

U.S. MILITARY EXPENDITURES TO PROTECT THE USE OF PERSIAN-GULF OIL FOR MOTOR VEHICLES

Report #15 in the series: *The Annualized Social Cost of Motor-Vehicle Use in
the United States, based on 1990-1991 Data*

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- Report 15:** U.S. Military Expenditures to Protect the Use of Persian-Gulf Oil for Motor Vehicles (M. Delucchi and J. Murphy)

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LIST OF ACRONYMS AND ABBREVIATIONS AND OTHER NAMES

The following are used throughout all the reports of the series, although not necessarily in this particular report

AER = *Annual Energy Review* (Energy Information Administration)
AHS = *American Housing Survey* (Bureau of the Census and others)
ARB = Air Resources Board
BLS = Bureau of Labor Statistics (U.S. Department of Labor)
BEA = Bureau of Economic Analysis (U.S. Department of Commerce)
BTS = Bureau of Transportation Statistics (U.S. Department of Transportation)
CARB = California Air Resources Board
CMB = chemical mass-balance [model]
CO = carbon monoxide
dB = decibel
DOE = Department of Energy
DOT = Department of Transportation
EIA = Energy Information Administration (U.S. Department of Energy)
EPA = United States Environmental Protection Agency
EMFAC = California's emission-factor model
FHWA = Federal Highway Administration (U.S. Department of Transportation)
FTA = Federal Transit Administration (U.S. Department of Transportation)
GNP = Gross National Product
GSA = General Services Administration
HC = hydrocarbon
HDDT = heavy-duty diesel truck
HDDV = heavy-duty diesel vehicle
HDGT = heavy-duty gasoline truck
HDGV = heavy-duty gasoline vehicle
HDT = heavy-duty truck
HDV = heavy-duty vehicle
HU = housing unit
IEA = International Energy Agency
IMPC = Institutional and Municipal Parking Congress
LDDT = light-duty diesel truck
LDDV = light-duty diesel vehicle
LDGT = light-duty gasoline truck
LDGV = light-duty gasoline vehicle
LDT = light-duty truck
LDV = light-duty vehicle
MC = marginal cost
MOBILE5 = EPA's mobile-source emission-factor model.
MSC = marginal social cost
MV = motor vehicle
NIPA = National Income Product Accounts
NO_x = nitrogen oxides
NPTS = Nationwide Personal Transportation Survey
OECD = Organization for Economic Cooperation and Development

O₃ = ozone
OTA = Office of Technology Assessment (U.S. Congress; now defunct)
PART5 = EPA's mobile-source particulate emission-factor model
PCE = Personal Consumption Expenditures (in the National Income Product Accounts)
PM = particulate matter
PM₁₀ = particulate matter of 10 micrometers or less aerodynamic diameter
PM_{2.5} = particulate matter of 2.5 micrometers or less aerodynamic diameter
PMT = person-miles of travel
RECS = Residential Energy Consumption Survey
SIC = standard industrial classification
SO_x = sulfur oxides
TIA = *Transportation in America*
TSP = total suspended particulate matter
TIUS = *Truck Inventory and Use Survey* (U.S. Bureau of the Census)
USDOE = U.S. Department of Energy
USDOL = U.S. Department of Labor
USDOT = U.S. Department of Transportation
VMT = vehicle-miles of travel
VOC = volatile organic compound
WTP = willingness-to-pay

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15. U.S. MILITARY EXPENDITURES TO PROTECT THE USE OF PERSIAN-GULF OIL FOR MOTOR VEHICLES

15.1 UNITED STATES SECURITY AND PERSIAN-GULF OIL

In this Report, we seek to answer the question: “If the U.S. highway transportation sector did not use oil, how much would the U.S. Federal government reduce its military commitment in the Persian Gulf?” The analysis goes in four parts.

First, we explain that the U.S. protects its “oil interests” in the Persian Gulf primarily to prevent supply disruptions and sudden price rises and the attendant macroeconomic problems. We cite evidence (including statements by the Joint Chiefs of Staff) that the U.S. Congress and the military do indeed plan and budget military operations for the Persian Gulf on account of U.S. oil interests there. We review and rebut arguments that the U.S. has other interests in the region substantially more important than those related to oil.

Second, we review the best available estimates of the amount that the U.S. military spends to protect U.S. interests in the Persian Gulf. We present and rebut arguments that these military expenditures are small.

Third, we consider whether any of the economic assistance granted to countries of the Middle East is related to U.S. oil interests in the region. We show that most of this assistance goes to Israel and Egypt, and probably is not motivated by a desire to protect U.S. oil interests in nearby Arab countries.

Finally, we work from our estimate of the cost of defending all U.S. interests in the Persian Gulf towards an estimate of the military cost of using oil in highway transportation. This proceeds in several steps:

- i) Estimate how much Congress might reduce military spending were there no Persian Gulf.
- ii) Estimate how much Congress might reduce military spending if there were no oil in the Persian Gulf.
- iii) Estimate how much Congress might reduce spending if the U.S. did not produce or consume oil from the Persian Gulf, but other countries still did.
- iv) Estimate how much spending might be reduced if U.S. producers had investments in the Gulf, but the U.S. did not consume Persian-Gulf oil.
- v) Lastly, estimate how much spending might be reduced if motor vehicles in the U.S. did not use oil, but other sectors still did and the U.S. (and other countries) still produced and consumed oil from the Gulf.

This last is the bottom line of our analysis. Our analysis of these steps generally is illustrative, not rigorously quantitative. We estimate that there were no oil in the Persian Gulf, then U.S. combined peacetime and wartime defense expenditures could be reduced in the long run by roughly \$27 to \$73 billion per year (in 2004 dollars). If all motor vehicles in the U.S. did not use oil, U.S. military expenditures could be reduced by \$6 to \$25 billion per year, or \$0.03 to \$0.15 per gallon (\$0.01 to \$0.04 per liter) of all motor fuel.

15.1.1 Notes on our conceptual framework

In this analysis we estimate two quantities: the total long-run variable cost of defending Persian Gulf oil used by motor vehicles in the U. S (in \$), and the long-run variable cost per gallon of oil used by motor vehicles in the U. S (\$/gallon). In terms of Figure 15-1, which shows a notional total cost function (Persian-Gulf defense expenditures as a function of oil consumption), the total long-run variable cost is equal to $TC_{Q^*} - TC_{FIXED}$, and the cost per gallon is equal to $(TC_{Q^*} - TC_{FIXED})/Q^*$.

Several conceptual points are important here. First, we estimate the *total* defense cost (associated with total current oil consumption by motor vehicles) *not* because we think that eliminating oil use in transportation is a realistic policy option, but because the total is a common (albeit arbitrary) point of reference that gives a sense of the scale of the problem (many analyses of the social cost of motor-vehicle estimate total costs), and because one must calculate the total in order to calculate the cost per gallon, which is a measure relevant to policy making.

Second, as have indicated in Figure 15-1, we do not think that the shape of the cost vs. quantity function is such that the either total cost or the cost per gallon are zero. The total cost (and hence the cost per gallon) will be zero if all costs are fixed costs – in Figure 15-1, if $TC_{Q^*} = TC_{FIXED}$ – but as we explain in some detail later, we think that truly fixed costs actually are quite small. In addition, the cost per gallon will be zero wherever the first derivative of the total cost function is zero, but this will occur only if the total cost function has some implausible form, such as a step function. (For any strictly increasing function, whether linear or nonlinear, the first derivative is always positive, as illustrated in Figure 15-1.) As regards this last point (that a step function is an implausible form), we note that even if a change in quantity must exceed some non-trivial threshold value in order to be “noticed” and hence potentially affect defense costs,¹ the total cost function still is not likely to be a step function because the discrete intervals over which quantity changes do not affect cost are neither fixed in size nor located at fixed spots along the quantity axis in Figure 15-1.

Third, although our estimate of the \$/gallon cost (UC-LTC in Figure 15-1) is the first derivative of a linear total cost function ($TC-Lf(Q)$ in Figure 15-1) and hence is a constant, this does not mean that our \$/gallon estimate is irrelevant if the total cost function in fact is nonlinear (e.g., $TC-NLf(Q)$ in Figure 15-1), which seems likely. To the contrary, the constant unit cost that we estimate is the “average” unit cost for a nonlinear total cost function of the form $Y=aX^b$. In Figure 15-1, our estimate of the per-gallon cost (UC-LTC) is greater than the unit cost derived from nonlinear function (UC-NLTC) up to quantity Q^* , and is less beyond quantity Q^* , but over the entire range of Q^* , the area under UC-NLTC is the same as the area under UC-LTC.

The upshot thus far is that, conceptually, our estimate of the \$/gallon defense cost is a policy-relevant estimate of the *typical* cost likely to be incurred for any plausible change in demand and any plausible form of the total cost-vs.-quantity function. However, if the total cost function is highly nonlinear, the unit cost associated with small changes around current quantities will be significantly different from the “average” unit cost we estimate. (In the section “Other issues bearing on the analysis” we discuss why the total cost function might be nonlinear.)

¹ This is our interpretation of a point made by an anonymous reviewer of the journal article version of this report.

Fourth, we estimate the military costs of protecting *Persian-Gulf* oil because we believe that these dwarf the costs of protecting oil from other regions and because it is more difficult to estimate those other costs. We discuss this further in the section “Other issues bearing on the analysis.”

Finally, we estimate the cost of changes in the petroleum use by the U. S. motor-vehicle sector *only*; we do not analyze cases in which changes in petroleum use by the U. S. motor-vehicle sector cause changes in petroleum use in other sectors or other countries. If there is such a linkage, and if total cost is proportional to total oil consumption, then the cost per gallon of U. S. motor-fuel use will be proportional to the ratio of total affected petroleum use to U. S. motor-vehicle petroleum use.

15.1.2 Why does the U.S. want to “protect” U.S. oil interests in the Persian gulf?

Oil is the major source of energy for every industrialized economy in the world. As a result, the price and quantity of oil in the world market directly affect economic output in the industrialized world. And apart from the actual price level, the *rate of change* of the price and output of oil also affect economic output. If the world oil market were free and competitive, and if property rights were well-defined and adequately enforced by property owners, then output and prices generally would be stable, and the risks of sudden changes in output and prices would be low. If these risks were low, then arguably there would be no need for international military protection of oil supplies and markets.

Unfortunately, the world oil market is not always stable and competitive. Most of the world’s oil is in the Persian Gulf. OPEC, the Organization of Petroleum Exporting Countries², has about 70% of the world’s proven oil reserves³, and the countries of the Persian Gulf⁴ alone have 56% (EIA, 2006b). Even though the countries of OPEC and the Persian Gulf produce only a small fraction of their reserves⁵, and even though the United States imports only a small fraction of its oil from the Persian Gulf (see Table 15-1), the countries of the Persian Gulf can have a considerable influence on the world price of oil and thus on the economic welfare of the United States and other heavy users of oil. This influence can be direct and intentional, as when OPEC countries set prices and abide by output quotas, or unintentional, as the result of a conflict that disrupts production or flow and thereby increases prices⁶.

² The Organization of Petroleum Exporting Countries (OPEC) was created in 1960 to set world oil prices by controlling production. The current (2006) members of OPEC are: Algeria, Indonesia, Iran, Iraq, Kuwait, Libya, Nigeria, Qatar, Saudi Arabia, United Arab Emirates and Venezuela (www.opec.org/aboutus/).

³ The EIA (2006b) projects that through 2025 additions to reserves and undiscovered resources will be greater in non-OPEC than in OPEC countries, with the result that in 2025 OPEC will have only 57% of the world’s oil resources, and the Middle East only 43%.

⁴ Bahrain, Iran, Iraq, Kuwait, Qatar, Saudi Arabia, and the United Arab Emirates.

⁵ While OPEC has 70% of the world’s proven oil reserves it typically has produced only about 40% of the world’s total output, and while the Persian Gulf has 56% of the world’s proven reserves it typically has produced only 25% to 30% of the world’s total output (www.eia.doe.gov/emeu/ipsr/supply.html).

⁶ Since World War II, over 90 military conflicts in the Middle East have claimed about 2.4 million lives (see Table 15-2). Most of these regional conflicts have been territorial disputes, religious cleavages, ethnic

The more expansive conflicts in the Persian Gulf inevitably threaten oil supplies. For example, during the Iran-Iraq War (1980-1988), the combatants attacked oil tankers and other commercial vessels from neutral nations, and as a result, Kuwaiti tankers were reflagged and escorted through the Gulf by the U.S. Military. The Iraqi invasion of Kuwait and the subsequent Gulf War in 1991 caused a brief panic in oil markets: immediately following the invasion, the world price of a barrel of oil more than doubled, from \$16.19 in July 1990 to \$30.03 in October 1990 (Figure 15-2).

Many economists believe that these price shocks hurt Western economies (Jones et al., 2004; Hamilton and Herrera, 2004)⁷. As McNaugher (1985) notes, western economies have “structural rigidities...[which can] hamper rapid adaptation to sharp changes in factor prices” (p. 8) and thereby [perhaps] give rise to inflation, recession and unemployment in the aftermath. Since 1947 there has been a strong correlation between oil price shocks and recessions: ten of the eleven recessions between 1947 and 2001 were preceded by oil shocks, and ten of the eleven oil shocks were followed by a recession (Table 3). Recent research suggests that the price shocks cause the recessions: Jones et al. (2004) review literature from 1996 to 2004 on the macroeconomic effects of oil price shocks, and conclude that recessions that followed oil-price shocks were attributable mainly to oil-price shocks, and could not have been prevented by alternative monetary policies. Even the mere threat of a disruption in the supply of oil can wreak havoc with oil prices and world economies

The United States cannot [easily] prevent OPEC from agreeing to set prices or restrict output, but it does believe that it can help prevent disruptions in production and flow due to wars in the region. Indeed, as we show next, the main objective of the U.S. military as concerns the Persian Gulf is to ensure that the oil flows freely⁸.

dissension, or ideological contests (Martin, 1987, p. 10). They have ranged in scale from small border clashes, such as those between Saudi Arabia and the Yemens, to large-scale, high-technology conflicts, such as the Iran-Iraq War, the 1991 Gulf War, and the 2003 Iraq War, which combined resulted in well over half a million casualties.

⁷ The past twenty-five years has seen the emergence of a very large literature on the macroeconomic impacts of oil price shocks. Mäkinen (1991), provides a clear discussion of the issues in lay terms. Mork (1981), Bohi and Montgomery (1982), Plummer (1982), the Energy Modeling Forum (Hickman et al., 1987), Tsai (1989), Walls and Jones (1990) and Bohi (1991) give more rigorous analyses. Jones et al. (2004) provide an excellent summary of recent research.

Of course, not all economists agree that price shocks have serious macroeconomic effects. For example, Bohi (1991) states that this conclusion is “far from unanimous in the economics literature” and that “there is no evidence to support either the wage rigidity hypothesis or the capital obsolescence hypothesis as an explanation of the effect of energy price shocks on macroeconomic behavior” (p. 145). Bohi proposes instead that monetary policy explains macroeconomic performance following price shocks. Toman (1991) takes a similar position. However, the recent analysis by Hamilton and Herrera (2004) and the review by Jones et al. (2004) conclude that monetary policy probably cannot significantly ameliorate the effects of oil shocks.

⁸ The Strategic Petroleum Reserve (SPR) also is meant to ameliorate a shortfall in oil supply. We estimate the cost of the SPR separately, in Report #7 of this social-cost series (see the list at the beginning of this document). For a discussion of filling and dispensing oil from the SPR, see the U. S. Government Accountability Office (2006).

