New Evidence on the Local Fiscal Multiplier and Employment from Military Construction Spending

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Abstract

This paper takes advantage of the 2005 Base Realignment and Closure process to analyze the effect of government spending on local economic conditions. Exploiting variation in the timing and amount of construction funding provided across counties, my analyses yield an estimated cost per job of $65,000 per year and a local fiscal multiplier of 1.21. Analyses of neighboring counties show little evidence of spillover effects. To further explore the mechanisms underlying these results, I investigate the effects of government spending on migration and show that the funding has positive effects on in-migration, but these effects are too small to explain the main results.

Keywords: Government spending; cost per job; local fiscal multiplier

JEL classification: E62, H30, H50, R23

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1 Introduction

One cannot overemphasize the need to better understand the effects of government spending. Is government spending really effective at stimulating the economy? How much does it cost to create a job? And, how large is the multiplier? Motivated by beliefs that the fiscal multiplier is relatively large, the federal government passed the American Recovery and Reinvestment Act (ARRA) to stimulate the economy in 2009 at a cost of more than $800 billion (Romer and Bernstein, 2009). Many other countries adopted similar policies in response to the Great Recession, the worst economic downturn since the 1930s. However, economists and policy makers still have not reached a consensus on the effectiveness of government spending.

The debate arises partly because theoretical models offer contradictory predictions. Simple neoclassical models usually yield a small multiplier (typically less than 0.5) while New Keynesian models can yield predictions larger than 2 (Ramey, 2011a). Difficulty in measuring the counterfactual in the macroeconomy only adds to the debate. To tackle this problem, a recent stream of the empirical literature utilizes cross-sectional variation to estimate the income multiplier and cost per job. However, this line of empirical evidence also offers a wide range of estimates for the cost per job ($25,000–$125,000) and the local income multiplier (0.4–2.2). This wide range of estimates may be due to differential effects of government spending across different periods of time, across different places or to heterogeneous treatment effects across various types of government spending (Feyrer and Sacerdote, 2011).

This paper offers new evidence on the effectiveness of government spending. It is the first to estimate the cost per job and the local multiplier associated with construction spending.[1] It is also the first paper to examine the effects of the $25 billion Base Realignment and

[1]A couple of studies have investigated the effects of public highway spending on economic outcomes. Leduc and Wilson (2013) studies the impulse response of state output to the Federal-Aid Highway Program, a program to fund construction, maintenance, and other improvements on a large array of public roads. Pereira (2000) examines the effects of public infrastructure investment on output using a structural VAR and aggregate U.S. data.

Closure (hereafter, BRAC) military construction program on local economies.[2] As such, it is quite relevant to the ongoing discussions about the Department of Defense's proposal of another BRAC in the near future.

In order to estimate the effect of government spending on local economies, I exploit variation in the timing and amount of construction funding provided by the 2005 BRAC across counties with military bases. The BRAC process realigned and closed some military installations to improve military efficiency and effectiveness.[3] A BRAC Commission was created to provide an objective and non-partisan analysis of military installations. It then produced a final, non-amendable recommendation list. The commission gave priority to military value during its selection process, and commissioners recused themselves from participation in matters related to installations in their home states. Thus, to some extent, the funding awarded to each county most likely was motivated by military considerations and plausibly was unrelated to local economies.

My analysis identifies the causal effect of the stimulus on local economies under the identifying assumption that, changes in local economic conditions would have been the same across military counties absent the 2005 BRAC funding. Using county-level economic data from the Bureau of Economic Analysis' Regional Economic Accounts and a novel dataset that contains 2005 BRAC construction funding information, I find an estimated cost per job of $65,000 and a local fiscal multiplier—the change in local per capita income produced by a one dollar change in per capita government spending—of 1.21. These estimates are robust to various model specifications and the empirical strategy passes falsification exercises. Furthermore, my industry-specific analysis reveals especially large effects on the construction

[2]Lee (2016) also studies the effects of 2005 BRAC on local economies, but he focuses on the effects of personnel relocation as opposed to construction funding. As shown in Section 4 of this paper, the observed effects are driven by construction funding, not personnel relocation. This paper explicitly examines the identifying assumption and explores the treatment effects dynamics, which are not feasible for Lee (2016) as it only uses one year of pre-treatment data (2005) and one year of post-treatment data (2011).

[3]I restrict the analysis to counties that did not experience any closure during the process in order to better investigate the effects of government stimulus, excluding disinvestment.

industry, which is consistent with the nature of the program.

Traditional Keynesian model usually yields a larger prediction on multiplier when the economy is in slack; that is, when some factors of production are in idle. In this case, counties in slack may benefit more from government spending compared to other counties. To test this hypothesis, I use unemployment rate as a measure of "slack" in an economy and divide the funded counties into counties with higher and lower unemployment rates. Results from this analysis provide mixed evidence. The estimates suggest larger effects on income for counties with higher unemployment rates. However, the effects on emploment are larger for counties with lower unemployment rates.

To further understand the regional impacts of government spending, I extend the analysis to directly measure the extent to which there are spillovers across neighboring counties. I find little evidence of any likely spillover effects. Furthermore, I investigate the extent to which there are spillovers on the construction industry for nearby counties, since the construction industry is directly affected by the program. These estimates are uniformly positive and larger, providing suggestive evidence that the BRAC funding leads to higher employment for construction workers nearby but has no effect on income for those workers.

In order to speak to the mechanisms at work, I also examine the extent to which the BRAC stimulus affects in-migration and out-migration. What if government spending attracts many high-ability migrants and they take the employment opportunities and drive up the average income? In this case, local residents may not gain from increased government funding because the benefits of the stimulus instead accrue to migrants. My analysis suggests that government spending has positive effects on in-migration and no effects on out-migration to the funded and nearby counties. However, the effects on migration are too small to explain the main results. This suggests that residents of the funded counties do benefit from the government spending.

It is important to note that the multiplier estimated in this paper is *local*, as opposed to the extensively studied *national* multiplier (Ramey and Shapiro, 1998; Fatás and Mihov, 2001; Blanchard and Perotti, 2002; Ramey, 2011b; Mountford and Uhlig, 2009; Barro and Redlick, 2009; Zubairy, 2014). Estimating the local multiplier does not inform us directly about the magnitude of the national multiplier, which has been the focus of the literature and is of great policy concern. Indeed, spillovers and migration are more likely to occur within a country rather than across country borders (Dupor, 2016). When a stimulus does lead to spillovers, or attracts migration, the local multipliers may be larger or smaller than the national multiplier depending on the direction and magnitude of the effects. For instance, if there are positive spillovers across counties, then the local multiplier will not fully capture the effects of government spending and thus will be smaller than the national multiplier. On the other hand, if government spending attracts many migrants who take employment opportunities and drive up average income, then the local multiplier will be larger than the national multiplier. The fact that there is not a one-to-one mapping between local and national multipliers does not negate the policy relevance of local parameters. State and local governments spend over 3 trillion dollars every year, and the effects of regional spending are certainly of interest to local policy makers and residents. Thus, while this paper is only informative about national stimulus, it provides a direct estimate of the effectiveness of regional investment.

The rest of the paper is organized as follows. In the next section I discuss related literature. Section 3 provides some background on the 2005 Base Realignment and Closure. Section 4 describes the methodology and data used to analyze the causal impact of government spending on local economics. Section 5 presents empirical results of my analyses. Section 6 concludes and provides a discussion of the implications of the results.

2 Related Literature

For decades, macroeconomists have tried to model and estimate the national fiscal multiplier, a parameter that summarizes the effects of government spending at the national level. Yet, there is still considerable debate over its magnitude. The debate arises in part because theoretical models offer contradictory predictions.[4] Simple neoclassical models often yield a small multiplier (usually smaller than 0.5); Baxter and King (1993) find that temporary spending financed by a distortionary tax could lead to a multiplier as small as -2.5. New Keynesian models, on the other hand, yield a wide range of predictions, depending crucially on the monetary policy. Less responsive monetary policy, such as the case of "zero lower bound," could yield a multiplier as large as 2.3 (Eggertsson, 2001, 2011; Eggertsson et al., 2003).[5] Difficulty in measuring the counterfactual only adds to the debate. To tackle this problem, this line of literature employs two major approaches. The first is to use a structural VAR model, which relies on structural assumptions and small changes in the assumptions can lead to large differences in the estimated multiplier (Blanchard and Perotti, 2002; Caldara and Kamps, 2012). The second approach uses military spending associated with wars as potentially exogenous shocks (Barro and Redlick, 2011; Ramey and Shapiro, 1998; Ramey, 2011b; Fisher and Peters, 2010). However, major episodes of war are rare, and other fiscal policies, patriotism, or capacity constraints that occur during the war could confound the estimates.

A recent stream of the empirical literature uses cross-sectional variation to estimate the local income multiplier and cost per job.[6] A number of these studies have used variation in the geographic distribution of funds under the ARRA. Chodorow-Reich, Feiveson, Liscow, and

[4] Ramey (2011a) provides a thorough review of the leading theories on the effects of government spending and related empirical work.

[5] At the zero lower bound, the nominal interest rate is held constant while inflation drives the real interest rate down (Ramey, 2011a).

[6] See Chodorow-Reich (2016) for a thorough review on this line of literatures.

