1.2 barrels of oil for every $1,000 of GDP; by 2010, that number had fallen by more than 50 percent to 0.5 barrels per $1,000 of GDP.[44]

This should mean that the United States is better insulated from economic shocks when oil-supply disruptions do happen. However, over the same time period, the way in which Americans use energy has changed. In 1975, the residential and commercial sector was using almost 12 percent of all the oil consumed in the United States, while almost 55 percent was being used by transportation. By 2010, those numbers had changed to roughly 6 and 71 percent, respectively. Over that period, the share of oil used by the industrial and electric sectors also fell slightly. The result is that more of the oil used by Americans is going to fuel the cars we use to get to work and run our errands and the trucks we use to haul foods and goods. This makes oil more indispensable to our daily lives than it was 40 years ago. Thus, oil demand has become more inelastic than it used to be; even if supplies decrease and prices go up, Americans will not easily adjust their petroleum-product buying habits.[45]

This combination of decreased energy intensity and greater inelasticity of demand roughly balance each other out and translate into a continued vulnerability of the U.S. economy to the sort of supply disruptions and even geopolitical instability assessed in this paper.

II. Methodology

Assessing the impact that a nuclear Iran would have on global oil prices is not as simple as measuring the repercussions of a conflict with Iran. The latter would almost certainly disrupt oil supplies in the Persian Gulf: Iran's oil exports are likely to grind to a halt and tanker traffic through the Strait of Hormuz could suffer as well. Several variables—such as: Is it an Israeli or U.S. strike? Does Iran attempt to close the strait? Does Iran inflict significant damage on Saudi oil facilities?—would affect the extent and duration of the disruption, which, in turn, would determine how high oil prices would spike and how long they would stay there.

Tehran crossing the nuclear threshold, however, might not immediately precipitate a conflict or cause a disruption in the flow of oil. It would, though, further significantly destabilize an already tumultuous region. Evaluating the repercussions of a nuclear Iran thus requires quantifying the price effects of instability: accounting for the resulting relative adjustments in the likelihood of various disruptions taking place and then calculating how global markets will price such geopolitical events.

Our study, thus, consists of four parts: First, we considered the range of political, diplomatic, and military repercussions of a nuclear Iran in order to develop a set of five possible scenarios—which, if they occurred, would disrupt the flow of oil—and to assess the probability of each scenario occurring. Secondly, we translated these scenarios into a range of possible disruptions of varying magnitudes and durations. Third, based on the likelihood of these disruptions occurring, we calculated the risk premium likely to be added to global oil prices currently as well as following an Iranian breakout. Finally, we assessed the impact this would have on the U.S. economy in terms of a range of macro-economic indicators, including gasoline prices, GDP, inflation, and unemployment.

A. Developing Scenarios

For each of the five possible scenarios, we examined the likely magnitude and duration of the disruption it would cause and considered what the probability of it occurring was in the current status quo, immediately after Iran crossed the nuclear threshold, and in the following two years (or three years of the world living with a nuclear Iran).

Although we do not include it as one of our five scenarios, we also considered the possibility of a military strike against Iranian nuclear facilities. Although evaluating the costs of such a strike is not the objective of this study, we chose to examine this scenario because it is perhaps the most likely disruptive threat in the current pre-nuclear Iran status quo. Thus, without it, we would not have been able to develop a plausible estimate of the current baseline risk premium already priced into the cost of a barrel of oil, nor accurately calculate the price increase that would result from a nuclear Iran. We were guided primarily by other studies conducted of this scenario, and the disruption magnitude and probable price spike resulting from its occurrence suggested by our model are in line with those found in the existing literature.[46]

To account for the duration and dynamism of each scenario—as some oil production is restored or bypass export routes activated over time—we express the magnitude of each scenario's disruption in terms of the average daily oil-supply loss over the period of a year. Thus, while we assume that the sabotage of Saudi oil-processing facilities might cause 5.7 mbpd to be disrupted in the immediate aftermath of the event, Saudi oil would be re-routed through pipelines in a matter of weeks or months, mitigating much of the supply loss and lowering the annualized average disruption to just half a million barrels per day. Moreover, this approach allows us to factor in the potential impact of petroleum released from public petroleum stocks,[47] such as the U.S. Strategic Petroleum Reserve,[48] by deducting expected reserve releases from the total disruption amount and adjusting the annualized average accordingly.

Next, we conducted a survey of our Task Force members, asking them to assess the likelihood of each scenario occurring in the current status quo, within one year of Iran acquiring nuclear weapons capability, and in the following two years. We averaged the results of the survey to arrive at an informed estimate—based upon the knowledge and experience of the respondents with the dynamics that drive events in the region—of the probabilities that any of our six scenarios would occur.

