Post-9/11 War Spending, Debt, and the Macroeconomy

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Abstract

Military activities in Iraq and Afghanistan have entered their ninth and tenth years respectively and have produced $1.1 trillion in direct costs through 2010. The federal budget has been in deficit since 2001, and by the end of 2010, debt held by the public had risen by more than $5.7 trillion, to a level exceeding 60% of GDP. A large part of this rapid increase was due to the recession of 2008 and the unprecedented fiscal policy response to the financial crisis. But the consequences of deficit spending to finance war activities have been considerable. Thus far, post-9/11 war spending has increased indebtedness by $1.3 trillion or around $4,000 per person, raised the ratio of public debt to GDP by 9–10 percentage points, roughly a third of the total increase since 2001, and probably raised long-term interest rates by 30–35 basis points. It also has likely boosted annual GDP by perhaps 0.5% on net, but that effect will dwindle as impacts of borrowing on the nation's capital stock emerge, and it is small relative to the effect on debt. If forecasts of war spending over the next ten years prove accurate, the associated war debt may increase the debt-to-GDP ratio by up to 20 percentage points, and interest rates may rise by 70 basis points.

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1. Background

Operations in Iraq (OIF) and Afghanistan (OEF) since the events of September 11, 2001, have cost over $1.1 trillion in total, and after accounting for interest costs they have added $1.3 trillion to the national debt.[1] The drawdown following the 2007 troop surge in Iraq is proceeding and will lower future OIF spending, but a similar troop surge is underway in Afghanistan. As a result, the Congressional Budget Office (CBO) forecasts growth in total OEF/OIF spending that averages 1% per year through 2020.[2] Accounting for expected future military expenditures raises the tally considerably, to a total of $2.8 trillion in direct costs by 2020 and an additional $1.0 to $1.7 trillion in interest costs, for a grand total of $3.8 to $4.5 trillion in additional debt held by the public in 2020 that is attributable to the wars.

The sum of war-related costs rises further when one accounts for the long-term burdens associated with death and disability borne by U.S. veterans.[3] In a widely cited estimate dating from 2007, these and other costs brought the grand total to $3 trillion in present value,[4] a figure that now appears conservative given the length of the conflicts. A recent forecast implies that future compensation and health benefits owed to wounded veterans over the coming decades may cost between $600 billion and $1 trillion in terms of present value today.[5] By comparison, the present value of the $2.8 trillion in direct military costs spent between 2001 and 2020 is about $2.7 trillion today.[6]

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[1] Congressional Budget Office. *The Budget and Economic Outlook: An Update* (Washington: CBO, 2010) Box 1-3, http://cbo.gov/ftpdocs/117xx/doc11705/08-18-Update.pdf. Congressional Budget Office. *The Budget and Economic Outlook: Fiscal Years 2011-2021* (Washington: CBO, 2011). Amy Belasco, *The Cost of Iraq, Afghanistan, and Other Global War on Terror Operations Since 9/11*, Congressional Research Service RL33110, March 29, 2011. And author's calculations assuming a 4.5% annual nominal discount rate.

[2] CBO, *The Budget and Economic Outlook*, Table 1-7.

[3] Scott Wallsten and Katrina Kosec. "The Economic Costs of the War in Iraq," *AEI-Brookings Joint Working Paper* No. 05-19, http://ssrn.com/abstract=848408. Joseph E. Stiglitz and Linda Bilmes. *The Three Trillion Dollar War* (New York: W.W. Norton, 2008).

[4] Stiglitz and Bilmes, *The Three Trillion Dollar War*.

[5] Linda J. Bilmes, "Statement of Linda J. Bilmes to the House Committee on Veterans' Affairs," September 30, 2010.

[6] When comparing dollars in different time period, economists prefer to use the concept of present discounted value, which corrects for the effects of inflation and the inflation-adjusted rate of return or interest rate one could earn on dollars invested today. The present value of the $2.8 trillion in nominal spending over 20 years is $2.7 trillion in 2011, not a very different statistic because of the relative stability of spending and interest rates during the period. But the present value is much lower than the $4.5 trillion reported as the net change in debt held by the public as of 2020, because those are 2020 dollars rather than 2011 dollars and because in addition to war spending itself, the change in debt also reflects the financing decision, in this case 100% borrowing and the associated interest costs. Both numbers are "right," but they answer different questions and should not be mixed up or combined with other dissimilar statistics. Economists

Recent macroeconomic events have renewed popular interest in deficit spending, fiscal balance, and sustainability. Federal budget surpluses of the late 1990s and 2000 gave way to deficits starting in 2002,[7] owing to the tax cuts of 2001 and 2003, the recession of 2001, and the expansion of Medicare to prescription drug coverage in 2003. As a result, increased military spending following 9/11 was financed almost entirely by deficits. Federal debt as a share of national income (gross domestic product, or GDP), a good indicator of the sustainability of government spending, was 32.5% at the end of fiscal year 2001 but had risen to 36.2% by 2007. Debt began to increase much more rapidly after the great recession of 2008 and the associated policy responses: the tax relief passed that spring, the Troubled Asset Relief Program and other asset purchases of later that fall, and the America Recovery and Reinvestment Act of 2009. As shown by the solid line in Figure 1 and the baseline statistics in Table 2, debt held by the public rose from 36.2% of GDP in 2007 to 62.1% by 2010. Under current law, it is projected to increase to more than 75% by 2020, according to the nonpartisan Congressional Budget Office.

How much of this vast increase in indebtedness is due to war spending? What are the consequences? Answering these questions requires specifying an appropriate counterfactual. How would the nation's GDP, debt, and interest rates have evolved had there been no wars in Iraq and Afghanistan?

2. Key Assumptions in the Counterfactual

Given that the wars did occur, we must estimate how events would have unfolded without the wars as best we can using available theories and evidence. Comparing reality to the counterfactual scenario in which there were no wars provides an estimate of the net effect of war spending on outcomes. In order to construct a plausible counterfactual, we need to model all the effects we believe warfare to have on key economic variables like labor, capital, and spending. Broadly speaking, we speculate that warfare in the Middle East may have impacted the U.S. economy in five ways.

First, regional instability in the Middle East, such as caused by a war, can disrupt oil markets and raise the price of oil, which can reduce economic activity in the U.S., a major importer of oil. Second, increased U.S. defense spending associated with warfare can raise GDP through the stimulative effect of government purchases, but it will also crowd out some private investment spending. Third, defense spending that is financed by deficits rather than taxes will raise indebtedness and reduce the domestic stock of productive capital, raising interest rates and reducing GDP. Fourth, casualties associated

prefer the present value as a measure of the total resources committed. It already accounts for the time value of money and does not include interest payments. To include them would lead to double-counting because the present value of a stream of future payments of interest and principal should equal the current-day cost of a debt contract. But the nominal future level of new debt attributable is a useful concept for the purposes of this paper, which is concerned with the effect of war deficits on the debt-to-GDP ratio and interest rates.

[7] Council of Economic Advisers. *Economic Report of the President 2010* (Washington: U.S. GPO, 2010).

with warfare will reduce the domestic supply of labor, lowering GDP. Fifth, U.S military operations could alter the likelihood of future terrorist attacks, which may affect GDP.

An earlier analysis considered many of these impacts.[8] Here I offer an updated accounting that incorporates recent developments and the results of new research on oil markets and on the stimulative effects of government spending. In the subsections that follow, I discuss each of the five channels through which the wars have affected the U.S. economy. Their marginal effects accumulate, and Table 1 lists the net impacts of each of the five influences on GDP and their sum total.