Woolston (2012) use state-level formula-driven variation in the allocation of ARRA Medicaid spending; they estimate a cost per job of around $25,000 and a local income multiplier of about 2. Wilson (2012) uses a similar approach to estimate the overall employment effects of the total ARRA spending, but finds a state-level cost per job of around $125,000 per year. The reason for differences in results between these two papers may be that medical spending and other types of expenditures have differents effects on the economy. Feyrer and Sacerdote (2011) also use state-level variation in the allocation of ARRA funding; they estimate a cost per job of $107,000 with an implied income multiplier from 0.5 to 1. They also suggest that the overall results mask considerable variation for different types of spending. Support programs for low income households and infrastructure spending are found to be highly expansionary while grants to states for education do not appear to have created any additional jobs.

Other studies have explored different sources of variation to estimate these parameters. Serrato and Wingender (2016) use variation in federal spending that is induced by the fact that much direct federal spending, and transfer programs to a local area depend on population estimates which are exogenously “shocked” after each Decennial Census. They estimate a county-level cost per job of $30,000 per year and income multiplier of 1.7 to 2. Shoag (2013, 2010) uses differences in returns to state pension funds as “windfall” shocks to state spending; he estimates a state-level income multiplier of 2.2 and a cost per job of around $35,000 per year. Fishback and Kachanovskaya (2010) use variation across states in federal spending during the Great Depression and estimate an income multiplier of 1.1 and no significant effect on employment. Clemens and Miran (2012) use state spending cuts induced by institutional rules on budget deficits to estimate a spending multiplier of 0.4. Nakamura and Steinsson (2014) use regional variation in military procurement spending to estimate a local multiplier of 1.5. Their theoretical model relates the estimated local multiplier to the traditional national multiplier; and their estimates fit well with an open economy New

Keynesian model in which consumption and labor are complements. Finally, Acconcia, Corsetti, and Simonelli (2014) use province-level variation in the temporary contractions in local public spending directed at combatting the Mafia in Italy to estimate a local multiplier of 1.5.[7] Overall, this line of literature offers a wide range of estimates for cost per job ($25,000–$125,000) and the income multiplier (0.4–2.2).

This paper complements the existing literature by providing the first estimates of cost per job and local multiplier based on a military construction program. This is of particular significance if heterogeneous treatment effects across various types of government spending may explain why we observe such a wide range of empirical estimates. Moreover, it provides guidance to policy makers as to how limited funding should be allocated across various types of expenditures. Furthermore, I use a recent spending episode (2006–2011) which is relevant to current policy if the effects of public spending vary across periods. In addition, this research adds to the literatures on the effects of the BRAC process on various outcomes (Hultquist and Petras, 2012; Freedman and Owens, 2014; Carlson, 2014; Hooker and Knetter, 2001). Because the Department of Defense is proposing another round of the BRAC in the near future and a sizable amount of money is at stake, it is valuable that this paper sheds light on the stimulus benefits of the program itself.

3 Base Realignment and Closure

Base Realignment and Closure (BRAC) is a congressionally authorized process that the Department of Defense has used to reorganize its base structure. Its goal is to more efficiently and effectively support the armed forces and to enhance operational readiness. The Defense Authorization Amendments and Base Closure and Realignment Act, enacted on October

[7] Dinerstein, Hoxby, Meer, and Villanueva (2014) uses an instrumental variable approach to investigate how stimulus-motivated federal funding directed to universities affects the economies of the counties in which the institutions are located, but they find little evidence of a stumulus effect, which could be due to the fact that only a small fraction of the funding "stuck where they hit".

24, 1988, provided the basis for implementation of the 1988 BRAC recommendations. On November 5, 1990, President George H. W. Bush signed the Defense Base Closure and Realignment Act of 1990, an attempt to isolate political influence from military activity. This act established an independent commission, the Defense Base Closure and Realignment Commission, to ensure a timely, independent, and fair process for closing and realigning U.S. military installations. Since then, there have been four additional BRACs in 1991, 1993, 1995, and 2005. The 2005 BRAC cost around 35 billion dollars, more than the sum of the previous 4 BRACs, and thus provides a good opportunity for examining the local effects of stimulus.

On May 13, 2005, the Department of Defense issued the initial recommendation list for the 2005 Base Realignment and Closure. An independent panel of nine commissioners was created to provide an objective and non-partisan review and analysis of that list. It then produced a final non-amendable recommendation list.[8] During this selection process, the commission followed eight selection criteria and it gave priority to military value.[9] To enhance the impartiality and integrity of the BRAC process, commissioners recused themselves from participation in matters related to installations in their home states.[10] President George W. Bush approved the 2005 BRAC commission's recommendation on September 15, 2005 with a statutory deadline of September 15, 2011. Given the process by which decisions were made, it is likely that the funding awarded to each county was motivated by military considerations and not local economic conditions. I provide graphical evidence and conduct a robustness check to support this hypothesis in Section 4. First, I show that funded and

[8]The 2005 BRAC commission consists of Anthony J. Principi, James H. Bilbray, Philip Coyle, Harold W. Gehman, Jr., James V. Hansen, T. Hill, Lloyd W. Newton, Samuel K. Skinner, Sue E. Turner.

[9]See Appendix A.1 for a full list of selection criteria.

[10]Four commissioners have recused themselves from participation in matters relating to installations in their home states. Commissioners Coyle and Gehman recused themselves because of their participation in BRAC-related activity in California and Virginia respectively. Commissioners Bilbray and Hansen recused themselves because of their long-time representation in the Congress and other public offices of Nevada and Utah respectively.

non-funded military counties did not have divergence in economic conditions prior to the first year of funding. Then, I perform a robustness check to show that the estimates are robust to the exclusion of states that were connected to the 2005 BRAC Commission; that is, the estimates remain robust after I drop states in which any of the commissioners were born or have worked.

The 2005 BRAC cost over 35 billion dollars; military construction alone cost around 25 billion dollars. Figure 1 presents the geographic distribution of the average annual per capita construction funding across the United States. The mean of the average annual per capita funding is roughly $122 for the funded counties. Almost every state has counties that received construction funding. In addition to funding construction across the nation, the 2005 BRAC relocated around 200,000 military and civilian personnel. The average net change in direct jobs was a net loss of 27 jobs per installation throughout the process (Lee, 2016). In Section 4, I conduct a robustness check and show that the main results are not due to personnel relocation. This is not surprising, as net personnel change only accounts for a tiny portion of county population.

4 Data and Methodology

4.1 Data

The 2005 Base Realignment and Closure construction funding data come from the 2013 Base Realignment and Closure Commission Execution Report. It provides an overview of the costs and savings for each the Department of Defense Component throughout the six-year BRAC implementation period (2006–2011). It also lists detailed annual construction funding information at the installation level. I geocode and aggregate this information into county-level funding information. To distinguish between the effects of personnel relocation and construction funding, I obtain county-level annual personnel counts for the years 2002 through 2011 from the U.S. Base Structure Reports. This administrative report is published annually by the Department of Defense, and lists annual installation-level personnel counts for installations of at least ten acres and at least $10 million in "Plant Replacement Value."[11] The personnel counts include military personnel, federal civilian employees and other non-military personnel, such as contractor personnel. I geocode and aggregate these personnel counts to county-level counts.

The data on county-level economic activity come from the Bureau of Economic Analysis' (BEA) Regional Economic Accounts. These data provide a wealth of economic statistics at the county level, including per capita income and employment.[12] The dataset comes from a variety of administrative sources. Employment and wage data are from the Bureau of Labor Statistics' Quarterly Census of Employment and Wages (QCEW) . It reports on workers covered by the state Unemployment Insurance (UI) program and federal workers covered by the Unemployment Compensation for Federal Employees (UCFE) program. The BEA then adjusts these data for employment and wages not covered, or not fully covered, by these programs to provide more comprehensive measures of income and employment. The Regional Economic Accounts also have annual information on economic activity for large industries, such as construction and manufacturing, at the county level.

To further investigate whether migrants drive the main results, I use county-level migration data from the Internal Revenue Service (IRS) Statistics of Income. The IRS tracks inflows and outflows based on address changes of individual tax filers. I use these data

[11] I use 2003–2012 Base Structure Reports because reports published in year t+1 would provide information on the personnel counts in year t. After 2012, the annual report changes format and stops listing personnel counts at the base level. "Plant Replacement Value" represents the Military Service or Washington Headquarter Service calculated cost to replace the current physical plant (facilities and supporting infrastructure) using today's construction cost (labor and materials) and standards (methodologies and codes).

[12] BEA reports data on a calendar year basis, whereas Department of Defense reports funding on a fiscal year basis. For instance, fiscal year 2005, begins on October 1, 2004 and ends on September 30, 2005. I match fiscal year directly with calendar year in the empirical analysis. This matching procedure should yield a relatively conservative estimate.

to construct measures of the number of individuals and households moving into and out of a particular county and to evaluate how the 2005 BRAC construction funding affects in-migration and out-migration.