15.1.3 United States military objectives and plans for the Persian Gulf

15.1.3.1 From 1974 to 1989: Protecting oil is a primary objective

In the 1970's and 1980's, the United States' had three key objectives in the Persian Gulf: to contain Soviet influence, to keep the region stable, and to guarantee uninterrupted access to the largest proven oil reserves in the world. For example, in FYs 1988 and 1989, the Joint Chiefs of Staff stated:

The security of the Middle East and Southwest Asia is critical to the economic health of the free world and, consequently, to the security of the United States. Regional stability, Free World access to oil resources, and the limitation of Soviet influence remain important U.S. objectives. (Joint Chiefs of Staff, FY1988, p. 16; Joint Chiefs of Staff, FY1989, p. 21).

But even when the Soviet Union was a threat, it still was more important to protect the oil than to contain the Soviets (to the extent, even, that concern about Soviet expansion or regional stability could be separated from concern about the oil). The Joint Chiefs of Staff said so explicitly in every issue of the *United States Military Posture Statement* from FY1979 to FY1989⁹. For example, in FY1982, the Joint Chiefs of Staff stated that:

"Of these interests [oil security, regional stability and Soviet containment], continued access to oil on reasonable political and economic terms is the most important to US and allied security" (Joint Chiefs of Staff, FY1982, p. 12).

In 1983, they stated that:

" U.S. interests in the Middle East and Southwest Asia focus largely, but not exclusively, on the region's oil reserves" (Joint Chiefs of Staff, FY1983, p. 6).

Even U.S. efforts to resolve Arab-Israeli conflicts have been related to U.S. oil interests. Again, according to the Joint Chiefs of Staff:

The United States is determined to preclude disruption or hostile control of the vital resources and to limit the spread of Soviet influence in the area. Other U.S. interests, important in their own right but bearing heavily on the security of energy resources, include peaceful resolution of the Arab-Israeli conflict and increased stability throughout the region (Joint Chiefs of Staff, FY1983, p. 6).

According to Kaufmann and Steinbruner (1991), the United States began contingency planning for the Middle East in 1974 – right after the 1973 oil embargo, which generated fears of an OPEC attempt to strangle the West by restricting oil supplies. Contingency planning became a more important part of U.S. military planning after 1980 (Kaufmann, 1992), as a result of the Iranian revolution and the Soviet invasion of Afghanistan, which confirmed the instability of the region. Those events eventually led to the Carter Doctrine which states:

An attempt by any outside force to gain control of the Persian Gulf region will be regarded as an assault on the vital interests of the United States of America and such an

⁹ FY1989 is the last year for which this document is available.

assault will be repelled by any means necessary, including military force (Carter, 1980, p. 197).

Also in 1980, the United States established the Rapid Deployment Joint Task Force (RDJTF), which in 1983 became the U.S. Central Command (CENTCOM). CENTCOM has a permanent staff of about 1,000. Its primary responsibility is to protect U.S. interests in Southwest Asia, including the Persian Gulf (Joint Chiefs of Staff, 1992, p. 4-3). Approximately one-fourth of the U.S. active Army and Marines Divisions, Aircraft Carriers and Fighter Wings have a first-priority commitment to CENTCOM (Sabonis-Chafee, 1987).

15.1.3.2 *From 1990 on: Protecting oil is the "overall" objective*

The end of the Cold War essentially eliminated any Soviet threats to U.S. interests, including those in the Middle East, and made the U.S. reformulate its military strategy to focus on regional, rather than global conflicts. According to the Joint Chiefs of Staff, "In the past, force requirements were generated by focusing attention on global conflict...Today, the probability of such a conflict is greatly reduced. Thus, our focus has shifted to regional hot spots where the probability of occurrence may now be greater than in the past" (Joint Chiefs of Staff, 1992, p. 2-9)¹⁰.

Now that there no longer is a Soviet threat to contain, protecting free-world access to oil clearly is the paramount if not virtually sole concern of the U.S. military in the Persian Gulf. In March, 1992, the New York Times published a story regarding the February 18, 1992, draft of a classified Pentagon document titled "Defense Planning Guidance for the Fiscal Years 1994-1999" (U.S. Department of Defense, 1992; in Tyler, 1992). The document states the U.S. military objective in the Persian Gulf unequivocally:

In the Middle East and Southwest Asia, our overall objective is to remain the predominant outside power in the region and preserve U.S. and Western access to the region's oil (U.S. Department of Defense, 1992; cited in Tyler, 1992).

Three years later, the Assistant Secretary for Defense for Economic Security reiterated the DoD's position to a Senate hearing on U.S. dependence on foreign oil: "...protecting against military threats to global oil supplies is an important factor for which we must be prepared" (cited in Koplou and Martin, 1998, . 4-2).

Finally, Fuller and Lesser (1997), in a discussion of U.S. policy towards the Persian Gulf, state that "Gulf policy is founded on the principal that access to the region's oil is critical to Western – indeed global – prosperity" (p. 42).

¹⁰ In 1993, the Joint Chiefs of Staff used a "scenario-based analysis" in order to evaluate the ability of the U.S. military to respond to potential crises. One of the scenarios depicted is a crisis in Southwest Asia in 1999. This contingency scenario depicts a situation in which "an aggressor again threatens U.S. interests in Southwest Asia, attempting to improve access to ports in the Persian Gulf, increase its oil reserves, and further its ambitions of regional hegemony" (Joint Chiefs of Staff, 1992, p. 9-8). The Joint Chiefs emphasize that this scenario is neither a prediction of future events nor a description of a military strategy. However, they note that this scenario was chosen for three reasons: (1) it is plausible, (2) it is demanding in the sense that it will challenge the capabilities of the U.S. military, and (3) it encompasses U.S. alliance commitments and vital interests, (Joint Chiefs of Staff, 1992, p. 9-2). They also remind us that "although the likelihood of another Gulf War is low at the present time, the violent history of the Southwest Asia region warns us that lasting peace is even less likely" (Joint Chiefs of Staff, 1992, p. 12-2).

15.1.3.3 Counter arguments and summary

We have made the case that the U.S. spends money on defense of the Persian Gulf mainly because of the oil there. However, not everyone would agree with this. In an analysis of the external costs of oil use in transportation, the Congressional Research Service (CRS) (1992) argues that concern about oil has been but one of many reasons that the U.S. military has cared about the Persian Gulf. The CRS (1992) even implies that oil security is a minor concern. In this section we review and rebut the CRS' arguments.

First, the CRS (1992) claims that throughout the Cold War, the U.S. military was concerned more with the Soviet threat (*per se*) in the Persian Gulf than with U.S. oil interests. But the CRS does not offer any evidence in support of this claim, which is directly refuted by statements in the *Military Posture* documents that we have cited.

Next, the CRS (1992) claims that the U.S. military also is concerned with the security of Israel. But we see no evidence of a *major* military concern for Israel *per se*, *independent* of concern about energy security. In the first place, the *Military Posture* statements cited above make it clear that the JCS cares about Israel only in the context of the Arab-Israeli conflict. On account of its oil interests in the Gulf, the U.S. does want the region to be stable, and to forestall and resolve Arab-Israeli conflicts. As cited above, the Joint Chiefs of Staff are clear on this. Thus, U.S. military planners care mainly about regional stability – because of the region's oil – and not so much about Israel *per se*. We believe that, if the Middle East had neither oil nor strategic importance, the U.S. would not maintain a significant military presence in the region solely to help protect Israel. Fuller and Lesser (1997) agree, stating that “at this point, Israel's security, however important, does not represent an extra dimension of U.S. Gulf Policy” (p. 45).¹¹

Third, the CRS suggests that another “major” interest is the protection of U.S. citizens. But we are hard pressed to conceive of this as a “major” interest. In 1992, there probably were on the order of 20 thousand tourists in the Middle East, including Israel and Egypt, and fewer than 10 thousand in the oil-rich countries of Saudi Arabia, Iran, Iraq, Kuwait, and the United Arab Emirates -- out of a total of nearly 7 million U.S. tourists abroad (Bureau of the Census, 1992). About 50,000 U.S. citizens were residents (as opposed to tourists) in the oil-rich countries of the Middle East, but it is likely that most of them worked for oil companies or related ventures, the U.S. Government, or the U.S. military. There is little doubt that, were there no oil in the Middle East, there would be very few U.S. citizens there, and the U.S. would not spend billions of dollars to protect the few that were there.

Fourth, and in its view most definitively, the CRS (1992) claims that the failure of the U.S. to go to war after the 1973-74 and 1979 supply disruptions suggests that the U.S. military really wasn't concerned with protecting oil supplies until perhaps the Gulf War. This claim is weak. There is no parallel between the 1973-74 and 1979 crises and the situation that led to the 1991 Gulf War, which the CRS does agree was motivated at least in part by a desire to protect oil interests. The 1973-74 disruption was the culmination of a politically motivated series of price increases and a trade embargo

¹¹ Note that we are *not* arguing that the U. S. does not have any interest in the security Israel; rather, we are arguing that U. S. military policy towards the Middle East is not predicated ultimately on the security of Israel. Indeed, as we discuss later, the U. S. does give Israel military and economic grant aid (the cost of which is separate from the U. S. DoD costs estimated here). Thus, whatever interest the U. S. has in the security of Israel it expresses mainly by giving Israel military and economic aid rather than by devoting more resources to the U. S. military presence and operation in the Middle East.

against the U.S. and the Netherlands, which were an Arab retaliation for the U.S.' support of Israel in the 1973 Arab-Israeli "Yom Kippur" war . It would have been outrageous for the U.S. to have attacked the Arab embargoers just because they had decided that they did not wish to sell oil to the U.S. In fact, it would have been just as outrageous to have attacked Iraq in 1991 if Iraq had done nothing other than refuse to sell oil to the U.S. Conversely, the U.S. surely would have attacked Iraq or any other Gulf state, at any time during the 1980s, had the country done what Iraq actually did in 1990, and had the Soviet Union been out of the equation.

The 1979-1980 "disruption" was the result of another major price rise and of the shutting down of Iranian production due to the Iranian revolution, and it would have been almost as unreasonable (and foolish, given the attitude of the Soviet Union at the time) to have intervened in the internal affairs of Iran as it would have been earlier to have attacked Arab nations on account of their political stance. In short, it hardly is reasonable to proffer lack of outrageous and provocative military behavior as evidence of lack of military interest. Consequently, the CRS' (1992) speculation about military impassiveness in the face of earlier oil "disruptions" does not stand against the unequivocal and steadfast mission statements by the U.S. military cited in this report.¹²

The CRS also implies that the Reagan administration's refusal to institute emergency price and supply controls in the aftermath of a severe price shock is evidence that the military was not charged with protecting oil supplies in the Persian Gulf. We fail to see the connection between pricing policy and military policy. Somewhat more to the point, the CRS states that the Reagan administration refused to "acknowledge" that it had any plan to use military force to prevent a price shock. This fact, though, has no import. In the first place, the Reagan administration might well have had such a plan, but have kept it secret. In any event, reluctance to start a war to keep oil cheap in no way implied that in the Persian Gulf the U.S. military was not primarily concerned with oil. Most likely, what the administration was "acknowledging" was the outrageousness of going to war over any price shock that was like the two previous ones. Had something like the Iraqi invasion of Kuwait happened, the Reagan administration most likely would have responded the way that the Bush administration did.

Summary. It is clear to us that the U.S. military cares (and always has cared) about the Middle East mainly because of the oil there. The United States believes that oil in the Persian Gulf is vital and often at risk, and hence demanding of a considerable commitment of U.S. military manpower, hardware, and planning. In the next section, we estimate the magnitude of this commitment.

¹² Moreover, while it may be true that the U. S. military wasn't much concerned with risks to oil supplies before the 1973-1974 oil embargo, this hardly means that the U. S. military never became concerned afterwards; to the contrary, it seems clear that the 1973-1974 embargo demonstrated the severe economic consequences of major oil price shocks and hence the need consider defending against military threats to oil supplies.

15.2. ESTIMATES OF PEACETIME AND WAR-TIME MILITARY EXPENDITURES IN THE PERSIAN GULF

15.2.1 Introduction

The U.S. spends a considerable amount of money protecting what it feels are its interests in the Persian Gulf. The exact amount is difficult to estimate, because the Defense budget is itemized not by region or mission, but rather, as shown in Table 15-4, by general function or cost area, such as operations and maintenance. Many of the functional areas cover more than one region or program, and hence one faces the difficult task of understanding how Congress – which ultimately authorizes defense spending – views military costs by region.

Before we consider the actual estimates, it is important to understand that there is only one coherent way to put our question. Namely: “If the U.S. did not have any military objectives related to the Persian Gulf, how much might Congress reduce defense spending?” This phrasing properly identifies the decision-making authority (Congress) and the practical question that the decision-maker faces (reducing spending if a regional problem is eliminated). Importantly, our phrasing makes it clear that the problem is *not* the same as the pricing problem of allocating joint production costs, because Congress would not be trying to price defense output, but rather would be trying to understand how long-run defense costs actually are related to the magnitude of a regional threat. Any defense costs that simply are not related in any way to the magnitude of a regional threat would not be considered for cutting. Hence, our problem is not how to allocate joint costs, but to figure out exactly how long-run costs *do* vary with magnitude of a regional threat.

Of course, different analysts have handled this problem differently (some within the improper context of a “joint-allocation” problem), and as a result estimates of the peacetime costs of maintaining a military presence in the Middle East range widely, from as little as \$0.5 billion to over \$100 billion per year (see Tables 15-5 and 15-6). Additional wartime costs, which we estimate separately) may be a substantial fraction of this.

15.2.2 Literature review (peacetime expenditures)

Ravenal (1991) and Kaufmann and Steinbruner (1991) have written book-length analyses of the U.S military budget, including estimates of the portion attributable to U.S. interests in the Persian Gulf. Ravenal’s (1991) estimate that the U.S. spends \$50 billion per year to defend the Persian Gulf, and Kaufmann and Steinbruner’s (1991) estimate that the U.S. spends \$64 billion per year, have been widely cited. Both groups use what might be called a “total-cost” approach, in which “fixed” costs (i.e., costs that supposedly don’t vary with the magnitude of regional threats), such as for the Department of Defense’s (DoD) overhead, and forces with multiple missions, are allocated to all of the affected programs and thereby counted as economic costs of the mission or program.

By contrast, the DoD’s own assessment of what it spends to defend the Persian Gulf counts only those forces or programs that would be eliminated immediately and entirely if the U.S. had no interests in the Persian Gulf; it excludes all expenditures for DoD-wide overhead and for forces and programs that are “assigned” only partly to the Persian Gulf (reported in the U.S. Government Accounting Office [GAO], 1991).

These and other estimates are reviewed in this section.

Ravenal (1991). Ravenal begins by dividing the Defense budget for FY1992 into two components: strategic nuclear forces and general purpose forces. He estimates that the budget can be allocated as follows (Ravenal, 1991, p. 44):

Strategic Nuclear Forces	\$63 Billion
<u>General Purpose Forces</u>	<u>\$215 Billion</u>
Total defense budget	\$278 Billion.

To allocate the cost of general-purpose forces to the various regions of the world, Ravenal uses the percentage of active land divisions (Army and Marine) attributable to each region. He includes “not just the divisions actually deployed there, but those procured and maintained primarily for contingencies in the region” (Ravenal, 1991, p. 50).

The Pentagon usually divides the world into three regions: NATO/Europe, Asia (i.e., East Asia and Western Pacific), and “Other Regions and the Strategic Reserve,” which encompass Southwest (SW) Asia. Ravenal bases his distribution of the active land forces among the various regions through an analysis of “all rationales and descriptions in the report of the Secretary of Defense and other sources” (Ravenal, 1984, p. 20). He estimates that, at the end of FY1992, the U.S. peacetime forces primarily attributable to “Other Regions and Strategic Reserve,” accounted for $6\frac{2}{3}$ of the 17 peacetime active land divisions, 4 of which could be ascribed to the Persian Gulf. Thus, Ravenal estimates that $\frac{4}{7}$ (23.5 percent), or \$50 billion, of the \$215 billion he attributes to general purpose forces was due to U.S. interests in the Persian Gulf in FY1992.¹³

Ravenal also estimates the “admittedly amorphous costs of possible wars of various types” (Ravenal, 1991, p. 46): an expected cost of \$5.3 billion per year due to conventional wars, and \$5 billion per year due to a nuclear war. See section 15.2.3 for more details.