2.1. The Wars and Oil Markets

Historically, political instability in the Middle East has been associated with disruptions in the supply of oil to world markets and costly "oil shocks" that reduce national income and raise inflation.[9] Several commentators expected the invasion of Iraq in 2003 to result in major supply disruptions.[10] It is also conceivable that increased use of fuels by the U.S. military could have raised the demand for oil and thus its price. Production in Iraq was indeed adversely affected by hostilities, and political instability in Venezuela starting in late 2002 further disrupted the supply of oil around the same time.[11]

But both of these supply shocks were surprisingly short-lived, and world production remained quite stable during the first decade of the new millennium.[12] While the 1990-91 Persian Gulf War produced a lasting disruption that economists have associated with a major U.S. recession,[13] prior to 2007 there was very little evidence of adverse macroeconomic effects, even though real oil prices had roughly tripled from about $20 per barrel in 2001 (in 2007 dollars) to $62 by 2006.[14] Economists point to a variety of reasons why the economy was more resilient, including the declining oil share

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[8] Stiglitz and Bilmes, *The Three Trillion Dollar War,* Chapter 5, pp 120-125.

[9] James D. Hamilton. "What is an Oil Shock?" *Journal of Econometrics* 113 (2003): 363-398.

[10] Stiglitz and Bilmes, *The Three Trillion Dollar War,* Chapter 5, pp 116-120. William D. Nordhaus. "The Economic Consequences of a War with Iraq," pp 51-86 in Kaysen, Carl, Steven E. Miller, Martin B. Malin, William D. Nordhaus, and John D. Steinbruner. "War with Iraq: Costs, Consequences, and Alternatives." Occasional Paper, American Academy of Arts & Sciences (Cambridge, MA: 2002).

[11] James D. Hamilton. "Causes and Consequences of the Oil Shock of 2007–08." *Brookings Papers on Economic Activity 2009*, no. 1 (2009): 215-261.

[12] Hamilton, "Causes and Consequences," pp 225-226.

[13] Hamilton, "What is an Oil Shock?" Hamilton, "Causes and Consequences."

[14] William D. Nordhaus. "Who's Afraid of a Big Bad Oil Shock?" *Brookings Papers on Economic Activity 2007*, no. 2 (2007): 219-238.

of the economy, increases in real wage flexibility, and the credibility of monetary policy.[15]

By the middle of 2008, oil prices had spiked sharply higher, reaching a record high of $145 per barrel in July. Some researchers attribute a portion of the Great Recession of 2008, or at least its timing, to this development,[16] which has no clear link to hostilities in the Gulf. But no recent research on oil prices and the macroeconomy identify the invasion of Iraq as a major disruption in oil markets, while they do establish the oil supply shocks of the 1970s and the turmoil surrounding the 1956 Suez Crisis and the First Gulf War. Rather, these papers pinpoint the unexpectedly rapid increases in the demand for oil by developing countries like China as the driver of sustained increases in oil prices since 2003.[17]

This is not to say that rising oil prices this past decade did not affect U.S. GDP. The consensus is that they have, although probably in different ways than traditional supply shocks.[18] But recent research implies that the wars in Iraq and Afghanistan had a relatively small net effect on oil markets, if they had any effect at all. Evidence from the market for oil futures reveals that expectations of a looming war in Iraq raised prices,[19] but they also continued to rise through the decade as demand from developing countries grew, suggesting the latter was unexpected and ultimately more important.[20] As shown in the appendix, there is little evidence of any effect of the invasion of Iraq on world oil output or on oil prices. Therefore we will make the simplifying assumption that oil prices were unchanged from their actual (historical) levels in the counterfactual scenario without the wars in Iraq or Afghanistan. This is shown in the first column of Table 1.

2.2. The Government Spending Multiplier

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[15] Olivier J. Blanchard and Jordi Galí, "The Macroeconomic Effects of Oil Price Shocks: Why are the 2000s so different from the 1970s?" in Jordi Galí and Mark Gertler, eds., *International Dimensions of Monetary Policy* (Chicago: University of Chicago Press, 2010): 373-421.

[16] Hamilton, "Causes and Consequences."

[17] Blanchard and Galí, "The Macroeconomic Effects of Oil Price Shocks." Hamilton, "Causes and Consequences." Lutz Kilian. "Exogenous Oil Supply Shocks: How Big Are They and How Much Do They Matter for the U.S. Economy?" *Review of Economics and Statistics* 90 (2008): 216-240. Lutz Kilian. "Not All Oil Price Shocks Are Alike: Disentangling Demand and Supply Shocks in the Crude Oil Market," *American Economic Review* 99 (2009): 1053-1069. Lutz Kilian and Bruce Hicks. "Did Unexpectedly Strong Economic Growth Cause the Oil Price Shock of 2003-2008?" mimeo, University of Michigan (2011).

[18] Kilian, "Exogenous Oil Supply Shocks." Kilian, "Not All Oil Price Shocks Are Alike."

[19] Stiglitz and Bilmes, *The Three Trillion Dollar War*, Chapter 5, p. 116.

[20] Ron Alquist and Lutz Kilian. "What Do We Learn from the Price of Crude Oil Futures?" *Journal of Econometrics* 25 (2010): 539-573.

Government purchases of domestically produced goods and services feed directly into GDP. To the extent that unanticipated increases in income may be partially spent by consumers and businesses, leading to increases in consumption and private investment, a traditional Keynesian "multiplier effect" may scale up the total impact on GDP beyond the amount of the increase in government spending alone. But increases in government spending must be paid for with tax increases either today or in the future, which could prompt individuals and corporations to reduce their current spending.

The magnitudes of fiscal multipliers are ultimately empirical parameters, but it can be difficult to estimate them because of measurement error in timing. Recent research based on improved measures of policy timing have found a very large and negative multiplier associated with tax changes,[21] while new estimates of the multiplier on government defense spending range between 0.6 and 1.2.[22] All such studies exploit intertemporal variation in macroeconomic outcomes over many years in order to estimate average effects, which may not directly generalize to every particular instance. While the latter results have been well received by economists and seem consistent with other findings,[23] it is less clear whether crowding out is likely to be as strong as it normally is during the current period of historically low interest rates.[24] But of all types of government spending, military expenditures are least likely to crowd out private spending, regardless of the level of interest rates, because of their inherently public nature. Within the U.S., private businesses can only sell defense equipment to the U.S. military, not to any other private demanders. The same is not true for other types of government spending, which are thus more likely to crowd out private spending.

Based on the literature, I assume a defense spending multiplier equal to 0.8, meaning that GDP rises by 80% of the amount of extra defense spending. I assume that all military spending on OEF/OIF represents domestic purchases, a pattern that is consistent with past U.S. war spending but may or may not be appropriate for the current wars.[25] I calculate the impact of annual OEF/OIF spending using the multiplier and subtract it from historical and projected GDP to construct the counterfactual. This simple technique abstracts from the more complicated patterns of timing we know to exist.[26]

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[21] Christina D. Romer and David H. Romer. "The Macroeconomic Effects of Tax Changes: Estimates Based on a New Measure of Fiscal Shocks," *American Economic Review* 100 (2010): 763-801.

[22] Valerie A. Ramey. "Identifying Government Spending Shocks: It's All in the Timing," *Quarterly Journal of Economics*, forthcoming (2011).

[23] Robert J. Barro. "Output Effects of Government Purchases," *Journal of Political Economy* 89 (1981): 1086-1121. Robert E. Hall. "By How Much Does GDP Rise If the Government Buys More Output?" *Brookings Papers on Economic Activity 2009*, no. 2 (2009): 183-231.

[24] Alan J. Auerbach and Christopher L. House. "Comments and Discussion." *Brookings Papers on Economic Activity 2009*, no. 2 (2009): 232-250.

[25] Stiglitz and Bilmes, *The Three Trillion Dollar War*, pp 120-121.

[26] Ramey, "Identifying Government Spending Shocks," figures.