Table 1 presents summary statistics based on these data. County-level per capita income and employment average around $33,000 and 120,000 across treatment and control counties respectively over the sample period. Construction employment accounts for around 6% of all employment in these counties. Military personnel account for about 1.24% of the overall population in those counties, more than the U.S. average of around 0.78%.[13]

4.2 Methodology

To identify the effects of government spending on local economies, I exploit variation in the timing and amount of BRAC construction funding across counties. Specifically, I estimate the following model:

$$Y_{it} = \alpha + \beta perCapitaFunding_{it} + \mu_i + \eta_t + X_{it} + \delta_{st} + u_{it}$$

where i indicates counties, t indicates years, and s indicates states. In this model, Y_{it} is a measure of the county economic condition; X_{it} refers to county-level time-varying demographic controls, including population, percentage Hispanic, African American, and female; and δ_{st} represents state-by-year fixed effects.[14] The county and year fixed effects are captured by μ_i and η_t, respectively. The county fixed effects control for county-level time-invariant characteristics and year fixed effects controls for nationwide economic shocks in any year. Moreover, I also include state-by-year fixed effects to capture state-level economic shocks in any given year. The inclusion of state-by-year fixed effects allows counties in different states

[13]Currently, there are 1.4 million active military personnel and 1.1 million reserve personnel in the United States.

[14]The county-level demographic data come from the U.S. Census Bureau.

to follow different trajectories and account for differential shocks by state over time. In this case, the crucial assumption is that in the absence of the 2005 BRAC construction funding, changes in economic condition would have been the same across all military counties *in the same state*. The variable of interest is $perCapitaFunding_{it}$, which measures 2005 BRAC construction funding at year t in county i.

Noted that while the BRAC report provides data on funding awarded, information on when the funding was spent is not available. Thus, I assume that all funding received by a county was spent linearly beginning in the year of receipt. That is, $perCapitaFunding_{it}$ equals zero prior to the receipt of any funding for county i and equals $\frac{\overline{Funding_{it}}}{Population_{i,2005}}$ for years after the initial funding receipt.[15] I make that assumption for two reasons. First, according to the Department of Defense's policy, military construction funding can remain available for up to five years. Second, most installations completed their projects in 2011, even though the Department of Defense distributed most of the funding between 2007 and 2009, and few counties received funding in 2011 (Lee, 2016).[16] The estimate of β identifies the causal effect of 2005 BRAC funding under the identifying assumption that, in the absence of the BRAC construction funding, the change in outcomes across counties would have been the same. Finally, standard errors are clustered at the state level to allow for arbitrary correlation of the error term at the state level across counties and years.

In reality, counties with military installations are likely to be systematically different from

[15]Each BRAC construction project should be at least 35-percent design complete to request funding from the Department of Defense, which generates variation in the timing of counties' first funding receipt. And $\overline{Funding_{it}}$ is defined as $\frac{TotalFunding_i}{2011 - firstyearoffundingreceipt + 1_i}$ for years after the initial funding receipt. I use population counts in 2005 to generate the treatment variable because population could be affected by government spending and 2005 is the last year prior to the BRAC construction program. I also present estimates where $perCapitaFunding_{it}$ equals zero prior to the receipt of any funding for county i and equals $\frac{\overline{Funding_{it}}}{Population_{it}}$ for years after the first year of funding receipt in Appendix Table A1. The results are robust to this exercise.

[16]Another assumption could be that each individual funding awarded to a county at a given year is spent equally between that year and 2011. For instance, County A receive M million dollars in 2008 and N million dollars in 2010, so spending for County A would be $\frac{M}{4}$ million dollars in 2008 and 2009, and $\frac{M}{4} + \frac{N}{2}$ million dollars in 2010 and 2011. The results are robust to this alternative assumption of spending pattern and are shown in Appendix Table A2.

counties that do not have installations. For this reason, I restrict my sample of unfunded counties to those with at least one military installation in the 2005 Base Structure Report, the administrative report on military installations that is published annually by the Department of Defense.[17] I further restrict the overall sample to counties that did not experience any closure during the 2005 BRAC to better investigate the effects of government spending, excluding disinvestment. The sample period is 2002–2011 for the main analysis. I use 2002 because it is the first year after the completion of the previous BRAC and 2011 because it is the statutory deadline for completion of the 2005 BRAC. When I explore treatment effects over time, I extend the sample period through 2013 to investigate whether the funding has lingering effects.

5 Results

In this section, I begin by presenting my main results. They are followed by robustness checks verifying that these results are robust under alternative identification strategies, to the exclusion of states linked to the 2005 BRAC Commission, and that they are not driven by personnel relocation. Then, I test the hypothesis that the effects of government spending are larger during periods of slack and examine the heterogeneous treatment effects of government spending across high and low unemployment counties. Next, I extend my analysis to explore the extent to which there are spillovers on the nearby counties. Finally, I examine the effects on migration to investigate whether migrants are responsible for the main results.

5.1 Main Results

Table 2 presents my main results with Panel A showing the estimated effects on employment and Panel B on income. Column 1 shows estimates from the baseline specification, simply

[17] I use the 2005 report because it is the last one published prior to the 2005 BRAC.

controlling for county and year fixed effects. The results from this specification suggest that a $1,000 increase in annual per capita BRAC construction funding would increase employment by 3.6%, or roughly 5,100 jobs.[18] This implies a cost per job of approximately $57,563, because it takes roughly 279 million dollars ($1,000 per capita spending multiplied by 278,884, which is the pre-funding population average for funded counties) to create these jobs. Similarly, the estimate implies that a $1,000 increase in annual per capita BRAC funding would increase per capita income by 5.6%. Multiplying this number by $31,891—the pre-funding average of per capita income in the funded counties—yields an increase of roughly $1,790. This estimate implies a fiscal multiplier of 1.79.

Column 2 adds county-level time-varying demographic controls to the model. Adding these covariates may be over-controlling, because county-level demographic characteristics could be affected by government spending and thus a causal path between local stimulus and economic conditions. So it is unclear whether the estimates in Column 2 are superior to those in Column 1. Nonetheless, the results change little after adding these controls. These estimates imply a cost per job of $54,533, and a fiscal multiplier of 1.59.

In Column 3, I present the results of a specification in which I control for county, year, and state-by-year fixed effects. Adding state-by-year fixed effects to the model controls for statewide economic shocks. The estimates from this specification suggest that a $1,000 increase in annual per capita funding would increase employment by 3.0% and per capita income by 4.5%, implying an estimated cost per job of around $69,075 and income multiplier of 1.44. Finally, in Column 4 I present a specification in which I control for state-by-year fixed effects and county-level time-varying controls. The results change little, with an estimated cost per job of approximately $64,795 and an income multiplier of 1.21. To summarize, the estimates in Table 2 provide strong evidence that the BRAC construction funding had a

[18]This number is calculated by multiplying 3.8% by 134,580, the pre-funding average of employment for funded counties.

significant impact on employment and income for funded counties, and these estimates are robust to various model specifications.

As an additional way to estimate the effects of government spending on local economies, I investigate the dynamic responses of economic conditions to 2005 BRAC construction funding. To do that, I interact average per capita funding with a set of indicator variables that correspond to 1, 2, 3, 4 years prior to the first year of funding receipt, the first year of funding receipt, and 1, 2, 3, 4, 5-or-more years after the first year of funding receipt. As in Column 4 of Table 2, I continue to control for county, year, state-by-year fixed effects and county-level time-varying demographic characteristics. Figure 1 plots the coefficient estimates and 95% confidence intervals from this analysis. None of the coefficient estimates for the years leading up to the funding receipt are statistically significant at the 5% level, supporting the common trends assumption. Furthermore, the estimates for years after the first year of funding receipt provide some evidence that the effects on employment and income are concentrated in the short term and it fades away once the funding is discontinued.

Finally, because the construction industry is directly affected by BRAC, we might expect there to be larger effects on this industry. I investigate this hypothesis and present the results in Table 3. Estimates from this industry-specific analysis are uniformly larger than the main results, suggesting that BRAC construction funding does have an especially large effect on the construction industry. Results from the specification where I control for county, year, state-by-year fixed effects and county-level time-varying demographic characteristics indicate that a $1,000 increase in per capita funding increases construction employment by 10.8% and personal income by 13.8%.[19] Compared with the main results—a 6.8% increase in overall employment and 3.8% increase in per capita income—these estimates are consistent with the hypothesis that the BRAC funding has a larger impact on the construction industry.

[19]BEA publish personal income as opposed to per capita income for large industries and population counts by industry is unavailable, so I focus on personal income instead of per capita income in the industry-specific analysis.

5.2 Robustness Checks

This section presents several tests to check the robustness of the main results. I begin by presenting results where I drop all unfunded counties from the analysis and only use variation in the timing and amount of funding among funded counties. Next, I extend the analysis to explore the extent to which dropping states linked to the 2005 BRAC Commission affects the results. Finally, I investigate whether the effects are driven by military personnel relocation or the stimulus.

In Table 4, I present the estimates based only on funded counties. This estimation strategy compares counties receiving lower levels of construction funding per capita to counties that receive more funding per capita. Each column in Table 4 follows the same specification as Table 2. The estimates are similar to those presented in Table 2; Column 4 indicates a 3.4% increase in employment and a 3.9% increase in per capita income for a $1,000 increase in annual per capita funding. That implies a cost per job of around $60,948 and an income multiplier of 1.24. The estimates remain robust when I use an alternative source of variation, lending further support to the main results.