Note that Cato Institute, where Ravenal is a distinguished senior fellow in foreign policy studies, periodically includes in its *Cato Handbook on Policy* and *Cato Handbook for Congress* estimates of the military cost of defending the Persian Gulf. (The estimates presumably are by Ravenal.) For example, the 6th edition of the *Cato Handbook on Policy*, published in 2005, says that “the deployment of the U.S. military to safeguard oil supplies from Saudi Arabia and the rest of the Persian Gulf – particularly since the first Gulf War – costs the United States between \$30 billion and \$60 billion a year” (Cato Institute, 2005, p. 562). The 1997 *Cato Handbook for Congress* has an estimate that the cost of defending the Persian Gulf was \$82 billion in fiscal year 1997 (Cato Institute, 1997, Table 7-3).

Kaufmann and Steinbruner (1991). Kaufmann and Steinbruner estimate that the U.S. spent \$64.5 billion (1992 dollars) in FY1990¹⁴ for the non-nuclear defense of the Middle East. Their estimate is based on a logic similar to that used by Ravenal – they

¹³ Since this figure is based on the peacetime force structure at the end of FY1992, it does include changes due to the diminished threat of a Soviet invasion. By that time, U.S. military strategy began to focus on fighting multiple simultaneous regional conflicts, rather than large-scale global confrontations.

¹⁴ The budget authority for fiscal year 1990 was completed prior to the demise of the Soviet Union and Iraqi invasion of Kuwait. Kaufmann and Steinbruner (1991) note that “the defense budget for that year is the last in what may be thought of as the long cold war series.” (p. 6).

allocate the budget authority to “force planning contingencies” in different regions of the world. These contingencies are scenarios developed by the Pentagon indicating where U.S. forces may be needed and are used to publicly justify the Defense budget. Their breakdown of the FY1990 Defense budget is shown in Table 15-7.

The Soviet invasion of Afghanistan, combined with the presence of a significant amount of Soviet troops on the Iranian border, represented the primary threats to Gulf stability in FY1990, according to Kaufmann. Repelling a Soviet attack would require at least six divisions and nine fighter wings. In order to maintain such a presence, it would be necessary to preposition three carrier battle groups and one Marine amphibious force in the Indian Ocean.

Obviously, the military balance has shifted dramatically since FY1990. However, Kaufmann and Steinbruner (1991) note that the collapse of the Soviet Union did not have a significant effect on the cost of defending the Gulf the following year: “although the threat [to the Gulf] shifted from the USSR to Iran by the time of the fiscal 1991 budget, the forces included in the Persian Gulf contingency package remained the same as before...” (p. 14).

General Accounting Office (GAO) (1991). The GAO asked the DoD to estimate its expenditures related to U.S. interests in SW Asia. In the information it provided to the GAO, the DoD distinguished four kinds of military expenditures: i) for programs “dedicated” to SW Asia; ii) for programs “oriented” to SW Asia; iii) for general contingencies and mobility related to SW Asia; and iv) for Operation Earnest Will (Table 15-8). The DoD estimated that the United States spent a total of \$21.4 billion on military programs “dedicated” to Southwest Asia between FY1980 and FY1990. This money funded construction, pre-positioning, operation of CENTCOM, and military exercises intended mainly for the defense of SW Asia. However, DoD said that two of these programs (including the most costly of the group) were not *really* dedicated to SW Asia, and would have been funded even if the U.S. had no interests in SW Asia. In fact, according to the DoD, only \$4.5 billion worth of “dedicated” programs -- less than \$0.5 billion per year -- would not have been funded (Table 15-8).

The DoD estimated that the U.S. spent \$5.8 billion on Southwest Asia- “oriented” (as opposed to Southwest Asia- “dedicated”) programs. These were defined as those programs which were motivated by the defense of U.S. interests in Southwest Asia *and* in other regions. But even though these programs were partly geared toward SW Asia, the DoD claimed that *all* of these programs would have been funded fully, in order to protect interests outside of SW Asia, regardless of what happened to U.S. interests in the Gulf.

The DoD also estimated that the United States spent \$272.6 billion on “other contingencies and mobility programs” over the 10-year period (Table 15-8). These programs allowed the U.S. to defend its interests in many regions, including but not primarily Southwest Asia. The cost of maintaining the forces available to CENTCOM accounted for \$220.3 billion of this. The DoD believed that this entire amount would have been budgeted regardless of U.S. interests in the Middle East.

The DoD/GAO grand total, including the amount spent to reflag Kuwaiti tankers during the Iran-Iraq war (“Operation Earnest Will”), is only \$4.7 billion over 10 years. This is out of about \$300 billion worth of programs that nominally were “dedicated” or “oriented” or generally in some way related to SW Asia (Table 15-8). This striking difference is due to the DoD’s claim that virtually all of these programs would have been funded *fully* regardless of U.S. interests in SW Asia -- a claim which we will address momentarily. The GAO also estimated that the U.S. provided \$66.2

billion in military, economic, and multilateral assistance to countries in SW Asia. We discuss economic assistance below.

Copulos (2003). Copulos estimates the “hidden costs” of imported oil, which in his analysis include the cost of defending Persian Gulf oil, the economic impacts of import dependence, and impacts on the environment and human health. To estimate the cost of defending Persian Gulf oil, Copulos first distinguishes between “ongoing expenditures,” which “represent outlays for permanent military capabilities that are maintained to assure the ability to defend Middle East oil supplies” (p. 27), and “one-time expenditures,” such as costs related to the Persian Gulf war. (Copulos’ “ongoing expenditures” is similar to our “peacetime expenditures”, and his “one-time expenditures” is similar to our “wartime expenditures.”) The one-time costs for pre-positioning equipment are 9.5\$ billion over 10 years, or an average of \$0.95 billion per year. The ongoing expenditures are equal to a portion of the outlays for CENTCOM, plus some relatively minor costs (such as for Southwest Asia contingencies) that total \$1.6 billion per year. Copulos estimates that outlays for Personnel and Operation and Maintenance for CENTCOM are about \$86 billion per year. (Personnel and Operations and Maintenance are appropriations category in the defense budget; see Table 15-4.) Copulos offers an alternative way of estimating the CENTCOM cost that results in an estimate of about \$71 billion per year. Later, he states that “slightly more than 70% of recent CENTCOM operations have been directed at the Middle East” (p. 31). The resulting total on going expenditure, \$52 to \$62 billion per year, is shown in Table 15-5.

Copulos (2003) provides a great deal of discussion to support his contention that the main focus of CENTCOM’s ongoing operations of wars in the Middle East is the protection of Persian-Gulf oil.

Moreland (1985). “Moreland applies a modified form of the CIA methodology used for estimating military spending in the Soviet Union. He divides the total budget of each force by the total active-duty personnel, to come up with a cost per active-duty soldier, ascribing each soldier to only one (his primary) mission. Moreland’s analysis arrives at \$54 billion per year for the Persian Gulf, or 23% of the conventional forces budget” (cited Sabonis-Chafee, 1987, p. 2).

Other estimates. Table 15-6 shows estimates that either are based on a literature rather than an original analysis or else are not full documented. For example, in an interview published in *Newsweek*, Former Secretary of the Navy John Lehman estimates that the U.S. spends approximately \$40 billion annually maintaining a military presence in the Middle East. However, he does not provide any information explaining how this estimate was developed. (*Newsweek*, 1987). Most recently, Plesch et al. (2005) claim that 25% of the U.S. military and intelligence budget “is focused on securing Middle East oil supplies” (p. 8), but they do not explain the basis of the 25%.

15.2.2.1 *Effect of the collapse of the Soviet Union*

Many of the estimates shown in Tables 15-5 and 15-6 were done before the dramatic recent changes in the balance of power globally and in the Gulf. The threat of a Soviet invasion has vanished, the Iran-Iraq war is over, and Iraq was defeated in the 1991 Gulf war. However, as we argued above, the U.S.’ primary interest in the region always has been oil, and nothing that has happened in the past few years has made the oil resource in the Middle East more secure. The risk of a supply disruption and price shock, and hence the perceived need for military protection, has not diminished. Given the huge oil reserves and the history of instability in the region, this perceived need will not diminish for the foreseeable future. If the primary military objective in the region

has not changed, then the estimates cited here -- even those made during or before the recent shifts in global and regional power -- are reasonable approximations of recent military expenditures on the Persian Gulf.

15.2.2.2 *What would the U.S. Congress do?*

As mentioned above, the DoD's estimate (GAO, 1991) excludes *all* of the cost of any force or program or function -- including DoD-wide "overhead" -- that supposedly serves more than just the Persian-Gulf interest. We shall refer to these excluded costs as multi-purpose costs. In contrast, most other researchers allocate these multi-purpose costs, including "fixed" overhead costs, across all of the affected regions. We believe that neither approach is quite correct conceptually, although as a practical matter the approach of allocating all costs gives approximately the right answer.

It is helpful to pose the right question, namely: if the U.S. suddenly had no interests in the Persian Gulf, how much would Congress and the President reduce the defense budget, year after year, over the long haul? There are three important aspects to this phrasing of the question. First, it properly acknowledges the role of Congress and the President in determining expenditures: the President proposes a budget plan, and Congress ultimately approves a budget and authorizes spending. Since they are the relevant decision makers, they are the ones whose decisions we should be trying to understand.

Second, our phrasing recognizes that the President and Congress may adjust the defense budget over a number of years, rather than all at once in the year of the change in the threat. It is a mistake to ignore "long-run" effects. If the DoD, for example, has ignored some costs only because they would not have been foregone *immediately*, then the DoD has made an error.

Third, and most importantly, our phrasing directly implies that the key task for Congress and the President is to determine just how the deployment of military resources is related to the kind and magnitude of various regional threats. That is, ours is *not* the pricing problem that a producer faces when he has joint products produced in fixed proportions from a single process, because Congress would not be trying to price military output. Rather, Congress' situation is that of a producer who is trying to figure out how a permanent drop in demand for one of the many products that comes out of his factory would affect his long-run production costs, assuming that output of the other products remains the same. To do this, the factory owner must understand how long-run production costs vary with the output of the product in question, holding all other output constant. Analogously, Congress' job is to figure out exactly what resources go to the production of "protection of the Persian Gulf," holding other protective services constant, and thusly to determine how much resources can be saved when the service is no longer required.

To recap, Congress' task is neither to allocate truly fixed costs nor to consider only short-run, directly variable costs, but rather to figure out how changes in threats affect the use of military resources, in any way, over the long run. This task is straightforward as regards those costs that are obviously, immediately, specifically and directly related to a particular threat. The challenge is to figure out how costs that nominally pertain to more than one region or function are related to changes in a regional threat. We discuss this challenge next.

To begin, we distinguish two kinds of multi-purpose costs: the cost of non-combat DoD-wide overhead, and the cost of combat military programs or missions that serve more than one region. This distinction is pertinent to an analysis of the defense

budget because a nontrivial fraction of the budget comprises overhead, administration, non-combat units, defense agencies, and other DoD-wide activities that are not attached to any one mission or program or region (Table 15-4).

Let us consider first military programs that nominally protect more than one region. As noted above, the DoD argues that all of such programs would be fully funded regardless of U.S. interests in the Persian Gulf. However, this would be true only if: a) all multi-regional programs were sized to deal with the “biggest” regional threat, and the Persian Gulf was not the biggest regional threat; b) forces and programs were developed to respond to only *one* regional problem at a time; and c) no programs had any components specifically for the Persian-Gulf mission.

For the DoD estimates to be correct, *all* of these conditions must hold. We doubt that they do, at least to the extent that the DoD avers. Indeed, it is much more likely that the opposite is true: that the procurement and deployment of military resources (in the eyes of military planners as well as the eyes of Congress) depends directly on the nature and extent of each and every perceived threat to U.S. interests. In fact, we think that the DoD estimates are disingenuous, and that the GAO (1991) is too credulous. If it really were true that eliminating the Persian-Gulf missions would not save anything, then it would follow that the DoD would not have to *ask* for any additional money if a new Persian-Gulf-like interest were to materialize. In response to Congressional inquiry into the cost of defending such an important and extensive new regional interest, honest DoD officials would reply: “We do not need any additional money to defend this important new interest, because we merely will add the region to the list of areas covered by existing forces”. More likely, of course, the DoD would insist that substantial additional resources would have to be devoted to defending the new interest.

Next, we consider “overhead” costs. Because these costs are not assigned to any one mission or program or region, it is not immediately obvious how Congress and the President would budget for them if the U.S. no longer was interested in the Persian Gulf. What is clear, though, is that in the long run there are few if any truly fixed costs (TC_{FIXED} in Figure 15-1). The number of planners, administrators, policy analysts, managers, and office workers, and the amount of resources devoted to them (including buildings and bases) is related to the amount of combat personnel and equipment being planned, administered, and managed. Indeed, it is not clear if there are *any* truly fixed costs – those that are the same regardless of the size of defense forces or the magnitude of a threat – except perhaps those related to upper-level administration (e.g., the salaries of senior staff in the Department of Defense). But these sorts of administrative costs clearly are a small fraction of total defense costs. We thus believe that Parry and Darmstadter (2003)¹⁵, the GAO, the DoD¹⁶, and others who argue that virtually all

¹⁵ Parry and Darmstadter (2003) write: “..military spending is more of a fixed cost than a variable cost. A policy to moderately reduce imports over time..would probably have little benefit in terms of cutting costs of U.S. military involvement in the region” (p. 20).

¹⁶ Ravenal (1991) notes that “Pentagon budgeteers will complain that it makes no sense to allocate certain categories of support and overhead, such as, in the extreme case, retirement pay, to combat functions” (p. 18). Presumably, this complaint follows from the thought that how much the military pays in retirement benefits today has nothing at all to do with current missions or expenditures. This is true, but irrelevant: the retirement-pay cost associated with current missions is the future retirement pay of those serving today, not the current pay of those who have already served. Total retirement pay is a function of total man-years of service; thus, if you eliminate a military mission and thereby reduce expected man-years of

military costs are fixed are wrong. Ravenal (1991) summarizes our critique of the DoD position well:

“When attempting to justify its entire defense budget request, or when demonstrating to our allies that we are paying a disproportionate share of the costs of an alliance, the Pentagon prefers to state its costs fully. But when defending against proposed cuts, it claims that deleting this or that unit or program from the force structure or the budget would save only the tip of its marginal costs” (p. 19).

We believe, then, that Congress might in fact reduce outlays for general overhead and support if the U.S. no longer had an interest in the Persian Gulf, and that it would do so relatively quickly. The Federal budget is so tight, and the potential “peace dividend” so large, that it is not unreasonable to believe that Congress would take the opportunity to reduce DoD overhead. Accordingly, we believe that the estimates of Ravenal (1991) and Kaufmann and Steinbruner (1991) are more accurate than the DoD’s (GAO, 1991), although we do accept that a very small fraction of DoD “overhead” costs would not be affected significantly if the Persian-Gulf mission were eliminated. We believe that in the long run, nearly all defense costs are variable (i.e., that in Figure 15-1, TC_{FIXED} is close to zero), and that Congress would recognize this. In the long-run, the Congress, the President, and the DoD can close bases, reduce personnel levels, scale back operations, and buy and deploy less material, equipment, and major weapons systems. This sort of restructuring happens all the time in the military, and hence it is not unreasonable to expect that there would be major cost savings across the board were a major military objective, such as protecting the Persian Gulf, eliminated.