Under these assumptions, current and projected war spending push GDP higher in the baseline by about 0.9% in 2011 and 0.7% in 2020 compared to the counterfactual, as shown in the second column of Table 1.

2.3. The Effects of Deficits and Debt on Saving, Capital, GDP, and Interest Rates

Deficits and debt matter for macroeconomic outcomes.[27] Government budget deficits divert resources away from capital investment, which lowers the nation's productive stock of private capital and thus reduces GDP. Imports of foreign saving can work to offset these effects, but empirical patterns suggest the degree of offset is only partial. One study estimates the offset at between 20 and 50%.[28] When the capital stock falls, interest rates tend to rise. The intuition behind this result is that in order to compensate for lost resources, capital markets work to attract more saving by offering higher returns.

Military operations in Iraq and Afghanistan have raised the annual deficit by about 1 percent of GDP, a trend that the CBO expects to continue through 2020.[29] To date, deficit spending on OEF/OIF has raised the ratio of debt to GDP by 8 percentage points. By 2020, the cumulative increase will be 20 percentage points. A recent study estimates that an increase in the debt-to-GDP ratio of 1 percentage point raises interest rates about 3.5 basis points.[30] A related study concurs with this estimate but identifies it as being somewhat conservative,[31] while another cites a range of 3–4 basis points.[32] This implies that interest rates are currently about 35 basis points above what they would have been in the counterfactual, and by 2020 they will be about 70 basis points higher, as shown by comparing the last column in each panel of Table 2.

To be sure, short-term interest rates are currently at historic lows, some near zero, because of the largest postwar recession and the monetary policy response of the Federal Reserve. Long-term interest rates, such as the rate on the 10-year Treasury note, are also very low by historical standards, probably also in part because of the Fed's quantitative easing, but they are well above zero. Still, it is a fair question whether deficits crowd out capital under such conditions to the same extent that they have during historical periods.

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[27] William G. Gale and Peter R. Orszag. "Budget Deficits, National Saving, and Interest Rates," *Brookings Papers on Economic Activity 2004*, no. 2 (2004): 101-187. Eric M. Engen and R. Glenn Hubbard. "Federal Government Debt and Interest Rates," *NBER Macroeconomics Annual 2004* 19 (2005): 83-138.

[28] Gale and Orszag, "Budget Deficits," p. 103.

[29] CBO, "The Budget and Economic Outlook," Box 1-3 and Table 1-7.

[30] Engen and Hubbard, "Federal Government Debt." Matthew D. Shapiro. "Comment." *NBER Macroeconomics Annual 2004* 19 (2005): 148-156.

[31] Gale and Orszag, "Budget Deficits," pp 150, 182, and 184, among others.

[32] Thomas Laubach, "New Evidence on the Interest Rate Effects of Budget Deficits and Debt," *Journal of the European Economic Association* 7(4): 858–885.

As a result, these estimates, especially for the period after 2008, should be viewed with a dose of healthy skepticism.

Analysis proceeds based on the Solow model, a standard framework in macroeconomics. It reveals similar magnitudes and also provides estimates of the effects of war deficits on the capital stock and GDP, which are also of interest. Assuming that half of the roughly 1 percent increase in deficit spending per GDP is offset by increases in private and foreign saving, war spending has resulted in a sustained reduction of the national investment rate of about 0.5 percentage point, or proportionally by about 2.5%. Given standard assumptions about the macroeconomy,[33] such a decline will ultimately lower the long-run levels of the capital stock and GDP by about 3.75% and 1.25% respectively. Estimates also suggest the economy will converge toward this new steady state at a rate of about 4% each year,[34] implying that in the counterfactual without war-related deficits, the level of GDP would be higher by about 0.37% in 2011 and by about 0.63% by 2020. This is shown in the third column of Table 1.

2.4. War Wounds and Labor Supply

Veterans returning from the wars in Iraq and Afghanistan face an array of challenging readjustment, perhaps none as great as dealing with the impacts of war-related injuries to physical and mental health.[35] What has become the VA compensation system was originally designed to compensate U.S. veterans for service-related disabilities that impeded their ability to work and earn wages.[36] The VA disability rating is meant to capture the percentage of work capacity lost to disability. Assuming that labor supply is otherwise unaffected by military service and injury, a reasonable estimate of civilian labor supply under the counterfactual scenario would add back in veterans of OEF/OIF whose disabilities reduced their work effort and are attributable to the wars.

The difficulties in constructing this counterfactual are that the levels of VA disability for veteran cohorts increase strongly with age, we also require an estimate of what VA disability rates would have been in the absence of war, and in addition we need to know the increase in force strength and thus the pool of veterans that is attributable to war. A recent study estimates that lifetime average VA disability ratings for Gulf War and OEF/OIF cohorts may reach 9.4%, compared to peacetime ratings of about 2.8%, but such levels are not likely to be reached before 2030, when the cohort is roughly 50 years

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[33] Shapiro, "Comment," p. 151.

[34] David Romer. *Advanced Macroeconomics*. (New York: McGraw-Hill, 2006): p. 25.

[35] Institute of Medicine. *Returning Home from Iraq and Afghanistan: Preliminary Assessment of Readjustment Needs of Veterans, Service Members, and Their Families* (Washington: National Academies Press, 2010).

[36] Institute of Medicine. *A 21st Century System for Evaluating Veterans for Disability Benefits* (Washington: National Academies Press, 2007).

old.[37] Although reserves and National Guard have likely seen their participation and exposure to risks increase, the current conflicts have not resulted in significant increases in active duty force sizes. For a pool of Iraq and Afghanistan veterans that may ultimately total about 3 million, these estimates imply a net reduction in labor supply attributable to the wars that is equivalent to about 200,000 individuals.[38] Compared to a civilian labor force equal to about 150 million today, this represents a reduction of about 0.13%.

To summarize, our estimate of the U.S. civilian labor supply under the counterfactual scenario is 0.13% higher by 2030. We project a simple linear annual increase in that percentage starting from zero in 2001. In the counterfactual, labor supply is 0.03% higher in 2011 and 0.06% higher in 2020, as shown in the fourth column of Table 1.

2.5. The Wars and Terrorism in the Counterfactual

Least well understood is the net effect that the wars in Iraq and Afghanistan may have had on terrorist activities potentially affecting the U.S. It is conceivable that the wars improved the domestic security environment by focusing the attention of terrorist groups elsewhere. It is also possible that the wars instead worked to increase terrorist plotting and activity through provocation. Another possibility is that domestic security and intelligence operations had much larger impacts on domestic terrorism than the wars themselves. All we know is that there have been no successful acts of domestic terrorism since 9/11, and it is difficult to know what roles the wars played in that outcome.

Wherever that truth lies, we also know that although the human costs, the psychological impacts, and the localized costs to businesses of 9/11 were significant, costs to the nation's GDP were very small.[39] This perspective suggests that a reasonable approach to estimating GDP in the counterfactual is to omit any possible links between the wars, domestic terrorism, and the economy. These zero estimates are shown in the fifth column of Table 1, and the sixth column shows the estimated cumulative effect of the wars on GDP via these five channels.

3. Debt, GDP, and Interest Rates in the Counterfactual

Using the estimates from the previous section, I calculate GDP and debt for the counterfactual scenario in which there had been no OEF/OIF spending. To the extent that OEF/OIF operations may represent reallocated defense spending rather than new defense spending, this counterfactual might overstate the costs of the conflicts. But during the wars, all other defense spending has grown rather than fallen as a share of GDP, rising

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[37] Ryan D. Edwards. "U.S. War Costs: Two Parts Temporary, One Part Permanent." *NBER Working Paper* 16108 (2010).

[38] This figure is the product of 3 million veterans times the difference between the 9.4% lifetime average VA disability rating estimated for OEF/OIF veterans and the 2.8% rating for the counterfactual peacetime cohort.