In Section 3, I discussed the institutional background of the 2005 BRAC program, arguing that political factors played a small role in the BRAC process and that funding was mainly motivated by military considerations. The analysis above supports this argument: it shows no evidence of economic divergence *prior to* the receipts of BRAC construction funding. None of the coefficient estimates for the years leading up to the funding award are statistically significant. However, this does not rule out the possibility that commissioners may have voted in favor of their connected states and that political factors may affect the BRAC process in a significant way. It is important to note that this sort of behavior would only bias the estimates if it was related to expected economic outcomes.

In any case, to address this concern, I conduct a robustness check by dropping states where any of the commissioners were born or had worked at any time throughout their career.[20] If the estimates change substantially after dropping those counties, then it would raise concerns about political involvement during the BRAC process. The estimates presented in Table 5 remain close to those shown in Table 2: estimates from Column 4 imply a cost per job of around $64,582 and a local fiscal multiplier of 1.19, This suggests little evidence of political manipulation that is systematically related to economic conditions.[21]

Because military personnel were relocated during 2005 BRAC process, the main results could be driven by more military personnel moving to the funded counties. To address this concern, I include logged military personnel counts as a covariate in my analysis. I present the estimates in Table 6. When I control for military personnel, the estimated effects of BRAC construction funding change little. Estimates from Column 4 imply a cost per job of approximately $57,166 and an income multiplier of 1.21. Furthermore, the estimates on logged personnel counts are small and never statistically significant, reassuring us that the main effects indeed are driven by funding, not personnel relocation. This finding is consistent with the fact that the number of military personnel in a county only accounts for a small portion of the population, and on average there is only a net loss of 27 jobs per installation throughout the process (Lee, 2016).[22]

Overall, these robustness checks indicate that the main results are robust under alternative identification strategies. Also, we observe little political manipulation related to economic conditions during the BRAC process, which lends further support to the identification strategy. Also, the main results are driven by the funding, not by relocation of military personnel. All of this evidence supports an interpretation of the main results as

[20] I drop the following states in this analysis: Arizona, California, Georgia, Hawaii, Illinois, Maryland, Mississippi, Nebraska, Nevada, New York, Ohio, South Carolina, Texas, Utah, Virginia, Washington.

[21] The estimated cost per job is calculated as $\frac{\$1{,}000\times 258{,}471}{3.5\%\times 140{,}167}$, and the local fiscal multiplier is calculated as $\frac{\$33{,}070\times 3.6\%}{\$1{,}000}$.

[22] The estimated cost per job is calculated as $\frac{\$1{,}000\times 343{,}123}{3.8\%\times 167{,}397}$, and the local fiscal multiplier is calculated as $\frac{\$32{,}672\times 3.7\%}{\$1{,}000}$.

cost per job and income multiplier.

5.3 Heterogeneous Effects

The traditional Keynesian model implies larger multipliers when the economy is in slack; that is, when some production factors are in idle.[23] This theoretical prediction implies that we shall observe larger effects on income and employment for counties that have idle productive capacity. If so, government spending may have a redistributional effect in addition to its stimulating effects: areas in slack would benefit more from the same amount of government spending than other areas. In this section, I investigate this issue by examining the degree to which the effects of BRAC funding on income and employment differ by the amount of slack in the local economy as measured by the unemployment rate. Specifically, I divide the funded counties into two groups based on their unemployment rates in the year of 2005, the last year prior to any counties receiving the BRAC construction funding. Table 7 presents results from this analysis. Panel A presents the results for counties with higher unemployment rates while Panel B for those with lower unemployment rates in 2005. Conttracted to the theoretical prediction, the point estimates for employment effects are larger for counties with lower unemployment rates, which could be due to the fact that counties with lower unemployment rates in the sample are more likely to be larger counties with more job opportunities. The effects on income, on the other hand, provide some evidence to support the slack hypothesis—economies in slack seems to gain more from federal spending. The estimated multiplier for counties with lower unemployment rates is smaller relative to the counties with higher unemployment rates and less robust to alternative model specifications.

[23]Empirical evidence from the macroeconomics literature yields contrasting results on whether government spending multipliers are larger during periods of slack. Auerbach and Gorodnichenko (2012) and Fazzari, Morley, and Panovska (2015) find evidence of larger multipliers during periods of slack, while Ramey and Zubairy (forthcoming), Owyang, Ramey, and Zubairy (2013), and Crafts and Mills (2013) do not observe higher multipliers during times of slack.

5.4 Spillover Effects

To further examine the effects of the BRAC construction funding, I consider the impact on neighboring counties.[24] This extension of the baseline analysis helps to capture the total regional impact of the stimulus; government spending may create externalities for neighboring counties that did not directly receive BRAC funding. Positive spillovers across counties would suggest that the main analyses understate the total regional effects of the BRAC funding. Spillovers might arise, for example, if some construction materials are purchased from neighboring counties: this increase in demand for input would have positive effects on those counties. On the other hand, if we find negative spillovers on nearby counties, then the main results may overstate the regional impact of the stimulus. For example, if the BRAC funding leads to higher wages and attracts migrants from neighboring counties, then decreases in population could have negative effects on businesses in those counties, ultimately resulting in negative spillovers.

In order to estimate the spillover effects, I define neighboring counties as the 10 nearest counties based on highway distance between county centroids for every county in the main analysis.[25] Comparing counties near the funded counties to those near the unfunded military counties, my results are shown in Table 8. None the estimates are significant and there is little evidence of spillovers. The estimates are precise enough to rule out effects on employment on the order of 1% at the 5 percent significance level for a $1,000 increase in per capita funding. Also the estimates on per capita income can rule out meaningful negative impact smaller than -0.6% at the 5 percent level.

Because the construction industry is directly affected, it is likely that the BRAC funding would lead to higher demand for construction workers in the funded counties, and would also drive up the income and employment for construction workers in the nearby counties. For

[24] Serrato and Wingender (2016) also finds little evidence of spillovers across neighboring counties.
[25] The County-to-County Distance data are from the Center for Transportation Analysis.

this reason, I also explore the spillover effects on the construction industry specifically. These results are shown in Table 9. The effects on employment are not robust across specifications, but the signs are uniformly positive, suggesting potential positive spillovers on employment in the construction industry.

5.5 Are Migrants Responsible for the Effects?

Are migrants are responsible for the main effects on employment and income?[26] If government spending does not lead to changes in migration, it would suggest that the effects we observe for the funded counties are likely driven by local residents, who benefit from increased government funding through higher incomes and more job opportunities. On the other hand, if government funding leads to higher wages and thus attracts many high-ability migrants, the observed effects on employment and income could be mainly driven by migrants. If this is the case, then the benefits of government spending accrue to the migrants instead of the local residents. To explore this question, I use IRS migration data and separately investigate the effects on in-migration and out-migration.

Table 10 shows the results of this analysis. The results suggest that government spending has a positive impact on in-migration to the funded counties, but little effect on out-migration. The estimate from a specification where I control for county, year, state-by-year fixed effects and county-level time-varying demographic characteristics indicate that a $1,000 increase in annual BRAC funding per capita attracts around 1,000 additional migrants.[27] Given the average population size of the funded counties (200,000), these additional migrants are not likely to have created an increase in per capita income of 4% as estimated in the main results. Similarly, because a $1,000 increase in per capita funding could increase employment

[26]Serrato and Wingender (2011) finds positive migration effects of government spending, and Shoag (2010) find little evidence of migration effects.

[27]This number is calculated as $6.7\% \times 13,807.22$, the pre-funding average of in-migrations for the funded counties.

by more than 5,000 as calculated from the main results, the observed effects on employment are unlikely to be driven by migrants to the funded counties.

BEA measure employment and income based on place of work, but IRS migration files measure migration pattern based on change of addresses, a place of residence measure. So it is possible that migrants move to counties near funded counties and take the employment opportunities in the funded counties. To investigate this hypothesis, I examine the impact of the BRAC funding on migration for the nearby counties. Similar to my analysis on the spillover effects, I define neighboring counties as the 10 nearest counties based on highway distance between county centroids. Table 11 presents the results from this analysis. The results show that the stimulus has a positive effect on in-migration to the neighboring counties, but no effects on out-migration. The estimates on in-migration shows that a $1,000 increase in annual BRAC funding attracts around 2,000 additional migrants to the ten nearest counties.[28] Combining these results with those on the funded counties, a $1,000 increase in annual BRAC funding attracts around 3,000 additional migrants in total. However, the effect on migration is still too small to have created an increase in per capita income of 4% and an additional 5,000 jobs for the funded counties. Thus, local residents do benefit from the stimulus.

6 Discussion and Conclusion

In this paper, I exploit variation across counties in the timing and amount of construction funding provided by the 2005 BRAC to estimate the effects of government spending on local economic conditions. My analysis yields an estimated cost per job of approximately $65,000 and a local fiscal multiplier of around 1.21, and these estimates are robust to various model specifications. Furthermore, an industry-specific analysis finds especially large effects on

[28]This number is calculated as $10 \times 2.6\% \times 78,00$, where 78,00 is the pre-funding average of in-migration for each of the nearby counties.

the construction industry, which is consistent with the nature of the spending. To better understand the regional impact of the BRAC funding, I directly estimate spillover effects on neighboring counties. I find little evidence of spillovers; however, there is suggestive evidence of positive spillovers on construction employment for neighboring counties.

