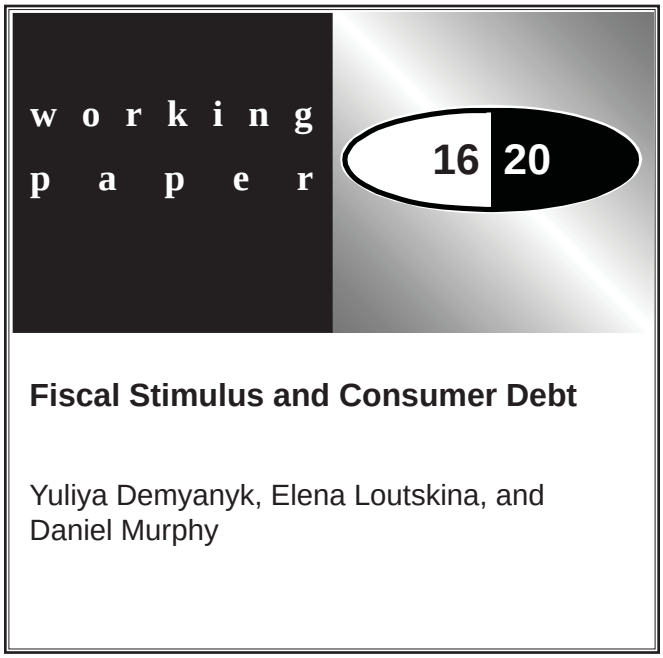

Fiscal Stimulus and Consumer Debt

Yuliya Demyanyk, Elena Loutskina, and
Daniel Murphy

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Fiscal Stimulus and Consumer Debt

Yuliya Demyanyk, Elena Loutskina, and Daniel Murphy

In the aftermath of consumer debt–induced recession, policymakers have questioned whether fiscal stimulus is effective during the periods of high consumer indebtedness. This study empirically investigates this question. Using detailed data on Department of Defense spending for the 2006–2009 period, we document that the open-economy relative fiscal multiplier is higher in geographies with higher consumer indebtedness. The results suggest that fiscal policy can mitigate the adverse effect of consumer (over)leverage on real economic output during a recession. We then exploit detailed microdata to evaluate aggregate demand and aggregate supply-side economic mechanisms potentially underlying this result.

JEL Classification: E62, E21, E32, E44, H56, H57.

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1. Introduction

The Great Recession illustrates the importance of consumer balance sheets during an economic downturn. A number of academic studies document that accumulation of debt by consumers set the stage for the 2007 crisis (see, e.g., Mian and Sufi, 2011). Debt overhang also slowed economic recovery (Mian, Rao, and Sufi, 2013; Mian and Sufi, 2015). In such an environment, both fiscal and monetary authorities face the challenge of designing a proper policy response, particularly because high consumer debt balances are frequently invoked to question the efficacy of expansionary fiscal policy. After all, Ricardian equivalence (Barro, 1974) implies that government spending only increases the effective debt burden of already overlevered consumers. "You cannot solve a problem created by debt by running up even more debt, say the critics," (Eggertsson and Krugman, 2012).

In this paper, we empirically investigate whether expansionary fiscal stimulus is effective during a consumer-debt-overhang-induced recession. Using transaction-level data on Department of Defense (DOD) spending during the 2007–2009 recessionary period, we document that the open-economy relative fiscal multiplier is higher in geographies with higher pre-recession consumer indebtedness. We then present evidence suggesting that both aggregate demand and aggregate supply-side economic mechanisms likely contribute to the debt-dependent multiplier.

Academic literature has long acknowledged the adverse effects of debt in a recession (Fisher, 1933; Minsky, 1988). After all, the 2008 crisis is not the only economic downturn accompanied by high consumer indebtedness. Japan's Lost Decade and the Great Depression are notable examples (Schularick and Taylor, 2012). However, only since the 2008 crisis has the theoretical literature explored optimal policy in a setting where the distribution of debt across heterogenous households can affect aggregate output (e.g., Eggertsson and Krugman, 2012; Guerreri and Lorenzoni, 2010). The *empirical* studies investigating this question are even more scarce.[2] This paper attempts to fill the void by documenting how the geographic heterogeneity in