15.2.2.3 *Our estimate of peacetime expenditures.*

Therefore, on the basis of the work of Ravenal (1991) and Kaufmann and Steinbruner (1991), but without doing a formal analysis, we judge that in 1991, the United States could have saved at least \$30 per year, and perhaps as much as \$60 billion per year, if it had had no interests in the Persian Gulf. Note that these figures do not include the expected cost of occasional conventional or (improbably, we hope) nuclear wars. (In the next section we provide a rough estimate of the additional expected cost of occasional “conventional” wars.)

Some data and analyses suggest that the cost is higher today than it was in 1991. In Tables 15-5 and 15-6, most of the estimates more recent than 1991 are higher than the Ravenal (1991) and Kaufman and Steinbruner (1991) estimates. However, one cannot make too much of this, because the estimation methods are different, and because lowest of the recent estimates (Copulos, 2003) may be the most credible.

Comparisons of defense spending with oil imports or the value of oil imports also suggest that the cost of protecting the Middle East has increased since 1991. Figure 15-3 shows defense spending and the value of Persian-Gulf oil imports from 1990 to 2004. The two curves fall and rise together. This positive correlation is consistent with the hypothesis that defense expenditures are related to the amount and cost of oil imported from the Persian Gulf. (Of course, the value of imports increased after 1999

service, you will reduce future retirement payments. These foregone future payments should be discounted to present dollars, but they should not be ignored.

because of increases in the price of oil, and defense expenditures increased after 2001 because of the Iraq War, and the two factors might or might not be related.)

Hall (1992) has a similar finding for the period 1968 to 1989. He estimates a single-variate autoregressive moving-average model in which total defense spending in year t depends on imports of crude oil and petroleum products in year $t-2$ (the 2-year lag accounts for lags in the political, legislative, and budgetary processes), and finds that for every million barrels of daily oil imports, defense spending increased by \$2.67 billion (in 1982 dollars)¹⁷.

With these considerations, we assume that the peacetime cost of defending the Persian Gulf increased by 0.5% (low cost case) to 1.5% (high cost case) per year, from the 1991 value.

15.2.3 Expected wartime expenditures related to the Persian Gulf

Expected wartime expenditures related to the Persian Gulf can be estimated as the annual probability of a war of a given magnitude multiplied by the estimated annual cost of such a war. For example, Ravenal (1991) speculates that over a decade there might be a 10% chance of having a conventional war that costs half as much as did the Vietnam war, and an 0.25% chance of having a nuclear war that costs 25% of GNP. Ravenal estimates that the Vietnam war cost about \$1,050 billion in 1991 dollars. Thus, the expected ten-year cost of a conventional war would be $0.1 \times 0.5 \times \$1050$ billion, which is \$53 billion total over 10 years or \$5.3 billion per year. To calculate the expected cost of a nuclear war, Ravenal takes the FY1992 GNP of \$6 trillion and compounds it at six percent annually to account for inflation and growth. This comes to \$79 trillion over ten years. The expected loss over the decade therefore would be $\$79 \times 0.25 \times 0.0025$, or \$5 billion per year. (This is lost GNP only; it does not include the value of human casualties.)

Our own estimate of the expected military cost of conventional wars in the Persian Gulf, based partly on the costs of the 1991 Gulf War and the 2003 Iraq war, is similar to Ravenal's. First, we note that the DoD spent around \$61 billion on the 1991 Gulf War (GAO, 1992, p. 51), although allied contributions offset much of this (see Table 15-4). From FY 2003 through FY 2006 the U. S. Federal government reportedly budgeted about \$300 billion specifically for the Iraq war, and almost \$100 billion for the war in Afghanistan (in current dollars, above peacetime spending levels), including costs of reconstruction (CBO, 2006a; Belasco, 2006; <http://costofwar.com>; Wheeler, 2006). The CBO (2006b) projects that a further \$200 to \$400 billion will be spent in Iraq through FY 2017 (in this case excluding reconstruction costs)¹⁸. However, as Bilmes and Stiglitz (2006) carefully point out, the total *economic* (or resource) cost of the Iraq War is much more than the reported direct budgetary cost, which in any case underestimates the true total budgetary cost to the federal government. Bilmes and Stiglitz (2006) add overlooked budgetary costs (such as veterans disability payments and increased defense spending not specifically assigned by the government to the Iraq War) and non-budgetary economic costs (such as the economic cost of injuries and deaths), and

¹⁷ Note that Hall relates defense spending to the quantity of oil imports, whereas we relate it to the value of imports from the Persian Gulf.

¹⁸ The CBO (2004) estimates wartime costs that are *in addition* to those for "routine" military operations, which is precisely what we want because we already estimate "routine" costs here (as "peacetime" costs).

estimate the economic cost of the Iraq War will be about \$800 to \$1200 billion, or around a *trillion* dollars¹⁹. They also point out that there are additional macroeconomic costs, such as losses in global income due to increases in the price of oil caused by the war.

Thus, the total cost of the 1991 Gulf War and the 2003 Iraq war is expected to be on the order of a trillion dollars, including rough estimates of the costs of reconstruction in Iraq, but excluding the cost of the war in Afghanistan on the grounds that it is not related to the Persian Gulf or oil. If such a sequence of wars is assumed to occur every 50 years, then the annual expected cost is approximately \$20 billion per year. We assume a range of \$15 to \$25 billion per year, in current dollars for any year from 1990 to 2005.

15.3. U.S. ASSISTANCE TO THE MIDDLE EAST: ATTRIBUTABLE TO OIL INTERESTS IN THE GULF?

The United States maintains an influence in the Middle East not only through its military presence and operations, but also through foreign military sales (which are separate from peacetime and wartime defense spending) and various types of foreign aid to countries throughout the region. Countries of the Middle East and North Africa receive 80-90% of all U.S. military assistance and 30-40% of total U.S. assistance – generally between \$5 and \$6 billion in total assistance per year (Table 15-9). Is any of this assistance – which is not part of the U. S. Defense budget, and is distinct from the U. S. military costs estimated elsewhere in this report – attributable to countries in the Middle East and North Africa motivated by U.S. oil interests in the region?²⁰

Most of the U.S. assistance in the Middle East and North Africa goes to Israel and Egypt. It is likely that none of the grants to these countries are *directly* related to U.S. oil interests, primarily because these countries do not produce much oil. However, to the extent that grants to these countries are meant to promote regional stability (as opposed to, say, the security or economic development of an individual country), they arguably are related to U.S. oil interests, because the U.S.' main reason for wanting to keep the region stable is to keep the oil accessible and inexpensive. However, we will argue that none of the grant aid to Israel is meant to promote regional stability, and that although some of the grant aid to Egypt and Turkey is, the amount is relatively small.

Israel receives more outright grant money from the U.S. than does any other country in the Middle East. However, it appears to us that the U.S. gives aid to Israel to

¹⁹ See also Wallsten and Kosec (2005), who perform a similar calculation, and whom Bilmes and Stiglitz (2006) cite frequently. A major difference between the Wallsten and Kosec (2005) study and the Bilmes and Stiglitz (2006) study is that Wallsten and Kosec (2005) include the value of the net change in deaths and injuries to Iraqis, where the net change is the difference between the number of Iraqis killed (or injured) during the war and the number that they estimate would have been killed had Saddam Hussein remained in power. Wallsten and Kosec (2005) estimate that this difference is close to zero, but they use on the one hand the Iraqbodycount.org estimate of Iraqi war deaths, which is known to be an underestimate, and on the other hand the murder rate under Saddam Hussein before Iraq was heavily policed by the international community. The number of murders that would have occurred in Iraq had Saddam Hussein remained in power but been heavily policed surely would have been much less than the high historical rate and much less than the actual Iraq-War deaths.

²⁰ Here, we ignore loans because they are supposed to be paid back, and sales because they are beneficial trade. Only outright grants are economic costs to the U.S.

help Israel directly, militarily and economically, and not out of a desire to maintain stability in the region (and hence protect oil supplies). Indeed, in general U. S. support of Israel antagonizes the Arab members of OPEC, and foments regional instability and ill-will towards the U.S.²¹ Thus, not only is U. S. aid to Israel *not* motivated by U. S. oil interests in the Persian Gulf, it probably actually undermines those interests. We believe that the U.S. helps Israel for reasons other than oil, and would continue to give Israel \$3 billion per year even if there were no oil in the region²².

Egypt is the second largest aid recipient in the region. To some extent, aid to Egypt is motivated by a desire to promote regional stability, which in turn is motivated by the desire to protect the oil there. A strong relationship with Egypt also provides the United States with an alliance with an important Arab nation and helps the U.S. maintain an influence in the region. Thus, an argument could be made that at least some of the \$2 billion in assistance to Egypt could be linked indirectly to U.S. oil interests in the region.

U.S. aid to Turkey is small relative to that provided to Israel and Egypt -- less than half a billion dollars. Some of this aid is the result of Turkey's membership in NATO and is therefore not directly linked to oil objectives in the Gulf. However, Turkey was used as a base of operations during the Gulf War, so it is possible that at least some of this aid can be attributed to U.S. interests in Gulf oil.

In summary, the U.S. provides almost \$6 billion annually in assistance to countries in the Middle East and North Africa, most of which goes to Israel and Egypt. We believe that substantially less than \$2 billion of this can be attributed to oil interests in the region -- that is, that if there were no oil in the Middle East, the U.S. would scale back its assistance to Middle East countries by considerably less than \$2 billion. Moreover, even if the U.S. did give less grant aid to the Middle East, it very well might give more to other regions. (Although, if this were the case, one would have to consider that there might be a cost to the U.S. of *not* giving to these other regions now.) It is not clear, then, that U.S. oil interests in the Middle East cost the U.S. more than a trivial amount in grant aid. We assume that the net cost of grant aid attributable to Middle East oil is small enough to be ignored.

²¹ This was demonstrated negatively in 1973 and 1974, when OPEC placed a temporary embargo on oil shipments to the U.S. and the Netherlands in retaliation for their support of Israel in the Arab-Israel War of October 1973. It was demonstrated positively during the 1991 Persian Gulf War, when Israel not only was excluded from the U.N. coalition, but was pressured to refrain from retaliating against Iraqi missile attacks on its territory, in order to maintain the support of the Arab nations.

²² Our position, then, is that if there were no oil in the Persian Gulf, the U.S. military would not have a major Persian-Gulf mission centered on Israel, but the U. S. would continue to grant economic and military assistance to Israel.

15.4. FROM THE COST OF DEFENDING ALL U.S. INTERESTS IN THE PERSIAN GULF, TO THE COST OF DEFENDING OIL CONSUMED FOR TRANSPORTATION

15.4.1 The five steps of the estimation

In this section, we work from our estimate of the cost of defending all U.S. interests in the Persian Gulf towards an estimate of the military cost of using oil in highway transportation. We start with: i) the estimated \$35 to \$75 billion spent annually to defend all U.S. interests in the Persian Gulf (see section 15.2), and deduct: ii) the cost of defending interests other than oil in the Persian Gulf; iii) the cost of defending against the possibility of a world-wide recession due to the effects of an oil price shock related to the use of Persian-Gulf oil by *other* countries (such a recession would harm the U.S., even if the U.S. did not produce or consume oil); iv) the cost of defending the investments of U.S. oil producers in the Persian Gulf, apart from the interests of U.S. consumers; and v) the cost of defending the use of oil in sectors other than highway transportation. The steps of the estimate are summarized in Table 15-12.

15.4.1.1 *The cost of defending the Persian Gulf.*

See section 15.2.

15.4.1.2 *The cost of defending interests other than oil in the Persian Gulf*

If, as we have argued, the main concern of the U.S. military in the Persian Gulf is to protect oil supplies, and if, as we also have argued, most military resources vary as a function of the number and extent of threats, then it follows that if there were no oil in the Persian Gulf, Congress eventually would eliminate most of the defense spending related to the Persian Gulf. (It would not eliminate *all* Persian-Gulf defense spending because of non-oil interests in the Gulf and because of the fixed costs that are incurred if there is any regional defense at all, regardless of its size, scope, and purpose.) We assume that if there were no oil in the Persian Gulf, Congress would reduce peacetime Persian-Gulf military expenditures by 60% to 75%, and leave 25% to 40% to protect non-oil interests and cover fixed costs (which we believe are relatively small).

By contrast, Koplw and Martin (1998) assume that non-oil interests – promoting regional stability, and preventing the emergence of a hegemonic power – are responsible for 2/3, or 67%, of the cost of defending the Persian Gulf. We think that this is too high, because if the area did not have so much oil, it is unlikely that the world would care much about its political make-up and stability²³. Moreover, Koplw and Martin (1998) note that Earl Ravenal, an expert on military spending, believes that virtually all defense spending on the Middle East should be attributed to oil.

We assume that underlying motivations for wartime military expenditures in the Middle East generally are similar to the underlying motivations for peacetime military expenditures, and hence that the share of Middle-East defense spending attributable to oil is similar in peacetime and wartime. (More precisely, we assume that the percentage by which Congress would reduce wartime expenditures were there no oil in the

²³ Koplw and Martin (1998) base their allocation on the discussion in Fuller and Lesser (1997) of U.S. goals in the Persian Gulf. However, we believe that Fuller and Lesser (1997) clearly indicate that the goals of preserving regional stability and preventing the emergence of a regional power ultimately derive from the overall all goal of preserving access to oil at reasonable prices.

Middle East is similar to the percentage it would reduce peacetime expenditures.) In any case, there is ample evidence that the desire to protect access to Middle East oil is a factor in U.S. wars in the Middle East. For example, Plesch et al. (2005) claim that “oil played a strong if not determining factor” (p. 8) in the Iraq-Iran war, the 1991 Gulf War, and the 2003 U.S. invasion of Iraq. They cite a statement by then Senator Jesse Helms, at a hearing on U.S. dependence on foreign oil, that the cost of the 1991 Gulf War “was really there to protect world oil demand” (in Plesch et al., 2005, p. 8). Similarly, Copulos (2003) notes that “while there are a variety of concerns associated with the Baghdad regime, the security of energy resources in the region is unquestionably a major consideration – especially given Saddam Hussein’s repeated attempts to gain control over neighboring oil-rich territory” (p. 30). Copulos (2003) ends up assuming that 50% of the wartime costs are attributable to oil (p. 35).

With these considerations, we assume that if there was no oil in the Middle East, the expected annual cost of wars in the area would be 50% to 75% less.

15.4.1.3 The cost of defending against the possibility of a world-wide recession due to the effects of an oil-price shock related to the use of Persian-Gulf oil by other countries

Rapid price changes could occur and would affect the U.S. even if the U.S. did not import any oil from the Middle East. A Congressional Research Service (CRS) analysis conducted after the Gulf war concluded that “so long as domestic suppliers of energy can participate in these [world-oil] markets, disruptions to the world supplies of energy will be felt even in a self-sufficient United States as domestic suppliers of the affected energy source divert their supplies to foreign markets and as suppliers of substitute energy sources do the same” (Makinen, 1991, p. CRS-7). Moreover, even if the U.S. did not produce or consume any oil at all, it still would be hurt by a world-wide recession triggered by a rapid increase in oil prices, at a minimum because foreign demand for U.S. goods and services would decrease. As the CRS points out, “the only way to prevent this sequence of events from occurring would be to completely isolate the U.S. from foreign markets” (Makinen, 1991, p. i).