We are fully aware that attempting to predict the future is no easy feat. We choose to assign probabilities to our scenarios not out of any conviction that we could accurately assign a numerical value to the likelihood of certain events happening, but because we believe that by quantifying these otherwise abstract possibilities, by attempting to measure their consequences, we can lend a concreteness to the debate on this vital issue. "[F]acts about crucial international issues are rarely conclusive," according to Harvard scholar and former Defense Department official Joseph Nye. "There is often enough evidence to indict, rarely enough to convict. Yet policymakers are under enormous pressure to make decisions." For these reasons he argues, "Rather than use vague words like 'possibly' or 'small but significant chance,' where feasible the estimates present judgments of likelihood as numerical percentages or bettor's odds. To be sure, this is a controversial approach; it is impossible to explain why something is one chance in two or one chance in three. Even so, the policymakers are better served than if [told] something is 'possible,' which is equivalent to telling them there is a 1 to 49 percent chance it will happen—not much help to someone trying to make an important decision."[49]

B. Pricing Risk

To arrive at a figure for the risk premium that would be added to the price of oil the day after Iran became a nuclear power, we used two main figures: the weighted sum of the amount of oil that could potentially be disrupted, expressed as a percent of total global oil demand, and the price elasticity of oil demand.

i. Disruption Amount

First, we translated each scenario into a range of different-sized disruptions (expressed as annualized disruption magnitudes) that could occur and assessed the likelihood of each taking place. This was necessary because the scenarios are not mutually exclusive in their precipitating causes and/or their disruptive effects. For example, Saudi production is disrupted in several of the scenarios described above (Saudi instability, Saudi facilities destroyed, and Iran-Saudi nuclear exchange). If two of the events were to happen at the same time, however, the disruption magnitude would not double—Saudi supply can only be lost once. Thus, by looking at the potential for different-sized disruptions, we were able to control for the interdependence of our original scenarios and avoid double-counting supply losses.

Second, for each time period—status quo, the first year of a nuclear Iran, and the following two years—we assessed the potential oil-supply disruption as a percent of the total global oil demand. To do so, we calculated the probability-weighted sum of the amount of oil that could be disrupted in each scenario (the probability of each disruption occurring multiplied by the amount of oil that would be disrupted, summed for all disruptions) and divided this figure by total demand for oil. We assumed global oil demand will remain relatively flat over the foreseeable future and used 2012 projected levels of 90 mbpd for this calculation.[50]

ii. Price Elasticity of Demand

Next, we used the equation for the price elasticity of demand (PED) for oil—the percent change in demand for oil as a result of a given percent change in price—to calculate the change in price that would result from the reductions to global oil supply caused by each scenario.[51] For the sake of simplicity, the PED might be assumed to be a constant, a property of all commodities that can be observed in and derived from historical pricing data. A PED of -1, for example, denotes that demand for a given commodity drops proportionally to any increase in its price. Thus, consumers will always spend the same quantity of money for such goods, regardless of how much of the good that money buys them. Clothing, which consumers might buy more of if it is on sale, but usually staying within a fixed budget, might be an example of such a good. A lower PED, for example -3, would represent a commodity that is said to be elastic and is likely to be a good that people can either do without or easily find substitutes for. Demand for alcoholic beverages, for example, falls into this category.[52]

A price elasticity that approaches zero, on the other hand, signifies a commodity for which demand changes little, even as prices rise. Commodities that have such inelastic demand are more likely to be necessities that are not easily replaced. Oil falls into this category. Economists have not coalesced on a single value for PED of oil; however, different studies using various methodologies have arrived at fairly similar results: between -0.05 and -0.07 in the short term. Following the lead of recent economic scholarship, we have used the average of these values (-0.06) in our calculations, but we have also included the results arrived at using both the higher and lower values to provide a possible range of risk premiums that could result from each scenario.

By dividing the total potential disruption as percent of global oil demand by the PED of oil, we arrived at the likely change in price that would occur from the market factoring in the risks contained in our scenarios. The resulting price-change figure for the status quo should reflect the risk premium currently placed on oil; whereas the figure for a nuclear Iran represents how high that premium could rise once Iran becomes a nuclear power.

C. Economic Impacts

We used two different models in our analysis: one developed by Dr. Daniel Ahn, a member of the Task Force, and one produced by the National Institute of Economic and Social Research, the National Institute Global Econometric Model (NIGEM). Both models yielded similar results. The numbers cited in this paper are the results of the former (Ahn) model.

Dr. Ahn's model is a full-scale computable general equilibrium (CGE) model of the U.S. economy and the global economy, involving nearly a thousand economic variables and relationships. In essence, the model is a miniature economy with virtual counterparts for a wide variety of economic actors, including households; firms; the financial sector; the central bank; the federal, state, and local governments; and beyond.

The main advantage of this model is that counterfactuals can be directly simulated and multiple causality loops, such as the response of the Federal Reserve interest rate, are explicitly taken into account. The model is distinctly "New Keynesian" in spirit, in that consumption, savings, investment, and other critical economic decisions are explicitly modeled. This behavior is estimated statistically using past historical data. Hence, sudden changes in behavior from previous history may be poorly anticipated and captured by the model. We believe the estimates returned are as sophisticated and credible as any other that can be derived using a model to assess the consequences of an oil shock on the global macro-economy.