[2] We are aware of only one empirical study exploring whether fiscal multiplier varies with private debt: Bernardini and Peersman (2015).

pre-recession consumer leverage affects the open-economy relative fiscal multiplier advocated by Nakamura and Steinsson (2014).[3]

To explore the heterogeneity in the open-economy relative fiscal multiplier (henceforth referred to as fiscal multiplier or DOD spending multiplier), we utilize new detailed data on DOD spending available from 2000 to 2014. This publicly available data includes information about contract-level DOD spending, from $25 disbursements to almost $32 billion military procurements. We observe the start and end date of the contracts, the primary contractor locations, and the ZIP codes in which the majority of the work is performed. We validate these DOD spending data by replicating the empirical experiment of Nakamura and Steinsson (2014), who use state-level DOD spending data and a Bartik-style instrument to estimate a state-level open-economy fiscal multiplier of about 1.4. While our sample period is much shorter, we find a state-level GDP multiplier of a similar magnitude to the multiplier documented by Nakamura and Steinsson (2014).

The state-level granularity, however, is too coarse to explore the effects of consumer leverage on economic growth. We augment the state-level results and estimate the DOD spending multiplier at different levels of geographic granularity (county, Core Based Statistical Areas [CBSAs], and state). The resulting estimates of fiscal multipliers are positive, statistically significant, and increase with the size of the geographic unit: the county-level multiplier is about 0.06 and the CBSA-level multiplier reaches 0.63. This is consistent with the notion that the effect of local DOD spending often extends beyond counties or CBSAs where government contractors reside. In the rest of the paper, we adopt the CBSA-level analysis since CBSAs are big enough to capture meaningful variation in DOD spending, yet not too big to lose meaningful variation in consumer leverage.

Armed with the validated DOD spending data, we turn to the core question of the paper and document that the post-crisis fiscal multiplier increases with local pre-recession consumer leverage. Specifically, we combine the empirical approaches of Mian and Sufi (2015) and Nakamura and Steinsson (2014) and implement an *instrumental variable* analysis that evaluates

[3] The relative open-economy multiplier is especially relevant in our context since we are interested in whether government spending is relatively more effective when consumer debt is relatively high.

the effects of pre-recession consumer debt-to-income ratios and increases in DOD spending from 2007 to 2009 on changes in real economic output over the same period.

The results suggest that the DOD spending multipliers are higher in CBSAs with higher pre-recession consumer debt-to-income ratios. The marginal effect is significant: the difference in the multiplier between the 75th and 25th percentiles of the consumer-leverage distribution is about the same as the average CBSA fiscal multiplier. The evidence also implies that expansionary fiscal stimulus can mitigate the adverse effects of consumer debt overhang on economic growth: one percentage point increase in government spending relative to local income can mitigate the adverse effects of consumer indebtedness by about 16%.

While it is important to know whether fiscal stimulus is effective during a consumer-debt-overhang-induced recession, it is no less important to understand what economic mechanisms contribute to the heterogeneity in the fiscal multiplier. Existing economic literature offers a number of channels through which government spending can affect real output. In these theories, the efficacy of fiscal stimulus depends on its net effect on aggregate demand and whether aggregate supply can accommodate any increases in aggregate demand.

Changes in *aggregate demand* are associated with changes in investment and consumption. Yet theories that rely on interest rate channels (e.g., Eggertsson 2010; Christiano, Eichenbaum and Rebelo, 2011) cannot explain our results since cities in the U.S. face identical interest rates. Similarly, our focus on defense spending rules out local public investment as a cause of heterogenous multipliers (Baxter and King, 1993). Our evidence is also inconsistent with arguments based on Ricardian equivalence (Barro, 1974). It is unlikely that current level of consumer leverage leads to *heterogeneous* effect on individual future *taxes*. The remaining demand-side channels rely on heterogeneity in the number and marginal propensity to consume (MPC) of credit-constrained hand-to-mouth consumers (e.g., Galí et al., 2007, Eggertsson and Krugman, 2012).