Unfortunately, we have no way of estimating how important it is for the U.S. to protect itself against this effect alone, as distinct from effects related to U.S. production and consumption of Persian-Gulf oil. We simply assume that this general interest in preventing any price shock, regardless of U.S. oil imports, is significantly less important than are the interests related specifically to U.S. production and consumption of Persian Gulf oil. Quantitatively, we assume that in the eyes of Congress, the value of defending against world-wide price shocks is 20% to 33% of the total value of defending Persian-Gulf oil, and hence that the direct interests of U.S. producers and consumers of Persian Gulf oil are 67% to 80% of the total value of defending Persian-Gulf oil.²⁴

15.4.1.4 The cost of defending the investments of U.S. oil producers in the Persian Gulf, apart from the interests of U.S. oil consumers

Even if the U.S. did not consume any oil at all and somehow was completely insulated from the worldwide economic impacts of sudden increases in the price of oil,

²⁴ It is possible that this portion of the marginal defense cost per gallon increases with increasing oil consumption. This will be the case if the higher prices that result from greater consumption cause an increase in the potential macroeconomic cost of a disruption, and if this higher potential cost elicits higher defense expenditures.

Congress still probably would allocate resources to defend Persian-Gulf oil, because U.S. corporations have invested billions of dollars in the petroleum industry in the Persian Gulf and sell billions of dollars worth of Persian-Gulf oil worldwide, and Congress is influenced by the financial interests of large oil corporations as well as by the ostensible interests of oil consumers. We can gain a sense of Congress' assessment of the need to defend the interests of producers per se by comparing the value of U.S. oil-producer assets, sales or investment in the Middle East with the value of U.S. consumption of oil from the Persian Gulf.

The Bureau of Economic Analysis (BEA) provides data on the assets of foreign affiliates of U.S. petroleum companies, sales of foreign affiliates of U.S. petroleum companies, and direct investment by the U.S. petroleum industry in its foreign affiliates (Table 15-10, parts A, B, and C). Table 15-10 part A indicates that the assets of Middle-East affiliates of U.S. petroleum companies have ranged from \$15 billion in 1997 to perhaps as much as \$30 billion today (extrapolating the trends in the data). Part B of Table 15-10 shows that the sales of Middle-East affiliates have ranged from \$7 to about \$15 billion (extrapolating the trends in the data), and Part C shows that that direct investment by the U.S. petroleum industry in foreign affiliates in the Middle East has ranged from \$3 billion in 1997 to perhaps \$5 or \$6 billion today (again, extrapolating the trends in the data)²⁵.

Which of the three measures best represents (in the eyes of Congress) the value of the "interest" of U.S. petroleum companies in the Middle East? The data of part A, the assets of Middle-East affiliates of U.S. petroleum companies, probably overstate the Middle-East interest of U.S. producers, because U.S. parent companies do not own all of the assets of their foreign affiliates (Mataloni, 1995). For example, if parent companies own half of their affiliates' assets, then the ownership interest of U.S. petroleum companies in their Middle-East foreign affiliates has ranged from \$8 to \$15 billion per year.

On the other hand, the data of part C, direct investment in Middle-East affiliates, probably understate the Middle-East interest of U.S. oil companies, because U.S. companies have indirect as well as direct investment in their Middle East affiliates²⁶. And finally, although the data of part B, sales of Middle-East affiliates of U.S. petroleum companies, may be a ready indicator to Congress of the magnitude of the Middle-East interest of U.S. producers, if U.S. parent companies do not own all of the assets of their foreign affiliates, then they probably do not have stake in all of their sales.

In order to narrow the range, we can consider possible "indirect" investment by U.S. petroleum companies in the Middle East, via holding companies in other parts of the world. Such indirect investment does not show up in part C of Table 15-10, because in the BEA statistics an indirect investment in country *B* via a holding company in

²⁵ The BEA data of Table 15-10 indicate that Middle-East assets, sales, and investment are 3% to 10% of all foreign assets, sales, and investment in the petroleum industry. However, data from the EIA (1994, 2006c) indicate that between 1986 and 1992, and 1998 and 2004, 10% to 16% of the total foreign income tax paid by 25-30 major energy companies (mostly petroleum companies) was on income from the Middle East. This difference may be due to differences in coverage between the EIA and the BEA surveys.

²⁶ Because direct investment "is measured as the yearend value of U.S. parents' equity (including retained earnings) in, and net outstanding loans to, their foreign affiliates" (Mataloni, 1995, p. 43), direct investment may be a proxy for direct ownership of the assets of Middle East affiliates of U.S. petroleum companies.

country *A* was counted as a direct investment in the country of the holding company – country *A* – not as an indirect investment in country *B*. For example, the BEA counted a direct investment in the Middle East by a U.S. foreign affiliate located in, say, the Netherlands as a direct investment in the Netherlands, not as a direct or indirect investment in the Middle East (see Borga and Mataloni [2001] and Koncz and Yorgason [2006] for more discussion). On the other hand, the BEA counts as a direct investment in the Middle East any investment in holding companies that are located in the Middle East but actually do business elsewhere.

Ideally, to get a true picture of total investment in working foreign-affiliate petroleum companies in the Middle East, we would deduct U.S. investment via non-working holding-company affiliates located in the Middle East, but add investment in holding-company affiliates, located in other regions, that invest in working affiliate companies in the Middle East. No such data are available, but we suspect that the addition would greatly exceed the deduction: it seems, for example, much more likely that U.S. companies will have in Europe holding companies for Middle-East operations than have in the Middle East holding companies for European operations. The Middle East has most of the oil; it is the necessary place for operations, but given its instability, unfamiliarity, and remoteness, certainly not a good place for a non-operating holding company. If such indirect investment in the Middle East is half as much as the direct investment²⁷, then the total direct+indirect investment by petroleum companies in the Middle East ranged from \$4 billion to about \$9 billion.

The discussion to this point suggests that value of the interest of U.S. oil producers in the Persian Gulf has ranged from \$4 billion to perhaps \$15 billion per year. However, one also has to consider that if the U.S. did not consume Persian-Gulf oil, U.S. producers might have less of a stake in the production of Persian-Gulf oil. Allowing for this, we assume that the interests of U.S. producers in the Persian Gulf, apart from the interest of U.S. consumers of Persian-Gulf oil, have ranged from \$3 to \$10 billion per year from the mid-1990s to 2005.

This range of \$3 to \$10 billion as the value of U.S. oil-producer interest in the Middle East can be compared with the value of U.S. oil-consumer interest in the Middle East, represented by the value of imports from the Persian Gulf²⁸. As shown in Table 15-11, the value of imports has ranged from around \$10 billion from 1993 to 1998, to over \$40 billion in 2005. Therefore, on the basis of these illustrative estimates, we assume that in the eyes of Congress, the “interests” of U.S. producers in the Persian Gulf are 25% to 33% of those of U.S. consumers of Persian Gulf oil, and that Congress would budget defense spending accordingly²⁹.

²⁷ The use of holding companies increased dramatically from 9% of the direct investment abroad position in 1982 to 35% in 2004 (Koncz and Yorgason, 2006).

²⁸ Although the “Middle East” as defined by the BEA includes a few more countries than does the “Persian Gulf” as defined by the EIA, none of the countries in the Middle East but not the Persian Gulf countries export significant amounts of oil to the U.S. (see Table 15-11).

²⁹ In the first version of this research report, we assumed that the interests of producers were 50% to 100% of the interests of consumers. Koplou and Martin (1998) cite a personal communication from an expert at the OECD who thought that this range was too high. We believe now that it is indeed too high.

15.4.1.5 *The cost of defending the use of oil in sectors other than highway transportation*

The deductions to this point leave us with the cost of protecting U.S. consumption of Persian Gulf oil in all sectors of the U. S. economy (motor vehicles, other ground transportation, air and water transportation, heating, power plants, etc.). We now wish to estimate the cost of protecting U. S. consumption of Persian Gulf oil by motor vehicles specifically, both in total dollars (for the whole motor-vehicle sector) and per gallon of all motor-fuel used by motor vehicles. If petroleum from the Persian-Gulf was distributed randomly throughout the U. S. economy – i.e., if it was in effect thoroughly mixed with all other petroleum used in the U. S. before being refined and distributed – then the fraction of Persian-Gulf petroleum that ended up being used by motor vehicles would be the ratio of total petroleum consumption in the motor-vehicle sector to total petroleum consumption in all sectors in the U. S. This ratio has been increasing gradually, from about 48% in 1991 to 52% in 2005.³⁰

However, for two reasons, the fraction of Persian-Gulf oil that ends up in the motor-vehicle sector may not be equal to this ratio. First, although it is difficult to trace the flow of crude oil from the Persian Gulf to any particular end-use sector, it is not difficult to trace the flow of other petroleum products: for example, all motor gasoline but no residual fuel is used in the motor-vehicle sector. Data in Delucchi (1996) indicate that in 1991, slightly more Persian-Gulf petroleum products went to non-motor-vehicle sectors than to motor-vehicle sectors, with the result that in 1991, 46.4% of Persian Gulf petroleum went to the motor-vehicle sector, assuming still that Persian Gulf crude oil was randomly mixed with other sources of crude oil.

Second, Persian-Gulf crude oil might not be randomly distributed to all end uses; by chance or by market forces, it might be disproportionately used more in one sector than another. For example, it might be that in the long run reductions in oil use reduce domestic production rather than Persian-Gulf imports, because domestic oil tends to be more costly than Persian Gulf imports.

Given these considerations, and without doing a formal analysis, we assume that in 1991, 40% to 50% of Persian Gulf petroleum ended up as motor fuel. We then assume that these percentages increased at 0.6% per year, consistent with the data cited above that indicate that the motor-fuel share of total petroleum consumption has been increasing slightly over time.

15.5 RESULTS AND DISCUSSION

15.5.1 Results

Table 15-12 shows the results of the analysis. Part A shows the results of the five-step analysis presented above. Part B shows the cost of defending each individual interest. The bottom line of our analysis is that if all motor-vehicles in the U.S. (light-duty and heavy-duty) did not use oil, Congress might reduce defense spending by \$6 to \$25 billion per year, over the long haul. This amounts to about \$0.03 to \$0.15 per gallon (\$0.01 to \$0.04 per liter) of all gasoline and diesel motor fuel in 2004 (based on fuel use

³⁰ Calculated by dividing the total volume of highway fuel consumed (FHWA, 2008) by the total volume of petroleum products supplied (EIA, 2007), and then adjusting the resultant ratio to account for differences in density between motor fuel and other petroleum products and for the use of non-petroleum products in motor fuel (adjustments based on data in Delucchi [1996]).

data from the Federal Highway Administration [2008]). The lower end of this range is trivial, but the upper end is not.

15.5.2 Other issues bearing on the analysis

15.5.2.1 *The beliefs of policy makers versus the beliefs of analysts*

We emphasize (again) that resources will be devoted to the military to protect U.S. oil interests if the President and the U.S. Congress, who propose and approve the military budget, *believe* that it is important to protect oil supplies. That is, for any case at hand, it does not matter if analysts such as Bohi (1991) and Toman (1991) are right in asserting that the macroeconomic costs of price shocks need not be large; what matters is what the decision-makers believe. Of course, one would hope that eventually decision makers would believe what was true, but this is only a hope, and in any event the “truth” presently is subject to debate.

15.5.2.2 *Free riders on U.S. defense*

Should some of the U.S. military cost be allocated to oil consumption and production by other nations, on the grounds that these other nations benefit from U.S. military expenditures? The answer is an unambiguous “no”. These other nations are free riders, and whenever there are free riders the incidence of benefits does not correspond to the incidence of costs. In an economic cost or cost-benefit analysis, the relevant question always focuses on opportunity cost, on the counterfactual: if the U.S. did not have oil interests in the Persian Gulf, and in fact was completely insulated from any worldwide recessions traceable to any country’s use of Persian Gulf oil, would it spend money (without reimbursement or reciprocation) to protect oil in the Persian Gulf? Obviously not. U.S. expenditures are motivated entirely by U.S. interests, broadly defined; no interests, no expenditures. The presence of free riders cannot change this reality³¹.

15.5.2.3 *Military spending and economic growth.*

One might ask if military spending affects economic growth, and hence has social benefits or costs in addition to the direct expenditures. One could argue, for example, that technological spin-offs of military research and development become a positive externality in the private sector and contribute to economic growth. However, there is no strong evidence that defense spending spurs economic growth. Most studies have found either no link between defense spending and economic growth, or else weak and ambiguous links. As Gerace (2002) notes, “the net effect of military expenditures on economic growth is theoretically ambiguous” (p. 2), and “there is no general consensus on whether military spending positively or negatively affects economic growth” (p. 1).

Huang and Mintz (1991) found that military expenditures have not had any significant effect, external or otherwise, on economic growth. Payne and Ross (1992) found “no causal relationship in either direction between defense spending and economic performance” (p. 161). Dunne (1990) stated that model results “do not suggest that the share of military expenditures is a significant influence on the

³¹ If U.S. allies reimburse the U.S., or otherwise have an explicit quid-pro-quo agreement regarding U.S. military services, then the U.S. cost is equal to its expenditures less the reimbursement or exchange.

unemployment rate...The fear that reductions in the share of military expenditures will be associated with higher average unemployment levels is misplaced" (p. 57). Kinsella (1990), Gold and Adams (1990), Huang and Mintz (1990), and Gerace (2002) also found no links between defense spending and economic growth.

There are some suggestions that reductions in defense spending boost the economy. Mintz and Huang (1990) found that "in the long run lower military expenditures encourage investment, which in turn promotes economic growth" (p. 1291). Others have reached similar conclusions. According to the Congressional Budget Office (1992):

Over the long term, the so-called peace dividend -- if used to reduce the federal deficit -- would increase national savings and investment and would therefore benefit the economy. By the next decade, the dividend realized under the 1991 plan could result in a permanent increase in GNP of around \$500 billion a year (in 1992 dollars)...Over the next few years, however, applying the dividend to deficit reduction could adversely affect the economy, lowering GNP and employment, unless an expansion of monetary policy offsets defense spending cutbacks. The short-run changes will be modest in the national economy -- within the normal range of variation in GNP -- and in state economies, but could be serious for some industries and local communities.

Findlay and Parker (1992) noted that:

Increases in military spending cause a significantly larger increase in interest rates than do increases in non-military spending...Our results then suggest that the crowding out of private expenditures can be reduced when the government shifts resources from military spending to non-military spending (p. 195).

Heo (1998) tests the effects of defense spending on growth in 80 countries using a nonlinear defense growth model, and finds that "two thirds of the countries under investigation may expect a 'peace dividend' due to the negative relationship between defense spending and economic growth" (p. 637).

Boyd and Chermak (2002?) used a computable general equilibrium model to analyze the welfare effects of military expenditures to protect Middle-East oil, domestic tax subsidies to oil producers, and the Strategic Petroleum Reserve. They found that eliminating the military expenditures to protect Middle-East oil (and reducing taxes commensurately) increased consumption and production in most sectors, even when the elimination was assumed to result in higher oil prices.

However, others have found that reductions in defense spending might hurt the economy. Atesoglu and Mueller (1990) estimated a two-sector production function of the economy and found that:

there is a positive and significant relation between defence spending and economic growth. But, findings indicate that the responsiveness of economic growth to changes in defence spending is small. If there are significant cuts in defence spending - except for very large sustained cuts - the adverse effects on the economic growth of the United States should not be large (p. 19)

Thomas et al. (1991) analyzed the economic impacts that would result from a reduction in defence spending, and found that "reducing the level of defence spending will reduce real output, the price level, and employment. The effects of such a reduction will tend to attenuate after about five years" (p. 195). Similarly, Mehay and

Solnick (1990) estimated the impact of total defense spending and of investment and operation expenditures on state economic growth, and found that:

Aggregate defense spending was found to be positively related to both state growth measures. However, when defense outlays are disaggregated, only investment-type spending is positively related to personal income growth, whereas both investment and operating programs appear to influence employment growth (p. 484).