[39] Gail Makinen. "The Economic Effects of 9/11: A Retrospective Assessment," *CRS Report* RL31617 (2002).

from 3.6 percent in 2001 to 4.4 percent by 2010.[40] This suggests that most OEF/OIF spending was indeed new spending, so the counterfactual is valid.

In order to calculate federal debt in the counterfactual, I subtract OEF/OIF spending from the primary deficit assuming the latter stays fixed at historical and projected levels. Then I recalculate debt held by the public using the implicit net interest rate in historical and projected statistics, which is similar to but often slightly different from the interest rate on the ten-year Treasury note.[41] I adjust the net interest rate for the effect of increased indebtedness associated with war spending with a one-year lag.[42] Debt at the end of each period is the sum of the following components: last year's debt; this year's net interest payments, which equal this year's net interest rate times last year's debt; the primary deficit; and a residual category that I take from CBO and assume to be unaffected by war spending.[43]

For the baseline, I use historical statistics in the *Economic Report of the President,* the January 2011 forecast provided by the CBO, and a recent report on war costs by the Congressional Research Service.[44] War spending for 2001–2011 is taken from the CRS report, with totals for 2001 and 2002 separated according to the CBO statistics. After 2011, I use the CBO forecasts of future war spending assuming current policies. The CBO baseline reflects current law, which may or may not accurately predict future fiscal conditions. These CRS and CBO numbers include small amounts of war-related spending by other departments, which probably have a smaller impact on GDP than defense spending. The impact of including these numbers is likely to be quite small. They do not include any of the additional defense spending deemed not to be war-related by CRS and CBO, nor do they include additional spending by the Department of Homeland Security.

3.1. Aggregate Debt Burdens and Interest Rates Attributable to the Wars

As shown in Tables 1 and 2, GDP is only slightly higher in the baseline scenario than in the counterfactual, because there are headwinds and tailwinds generated by war spending. The stimulative effect of military procurement on GDP is estimated at 0.9% in

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[40] National Income and Product Account Table 1.1.5, http://bea.gov/national/nipaweb/DownSS2.asp.

[41] The implicit net interest rate is net interest payments in a fiscal year's budget divided by debt held by the public at the end of the previous fiscal year. In FY2000, this was 6.14% while the average yield on the 10-year Treasury note was 6.03%.

[42] That is, to avoid simultaneity in the model, the current level of debt affects next period's interest rate, which in turn affects next period's level of debt.

[43] This category is called "Other means of financing" and includes changes in the government's cash balance and changes in financing accounts for student and other types of loans.

[44] CEA, *Economic Report*. Congressional Budget Office. *The Budget and Economic Outlook: Fiscal Years 2011 to 2021.* (Washington, DC: Congressional Budget Office, 2011). Belasco, *The Cost of Iraq*, Table 1.

2011, but the negative effects of reduced domestic investment and disabled workers combine to reduce GDP by 0.4%, leaving a net increase that year of 0.5%. Over time, the negative effects accumulate while the stimulative impacts are expected to decline slowly, resulting in a net drag on GDP associated with war costs by 2020.

Table 2 lists selected aggregate statistics each year starting from 2000 separately for the baseline and counterfactual. At baseline, the yield on the ten-year Treasury note was 3.19 percent in 2010, but in the counterfactual scenario without war deficits, it probably would have been 2.88 percent, some 31 basis points lower. The interest rate ultimately rises to 5.40 percent by 2020 in the baseline forecast, while under the counterfactual it only reaches 4.70 percent, 70 basis points lower.

These two dynamics exert countervailing influences on fiscal balance as measured by the debt-to-GDP ratio. The increase in GDP associated with war spending lowers the burden of deficit financing by increasing the denominator and reducing the ratio. But higher interest rates raise the cost of debt service and thus increase the total deficit, adding to more borrowing and an increase in the debt-to-GDP ratio. Of these two effects, the stimulative effect on GDP may appear to be larger in the short term, but in fact it is nowhere near enough to reverse the deterioration in the debt-to-GDP ratio caused by deficit financing of war spending.

The solid and dashed lines in Figure 1 depict the projected baseline and counterfactual trajectories of the debt-to-GDP ratio from 1943 to 2020.[45] The eye is drawn to two patterns. First, the gap between the baseline and the counterfactual, which represents the additional debt burden attributable to the wars, appears to be very narrow during the decade just ended. This is an illusion created by the rapid increases in debt associated with the Great Recession of 2008 and the fiscal policy response. They shift both trajectories sharply upward and make the gap between them appear as though it were smaller. In fact, the increase in the debt-to-GDP ratio associated with the wars has risen robustly and monotonically since their beginning, as is implicit in the statistics in Table 2. The wars have continued to raise indebtedness at a steady pace even while other factors have also affected fiscal balance in fits and starts. The monotonic rise in extra indebtedness associated with war spending is shown more clearly in Figure 2, which plots the cumulative addition to debt each year from 2000 to 2020.

The second visual pattern in Figure 1 is that by the end of the forecast, there is a noticeable difference between the baseline and the counterfactual. This is because by 2020, the accumulated direct military costs of the wars in Iraq and Afghanistan are large

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[45] The ratio of debt to GDP is a good indicator of the sustainability of the debt burden. Because only a portion of income can be diverted to interest costs and paying down the principal each year, when this statistic begins to rise it indicates that taxes must rise or spending must be reduced in order to restore balance. The ratio of debt to GDP varies across industrialized countries, with an average level around 50% but extremes such as 125% in Greece and 20% in Switzerland (OECD.StatExtracts, http://stats.oecd.org/Index.aspx?DataSetCode=GOV_DEBT). Broadly speaking, the level of the ratio indicates the government's fiscal health, but the trend is the ratio is equally important. As a condition for adoption of the euro, for example, member states were required to keep debt below 60% of GDP.

indeed, and they swamp other elements in the CBO current-policy forecast. After accounting for interest, the nominal sum of $2.8 trillion in deficit spending over 20 years becomes the net addition to national debt of $4.5 trillion by 2020 that is shown in Table 3 and plotted in Figure 2. By then, war spending will have increased the debt-to-GDP ratio by nearly 20 percentage points and raised long-term interest rates by 70 basis points. In the near term, the effect is substantial but smaller. The $1.1 trillion spent to date had a present value in 2010 of $1.3 trillion, and it had already raised the debt-to-GDP ratio by nearly 9 percentage points, between a quarter and a third of the total increase since 2001.

The roughly $0.2 trillion separating past spending totals from their present value is attributable to interest costs, which are already substantial and will only increase. Table 3 decomposes the total increase in indebtedness associated with war spending each year into parts attributable to the cumulative flows of war spending themselves (column 2), the cumulative flows of interest payments associated with past spending (column 3), and the extra interest payments on all debt that are incurred because war spending raises total debt and thus also raises interest rates (column 4). This final component starts off relatively small but grows rapidly because of recent increases in federal indebtedness. In 2010, all interest costs represent roughly 15% of the total new accumulated debt associated with war spending. But that share will rise to more than a third by 2020.

3.2. Average Burdens on Taxpayers and Borrowers

War deficits have raised both the level of the national debt and have probably raised market interest rates. Both of these increase burdens on taxpayers and borrowers. In 2000, total federal debt per person in the U.S. was around $12,000 while nominal GDP per person was roughly $35,000, revealing a debt-to-income ratio of about 35%. By 2010, average income had risen to $46,800, but the wars had increased the average debt burden by $4,200 per person, raising the federal debt-to-income ratio by almost 9 percentage points above baseline to 62%. By 2020, if CBO forecasts are correct, the extra federal debt attributable to the wars will have increased to about $13,300 per person, or roughly an extra 20% of the forecast level of nominal GDP per capita, which is $66,800 that year. These statistics are presented in two pie charts in Figure 3. As shown in Table 2, total debt as a share of GDP is projected to be much higher at 76.2 percent by 2020. But when expressed as a share of the 40 percentage point increase in the debt-to-GDP ratio since 2001, 20 percentage points is large.