To test traditional Keynesian prediction that economies with higher amount of slack would gain more from government spending, I investigate if counties with higher unemployment rates benefit more from the stimulus. Results from this analysis are mixed. While the effects on income are larger for counties with higher unemployment rates, implying a larger multiplier for those counties, the effects on employment are larger for counties with lower unemloyment rates.

Finally, to better understand how stimulus affects relocation decision, I also examine the effects of government spending on in-migration and out-migration. Government spending potentially could attract more in-migration into the funded areas, so the main estimated effects could be driven mainly by migrants. My analysis shows that government spending has positive effects on in-migration to funded counties and their neighboring counties but no effects on out-migration. In any case, the migration effects are too small to bring about the results I observe in the main analyses. Thus we can conclude that residents of the funded counties do benefit from the government spending.

This paper complements the existing literature on the regional impacts of stimulus by estimating the effects of a quite recent military construction program. The magnitude of the estimated cost per job falls in the middle of the distribution on the employment effects of government spending. Still, the income effects I estimate are modest compared to estimates based on other stimulus programs. I therefore conclude that government spending, especially construction spending, could play a significant role in creating jobs and increasing income. Because the construction industry is usually one of the hardest-hit during economic downturns (Hadi, 2011), and my results suggest especially large effects for this sector, it seems that government investment in construction could effectively mitigate economic slowdowns. Furthermore, heterogeneous treatment effect analysis shows that this program has a larger income effects on counties with higher unemployment rates. Thus, to the extent that the federal government wants to redistribute resources to counties with more slack, the BRAC construction program provides an attractive approach for its impact on those counties and the fact that it allows the federal government to directly engage in stimulating the economy.

References

Acconcia, A., G. Corsetti, and S. Simonelli (2014): "Mafia and Public Spending: Evidence on the Fiscal Multiplier from a Quasi-Experiment," *The American Economic Review*, 104(7), 2185–2209.

Auerbach, A. J., and Y. Gorodnichenko (2012): "Measuring the Output Responses to Fiscal Policy," *American Economic Journal: Economic Policy*, 4(2), 1–27.

Barro, R. J., and C. J. Redlick (2009): "Macroeconomic Effects from Government Purchases and Taxes," Discussion paper, National Bureau of Economic Research.

——— (2011): "Macroeconomic Effects From Government Purchases and Taxes*.," *Quarterly Journal of Economics*, 126(1).

Baxter, M., and R. G. King (1993): "Fiscal Policy in General Equilibrium," *The American Economic Review*, pp. 315–334.

Blanchard, O., and R. Perotti (2002): "An Empirical Characterization of the Dynamic Effects of Changes in Government Spending and Taxes on Output," *Quarterly Journal of Economics*, pp. 1329–1368.

Caldara, D., and C. Kamps (2012): "The Analytics of SVARs: A Unified Framework to Measure Fiscal Multipliers," *Working Paper*.

Carlson, K. (2014): "Red Alert: Prenatal Stress and Plans to Close Military Bases," *Available at SSRN 2448337*.

Chodorow-Reich, G. (2016): "Geographic Cross-Sectional Fiscal Multipliers: What Have We Learned?," Discussion paper.

Chodorow-Reich, G., L. Feiveson, Z. Liscow, and W. G. Woolston (2012): "Does State Fiscal Relief during Recessions Increase Employment? Evidence from the American Recovery and Reinvestment Act," *American Economic Journal: Economic Policy*, pp. 118–145.

Clemens, J., and S. Miran (2012): "Fiscal Policy Multipliers on Subnational Government Spending," *American Economic Journal: Economic Policy*, pp. 46–68.

Crafts, N., and T. C. Mills (2013): "Rearmament to the Rescue? New Estimates of the Impact Of "Keynesian" Policies in 1930s' Britain," *The Journal of Economic History*, 73(04), 1077–1104.

Dinerstein, M. F., C. M. Hoxby, J. Meer, and P. Villanueva (2014): "Did the Fiscal Stimulus Work for Universities?," in *How the Financial Crisis and Great Recession Affected Higher Education*, pp. 263–320. University of Chicago Press.

Dupor, B. (2016): "Local and Aggregate Fiscal Policy Multipliers," *FRB St. Louis Working Paper*, (2016-4), 2015–269.

Eggertsson, G. (2001): "Real Government Spending in a Liquidity Trap," .

Eggertsson, G. B. (2011): "What Fiscal Policy Is Effective at Zero Interest Rates?," in *NBER Macroeconomics Annual 2010, Volume 25*, pp. 59–112. University of Chicago Press.

Eggertsson, G. B., et al. (2003): "Zero Bound on Interest Rates and Optimal Monetary Policy," *Brookings Papers on Economic Activity*, 2003(1), 139–233.

Fatás, A., and I. Mihov (2001): "The Effects of Fiscal Policy on Consumption and Employment: Theory and Evidence," .

Fazzari, S. M., J. Morley, and I. Panovska (2015): "State-Dependent Effects of Fiscal Policy," *Studies in Nonlinear Dynamics & Econometrics*, 19(3), 285–315.

Feyrer, J., and B. Sacerdote (2011): "Did the Stimulus Stimulate? Real Time Estimates of the Effects of the American Recovery and Reinvestment Act," Discussion paper, National Bureau of Economic Research.

Fishback, P. V., and V. Kachanovskaya (2010): "In Search of the Multiplier for Federal Spending in the States during the Great Depression," Discussion paper, National Bureau of Economic Research.

Fisher, J. D., and R. Peters (2010): "Using Stock Returns to Identify Government Spending Shocks," *The Economic Journal*, 120(544), 414–436.

Freedman, M., and E. G. Owens (2014): "Your Friends and Neighbors: Localized Economic Development and Criminal Activity," *Review of Economics and Statistics*, (0).

Hadi, A. (2011): "Construction employment peaks before the recession and falls sharply throughout it," *Monthly Labor Review*, 134(4), 24–27.

Hooker, M. A., and M. M. Knetter (2001): "Measuring the Economic Effects of Military Base Closures," *Economic Inquiry*, 39(4), 583–598.

Hultquist, A., and T. L. Petras (2012): "An Examination of the Local Economic Impacts of Military Base Closures," *Economic Development Quarterly*, 26(2), 151–161.

Leduc, S., and D. Wilson (2013): "Roads to Prosperity or Bridges to Nowhere? Theory and Evidence on the Impact of Public Infrastructure Investment," *NBER Macroeconomics Annual*, 27(1), 89–142.

Lee, J. (2016): "The Regional Economic Effects of Military Base Realignments and Closures," *Defence and Peace Economics*, pp. 1–18.

Mountford, A., and H. Uhlig (2009): "What Are the Effects of Fiscal Policy Shocks?," *Journal of applied econometrics*, 24(6), 960–992.

Nakamura, E., and J. Steinsson (2014): "Fiscal Stimulus in a Monetary Union: Evidence from US Regions," *The American Economic Review*, 104(3), 753–792.

Owyang, M. T., V. A. Ramey, and S. Zubairy (2013): "Are Government Spending Multipliers Greater During Periods of Slack? Evidence from Twentieth-Century Historical Data," *The American Economic Review*, 103(3), 129–134.

Pereira, A. M. (2000): "Is all public capital created equal?," *Review of Economics and Statistics*, 82(3), 513–518.

Ramey, V. A. (2011a): "Can government purchases stimulate the economy?," *Journal of Economic Literature*, 49(3), 673–685.

——— (2011b): "Identifying Government Spending Shocks: It's all in the Timing," *The Quarterly Journal of Economics*, 126(1), 1–50.

Ramey, V. A., and M. D. Shapiro (1998): "Costly Capital Reallocation and the Effects of Government Spending," in *Carnegie-Rochester Conference Series on Public Policy*, vol. 48, pp. 145–194. Elsevier.

Ramey, V. A., and S. Zubairy (forthcoming): "Government Spending Multipliers in Good Times and in Bad: Evidence from US Historical Data," *Journal of Political Economy*.

Romer, C., and J. Bernstein (2009): "The job impact of the American recovery and reinvestment plan," .

Serrato, J. C. S., and P. Wingender (2011): "Estimating the Incidence of Government Spending," Discussion paper, Mimeo, November.

——— (2016): "Estimating Local Fiscal Multipliers," *University of California at Berkeley, mimeo*.

Shoag, D. (2010): "The Impact of Government Spending Shocks: Evidence on the Multiplier from State Pension Plan Returns," *Working Paper, Harvard University*.

——— (2013): "Using State Pension Shocks to Estimate Fiscal Multipliers since the Great Recession," *The American Economic Review*, 103(3), 121–124.

Wilson, D. J. (2012): "Fiscal spending jobs multipliers: Evidence from the 2009 American Recovery and Reinvestment Act," *American Economic Journal: Economic Policy*, pp. 251–282.

Zubairy, S. (2014): "On Fiscal Multipliers: Estimates from a Medium Scale DSGE Model," *International Economic Review*, 55(1), 169–195.