Eggertsson and Krugman (2012) present a Keynesian-style model in which agents with debt overhang are forced to delever; yet fiscal stimulus leads to more consumption by the credit-constrained agents due to their higher MPC out of income. Similar to Galí et al. (2007), Eggertsson and Krugman (2012) argue that debtors' consumption on the margin depends on the fiscal stimulus while non-debt-constrained agents' consumption is unaffected by additional income.

To evaluate this heterogeneous MPC hypothesis, we utilize two proxies to capture household consumption: (a) individual-level consumer credit card balances, and (b) county-level new car registrations following Mian and Sufi (2011).[4] The evidence offers support for debt-dependent multipliers being driven by debt-constrained households having higher MPC. We find that the credit card balances of consumers with higher pre-recession debt-to-income ratios respond positively to DOD spending as compared to credit card balances of consumers with lower pre-recession debt-to-income ratios. Similarly, car registrations in higher debt-to-income geographies respond more positively to an increase in DOD spending during the crisis period than car registrations in lower debt-to-income geographies.[5] Combined with the evidence that these purchases are unlikely to be funded via an increase in car loans, as well as the lack of evidence supporting a heterogeneous response in overall credit capacity, the results are consistent with the economic mechanism proposed by Eggertsson and Krugman (2012).

Aggregate supply constraints, however, can also lead to heterogeneous multipliers by counteracting the effect of increases in aggregate spending on output. Recent studies argue that differences in local economic slack may lead to differences in the extent to which local employment responds to government spending (see, e.g., Michaillat, 2012).[6] In the presence of excess capacity, fiscal stimulus is less likely to crowd out private-sector employment and thus should be more effective in stimulating the local economy. In the context of the 2008 recession, consumer debt overhang leads to consumption slumps and associated declines in local employment (Mian and Sufi, 2015). The resulting economic slack might contribute to the efficacy of fiscal stimulus and should manifest in a higher fiscal multiplier.

We empirically evaluate the validity of this channel by analyzing the growth of employment and wages in the sectors of the economy that do not directly benefit from local household spending but are potentially affected by local labor market conditions, such as the

[4] A wide set of prior literature exploits credit card balances to proxy for individual consumption levels. See, e.g., Mian, Rao, and Sufi (2013), Aaronson, Agarwal, and French (2012), Agarwal, Liu, and Souleles (2015).
[5] Notably, consistent with Mian and Sufi (2011), we find that car registration declines more in geographies with more levered households than in the geographies with lower household leverage.
[6] See Michaillat (2012) for a theory in which government spending increases labor-market tightness (job vacancies relative to job seekers) *less* in states of high unemployment, and Murphy (2015) for a theory in which demand stimulus removes excess capacity in goods markets without any crowding-out effects.

National Security and International Affairs sector (NAICS 9811).[7] Consistent with the notion that employment in national security does not depend on local-area spending, we find that pre-crisis consumer debt does not affect employment in this sector during the crisis. The positive effect of DOD spending on local employment in the national security sector, however, increases with the local consumer debt-to-income ratio. The dependence of this multiplier on pre-recession consumer indebtedness cannot be explained by any individual consumption-driven economic mechanisms.

Overall, our results suggest that fiscal policy is effective during consumer-debt-overhang-induced recessions. Both local economic slack and the high MPC of highly levered households contribute to higher open-economy DOD spending multipliers in CBSAs with higher pre-recession consumer leverage. Our results suggest that the ills of private debt can be mitigated by government spending: at least in the short term (two years are considered in this study), public debt is more effective in stimulating income and employment in areas of high consumer debt-to-income ratios.

This paper contributes to a number of strands of literature on fiscal policy and consumer behavior. First and foremost, we contribute to the debate about the efficacy of fiscal policy during consumer-debt-overhang-induced slumps. Inspired by the 2008 crisis, an emerging theoretical literature explores optimal policy during recessions that feature financial frictions and heterogeneous consumers (e.g., Hall, 2011; Curdia and Woodford, 2010, 2011; Guerreri and Lorenzoni, 2011; Eggertsson and Krugman, 2012). Bernardini and Peersman (2015) examine 1932–2014 U.S. time-series data in a vector autoregression (VAR) setting and document that fiscal multipliers are higher during times in which domestic nonfinancial private debt-to-GDP exceeds its trend. We augment this literature and offer new insights on the economic mechanisms potentially contributing to fiscal policy effectiveness in the environments analyzed by this growing theoretical literature.