Interest rates charged to borrowers by banks and other creditors tend to move one-for-one with interest rates paid on government securities. In 2010, interest rates were probably higher by 35 basis points or 0.35 percentage point because of deficit-financed spending on the war. While not enormous, the cost of that difference for consumers can be significant. For a 30-year fixed rate mortgage on a home priced at the median of $250,000 with 90% borrowed funds, an increase of 35 basis points would cost new homeowners an extra $50 per month or about $600 per year given the current rate of 5%. While not large compared to income, this amount is not insignificant. By comparison, the

2001 tax cut rebate checks, which stimulated aggregate demand, were typically $600 per household.[46]

Housing debt is a relatively large portion of total household debt; the impacts of higher interest rates on other types of household debt is more circumscribed. For the 46 percent of households who carry credit card debt, for example, an increase in the interest rate of 0.35% would raise the annual costs of servicing the median level of credit card debt, which was $3,000 in 2007, by only about $10.[47] The extra burden associated with servicing the larger stock of installment loans outstanding, which include car payments and student loans and are held by 47 percent of households, might be about $45 per year.

The looming costs of restoring fiscal balance are far greater than extra interest payments. The CBO baseline assumes tax revenues as a share of GDP will rise by about 5 percentage points over the next several years as the Bush-era tax cuts are set to expire, among other things. If it were felt proportionally, a tax hike of that size would cost individuals between $2,400 and $2,800 per person per year. The tax code is progressive, and spending cuts could remove some upward pressure on tax rates. But even those relatively large increases merely restore temporary rather than long-term fiscal balance, which is expected to erode further due to the retirement of the baby boom and other demographic pressures.[48]

The share of the current fiscal imbalance due to unfunded war costs is substantial but far less than 100%. In order to pay for all direct war costs incurred between 2001 and 2020, the average tax rate on GDP from 2011 to 2020 would have to rise by about 1.7 percentage points, for example.[49] A longer period of repayment would reduce the required tax rate, but accounting for the costs of future veterans' disability and health benefits would significantly raise it. By comparison, the Great Recession of 2008 and the policy response produced an increase in debt of about $4.6 trillion between 2007 and 2011 in the counterfactual scenario shown in Table 2. Over the same repayment period, that burden represents a roughly 3 percentage point increase in taxes.

4. Discussion

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[46] David S. Johnson, Jonathon A. Parker, and Nicholas S. Souleles. "Household Expenditure and the Income Tax Rebates of 2001," *American Economic Review* 96 (2006): 1589-1610.

[47] Brian K. Bucks, Arthur B. Kennickell, Traci L. Mach, and Kevin B. Moore. "Changes in U.S. Family Finances from 2004 to 2007: Evidence from the Survey of Consumer Finances." *Federal Reserve Bulletin* 95 (2009): A1-A56.

[48] National Commission on Fiscal Responsibility and Reform. *The Moment of Truth: Report of the National Commission on Fiscal Responsibility and Reform* (Washington: The White House, 2010).
http://www.fiscalcommission.gov/sites/fiscalcommission.gov/files/documents/TheMomentofTruth12_1_2010.pdf

[49] I calculate this as the ratio of the present discounted value of war costs between 2001 and 2020 to the present discounted value of GDP earned between 2011 and 2020.

The budgetary costs of the wars in Iraq and Afghanistan have been and will continue to be large, and these costs contribute significantly to U.S. fiscal imbalances. War spending is stimulative to an extent, but when financed by deficits and borrowing, the benefits do not seem to be worth the costs. The net increase in annual GDP associated with deficit-financed war spending has probably averaged only about 0.5% to date, and it will likely fall to zero as the drag associated with the crowding out of capital increases.

Military spending is only one part of the total budgetary costs of war, with future veterans' benefits representing an equally important component.[50] A recent working paper gauges the total present value of historical veterans' disability and health benefits at between one-third to one-half of total budgetary costs of major U.S. wars.[51] The current state of our knowledge suggests these transfers also represent only partial compensation for the significant reductions in human capital and quality of life caused by combat-related wounds. An open question for future research is to what extent these transfer payments to veterans may provide some economic stimulus in the form of an increased marginal propensity to consume relative to the average taxpayer. But it seems unlikely that any such effect could outweigh the costly distortions of either deficit financing of benefits or the higher tax rates they might require.

The Great Recession of 2008 significantly worsened debt burdens by lowering GDP and vastly expanding current and future deficits. Other policies enacted earlier during the decade just ended, such as the tax cuts and the Medicare prescription drug expansion, contributed equal or greater shares.[52] But the costs of the wars in Iraq and Afghanistan are large and continuing, and because the government has financed them via deficits, they have crowded out private capital. War costs have thus raised interest rates, increasing borrowing costs for consumers and governments alike and arguably hampering the government's ability to conduct countercyclical fiscal policy during a time of great macroeconomic peril. The effect of war costs on interest rates has probably also impeded monetary policy, which requires interest rates to fall during recessions in order to stimulate spending by businesses and consumers.

Popular perception suggests there must be benefits to at least some types of warfare. Freedom, liberty, and safety are all highly valued. One study compared costs against benefits of going to war in Iraq but found that the benefits net of costs were difficult to gauge.[53] Some also suspect that misperceptions and miscalculations play a

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[50] Stiglitz and Bilmes, *The Three Trillion Dollar War*.

[51] Ryan D. Edwards. "U.S. War Costs."

[52] Kathy A. Ruffing and James R. Horney. "Critics Still Wrong on What's Driving Deficits in Coming Years," Center on Budget and Policy Priorities, June 28, 2010. http://www.cbpp.org/cms/index.cfm?fa=view&id=3036.

[53] Steven J. Davis and Kevin M. Murphy and Robert H. Topel. "War in Iraq Versus Containment," in Gregory D. Hess, ed., *Guns and Butter: The Economic Causes and Consequences of Conflict* (Cambridge: MIT Press, 2009): 203-270.

significant role in the decision to go to war,[54] which suggests that costs are likely to exceed benefits ex post. The role of analysis is to inform policymakers and the public about the scope of costs and benefits, even if some may prefer not to know. Like others before it, this report suggests that the costs of the wars in Iraq and Afghanistan have been very high.