Figure 1: Geographic Distribution of Annual BRAC Funding per Capita

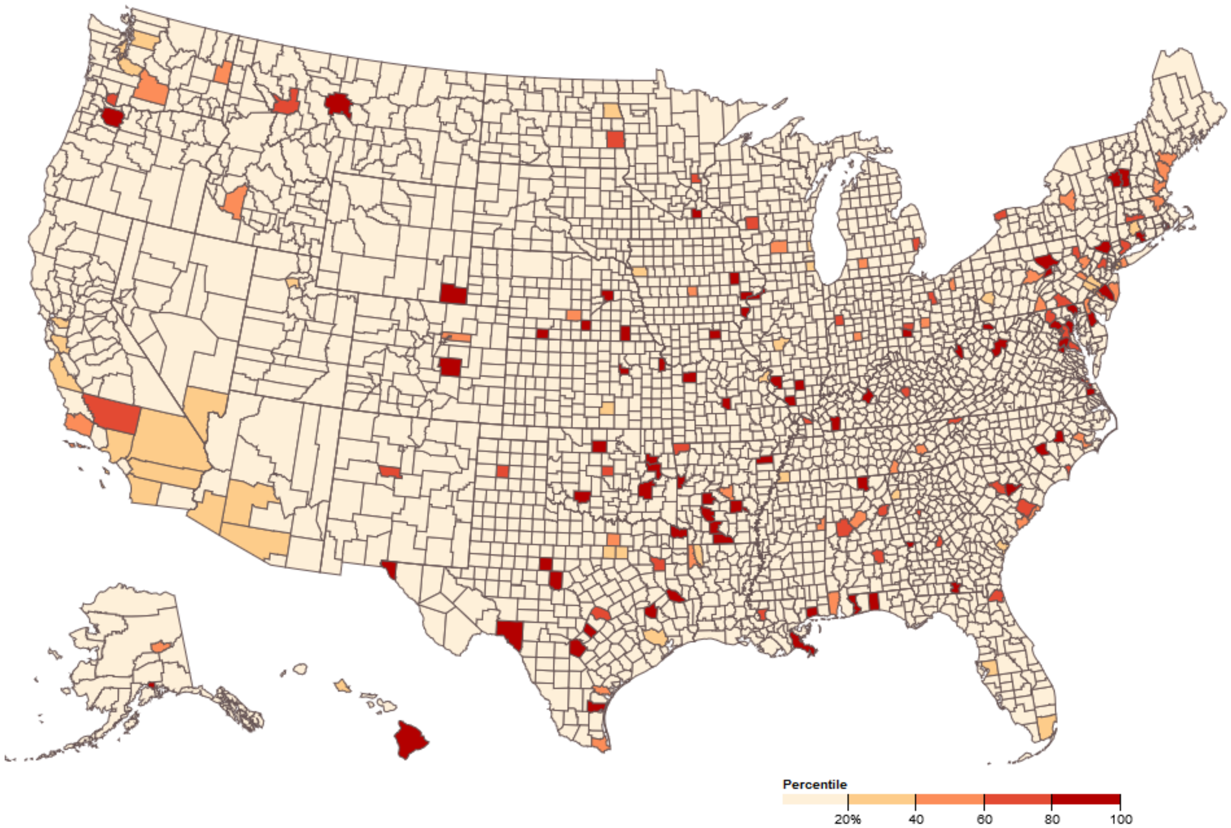
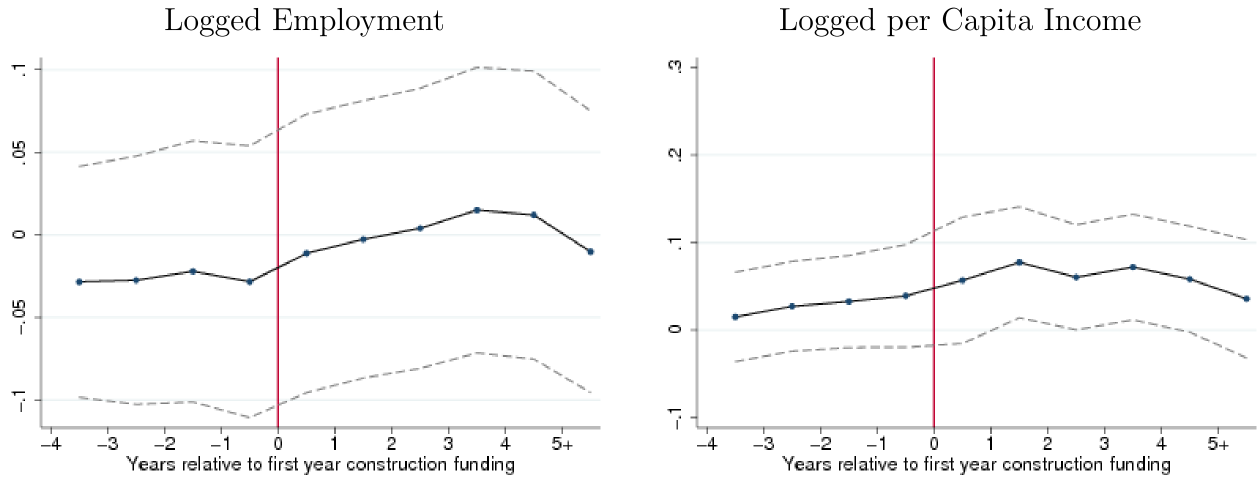


Figure 2: Estimated Effects of 2005 BRAC Construction Funding Over Time



Note: Data to generate these figures are from BEA. These figures present the coefficient estimates from a model that includes county fixed effects, year fixed effect, state-by-year fixed effects and county-level time-varying controls. County-level controls include population, percentage of female, Hispanics and African Americans. Standard errors are clustered at the state level. Control counties are counties with at least one military base reported in base structural report in 2005, the last report published prior to the 2005 BRAC. Estimates are unweighted.

Table 1: Summary Statistics

Variable	N	Mean	S.D.
Panel A: Outcome Variables			
Employment	5,370	127,161	199,438
per Capita Income	5,370	33,917	8,235
Employment: Construction Industry	5,163	7,630	11,854
Personal Income: Construction Industry	5,168	404,793	742,842
Number of Households: In-migration	5,449	5,429	7,879
Number of Individual: In-migration	5,449	10,072	14,219
Number of Households: Out-migration	5,449	5,334	7,840
Number of Individuals: Out-migration	5,449	9,941	14,476
Panel B: Control Variables			
Population	5,370	214,354	32,6572
Percentage of Females	5,370	0.504	0.020
Percentage of Hispanics	5,370	0.093	0.136
Percentage of African Americans	5,370	0.105	0.136
Number of Personnel	4,108	2,654	7,809

Note: The sample includes counties receiving the construction funding and counties with at least one military base reported in 2005 Base Structure Report.

Table 2: Estimated Effects of 2005 BRAC Construction Funding on Local Economic Conditions

	(1)	(2)	(3)	(4)
Panel A: Log(Employment)				
BRAC Funding per Capita ($1,000s)	0.036***	0.038***	0.030**	0.033***
	(0.007)	(0.007)	(0.013)	(0.009)
N	5,370	5,370	5,370	5,370
Panel B: Log(Per Capita Income)				
BRAC Funding per Capita ($1,000s)	0.056***	0.050**	0.045***	0.038***
	(0.019)	(0.020)	(0.011)	(0.012)
N	5,370	5,370	5,370	5,370
Cost per Job	57,563	54,533	69,075	64,795
Income Multiplier	1.79	1.59	1.44	1.21
Controls	No	Yes	No	Yes
State-by-Year Fixed Effect	No	No	Yes	Yes

Note: *** p<0.01, ** p<0.05, * p<0.1 All regressions include county and year fixed effects. County-level controls include population, percentage of female, Hispanics and African Americans. Standard errors are clustered at the state level. Control counties are counties with at least one military base reported in base structural report in 2005, the last report published prior to the 2005 BRAC. Estimates are unweighted. The cost per job is calculated as $\frac{\$1{,}000 \times \text{pre-funding average of population size for funded counties}}{\text{estimated percentage change} \times \text{pre-funding average of employment for funded counties}}$ and the local fiscal multiplier is calculated as $\frac{\text{estimated percentage change} \times \text{pre-funding average of per capita income for funded counties}}{\$1{,}000}$.

Table 3: Estimated Effects of 2005 BRAC Construction Funding on the Construction Industry

	(1)	(2)	(3)	(4)
Panel A: Log(Employment)				
Annual BRAC Funding per Capita	0.139***	0.138***	0.111***	0.108***
	(0.027)	(0.024)	(0.036)	(0.033)
Observations	5,163	5,163	5,163	5,163
Panel B: Log(Personal Income)				
Annual BRAC Funding per Capita	0.203***	0.202***	0.142**	0.138***
	(0.038)	(0.036)	(0.053)	(0.049)
N	5,168	5,168	5,168	5,168
Controls	No	Yes	No	Yes
State-by-Year Fixed Effect	No	No	Yes	Yes

Note: *** $p<0.01$, ** $p<0.05$, * $p<0.1$. All regressions include county and year fixed effects. County-level controls include population, percentage of female, Hispanics and African Americans. Standard errors are clustered at the state level. Control counties are counties with at least one military base reported in base structural report in 2005, the last report published prior to the 2005 BRAC. Estimates are unweighted.