It appears, then, that defense spending does not necessarily have strong economic effects one way or the other. Payne and Sahu (1993) sum up prevailing views well:

Studies in this volume show that there are theoretical bases for expecting defense spending to have an effect on economic growth both for industrialized and less developed countries. While the economic growth could be affected both from the supply-side and the demand-side, the net effect of the diverse forces on economic growth of a nation is theoretically ambiguous. Measuring the impact of defense spending on economic growth then ultimately becomes an empirical question...Most studies cited in the volume suggest that defense spending has rather modest effect on the economic growth of an industrialized nation...In light of the weak link between defense spending and economic growth for developed countries, one should realistically expect that a reduction in defense spending would not make a significant difference...The defense cuts, however, mask some harsh realities at the regional levels. Defense-based communities may be very hard hit (p. 14-15).

On the basis of this brief literature review, we conclude that defense spending does not have any offsetting economic benefits or additional external costs.

15.5.2.4 The shape of the total cost function

As mentioned above, if the total cost-vs.-quantity function is nonlinear and has the shape of $TC-NL_f(Q)$ in Figure 15-1, then our estimate of the \$/gallon unit cost (UC-LTC in Figure 15-1) will underestimate the true \$/gallon cost (given by UC-NLTC in Figure 15-1) until the quantity of oil consumed drops below Q^* in Figure 1. This situation seems plausible. For example, if the oil defense cost per gallon is proportional to the price of oil per gallon, then, given that the price of oil increases with Q , the defense cost per gallon will increase with Q , in the manner of UC-NLTC in Figure 15-1. The defense cost per gallon will be proportional to price if (for example) the total defense cost is proportional to total revenues received by oil-exporting countries, which in turn will be the case to the extent that the general instability in the Middle East that the U. S. is defending against is positively related to oil revenues.³² Although we cannot formally evaluate these possibilities, we think they are plausible examples of mechanisms that might lead to a nonlinear total cost function.

15.5.2.5 Security costs other than peacetime and wartime military expenditures for the Persian Gulf

Expenditures on the military are only a portion of the entire relevant "security" cost of using oil. Just as the total social cost of pollution due to cars is equal to the value of the resources devoted to controlling pollution (the control cost) plus the value of the

³² An anonymous reviewer of the journal article version of this report suggested this possibility.

resources damaged by whatever pollution still is emitted (the residual damages), the total security cost of using oil is equal to the military “control” cost plus the dollar cost of whatever security problems remain in spite of – or even due to – the military expenditures. These “residual” security costs include reduced flexibility in the conduct of U.S. foreign policy, strains on international relations due to the activities of the U.S. military and even to competition for oil (U.S. Department of Energy, 1987), anti-American sentiments due to the presence of the U.S. military in the Middle East (Cato Institute, 2005, p. 563), political destabilization of the Middle East, and the nonfinancial human-suffering costs of war and political instability related to U.S. demand for oil. Although to our knowledge nobody has ever quantified these costs, we believe that they are important³³. Indeed, one could argue that a primary motivation of many programs and policies aimed at reducing U.S. dependence on foreign oil is not to reduce military expenditures related to defending the Persian Gulf, but rather to mitigate some of the political and human costs associated with U.S. demand for Persian Gulf oil. If this is right, then the “costs” that we have not estimated may be large relative to the military costs we have estimated.

Also, we have not included the military cost of protecting oil interests in any other regions. For example, the U.S. might be spending money to defend oil pipelines and ports in Alaska, oil refineries in the Caribbean, and oil fields in South America, Africa, and Indonesia.

15.5.2.6 Will Congress reduce defense expenditures in the future, given the same set of interests to protect?

It may well be that whatever the U.S. is spending on the Persian Gulf is too much (or, doubtfully, too little), and can be reduced without compromising any U.S. interests or missions. If Congress recognizes this, and decides that it can provide for what it perceives to be necessary missions in the region at less cost, then present expenditures overestimate future costs³⁴. Several researchers have argued that defense expenditures in the Middle East can, in fact, be reduced without compromising U.S. objectives in the region. Kaufmann and Steinbruner (1991) use then-Defense Secretary Cheney’s Future Years Defense Plan (FYDP) for FY1996 as a baseline for one such projection. They estimate that \$55.1 billion of Cheney’s total budget of \$243.7 billion should be allocated to the Middle East, and then propose two alternative force planning contingencies for FY2001 for the Middle East: one that requires \$45 billion, and a “low-cost” option that requires \$29 billion (Table 15-13).

Carpenter and Fiscarelli (1990) and Ravenal (1991) argue that the benefits of protecting the Persian Gulf are substantially less than the military costs. Carpenter and

³³ If one accepts the estimate of Burnham et al. (2006) that over 600,000 people have died in Iraq as a result of the U. S. war, and if one believes (as we do) that there would not have been a war and hence that those people would not have died if the region did not have oil, then the oil/war-related cost of those deaths could be on the order of 10 billion dollars per year, depending on how many more people die, the value of life, and the frequency of such conflicts.

³⁴ Note that, in a analysis of what social costs have been and will be, the relevant quantity is what we have spent or will spend on defense of the Middle East, not what we “should” spend in order to maximize net social benefits. We would want to estimate the “optimal” amount of military spending only if the military were funded in accordance with an explicit social cost-benefit analysis, which of course it is not.

Fiscarelli (1990) believe that the U.S. should transfer much of the burden of protecting the Gulf to its Western allies and thereby reduce its own military expenditures for the region from some \$40 billion to year to \$10 billion per year (Table 15-13). Ravenal (1991) suggests that U.S. stop policing the Gulf altogether and instead let the private sector protect against supply disruptions by developing domestic petroleum and non-petroleum fuels and using petroleum more efficiently³⁵.

We do not account for this possibility here.

15.6 CONCLUSION

To estimate the military cost of using Persian-Gulf oil in transportation, one must evaluate a series of grand counter-factuals (“If the U.S. had no interests in the Persian Gulf at all...”; “If there were no oil in the Persian Gulf...”; “If the U.S. produced but did not consume oil...”). These counterfactuals account for the fact that, in regards to the Persian Gulf, the U.S. cares not only about the use of Persian-Gulf oil in transportation, but also about the use of Persian-Gulf oil in non-transportation sectors, the interests of U.S. oil producers in the Persian Gulf, the stability of the world price of oil, and even matters unrelated to oil. Unfortunately, these counterfactuals are difficult to analyze formally, and as a result much of the analysis is judgment. Although we believe that our conceptual outline is correct, and that our estimated ranges (Table 15-12) are not evidently absurd, we recognize that other analysts might disagree with us, perhaps vehemently, at every step. Certainly, we cannot deny the possibility that the military cost of using Persian-Gulf oil in transportation is very small -- much less, even, than our lower bound.

In principle, the uncertainty could be narrowed through a carefully specified multivariate regression, in which some measure of U.S. oil interests in the Persian Gulf, along with measures of other determinants of the U.S. military budget, explain the military budget over time. The challenge, of course, is to find an adequate measure of U.S. oil interests, and to identify and quantify other determinants of the military budget. We know of no such attempt. As discussed above, Hall (1992) does find a significant positive correlation between the value of U.S. oil imports and the U.S. military budget (with a two-year lag)³⁶. Of course, given that his is a single-variable regression, one reasonably can argue that the results are spurious, or that the oil-import variable captures the effects of omitted correlated variables, or even that if there is any causality, it goes the other way (i.e., that something that is associated with an increase in

³⁵ We agree.

³⁶ All specifications of Hall’s model yielded the same, statistically significant (10% level) coefficient: for every million barrels of daily oil imports, defense spending increased by \$2.67 billion (in 1982 dollars). In 1990 dollars, Hall’s result is $2670 \times 1.328 / 365 = \9.71 of defense spending per barrel of imported oil (the 1.328 factor is the 1990/1982 implicit price deflator). In 1990, the U.S. imported 2.93 billion barrels of crude oil and petroleum products (EIA, 2006a), which according to Hall’s model would have been associated with an increase in defense spending of $2.93 \times 9.71 = \$28$ billion/year. This is the lower end of the range of estimates, cited above, that were derived by allocating the military budget.

military spending causes an increase in oil imports)³⁷. We encourage further analytical work in this area, to help narrow the range of reasonable estimates.

³⁷ Hall argues that “as long as the omitted variables, such as the perceived Soviet threat, are not correlated with oil imports, a model with a single explanatory variable could result in an unbiased statistical estimate of the portion of defense spending due to imports” (p. 1093).

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TABLE 15-1. SOURCES OF CRUDE OIL AND PRODUCTS SUPPLIED IN THE UNITED STATES, 1990-2004 (PERCENT OF TOTAL PETROLEUM PRODUCTS SUPPLIED)

Year	Imports	OPEC ^a	Persian Gulf ^b	Non-OPEC ^c
1990	47%	25%	12%	22%
1991	46%	25%	11%	21%
1992	46%	24%	10%	22%
1993	50%	25%	10%	25%
1994	51%	24%	10%	27%
1995	50%	23%	9%	27%
1996	52%	23%	9%	29%
1997	55%	25%	9%	30%
1998	57%	26%	11%	31%
1999	56%	25%	13%	30%
2000	58%	26%	13%	32%
2001	60%	28%	14%	32%
2002	58%	23%	11%	35%
2003	61%	26%	12%	35%
2004	63%	27%	12%	35%

Source: EIA (2006a).

^a Includes the Persian-Gulf members of OPEC. The main *non*-Persian-Gulf OPEC suppliers are Nigeria, Venezuela, and Algeria.

^b Saudi Arabia is the main Persian-Gulf supplier.

^c Nigeria, Venezuela, and Algeria are the main non-OPEC suppliers.

TABLE 15-2. DEATHS FROM MILITARY CONFLICTS IN THE MIDDLE EAST SINCE WORLD WAR II, THROUGH 2006

Period and region	War-Related Deaths		
	<i>Civilian</i>	<i>Military</i>	<i>Total</i>
<i>Through early 1990s^a</i>			
Red Sea ^b	966,422	387,805	1,354,227
North Africa ^c	98,443	35,430	135,673
Persian Gulf	270,312	406,432	676,744
Arab-Israeli	109,516	74,533	184,249
<i>Total through early 1990s</i>	<i>1,444,693</i>	<i>904,200</i>	<i>2,350,893</i>
<i>From 2000 to 2006</i>			
Afghanistan	not estimated	not estimated	not estimated
Iraq ^d	45,000	15,000	60,000 (600,000+?) ^e

^a From Cordesman (1993), pages 5-8.

^b Almost ninety percent of the deaths in the Red Sea region were the result of struggles between Ethiopia and Sudan, as well as internal strife within these two nations.

^c About three-quarters of these deaths resulted from the Algerian war of independence with France (1954-1962). The more recent conflicts have been smaller, low-intensity struggles such as the Libyan-Chad war, and the U.S. raid on Libya.

^d Civilian deaths from www.iraqbodycount.org. (Note that Roberts et al. [2004] and Burnham et al. [2006] estimate an order of magnitude more deaths.) Military deaths equal to 3,000 military deaths among U.S. and other coalition forces (<http://icasualties.org/oif/>) plus an assumed 4 times that amount on the Iraqi side.

^e Burnham et al. (2006) performed a national cross-sectional cluster sample survey of mortality in Iraq, using actual household interviews to determine deaths. (This was an update and expansion of a survey done in 2004 [Roberts et al., 2004].) They estimate that as of July 2006 there had been 655,000 excess Iraqi deaths as a result of the U. S. invasion. Burnham et al. (2006) explain that it is common for “surveillance methods,” such as those used by iraqbodycount.org, to greatly underestimate actual deaths.

TABLE 15-3. OIL-PRICE SHOCKS AND RECESSIONS, 1947 - 2005

Oil Price Spikes	Recessions Began
1947	1948
1953	1953
1957	1957
-----	1960
1969	1969
1970	-----
1973	1974
1979	1979
1980-1	1981
1990	1991
1999	2001
2002?	-----
2004-5?	-----

Sources: Hamilton (1985); Santini (1995); recessionary periods reported by the Bureau of the Census (www.census.gov/hhes/poverty/histpov/recessn.html); and our interpretation of crude oil price histories (http://tonto.eia.doe.gov/dnav/pet/hist/f000000_3m.htm).

TABLE 15-4. U.S. DEPARTMENT OF DEFENSE BUDGET AUTHORITY BY APPROPRIATION (BILLION CURRENT DOLLARS)

A. FISCAL YEARS 1990 TO 1997

	1990	1991^a	1992	1993	1994	1995	1996	1997
Military Personnel	78.9	84.2	81.2	76.0	70.8	71.6	69.8	70.3
Operations & Maintenance	88.3	117.2	93.8	89.2	88.0	93.7	93.7	92.4
Procurement	81.4	71.7	63.0	52.8	44.5	43.6	42.4	42.9
Research, Development, Test, and Evaluation	36.5	36.2	36.6	38.0	34.8	34.5	35.0	36.4
Military Construction	5.1	5.2	5.3	4.6	6.0	5.4	6.9	5.7
Family Housing	3.1	3.3	3.7	3.9	3.5	3.4	4.3	4.1
Defense-wide Contingency Revolving and Mgmt. Funds	0.6	2.7	4.6	4.5	2.2	5.3	3.1	7.5
Trusts and Receipts	(0.8)	(44.3)	(5.7)	(0.4)	(0.6)	(1.6)	(0.3)	(1.3)
(Intragovernment Receipts)	0.0	0.0	(0.6)	(1.1)	(0.1)	(0.2)	(0.3)	(0.2)
Total	293.0	276.2	281.9	267.4	249.0	255.7	254.4	258.0

Source: Aspen (1994), p. B-1; Cohen (1999), p. B-1

^a In FY1991, abrupt increases in budget authority, especially Operations and Maintenance, were due to the incremental costs of Operation Desert Storm. The sharp rise in receipts reflects offsetting allied contributions.

B. FISCAL YEARS 1998 TO 2004

	1998	1999	2000	2001	2002	2003	2004
Military Personnel	69.8	70.7	73.8	76.9	87.0	109.1	116.1
Operations & Maintenance	97.2	105.0	108.8	115.8	133.9	178.3	189.8
Procurement	44.8	51.1	55.0	62.6	62.7	78.5	83.1
Research, Development, Test, and Evaluation	37.1	38.3	38.7	41.6	48.7	58.1	64.6
Military Construction	5.5	5.4	5.1	5.4	6.6	6.7	6.1
Family Housing	3.8	3.6	3.5	3.7	4.0	4.2	3.8
Defense-wide Contingency Revolving and Mgmt. Funds	2.6	5.4	7.3	5.3	4.5	4.2	8.0
Trusts and Receipts	(2.1)	(0.7)	(1.6)	(1.2)	(1.5)	(0.9)	(0.3)
(Intragovernment Receipts)	(0.1)	(0.1)	(0.2)	(0.1)	(0.2)	(0.2)	(0.2)
Total	258.5	278.6	290.5	309.9	345.6	437.8	471.0

Source: Cohen (1999), p. B-1; Rumsfeld (2004), p. A-1.

TABLE 15-5. ORIGINAL ESTIMATES OF U.S. MILITARY EXPENDITURES IN THE MIDDLE EAST

Author (year)	Estimate (Billion Dollars)	Year of expen- diture	Year of \$\$	Comments
Copulos (2003)	\$52-62	~2003	~2003	Estimated outlays for CENTCOM (\$71-\$86 bill./yr) multiplied by % of CENTCOM activities directed to Middle East (70%), plus \$1.6 bill./yr. in other Middle-East costs.
Ravenal (1991)	\$50	FY1992	1992	Analyzes DoD reports to estimate percent of land forces allocated to Persian Gulf. Uses this ratio to estimate share of general-purpose forces attributable to the region.
Kaufmann and Steinbruner (1991)	\$64.5	FY1990	1992	Allocates budget to various "force planning contingencies," including defense of the Middle East.
US Government Accounting Office (GAO), (1991)	\$4.7 for SW Asia specific missions (\$0.5 per year)	Total for FY1980 - FY1990	1990	Uses incremental cost approach, which includes only programs that would not exist (in the short run) without the SW Asia mission.
Moreland (1985)	\$54			Uses a CIA methodology to attribute costs; cited in Sabonis-Chafee (1987).