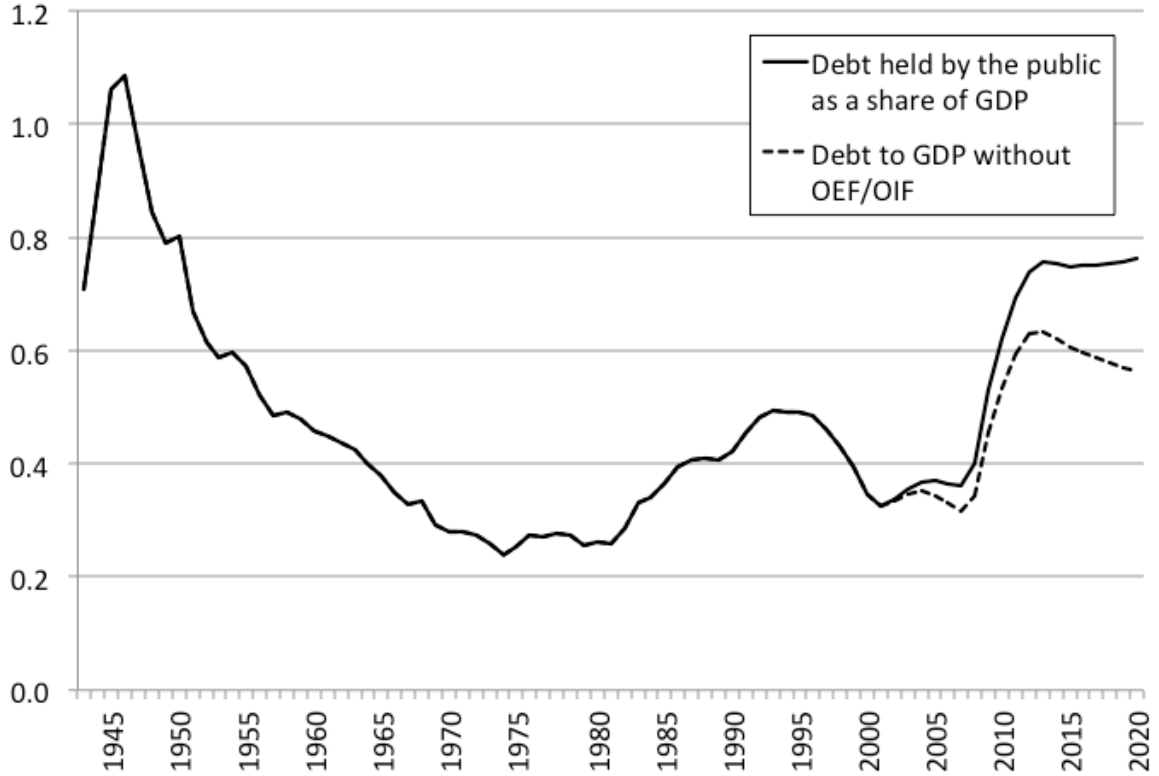[54] Nordhaus, "Economic Consequences."

Figure 1: Federal debt held by the public as a share of GDP since 1943, with and without spending on wars in Iraq (OIF) and Afghanistan (OEF).

Notes: Data from 1943 to 2008 are from CEA, *Economic Report*, Table B78. Data for spending on the wars in Iraq and Afghanistan (OEF/OIF) up to 2010 are from CBO, *Budget and Economic Outlook: An Update*, August 2010, Tables 1-6, 1-7, C-2, and Box 1-3. Data from 2011 are from CBO, *Budget and Economic Outlook*, January 2011, Tables 1-7 and C-1. The interest rate is the yield on the 10-year Treasury note and is available in the January 2011 CBO report, Table C-1. In the counterfactual scenario, the present value of current and past OEF/OIF spending is calculated using the current 10-year Treasury rate, which is then subtracted from the baseline level of debt held by the public. The interest rate in the counterfactual is calculated based on the debt-to-GDP ratio as described in the text. Nominal GDP in the counterfactual is calculated using the methodology explained in the text.
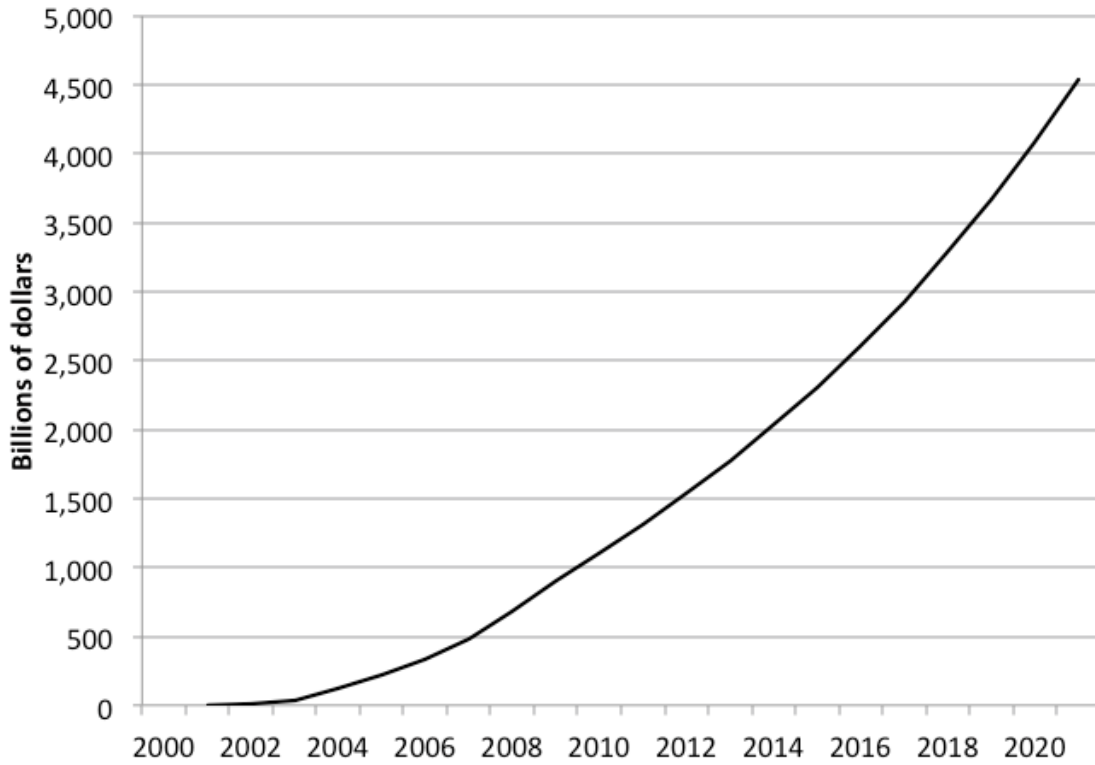
Figure 2: Additional federal debt attributable to military spending on wars in Iraq (OIF) and Afghanistan (OEF).
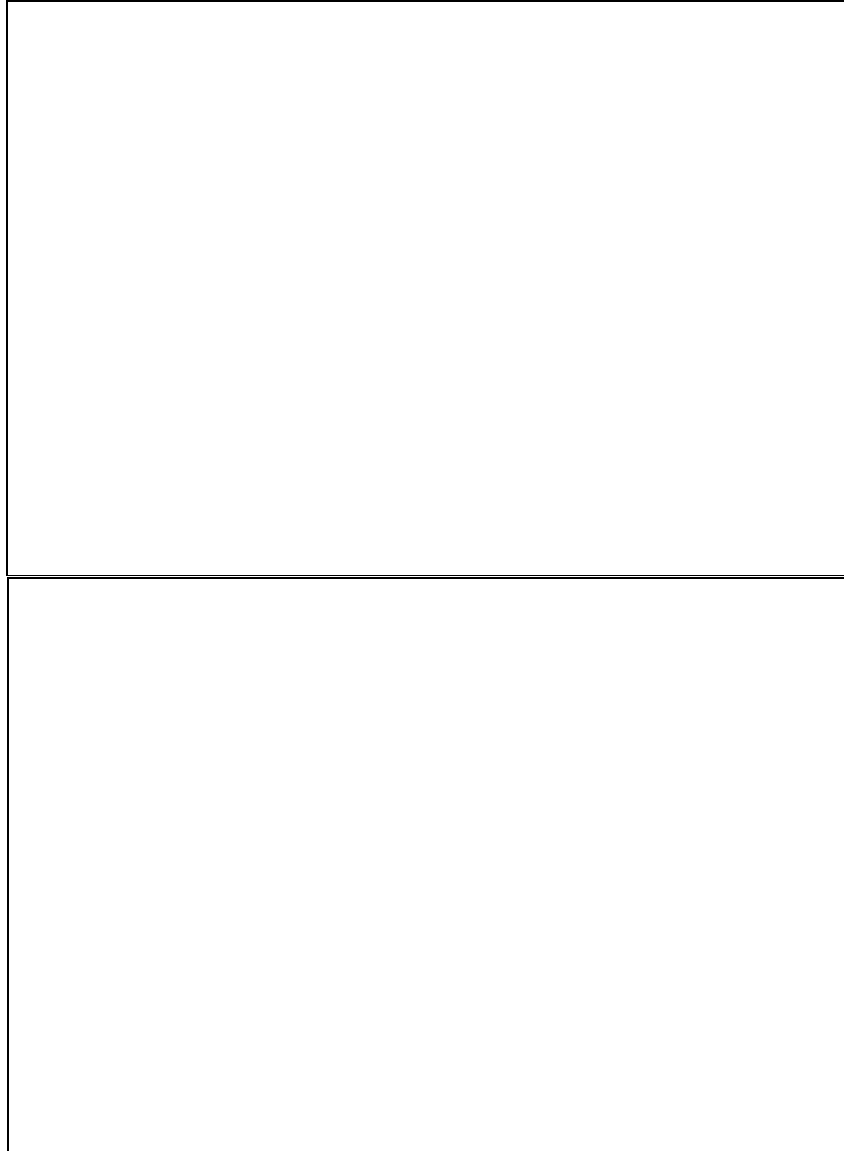
Notes: See notes to Figure 1.