Second, our evidence of a debt-dependent multiplier contributes to the empirical literature that estimates the impact of the fiscal policy on real output. We offer and validate new

[7] We cannot directly test the excess capacity channel since finding an exogenous measure of economic slack during a recession is challenging. The decline in unemployment in a given CBSA is endogenous to local real economic output and pre-recession unemployment is only weakly correlated with recession unemployment at the CBSA level.

granular data on DOD spending that allows us to estimate relative open-economy government-spending multipliers using a short time series. Our estimated multipliers are consistent in magnitudes with those based on U.S. cross-state evidence (Nakamura and Steinsson, 2014; Shoag, 2010). Effectively, our data and empirical approach allows us to estimate relative fiscal-spending multipliers that are potentially most relevant in the recent economic environment.

We add to an expanding literature on state-dependent multipliers. Much of this literature employs structural vector autoregressions (SVARs) and national aggregate statistics to evaluate whether fiscal policy is more effective in recessions than in expansions. The most recent empirical studies include Auerbach and Gorodnichenko (2012), Bachmann and Sims (2012), Ramey and Zubairy (2014, 2015), and Tagkalakis (2008). We explore this question via a cross-sectional U.S.-based analysis that utilizes local employment and income data. The cross-sectional nature of the analysis arguably allows us to isolate the effect of economic slack from the zero-lower-bound-interest-rate-driven explanations for higher fiscal multipliers during recessions. The granularity of the data employed allows us to offer additional insights into the mechanism responsible for state-dependent multipliers. We offer evidence consistent with the theoretical arguments behind the excess capacity channel (see, e.g., Michaillat, 2012; and Murphy, 2015).

Finally, a growing literature empirically evaluates consumer behavior in response to various forms of stimulus such as tax rebates (e.g., Shapiro and Slemrod 2003; Parker, Souleles, Johnson, and McClelland, 2013; Agarwal and Qian 2014; Agarwal, Liu, and Souleles, 2015), reductions in mortgage interest rates (Keys, Piskorski, Seru, and Yao, 2014), and government refinancing guarantees (Agarwal, Amromin, Chomsisengphet, Piskorski, Seru, and Yao, 2015). Many of these studies document that, in response to increases in their discretionary income, consumers increase their durable and nondurable purchases and finance this consumption in part by an increase in debt. The effect tends to be more pronounced among liquidity-constrained households, which is consistent with the higher-MPC hypothesis. We document that highly levered households tend to consume more in response to higher DOD spending as compared to less levered households.

The remainder of the paper proceeds as follows. Section 2 describes the data. Section 3 presents the results on the effects of debt on government-spending multipliers at the CBSA level. Section 4 presents the analysis of the response of consumer debt categories to fiscal stimulus.

2. Data and Sample Selection

1.1. Government-Spending Data

The core objective of this paper is to evaluate heterogeneity in the effect of government spending on the real economy across geographic regions with varied consumer leverage. Government spending data is crucial to evaluate this question. In this paper, we use the new database of DOD contracts available at USAspending.gov. This official government website contains detailed information on DOD contracts signed since 2000. The data is based on DD-350 and DD-1057 military procurement forms.[8] It covers purchases and obligated funds from $25 to multi-million dollar contracts. The database also offers information on amounts that were de-obligated and contracts that have been terminated, and the date of such termination.

Each observation in the dataset corresponds to a unique individual contract between the DOD and a prime contractor. One can observe the total contract amount (obligated funds) and the duration of the contract: from a minimum of one day in cases of outright purchase of readymade goods or services to more than a decade in cases of large military contracts (the latter of which account for less than 0.2% of contracts). Furthermore, we observe the location, industry, and tax characteristics of the prime contractor and, in most cases, information on the location(s) (ZIP codes) wherein the majority of the work was actually performed.

The DOD spending data is uniquely suited to evaluate our core question. DOD spending is the third-largest source of government spending (18% of the U.S. budget) after Social Security (25%) and Medicare/Medicaid (24%), and thus constitutes a significant force of fiscal stimulus during a recession. More importantly, DOD spending constitutes more than half of discretionary government spending. Not surprisingly, a number of studies in prior literature have exploited the aggregate DOD spending in evaluating the effect of fiscal policy on economic growth (Hall (2009), Barro and Redlick (2010), Fisher and Peters (2010), Ramey (2011), and Auerbach and Gorodnichenko (2012)).