Note: CENTCOM = United States Central Command; DoD = Department of Defense; GAO = Government Accounting Office; CIA = Central Intelligence Agency.

**TABLE 15-6. ESTIMATES OF U.S. MILITARY EXPENDITURES IN THE MIDDLE EAST:
SOURCE UNKNOWN OR LITERATURE REVIEW**

Author (year)	Estimate (Billion Dollars)	Year of expen- diture	Year of \$\$	Comments
Plesch et al. (2005)	\$120	2005	2004-5	The authors claim that 25% of U.S. spending on defense & intelligence is related to Middel East oil.
Cato Institute (2005)	\$30 - \$60	post-1991	post-1991	The cost of safeguarding oil supplies from the Persian Gulf; presumably, the cost of defending all interests would be higher.
International Center for Technology Assessment (1998, 2005)	\$55 - \$96 (1998 report) \$48 - \$113 (2005 report)	1998 2005	1997 2003	ICTA estimates the annual military cost of protecting oil supplies, including wartime costs; the cost of defending all interests in the Middle East is slightly higher. Based on Ravenal, Koplow and Martin (1998), and others.
Cato Institute (1997)	\$82	1997	1997	This estimate is probably by Ravenal or based on his work.
Wahl (1996)	\$26 - \$69	1996	1996?	The cost of routine protection of oil resources (assumed to be 10% to 25% of the annual military budget) plus the annualized cost of combat.
Romm & Lovins (1992)	\$50			Source unknown.
Hubbard(1991)	\$15 to \$54			Literature review - sources unknown.
Carpenter and Fiscarelli (1990)	\$40	1985	1985	Decreased Ravenal's (1984) figure slightly to account for the fact that CENTCOM has a commitment to NATO, in addition to the Gulf. ^a
Tonelson (1990)	\$40 to \$45	1990	1990	Based on literature review of Lehman (Newsweek, 1987), Ravenal (1984), and others. ^b
Lehman (Newsweek, 1987)	\$40			Source unknown. Lehman is a former Secretary of the Navy.
Sabonis-Chafee (1987)	\$47			Literature review, based on Ravenal (1984), Moreland (1985), and Sanders and Schwenninger (1986).

^a Personal communication with Ted Galen Carpenter on August 31, 1994.

^b Personal communication with Alan Tonelson in July 1994.

TABLE 15-7. KAUFMANN AND STEINBRUNER'S (1991) ESTIMATES OF BUDGET AUTHORITY ALLOCATED TO U.S. FORCE PLANNING CONTINGENCIES, FISCAL YEAR 1990 (BILLIONS OF 1992 \$)

Force Planning Contingency	Budget Authority
<i>Non-Nuclear Defense of:</i>	
Middle East / Persian Gulf	64.5
All other regions	182.2
<i>Subtotal Non-nuclear Defense</i>	<i>246.7</i>
<i>Nuclear Deterrence</i>	
Strategic Nuclear Deterrence	48.2
Tactical Nuclear Deterrence	2.4
<i>Subtotal Nuclear Deterrence</i>	<i>50.6</i>
National Intelligence & Communications	19.2
<i>Total Budget Authority</i>	<i>316.5</i>

TABLE 15-8. GAO (1991) ESTIMATES OF COSTS RELATED TO SOUTHWEST ASIA INTERESTS FISCAL YEARS 1980 TO 1990 (BILLION \$)

Program	Total cost ^a	Cost assigned to SW Asia^b
<i>Military Expenditures</i>		
SW Asia "Dedicated" programs ^c	21.4	4.5
SW Asia "Oriented" programs ^d	5.8	0.0
Contingency and mobility programs (including CENTCOM)	272.6	0.0
Operation Earnest Will ^e	0.2	0.2
<i>Sub-total military expenditures</i>	<i>300.0</i>	<i>4.7</i>
<i>Other Assistance</i>		
Military Assistance	30.8	30.8
Economic Assistance	28.3	28.3
Multilateral Assistance	6.6	6.6
Aid for Petroleum Activities	0.5	0.5
<i>Sub-total assistance</i>	<i>66.2</i>	<i>66.2</i>
Total	366.2	70.9

Source: adapted from GAO (1991). Note that these are costs over a 10-year period.

^a The total cost of the entire program or mission named in the column to the left. This total cost includes objectives or functions that the DOE claims would continue to be funded independent of U.S. interests in SW Asia.

^b These are expenditures that pertain only to the mission of protecting U.S. interests in SW Asia. This is the amount that, according to the DoD, would not be spent if the U.S. had no interest in SW Asia.

^c The DoD terminology here is confusing. Most of these programs actually are dedicated to SW Asia, in the normal sense of "dedicated," but two programs -- the pre-positioned force at Diego Garcia (\$0.8 billion), and carrier battle group in the Indian Ocean (\$16.1 billion) -- are not, and according to DoD would continue to be spent in the absence of a mission in SW Asia.

^d Programs which were created in part to defend U.S. interests in SW Asia, and in part to meet military objectives in other regions. According to the DoD, all of these programs would continue to be funded, even in the absence of a mission in SW Asia, because they are needed for contingencies in other regions.

^e Reflagging Kuwaiti tankers during Iran-Iraq War.

TABLE 15-9. UNITED STATES FOREIGN ASSISTANCE TO THE MIDDLE EAST AND NORTH AFRICA

A. BY COUNTRY, FISCAL YEAR 1992 (MILLION \$)

Country	Economic ^a		Military ^b		Total	
	Loans	Grants	Loans	Grants	Loans	Grants
Israel	0	1,200	0	1,800	0	3,000
Egypt	40	893	0	1,302	40	2,195
Turkey	0	1	25	479	25	480
Morocco	45	46	0	23	45	69
Oman	0	30	0	1	0	31
Greece	0	0	32	30	32	30
Jordan	20	9	0	21	20	30
Pakistan ^c	0	19	0	0	0	19
Lebanon	0	16	0	0	0	16
Tunisia	15	5	0	11	15	16
Iraq	0	8	0	0	0	8
West Bank / Gaza	0	8	0	0	0	8
Yemen Arab Republic	0	6	0	0	0	6
Algeria	0	3	0	0	0	3
Bahrain	0	0	0	1	0	1
Iran	0	0	0	0	0	0
Kuwait	0	0	0	0	0	0
Saudi Arabia	0	0	0	0	0	0
Syria	0	0	0	0	0	0
Yemen, PDR	0	0	0	0	0	0
Totals						
U.S. Assistance, Middle East and North Africa	120	2,244	57	3,668	177	5,912
U.S. Assistance, World	494	10,748	57	4,003	551	14,751
Middle East and North Africa Assistance as Percent of World Total	24%	21%	100%	92%	32%	40%

Source: U.S. Agency for International Development (USAID) (1993).

^a Includes U.S.A.I.D, Food for Peace, Peace Corps, contributions to international lending organizations, and other economic programs.

^b Includes Military Assistance Program Grants, Foreign Military Sales Credit Financing, Transfers from Excess Defense Stocks, International Military Education and Training Programs, and other military programs.

^c Throughout the 1980's, Pakistan received substantial amounts of U.S. aid. However, aid to Pakistan has been dramatically reduced since 1991.

**B. FOR ISRAEL, EGYPT, TURKEY, IRAQ, AND THE WHOLE REGION (MIDDLE EAST AND NORTH AFRICA), BY FISCAL YEAR
(MILLION CURRENT \$ EXCEPT AS NOTED)**

World total	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Economic Assistance	11,894	9,898	9,589	10,827	12,023	11,474	12,986	16,166	20,807	26,613
Total Military Assistance	3,930	4,303	3,956	3,642	3,764	4,619	3,754	4,522	6,506	6,791
Total assistance	15,823	14,201	13,545	14,469	15,787	16,092	16,740	20,689	27,312	33,405
Middle East & North Africa										
Total Economic Assistance	2,311	2,199	2,336	2,285	2,316	2,244	2,145	2,402	6,371	8,514
Total Military Assistance	3,192	3,327	3,170	3,181	3,314	4,281	3,380	3,550	5,340	5,604
Total assistance ^a	5,502	5,526	5,506	5,465	5,630	6,525	5,525	5,952	11,711	14,118
Israel										
Total Economic Assistance	1,200	1,250	1,250	1,200	1,080	949	838	720	597	555
Total Military Assistance	1,880	1,822	1,800	1,800	1,861	2,821	1,976	2,040	3,086	2,147
Total assistance	3,080	3,072	3,050	3,000	2,941	3,770	2,814	2,760	3,684	2,702
Egypt										
Total Economic Assistance	976	825	811	833	862	743	410	894	461	664
Total Military Assistance	1,301	1,301	1,301	1,301	1,301	1,301	1,298	1,301	1,293	1,294
Total assistance	2,277	2,126	2,112	2,134	2,163	2,044	1,708	2,196	1,754	1,958
Turkey^b										
Total Economic Assistance	166	34	24	11	6	2	5	206	1,008	10
Total Military Assistance	329	321	177	2	2	2	2	51	20	40
Total assistance	496	355	200	12	8	3	7	257	1,028	50
Iraq										
Total Economic Assistance	0	7	8	0	0	0	0	39	3,802	6,421
Total Military Assistance	-	-	14	-	-	5	-	-	142	1,842
Total assistance	0	7	22	0	0	5	0	39	3,944	8,263
Middle East and North Africa, % of world total										
Total Economic Assistance	19%	22%	24%	21%	19%	20%	17%	15%	31%	32%
Total Military Assistance	81%	77%	80%	87%	88%	93%	90%	78%	82%	83%
Total assistance	35%	39%	41%	38%	36%	41%	33%	29%	43%	42%

Notes: see next page.

Source: U.S. Agency for International Development (USAID, 2006).

^a Note that the total assistance in 2003 and 2004 is high because of the large assistance to Iraq in the aftermath of the 2003 invasion.

^b Note that in the USAID accounting Turkey is part of Europe, not the Middle East.

TABLE 15- 10. THE VALUE OF THE INTERESTS OF U.S. PETROLEUM COMPANIES IN THE MIDDLE EAST

A. ASSETS OF FOREIGN AFFILIATES OF U.S. PETROLEUM COMPANIES

Data and industry category ^a	1997	1998	1999	2000	2001	2002	2003
Assets, all countries (million \$)							
Oil and Gas Extraction	148,892	166,486	166,160	170,173	214,354	236,811	268,199
Petroleum and coal products	78,946	75,652	88,258	75,565	78,846	86,229	102,224
Petroleum and petroleum products/ Petroleum wholesale trade	47,237	61,637	60,701	65,901	59,437	63,846	60,935
Total	275,075	303,775	315,119	311,639	352,637	386,886	431,358
Assets, Middle East^b (million \$)							
Oil and Gas Extraction	n.r.	n.r.	13,268	13,211	n.r.	n.r.	n.r.
Petroleum and coal products	6,900	7,842	4,729	n.r.	n.r.	n.r.	8,934
Petroleum and petroleum products/ Petroleum wholesale trade	n.r.	n.r.	2,125	2,671	2,525	3,582	3,993
Total	15,081	15,894	20,122	n.a.	n.a.	n.a.	n.a.
Assets, Middle East^b (% of total)							
Oil and Gas Extraction	n.r.	n.r.	8%	8%	n.r.	n.r.	n.r.
Petroleum and coal products	9%	10%	5%	n.r.	n.r.	n.r.	9%
Petroleum and petroleum products/ Petroleum wholesale trade	n.a.	n.a.	4%	4%	4%	6%	7%
Total	5%	5%	6%	n.a.	n.a.	n.a.	n.a.

TABLE 15-10, PART B. SALES OF FOREIGN AFFILIATES OF U.S. PETROLEUM COMPANIES

Data and industry category ^a	1997	1998	1999	2000	2001	2002	2003
Sales, all countries (million \$)							
Oil and Gas Extraction	69,954	55,850	53,258	80,703	80,436	82,181	100,352
Petroleum and coal products	132,097	102,318	141,101	145,701	140,643	145,633	187,184
Petroleum and petroleum products / Petroleum wholesale trade	132,336	153,299	135,377	172,119	158,029	134,956	149,071
Total	334,387	311,467	329,736	398,523	379,108	362,770	436,607
Sales, Middle East^b (million \$)							
Oil and Gas Extraction	n.r.	n.r.	4,522	6,809	n.r.	n.r.	n.r.
Petroleum and coal products	n.r.	n.r.	3,443	n.r.	n.r.	n.r.	10,194
Petroleum and petroleum products / Petroleum wholesale trade	n.r.	n.r.	1,476	2,256	3,834	2,601	3,272
Total	n.a.	7,529	9,441	n.a.	n.a.	n.a.	n.a.
Sales, Middle East^b (% of total)							
Oil and Gas Extraction	n.r.	n.r.	8%	8%	n.r.	n.r.	n.r.
Petroleum and coal products	n.r.	n.r.	2%	n.r.	n.r.	n.r.	5%
Petroleum and petroleum products / Petroleum wholesale trade	n.r.	n.r.	1%	1%	2%	2%	2%
Total	n.a.	2%	3%	n.a.	n.a.	n.a.	n.a.

TABLE 15-10, PART C. DIRECT INVESTMENT ABROAD BY THE PETROLEUM INDUSTRY, 1990-1998

Year	Direct investment abroad (10 ⁹ \$) ^c		Mideast/total	Industry group ^d
	Total	Middle East ^b		
1990	52.826	1.317	2.5%	petroleum
1991	57.742	1.735	3.0%	petroleum
1992	58.537	2.019	3.4%	petroleum
1993	64.175	2.263	3.5%	petroleum
1994	67.592	2.685	4.0%	petroleum
1995	68.639	2.584	3.8%	petroleum
1996	75.232	2.599	3.5%	petroleum
1997	84.116	2.751	3.3%	petroleum
1998	91.248	2.729	3.0%	petroleum

Notes to Table 15-10.

Source of parts A and B: Bureau of Economic Analysis (BEA) on-line data tables, www.bea.gov/nea/di/home/directinv.htm, "Financial and operating data, Interactive tables," retrieved September 2006. n.r. = not reported; n.a. = not applicable.

Source of part C: Bureau of Economic Analysis (BEA) on-line data tables, www.bea.gov/nea/di/di1usdbal.htm, "U.S. direct investment position abroad on a historical-cost basis," retrieved September 2006.

^a In 1997 and 1998, the BEA's industry groupings were based on the Standard Industrial Classification (SIC) system. From 1999 to 2003, the BEA's industry groupings were based on the North American Industry Classification System (NAICS). However, the names of the industry groupings for which the BEA reports data are the same – or nearly the same – under the two systems:

Industry groupings for which the BEA reports assets and sales in the SIC system	Industry groupings for which the BEA reports assets and sales data in the NAICS
Oil and gas extraction	Oil and gas extraction
Petroleum and coal products	Petroleum and coal products
Petroleum and petroleum products, wholesale	Petroleum wholesale trade
	Other

The Bureau of the Census provides a mapping between SIC categories and NAICS categories (www.census.gov/epcd/ec97brdg/). This mapping indicates that the BEA's SIC groupings do indeed include the same establishments as do their NAICS groupings, as their use of identical or nearly identical group names suggests.