Table 4: Estimated Effects of 2005 BRAC Construction Funding on Local Economic Conditions, Restricting Analysis to Funded Counties

	(1)	(2)	(3)	(4)
Panel A: Log(Employment)				
BRAC Funding per Capita ($1,000s)	0.026***	0.030***	0.029**	0.034***
	(0.009)	(0.007)	(0.015)	(0.008)
N	1,250	1,250	1,250	1,250
Panel B: Log(Per Capita Income)				
BRAC Funding per Capita ($1,000s)	0.057***	0.048**	0.049***	0.039***
	(0.021)	(0.018)	(0.010)	(0.007)
N	1,250	1,250	1,250	1,250
Cost per Job	79,701	69,075	71,457	60,948
Income Multiplier	1.82	1.53	1.56	1.24
Controls	No	Yes	No	Yes
State-by-Year Fixed Effect	No	No	Yes	Yes

Note: *** $p<0.01$, ** $p<0.05$, * $p<0.1$ These estimates utilize variation in the timing and amount of funding awarded within funded counties to estimate the results. All regressions include county and year fixed effects. County-level controls include population, percentage of female, Hispanics and African Americans. Standard errors are clustered at the state level. Estimates are unweighted. The cost per job is calculated as $\frac{\$1{,}000 \times \text{pre-funding average of population size for funded counties}}{\text{estimated percentage change} \times \text{pre-funding average of employment for funded counties}}$ and the local fiscal multiplier is calculated as $\frac{\text{estimated percentage change} \times \text{pre-funding average of per capita income for funded counties}}{\$1{,}000}$.

Table 5: Estimated Effects of 2005 BRAC Construction Funding on Local Economic Conditions: Omitting States linked to the 2005 BRAC Commission

	(1)	(2)	(3)	(4)
Panel A: Log(Employment)				
BRAC Funding per Capita ($1,000s)	0.032***	0.031***	0.034***	0.035***
	(0.008)	(0.006)	(0.010)	(0.008)
N	3,390	3,390	3,390	3,390
Panel B: Log(Per Capita Income)				
BRAC Funding per Capita ($1,000s)	0.050**	0.042**	0.045***	0.036***
	(0.019)	(0.018)	(0.013)	(0.013)
N	3,390	3,390	3,390	3,390
Cost per Job	70,637	72,915	66,482	64,582
Income Multiplier	1.65	1.39	1.49	1.19
Controls	No	Yes	No	Yes
State-by-Year Fixed Effect	No	No	Yes	Yes

Note: *** p<0.01, ** p<0.05, * p<0.1 All regressions include county and year fixed effects. County-level controls include population, percentage of female, Hispanics and African Americans. Standard errors are clustered at the state level. Control counties are counties with at least one military base reported in base structural report in 2005, the last report published prior to the 2005 BRAC. Estimates are unweighted. Counties in state linked to the 2005 BRAC Commission are dropped from the analysis. The cost per job is calculated as $\frac{\$1{,}000\times\text{pre-funding average of population size for funded counties}}{\text{estimated percentage change}\times\text{pre-funding average of employment for funded counties}}$ and the local fiscal multiplier is calculated as $\frac{\text{estimated percentage change}\times\text{pre-funding average of per capita income for funded counties}}{\$1{,}000}$.

Table 6: Are the Estimated Effects Driven by Personnel Relocation?

	(1)	(2)	(3)	(4)
Panel A: Log(Employment)				
BRAC Funding per Capita ($1,000s)	0.037***	0.038***	0.038***	0.038***
	(0.007)	(0.007)	(0.008)	(0.007)
Logged(Personnel)	-0.001	-0.002	-0.002	-0.003
	(0.002)	(0.001)	(0.002)	(0.002)
N	4,108	4,108	4,108	4,108
Panel B: Log(Per Capita Income)				
BRAC Funding per Capita ($1,000s)	0.052***	0.045**	0.044***	0.037***
	(0.018)	(0.018)	(0.012)	(0.013)
Logged(Personnel)	0.002	0.002	0.002	0.002
	(0.002)	(0.001)	(0.002)	(0.002)
N	4,108	4,108	4,108	4,108
Cost per job	58,710	57,166	57,166	57,166
Income Multiplier	1.70	1.47	1.44	1.21
Controls	No	Yes	No	Yes
State-by-Year Fixed Effect	No	No	Yes	Yes

Note: *** p<0.01, ** p<0.05, * p<0.1 All regressions include county and year fixed effects. County-level controls include population, percentage of female, Hispanics and African Americans, and natural log of military personnel counts. Standard errors are clustered at the state level. Control counties are counties with at least one military base reported in base structural report in 2005, the last report published prior to the 2005 BRAC. Estimates are unweighted. The cost per job is calculated as $\frac{\$1{,}000 \times \text{pre-funding average of population size for funded counties}}{\text{estimated percentage change} \times \text{pre-funding average of employment for funded counties}}$ and the local fiscal multiplier is calculated as $\frac{\text{estimated percentage change} \times \text{pre-funding average of per capita income for funded counties}}{\$1{,}000}$.

Table 7: Estimated Effects of 2005 BRAC Construction Funding on Local Economic Conditions: High vs Low Unemployment Rate Counties

Panel A: High Unemployment Rate

	(1)	(2)	(3)	(4)
Panel A1: Log(Employment)				
BRAC Funding per Capita ($1,000s)	0.032***	0.031***	0.029*	0.030**
	(0.006)	(0.005)	(0.015)	(0.012)
N	4,750	4,750	4,750	4,750
Panel A2: Log(Per Capita Income)				
BRAC Funding per Capita ($1,000s)	0.058**	0.048**	0.047***	0.038***
	(0.023)	(0.021)	(0.014)	(0.013)
N	4,750	4,750	4,750	4,750
Cost per Job	70,660	72,939	77,968	75,371
Income Multiplier	1.72	1.42	1.39	1.12

Panel B: Low Unemployment Rate

Panel B1: Log(Employment)				
BRAC Funding per Capita ($1,000s)	0.074**	0.089***	0.052*	0.063***
	(0.032)	(0.027)	(0.028)	(0.022)
N	4,740	4,740	4,740	4,740
Panel B2: Log(Per Capita Income)				
BRAC Funding per Capita ($1,000s)	0.036	0.060*	0.025	0.029
	(0.033)	(0.033)	(0.015)	(0.018)
N	4,740	4,740	4,740	4,740
Cost per Job	25,931	21,561	36,903	30,459
Income Multiplier	1.23	2.06	0.86	0.99
Controls	No	Yes	No	Yes
State-by-Year Fixed Effect	No	No	Yes	Yes

Note: *** p<0.01, ** p<0.05, * p<0.1 . Data on migration pattern are from IRS county migration data. All regressions include county and year fixed effects. County-level controls include population, percentage of female, Hispanics and African Americans. Standard errors are clustered at the state level. Control counties are counties with at least one military base reported in base structural report in 2005, the last report published prior to the 2005 BRAC. Estimates are unweighted. The cost per job is calculated as $\frac{\$1{,}000 \times \text{pre-funding average of population size for funded counties}}{\text{estimated percentage change} \times \text{pre-funding average of employment for funded counties}}$ and the local fiscal multiplier is calculated as $\frac{\text{estimated percentage change} \times \text{pre-funding average of per capita income for funded counties}}{\$1{,}000}$.

Table 8: Spillover Effects of 2005 BRAC Construction Funding on Neighboring Counties

	(1)	(2)	(3)	(4)
Panel A: Log(Employment)				
BRAC Funding per Capita ($1,000s)	-0.001	0.000	-0.008	-0.006
	(0.010)	(0.010)	(0.006)	(0.006)
N	24,010	24,010	24,010	24,010
Panel B: Log(Per Capita Income)				
BRAC Funding per Capita ($1,000s)	0.013	0.012	0.012	0.010
	(0.012)	(0.012)	(0.009)	(0.008)
N	24,010	24,010	24,010	24,010
Controls	No	Yes	No	Yes
State-by-Year Fixed Effect	No	No	Yes	Yes

Note: *** p<0.01, ** p<0.05, * p<0.1 . All regressions include county and year fixed effects. County-level controls include population, percentage of female, Hispanics and African Americans. Standard errors are clustered at the state level. Control counties are counties with at least one military base reported in base structural report in 2005, the last report published prior to the 2005 BRAC. Estimates are unweighted. Nearby counties are selected according to highway distance.

Table 9: Spillover Effects of 2005 BRAC Construction Funding on Construction Industry

	(1)	(2)	(3)	(4)
Panel A: Log(Employment)				
BRAC Funding per Capita ($1,000s)	0.033	0.031	0.030**	0.031**
	(0.021)	(0.020)	(0.014)	(0.013)
N	21,951	21,951	21,951	21,951
Panel B: Log(Personal Income)				
BRAC Funding per Capita ($1,000s)	0.048	0.045	0.030	0.031
	(0.039)	(0.038)	(0.028)	(0.027)
N	21,951	21,951	21,951	21,951
Controls	No	Yes	No	Yes
State-by-Year Fixed Effect	No	No	Yes	Yes

Note: *** p<0.01, ** p<0.05, * p<0.1 . All regressions include county and year fixed effects. County-level controls include population, percentage of female, Hispanics and African Americans. Standard errors are clustered at the state level. Control counties are counties with at least one military base reported in base structural report in 2005, the last report published prior to the 2005 BRAC. Estimates are unweighted. Nearby counties are selected according to highway distance.