Figure 3: Debt attributable to spending on wars in Iraq (OIF) and Afghanistan (OEF) as proportions of GDP per person, 2010 and 2020.

Notes: See notes to Figure 1.

Table 1: Impacts of wars on GDP by channel of effect

	1	2	3	4	5	6
Year	Oil prices	Net stimulus of defense spending	Crowding out of capital	Reductions in labor supply due to VA disability	Domestic terrorism	Total net impact of wars
2000	0%	0.00%	0.00%	0.00%	0%	0.00%
2001	0%	0.11%	0.00%	0.00%	0%	0.11%
2002	0%	0.15%	0.00%	0.00%	0%	0.15%
2003	0%	0.59%	-0.05%	-0.01%	0%	0.54%
2004	0%	0.64%	-0.09%	-0.01%	0%	0.54%
2005	0%	0.69%	-0.14%	-0.01%	0%	0.54%
2006	0%	0.73%	-0.18%	-0.01%	0%	0.54%
2007	0%	0.98%	-0.22%	-0.02%	0%	0.74%
2008	0%	1.03%	-0.26%	-0.02%	0%	0.75%
2009	0%	0.87%	-0.30%	-0.02%	0%	0.55%
2010	0%	0.91%	-0.34%	-0.03%	0%	0.55%
2011	0%	0.89%	-0.37%	-0.03%	0%	0.49%
2012	0%	0.87%	-0.41%	-0.03%	0%	0.43%
2013	0%	0.82%	-0.44%	-0.04%	0%	0.35%
2014	0%	0.77%	-0.47%	-0.04%	0%	0.27%
2015	0%	0.74%	-0.50%	-0.04%	0%	0.20%
2016	0%	0.71%	-0.53%	-0.04%	0%	0.14%
2017	0%	0.69%	-0.55%	-0.05%	0%	0.09%
2018	0%	0.67%	-0.58%	-0.05%	0%	0.04%
2019	0%	0.66%	-0.60%	-0.05%	0%	0.00%
2020	0%	0.65%	-0.63%	-0.06%	0%	-0.04%

Notes: See sections 2.1-2.5 in the text for details. A positive number means the wars increased GDP through the given channel. As described in the text, the effects of the wars on oil prices is assumed to be zero; their net effect on domestic terrorism is unknown, but the cost to GDP of domestic terrorism is assumed to be zero. The net stimulus of defense spending is calculated as 80% of the additional dollars. Domestic investment rates are assumed to fall with half of the increase in budget deficits, leading to a lower steady-state level of capital. The average VA disability rate of three million Iraq and Afghanistan veterans is assumed to rise linearly from 0% in 2001 to 9.4% in 2030, producing a reduction in labor supply equal to the percentages shown here.

Table 2: War spending, GDP, and debt held by the public, with and without spending on wars in Iraq (OIF) and Afghanistan (OEF).

	Baseline: History and Projection					Counterfactual: All OEF/OIF Spending is Zero				
Year	OEF/OIF spending	GDP	Debt held by the public	Debt/GDP ratio	Yield on the 10-year Treasury note	OEF/OIF spending	GDP	Debt held by the public	Debt/GDP ratio	Yield on the 10-year Treasury note
	(Billions of nominal dollars)			(Percent)	(Percent)	(Billions of nominal dollars)			(Percent)	(Percent)
2000	0	9,821	3,410	34.7	6.03	0	9,821	3,410	34.7	6.03
2001	14	10,225	3,320	32.5	5.02	0	10,214	3,306	32.4	5.01
2002	20	10,544	3,540	33.6	4.61	0	10,528	3,506	33.3	4.60
2003	81	10,980	3,913	35.6	4.02	0	10,921	3,796	34.8	3.98
2004	94	11,686	4,296	36.8	4.27	0	11,622	4,078	35.1	4.22
2005	108	12,446	4,592	36.9	4.29	0	12,378	4,255	34.4	4.20
2006	121	13,225	4,829	36.5	4.79	0	13,154	4,350	33.1	4.67
2007	171	13,896	5,035	36.2	4.63	0	13,793	4,357	31.6	4.47
2008	186	14,439	5,803	40.2	3.67	0	14,331	4,898	34.2	3.46
2009	155	14,237	7,545	53.0	3.26	0	14,159	6,445	45.5	2.99
2010	165	14,513	9,018	62.1	3.19	0	14,434	7,707	53.4	2.88
2011	168	15,034	10,430	69.4	3.35	0	14,960	8,895	59.5	3.00
2012	170	15,693	11,598	73.9	3.75	0	15,626	9,823	62.9	3.36
2013	168	16,400	12,386	75.5	4.15	0	16,343	10,356	63.4	3.72
2014	167	17,258	12,996	75.3	4.55	0	17,212	10,690	62.1	4.09
2015	167	18,195	13,625	74.9	4.95	0	18,159	11,021	60.7	4.45
2016	170	19,141	14,358	75.0	5.33	0	19,114	11,429	59.8	4.79
2017	173	20,033	15,064	75.2	5.40	0	20,016	11,781	58.9	4.83
2018	176	20,935	15,767	75.3	5.40	0	20,927	12,099	57.8	4.79
2019	180	21,856	16,557	75.8	5.40	0	21,856	12,473	57.1	4.75
2020	184	22,817	17,392	76.2	5.40	0	22,826	12,857	56.3	4.70

Notes: See notes to Figure 1.

Table 3: Cumulative war spending and interest costs

	1	2	3	4	5
Year	Flows of new OEF/OIF spending	Cumulative OEF/OIF spending to date	Interest costs due to cumulative OEF/OIF spending	Extra interest costs due to higher interest rates caused by OEF/OIF spending	Net addition to debt held by the public attributable to OEF/OIF spending (sum of cols 2 + 3 + 4)
			(Billions of nominal dollars)		
2000	0	0	0	0	0
2001	14	14	0	0	14
2002	20	34	1	0	35
2003	81	115	2	0	118
2004	94	209	7	2	218
2005	108	317	16	4	337
2006	121	438	33	8	479
2007	171	609	56	14	679
2008	186	795	89	21	905
2009	155	950	118	32	1,100
2010	165	1,115	145	50	1,310
2011	168	1,283	177	75	1,535
2012	170	1,453	214	107	1,774
2013	168	1,621	260	148	2,030
2014	167	1,788	320	197	2,306
2015	167	1,955	395	254	2,604
2016	170	2,125	486	318	2,929
2017	173	2,298	593	392	3,283
2018	176	2,474	717	476	3,668
2019	180	2,654	858	571	4,084
2020	184	2,838	1,018	679	4,535

Notes: See notes to Figure 1. Column 2 is the simple cumulative sum of nominal dollars spent to date on the wars, with the annual flows shown in column 2. Column 3 shows the cumulative interest costs associated with the primary spending in column 2 using the baseline level of the net interest rate paid by the government on debt held by the public. Column 4 lists the extra interest payments associated with the servicing of all debt in the baseline that are attributable to the increases in the interest rate owing to OEF/OIF spending. Column 4 is calculated as the residual of column 5, the net addition to debt held by the public attributable to OEF/OIF spending, minus columns 2 and 3.