- ^b Middle East is Israel, Saudi Arabia, United Arab Emirates, Bahrain, Iran, Iraq, Jordan, Kuwait, Lebanon, Oman, Qatar, Syria, Yemen.
- ^c Direct investment in the petroleum industry in the Middle East is equal to direct investment by U. S. petroleum companies in working petroleum companies in the Middle East plus investment by U. S. petroleum companies in companies in the Middle-East that actually were holding companies for working companies in other regions.
- ^d After 1998, the BEA changed from the SIC system to the NAICS. Under the SIC system, the BEA reported direct investment for the “petroleum” industry, but under the NAICS, the BEA reports direct investment for the broad industry categories “mining” and “manufacturing,” which include petroleum industries but of course many other industries as well. Hence, there are no data on direct investment in the foreign affiliates of U. S. petroleum companies after 1998.

TABLE 15-11. ESTIMATING THE VALUE OF PETROLEUM IMPORTS FROM THE PERSIAN GULF

Year	U.S. Landed Costs of Persian Gulf Countries Crude Oil (Dollars per Barrel) ^a	Imports of crude and products from the Persian Gulf (thousand barrels) ^b	Value of imports (billion dollars) ^c
1990	20.55	717,425	14.7
1991	17.34	673,288	11.7
1992	17.58	650,853	11.4
1993	15.26	650,273	9.9
1994	15.00	630,731	9.5
1995	16.78	574,032	9.6
1996	20.45	587,003	12.0
1997	17.44	640,470	11.2
1998	11.18	779,627	8.7
1999	17.37	899,241	15.6
2000	26.77	910,598	24.4
2001	20.73	1,007,807	20.9
2002	24.13	828,226	20.0
2003	27.54	912,749	25.1
2004	36.53	912,447	33.3
2005	49.68	838,922	41.7

^a From the U.S. Energy Information Administration web page (<http://tonto.eia.doe.gov/dnav/pet/hist/i040000008a.htm>).

^b From the U.S. Energy Information Administration (2006a). The Persian Gulf is Bahrain, Iran, Iraq, Kuwait, Qatar, Saudi Arabia, and United Arab Emirates. Other countries in the Middle East – Jordan, Lebanon, Oman, Syria, and Yemen – exported less than 20 million barrels (about 2% of Persian Gulf exports) to the U.S. in 2005. Crude oil is about 95% of the total, products about 5%.

^c Equal to the cost per barrel of crude oil multiplied by the number of barrels of petroleum imported. Technically, petroleum product imports should be multiplied by their specific value, which is higher than the value of the crude oil they are made from, but because products are only a tiny fraction of total Persian-Gulf imports, and the difference between the cost of crude oil and the cost of the products is not large, there would be essentially no difference between our calculation and the technically correct calculation, which requires data that are hard to come by.

TABLE 15-12. OUR ESTIMATE OF THE MILITARY COST OF OIL USE BY MOTOR VEHICLES (BILLION DOLLARS PER YEAR)

A. STEPWISE ESTIMATES OF THE COST

<i>U.S. military costs that Congress might eliminate if:</i>	in 1991		in 2004	
	<i>Low</i>	<i>High</i>	<i>Low</i>	<i>High</i>
1. There was no Persian Gulf (peacetime costs plus additional annual-average war-time costs)	45.0	85.0	47.0	97.8
2. There was a Persian Gulf, but it did not have oil ^a	25.5	63.8	26.7	73.4
3. The Persian Gulf had oil, but the U.S. did not produce or consume Persian-Gulf oil, while other countries did ^b	17.1	51.0	17.9	58.7
4. The U.S. produced but did not consume Persian-Gulf oil oil ^c	12.8	40.8	13.4	47.0
5. Motor vehicles in the U.S. did not consume any oil^d	5.1	20.4	5.8	25.4

B. THE COST OF DEFENDING EACH U. S. INTEREST IN THE PERSIAN GULF

<i>The cost of defending:</i>	in 1991		in 2004	
	<i>Low</i>	<i>High</i>	<i>Low</i>	<i>High</i>
the use of oil by motor vehicles in the U. S. (line 5).	5.1	20.4	5.8	25.4
the use of oil by other sectors in the U. S. (line 4 -line 5).	7.7	20.4	7.6	21.6
the interests of U. S. oil producers in the Persian Gulf (line 3 -line 4).	4.3	10.2	4.5	11.7
the world economy from the effects of disruptions in the supply of oil from the Persian Gulf (line 2-line 3).	8.4	12.8	8.8	14.7
U. S. non-oil interests in the Persian Gulf (line 1-line 2).	19.5	21.3	20.3	24.5
all U. S. interests in the Persian Gulf (sum of above).	45.0	85.0	47.0	97.8

C. ALLOCATION OF THE MOTOR-VEHICLE COST TO SIX CLASSES OF VEHICLES IN 1991

<i>Allocation of line 5 to six classes of motor vehicles:^e</i>	<i>Low</i>	<i>High</i>
Gasoline light-duty autos	2.7	10.6
Gasoline light-duty trucks	1.1	4.4
Gasoline heavy-duty vehicles	0.1	0.5
Diesel light-duty autos	0.0	0.1
Diesel light-duty trucks	0.0	0.1
Diesel heavy-duty vehicles	1.1	4.7

Source: See text for details. The estimates of Part A are not additive or cumulative, but rather sequential or step-wise. The estimates of Part B are additive. The estimates *do* include the additional cost of occasional wars in the Gulf, such as the 1991 Gulf War and the 2003 Iraq war, but do *not* include the cost of defending oil interests in other regions.

^a The difference between line 1 and line 2 is the cost of defending interests other than oil in the Persian Gulf (see table Part B).

^b The difference between line 2 and line 3 is the cost of defending against the possibility of a world-wide recession due to the effects of an oil price shock related to the production and use of Persian-Gulf oil by other countries (see table Part B). (Such a recession would harm the U.S., even if the U.S. did not produce or consume oil.)

^c The difference between line 3 and line 4 is the cost of defending the investments of U.S. oil producers in the Persian Gulf, apart from the interests of U.S. oil consumers (see table Part B).

^d The difference between line 4 and line 5 is the cost of defending the use of oil in sectors other than highway transportation (see table Part B).

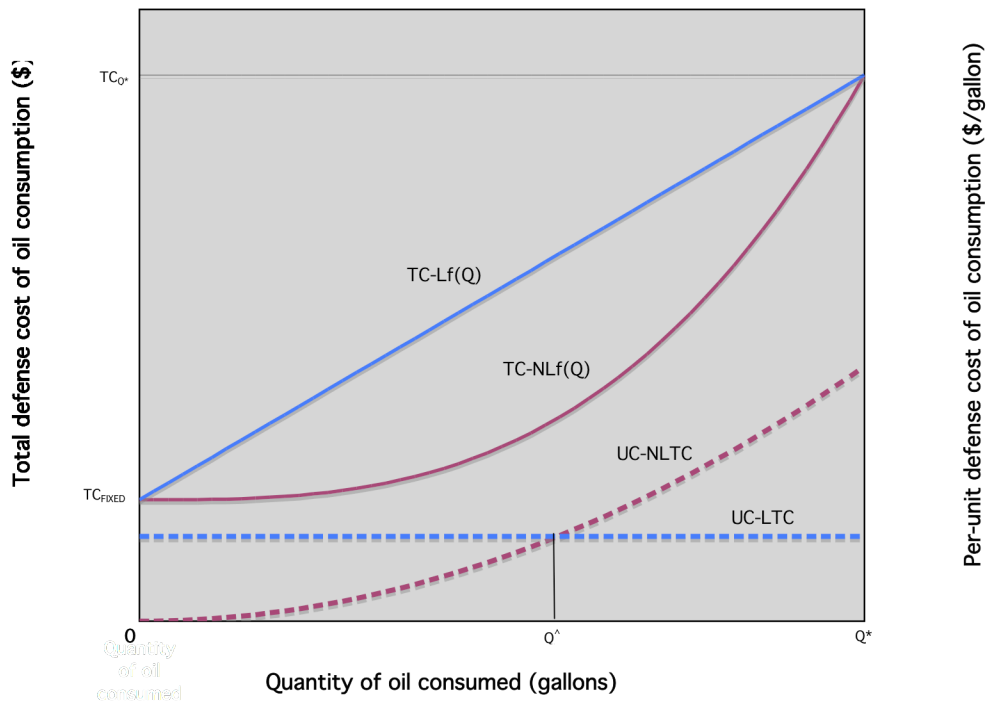
^e Estimated using the allocation factors developed in Report #10.

TABLE 15-13. TWO ESTIMATES OF FEASIBLY REDUCED MILITARY EXPENDITURES IN THE PERSIAN GULF

Author (year)	Estimate (billion \$)	Year of est.	Year of \$\$	Comments
Kaufmann and Steinbruner (1991)	\$29 to \$45	FY2001	1992	Feasible budgets resulting from careful reductions in spending source unknown
Carpenter and Fiscarelli (1990) ^a	\$10	FY1995		

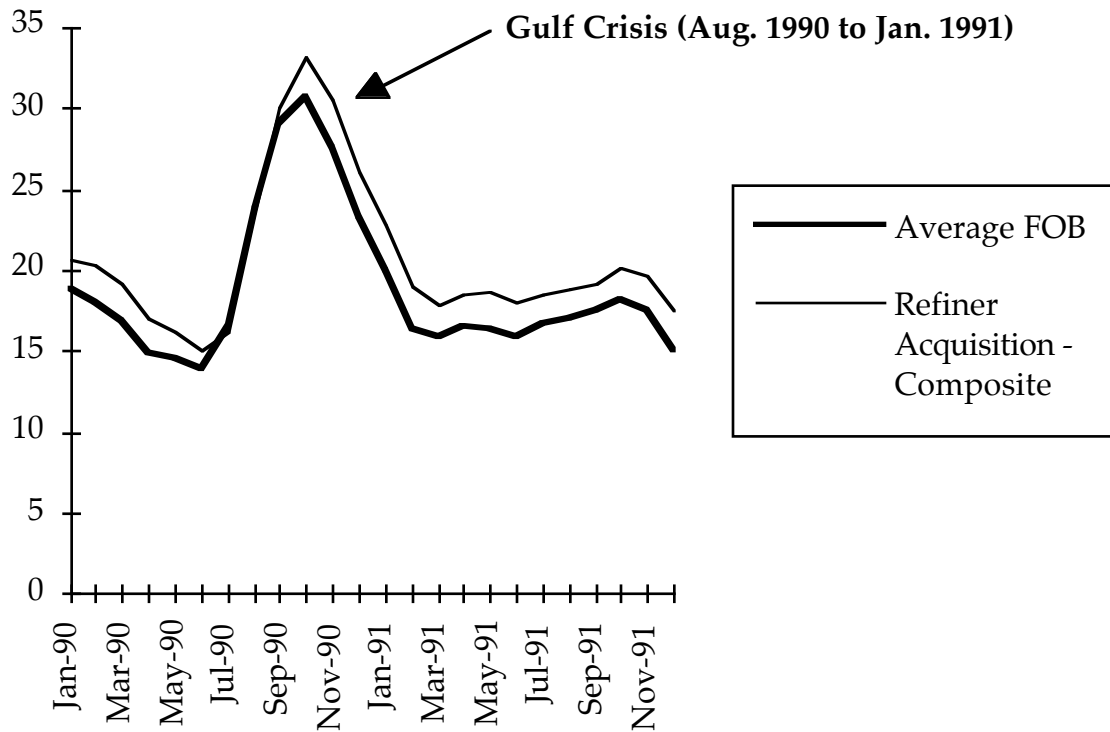
^a This paper was written before the 1991 Gulf War and the 2003 Iraq war, and did not anticipate U.S. involvement in such regional conflicts.

FIGURE 15-1. DEFENSE EXPENDITURES VERSUS OIL CONSUMPTION



TC_{Q^*} = the total defense cost at quantity Q^* ; Q^* = the current total quantity of oil consumed; TC_{FIXED} = the total "fixed" or non-variable defense cost; $TC-Lf(Q)$ = total cost as a linear function of quantity; $TC-NLf(Q)$ = total cost as a nonlinear function of quantity; $UC-LTC$ = unit cost derived from the linear total-cost function (the first derivative of $TC-Lf(Q)$); $UC-NLTC$ = unit cost derived from the nonlinear total-cost function (the first derivative of $TC-NLf(Q)$); \hat{Q} = the quantity at which $UC-NLTC=UC-LTC$.

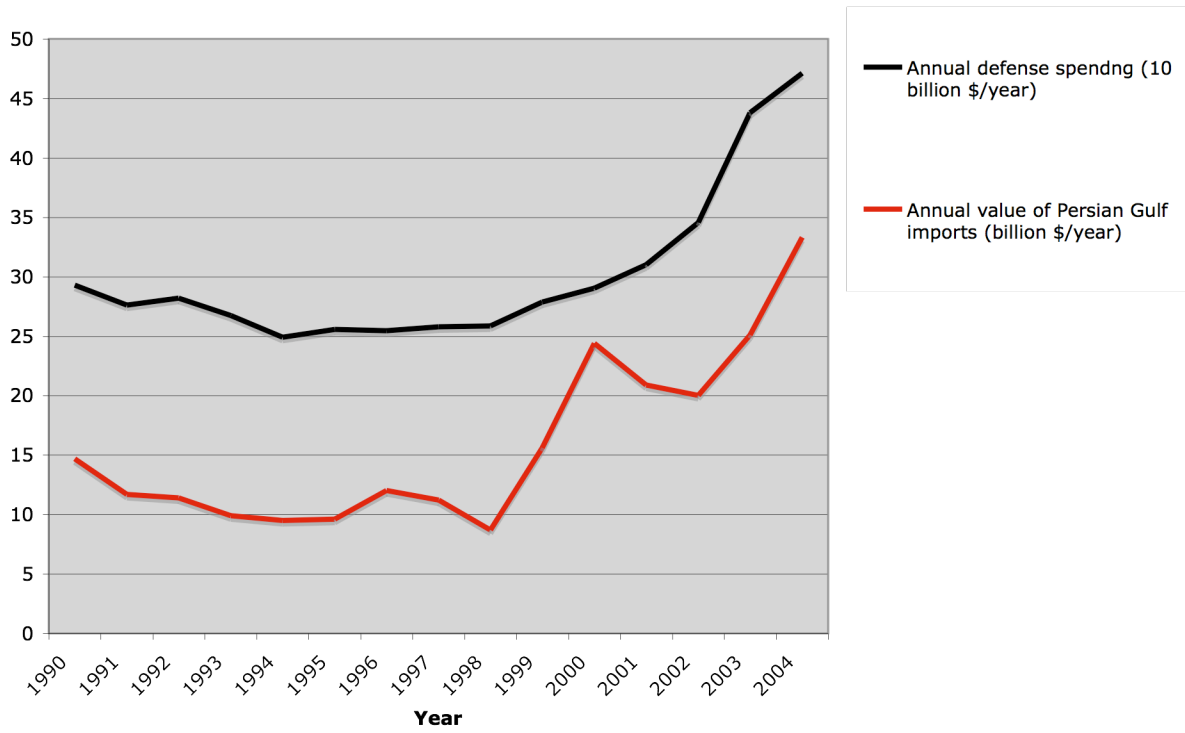
FIGURE 15-2. MONTHLY CRUDE OIL PRICES 1990-1991 (\$/barrel)



Source: Data retrieved from the EIA web site, http://tonto.eia.doe.gov/dnav/pet/hist/r0000_3m.htm (composite refiner acquisition cost) and <http://tonto.eia.doe.gov/dnav/pet/hist/i000000004m.htm> (U. S. average FOB costs of crude oil).

The average FOB is the average “free on board” price, which is the price charged at the producing country’s point of loading. The refiner acquisition cost of crude is the cost of crude oil paid by the refiner, including all transportation costs and fees up to the time the oil is booked into the refinery. (Thus, the refiner acquisition cost generally is higher than the FOB cost.) The composite price is an average of prices for domestic and imported oil.

FIGURE 15-3. DEFENSE SPENDING AND THE VALUE OF PERSIAN-GULF OIL IMPORTS, 1990-2004



Source: Tables 15-4 and 15-11.