Table 10: Estimated Effects of 2005 BRAC Construction Funding on Migration

Panel A: Inflow

	(1)	(2)	(3)	(4)
Panel A1: Log(Households)				
BRAC Funding per Capita ($1,000s)	0.075***	0.074***	0.057*	0.060**
	(0.028)	(0.025)	(0.033)	(0.029)
N	5,369	5,369	5,369	5,369
Panel A2: Log(Individuals)				
BRAC Funding per Capita ($1,000s)	0.084**	0.080***	0.065*	0.067**
	(0.032)	(0.028)	(0.036)	(0.032)
N	5,369	5,369	5,369	5,369

Panel B: Outflow

Panel B1: Log(Households)				
BRAC Funding per Capita ($1,000s)	0.023	0.029	0.022	0.028
	(0.022)	(0.020)	(0.025)	(0.023)
N	5,369	5,369	5,369	5,369
Panel B2: Log(Individuals)				
BRAC Funding per Capita ($1,000s)	0.027	0.031	0.028	0.033
	(0.024)	(0.022)	(0.028)	(0.025)
N	5,369	5,369	5,369	5,369
Controls	No	Yes	No	Yes
State-by-Year Fixed Effect	No	No	Yes	Yes

Note: *** p<0.01, ** p<0.05, * p<0.1 . Data on migration pattern are from IRS county migration data. All regressions include county and year fixed effects. County-level controls include population, percentage of female, Hispanics and African Americans. Standard errors are clustered at the state level. Control counties are counties with at least one military base reported in base structural report in 2005, the last report published prior to the 2005 BRAC. Estimates are unweighted.

Table 11: Spillover Effects of 2005 BRAC Construction Funding on Migration for Neighboring Counties

Panel A: Inflow

	(1)	(2)	(3)	(4)
Panel A1: Log(Households)				
BRAC Funding per Capita ($1,000s)	0.026**	0.023*	0.017*	0.017*
	(0.012)	(0.013)	(0.010)	(0.009)
N	23,980	23,980	23,980	23,980
Panel A2: Log(Individuals)				
BRAC Funding per Capita ($1,000s)	0.035**	0.031**	0.026**	0.025**
	(0.014)	(0.015)	(0.013)	(0.012)
N	23,980	23,980	23,980	23,980

Panel B: Outflow

Panel B1: Log(Households)				
BRAC Funding per Capita ($1,000s)	0.012	0.014	-0.002	0.002
	(0.010)	(0.010)	(0.013)	(0.012)
N	24,078	24,078	24,078	24,078
Panel B2: Log(Individuals)				
BRAC Funding per Capita ($1,000s)	0.016	0.016	-0.000	0.003
	(0.012)	(0.012)	(0.015)	(0.015)
N	24,078	24,078	24,078	24,078
Controls	No	Yes	No	Yes
State-by-Year Fixed Effect	No	No	Yes	Yes

Note: *** p<0.01, ** p<0.05, * p<0.1 . Data on migration pattern are from IRS county migration data. All regressions include county and year fixed effects. County-level controls include population, percentage of female, Hispanics and African Americans. Standard errors are clustered at the state level. Control counties are counties with at least one military base reported in base structural report in 2005, the last report published prior to the 2005 BRAC. Estimates are unweighted.

Appendix A.1: Selection Criteria

In selecting military installations for closure or realignment, the Department of Defense, giving priority consideration to military values, the first four criteria listed below, will consider:

Military Value

1. The current and future mission capabilities and the impact on operational readiness of total force of the Department of Defense, including the impact on joint warfighting, training, and readiness.

2. The availability and condition of land, facilities, and associated airspace (including training areas suitable for maneuver by ground, naval, or air forces throughout a diversity of climate and terrain areas and staging areas for the use of the Armed Forces in homeland defense missions) at both existing and potential receiving locations.

3. The ability to accommodate contingency, mobilization, surge, and future total force requirements at both existing and potential receiving locations to support operations and training.

4. The cost of operations and the manpower implications.

Other Considerations

5. The extent and timing of potential costs and savings, including the number of years, beginning with the date of completion of the closure or realignment, for the savings to exceed the costs.

6. The economic impact on existing communities in the vicinity of military installations.

7. The ability of the infrastructure of both the existing and potential receiving communities to support forces, missions, and personnel.

8. The environmental impact, including the impact of costs related to potential environmental restoration, waste management, and environmental compliance activities.

Appendix A.2: Additional Figures and Tables

Table A1: Estimated Effects of 2005 BRAC Construction Funding on Local Economic Conditions, Alternative Construction of per Capita Funding

	(1)	(2)	(3)	(4)
Panel A: Log(Employment)				
BRAC Funding per Capita ($1,000s)	0.037***	0.041***	0.030*	0.033**
	(0.009)	(0.008)	(0.017)	(0.014)
N	5,370	5,370	5,370	5,370
Panel B: Log(Per Capita Income)				
BRAC Funding per Capita ($1,000s)	0.073***	0.074***	0.058***	0.058***
	(0.012)	(0.010)	(0.021)	(0.018)
N	5,370	5,370	5,370	5,370
Cost per Job	56,007	50,543	69,075	62,796
Income Multiplier	2.33	2.36	1.85	1.85
Controls	No	Yes	No	Yes
State-by-Year Fixed Effect	No	No	Yes	Yes

Note: *** p<0.01, ** p<0.05, * p<0.1 All regressions include county and year fixed effects. County-level controls include population, percentage of female, Hispanics and African Americans. Standard errors are clustered at the state level. Control counties are counties with at least one military base reported in base structural report in 2005, the last report published prior to the 2005 BRAC. Estimates are unweighted. $\overline{perCapitaFunding_{it}}$ equals to zero prior to the receipt of any funding for county i and equals to $\frac{\overline{Funding_{it}}}{Population_{it}}$ for years after the first year of funding receipt. The cost per job is calculated as $\frac{\$1,000 \times \text{pre-funding average of population size for funded counties}}{\text{estimated percentage change} \times \text{pre-funding average of employment for funded counties}}$ and the local fiscal multiplier is calculated as $\frac{\text{estimated percentage change} \times \text{pre-funding average of per capita income for funded counties}}{\$1,000}$.

Table A2: Estimated Effects of 2005 BRAC Construction Funding on Local Economic Conditions: Alternative Assumption on Spending Pattern

	(1)	(2)	(3)	(4)
Panel A: Log(Employment)				
BRAC Funding per Capita ($1,000s)	0.033***	0.034***	0.028**	0.031***
	(0.006)	(0.005)	(0.011)	(0.008)
N	5,370	5,370	5,370	5,370
Panel B: Log(Per Capita Income)				
BRAC Funding per Capita ($1,000s)	0.042***	0.038**	0.036***	0.031***
	(0.015)	(0.016)	(0.009)	(0.010)
N	5,370	5,370	5,370	5,370
Cost per Job	62,795	60,949	74,009	66,847
Income Multiplier	1.34	1.21	1.15	0.99
Controls	No	Yes	No	Yes
State-by-Year Fixed Effect	No	No	Yes	Yes

Note: *** p<0.01, ** p<0.05, * p<0.1 All regressions include county and year fixed effects. County-level controls include population, percentage of female, Hispanics and African Americans. Standard errors are clustered at the state level. Control counties are counties with at least one military base reported in base structural report in 2005, the last report published prior to the 2005 BRAC. Estimates are unweighted. Assume each individual funding awarded to a county at a given year is spent equally between that year and 2011. For instance, County A receive M million dollars in 2008 and N million dollars in 2010, so the spending for County A would be $\frac{M}{4}$ million dollars in 2008 and 2009, and $\frac{M}{4} + \frac{N}{2}$ million dollars in 2010 and 2011. The cost per job is calculated as $\frac{\$1{,}000 \times \text{pre-funding average of population size for funded counties}}{\text{estimated percentage change} \times \text{pre-funding average of employment for funded counties}}$ and the local fiscal multiplier is calculated as $\frac{\text{estimated percentage change} \times \text{pre-funding average of per capita income for funded counties}}{\$1{,}000}$.

Table A3: Estimated Effects of 2005 BRAC Construction Funding on Other Measures of Local Economic Conditions

Panel A: Log(Average Wage)				
BRAC Funding per Capita ($1,000s)	0.061***	0.059***	0.054***	0.052***
	(0.007)	(0.007)	(0.005)	(0.004)
N	5,370	5,370	5,370	5,370
Panel B: Log(Unemployment Rate)				
BRAC Funding per Capita ($1,000s)	-0.047*	-0.049**	-0.005	-0.008
	(0.025)	(0.023)	(0.010)	(0.010)
N	63,745	62,809	63,745	62,809
Panel C: Log(Population)				
BRAC Funding per Capita ($1,000s)	0.013	0.014	0.012	0.017
	(0.019)	(0.019)	(0.022)	(0.023)
N	5,370	5,370	5,370	5,370
Panel C: Log(Average Monthly Employment)				
BRAC Funding per Capita ($1,000s)	0.040***	0.045***	0.034***	0.039***
	(0.008)	(0.007)	(0.011)	(0.009)
N	21,255	20,943	21,255	20,943
Controls	No	Yes	No	Yes
State-by-Year Fixed Effect	No	No	Yes	Yes

Note: *** p<0.01, ** p<0.05, * p<0.1 . Information on average wage and population are taken from BEA's REIS. Data on unemployment rate are from BLS. Control variables include population, percentage of female, percentage of African Americans and percentage of Hispanics. Standard errors are clustered at the state level. Estimates are unweighted.