D. Caveat

Attempts at prediction and quantification of future events are fraught with perils and ought be approached with humility. Thus, we undertook this study not to yield an authoritative description of what *will* happen the day after Iran becomes a nuclear power, but to provide an account of what *might* happen that could lay the foundation for discussion among reasonable people.

For this reason, our effort has been guided throughout by the twin principles of simplicity and peer review. First, rather than develop highly complex and technical models of how energy markets function or of what drives the U.S. economy, we have opted throughout to make simplifying assumptions. This might sacrifice predictive accuracy, but we decided it more important to demonstrate intelligibly general trends and linkages to policy experts and the general public alike than to build quantitative models worthy of Wall Street. Second, we undertook to vet our thinking with several reputable energy and economic experts. To that end, beyond our own Task Force and staff—which includes mostly military and national security experts, with a couple of economic and energy experts—we assembled a review board to test our assumptions, examine each of our scenarios, inspect our methodology, and appraise our conclusions. As a result, the conclusions we have arrived at represent the reasoned judgment of a diverse group of experts—comprising former elected leaders, military officials, diplomats, policy makers, energy analysts, and economists—of what to expect the day after Iran obtains a nuclear weapons capability.

ANNUALIZED DISRUPTION QUANTITY (MBPD)			PROBABILITY OF OCCURRENCE		
		Scenarios	**Baseline: Pre-Nuclear Iran**	**Nuclear Iran**	
No Release	*Reserves Released*			*1 year*	*3 years*
12.2	9.0	Iran-Saudi Nuclear Exchange	0.0%	5.0%	15.0%
7.3	3.4	Military Strike & Saudi Instability or Iran-Israel Nuclear Exchange	10.0%	5.0%	5.0%
5.0	2.1	Saudi Instability or Iran-Israel Nuclear Exchange	15.0%	40.0%	45.0%
3.9	1.3	Saudi Instability & Sanctions Lapse	1.0%	5.0%	10.0%
2.2	1.2	Military Strike	30.0%	5.0%	5.0%
0.5	0.2	Saudi Facilities Destroyed	5.0%	10.0%	10.0%
-1.2	-1.2	Sanctions Lapse	5.0%	10.0%	10.0%
Disruption Potential (mbpd)			1.93	3.2	4.6
% Change in Demand			2.1%	3.6%	5.2%
Global Demand (mbpd)			90.0		
Price Elasticity of Oil Demand			-0.06		
% Price Change No Release			35.8%	60.0%	86.1%
% Price Change Reserves Released			16.4%	29.3%	45.3%
% Price Change from Baseline No Release				**24.2%**	**50.2%**
% Price Change from Baseline Reserves Released				**12.9%**	**29.0%**

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Endnotes

1. Barack Obama, "Speech to the United Nations General Assembly," September 25, 2012.
2. Oil prices went up 5 percent on July 3, 2012, following Iranian military exercises and 3 percent on July 19, 2012, after Israel accused Iran of responsibility for a terrorist attack that killed Israeli tourists in Bulgaria. "Oil isn't trading on fundamentals the way some other commodities are because of the fact you have massive geopolitical concerns about the disruption of supply," Ruchir Kadakia, director of global oil fundamentals for IHS Cambridge Energy Research Associates, told *The Wall Street Journal.* See: John M. Beirs, "Oil-Price Surge Is All About Iran," *The Wall Street Journal*, July 22, 2012.
3. We recognize that the probabilities that we assign to the different scenarios considered in this paper might differ from those of the market.
4. To calculate the change in risk premium, we divided the probability-weighted sum of the amount of oil potentially disrupted by global oil demand, yielding the potential oil disruption resulting from a nuclear Iran as a percent of the total oil supply. We assumed that global oil demand will remain relatively flat over the foreseeable future and used 2012 projected levels of 90 mbpd for this calculation. See: Energy Information Administration, "Short-Term Energy Outlook," September 2012. The potential disruption as a percent of global demand was in turn divided by the price elasticity of demand (PED) for oil, yielding the change in price as a result of change in supply. See: James D. Hamilton, "Understanding Crude Oil Prices," *The Energy Journal* (International Association for Energy Economics) 179–206 (2009).
5. We used two different models in our analysis: one developed by Dr. Daniel Ahn, a member of the Task Force, and one produced by the National Institute of Economic and Social Research, the National Institute Global Econometric Model (NIGEM). Both models yielded similar results. The numbers cited in this paper are the results of the Ahn model.
6. GDP growth in 2012 has been under 2 percent.
7. See: Anthony Andrews and Robert Pirog, "The Strategic Petroleum Reserve and Refined Product Reserves: Authorization and Drawdown Policy," Congressional Research Service, March 11, 2011.
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