Appendix

Oil Markets

Figure A.1 plots the refiner's acquisition cost of crude oil in the U.S., a composite of domestic and imported acquisitions costs. The graph shows relatively steady increases starting at the beginning of 2002 and a huge upward spike in 2008 followed by a collapse. There is practically no evidence of an effect of the Iraq War, which began in 2003 but markets may have expected as early as the summer of 2002. As described in the text, recent research on oil markets suggests that rapid growth in demand originating from developing countries was the cause of the increase between 2002 and 2008.
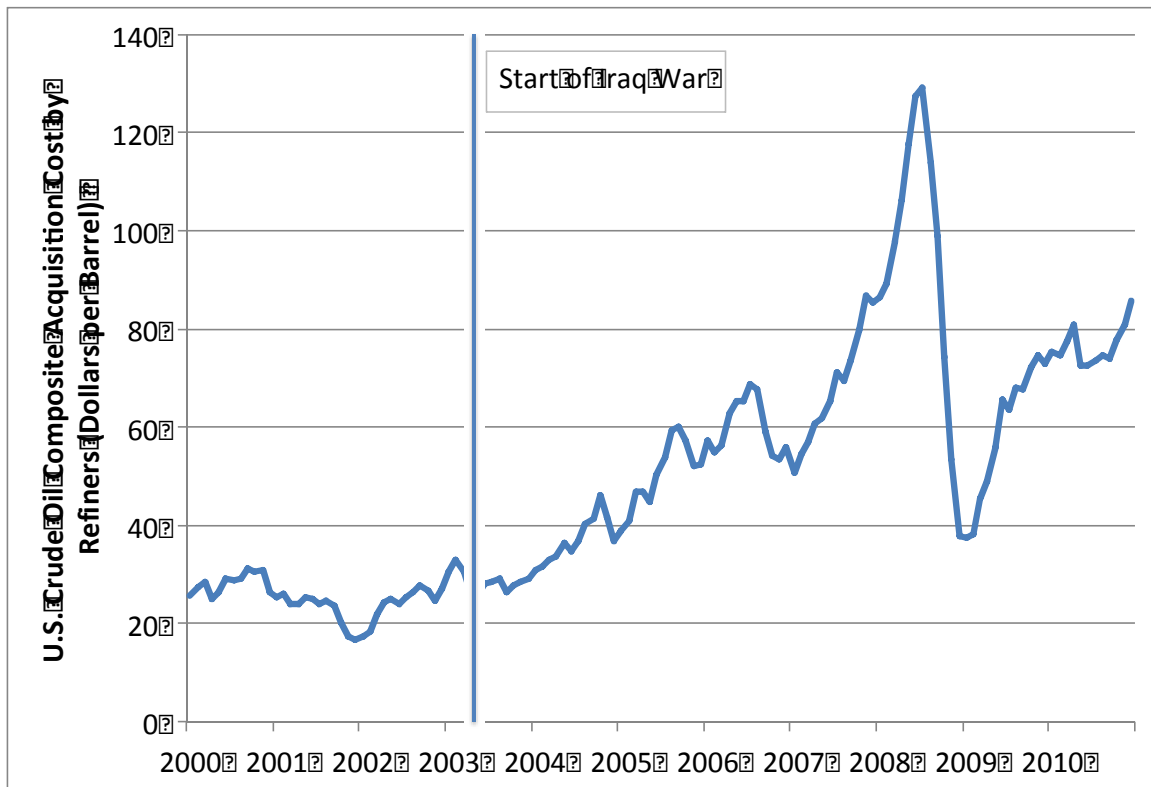

Figure A.1: Refiner's acquisition cost of crude oil in the U.S. since January 2000.

Source: U.S. Energy Information Administration.
http://www.eia.gov/dnav/pet/pet_pri_rac2_dcu_nus_m.htm

Figure A.2 plots the quantity of oil supplied to world markets by all producing regions. The series is characterized by volatility around a sharply upward trend beginning in early 2002 that lasts until 2005. Following that, world production plateaued; matched with rising world demand, this stagnation in supply after 2005 likely caused the near monotonic increases in oil prices shown in Figure A.1. The timing does not support a close connection to developments in the Iraq War.
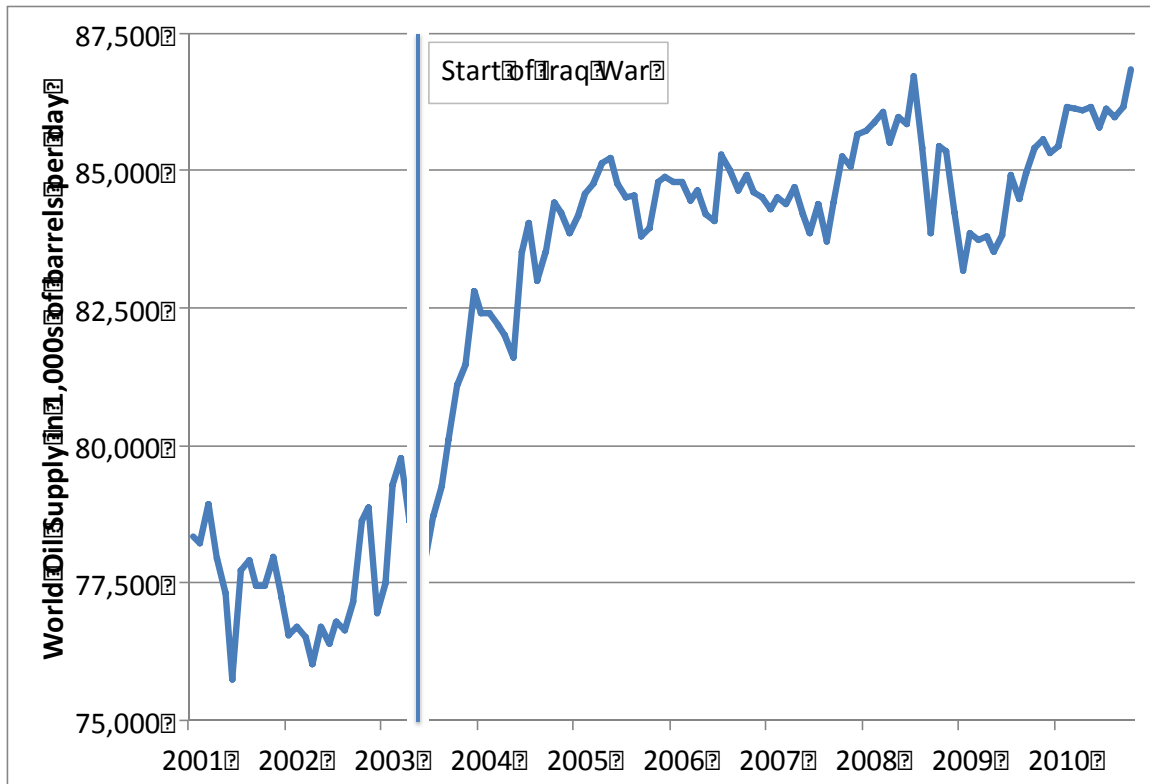

Figure A.2: World oil supply in thousands of barrels per day.

Source: U.S. Energy Information Administration.
http://www.eia.gov/cfapps/ipdbproject/IEDIndex3.cfm