We first build DOD spending variables based on DOD obligations—the total amount of new contracts signed—disregarding the maturity of the contracts and the timing of actual DOD

[8] Prior research has shown that DD-350 and DD-1057 spending covers in excess of 96% of total DOD spending and accounts for almost all of the time-series variation in DOD spending at the state-year level (Nakamura and Steinsson, 2014).

disbursements.[9] We isolate the location of the primary DOD contractor/supplier (county, CBSA, and state) and the timing of the contract. While we always observe the ZIP code of the primary contractor, the ZIP code in which the majority of the work was performed is available only for about 70% of contracts. If this information is missing, we use the location of the company as the location in which the work was performed. The location of the company matches the location in which the work was performed in more than 60% of the contracts for which we observe both locations. We also subtract de-obligations—a DOD contract with a negative contract amount. We build the measure of DOD obligations at different levels of geographic granularity by mapping the ZIP codes into county, CBSA, or state.

Since some of the hypotheses of the paper link fiscal spending and consumer behavior, we augment DOD obligations measurements with a proxy for actual DOD spending (disbursements). Arguably, in the presence of credit constraints, only actual government disbursements can affect consumption and/or the loan-repayment behavior of individual households. To build the spending proxy, we allocate the obligated amount of the contract equally across all months of the contract duration and then aggregate the monthly data into geographic spending estimates over considered periods of time. Since the vast majority of de-obligated contracts represent a terminated contract with no fund outlays, we remove de-obligations and matching original obligations that each de-obligation negates. Specifically, we match de-obligations with prior obligation contracts that have the same contractor ID, the same primary contractor ZIP code, and a dollar amount of the original contract within 0.5% of the de-obligated amount. In the case of a match, we consider both contracts null and void. This restriction removes 4.7% of contracts from the sample. We account for the remaining de-obligations as immediate negative outlays of funds.[10] For simplicity, through the rest of the paper, we refer to both DOD obligations and DOD spending as government spending.

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[9] Influential studies of fiscal stimulus focus on current fiscal outlays (e.g., Blanchard and Perotti, 2002; Auerbach and Gorodnichenko, 2012), although others note that current outlays ignore anticipation effects. In particular, Ramey (2011) argues that the present discounted value of spending, rather than current outlays, is the relevant measure of stimulus from the perspective of the neoclassical model. It is not clear a priori which measure is most relevant for household behavior. In the presence of heterogeneous workers and imperfect information, the anticipation effects associated with long-term spending commitments can be muted relative to the effects of perceptions of permanent income associated with current outlays (Murphy, 2015), consistent with our finding that current outlays have larger effects than new obligations.

[10] Ideally, we would like to isolate the actual amount spent for even partially completed contracts. One can argue that we can do so by allocating the difference between the original contract amount and the de-obligated amount

2.1. Real Economic Data

To build various measures of real economic growth, we exploit two datasets. First, we obtain aggregate wage-based income and employment data from the Quarterly Census of Employment and Wages (QCEW) dataset provided by the Bureau of Labor Statistics. The data allow us to build two core dependent variables—growth in income and growth in employment—across counties, CBSAs, and states, as well as across different industries. We exploit this feature of the data in our robustness tests. Second, we augment the employment and income data with CBSA-level GDP data from the Bureau of Economic Analysis (BEA). The data is available for only 372 CBSAs, which limits our ability to use the data in all our tests.

Alongside the aggregate economic indicators within a given geography, we conduct the analysis by sector of the economy. Specifically, we evaluate how tradable and nontradable sectors react to consumer indebtedness and fiscal stimulus. To do so, we separate industries into two respective categories. First, following Mian and Sufi (2012), we classify only the retail and restaurant sectors as nontradable; we also further exclude auto dealers and home furniture stores to obtain "strict nontradables" sector. Given that the response of purchases of durables to government stimulus is muted during a recession (Berger and Vavra, 2015), we expect that the more precisely defined nontradables will demonstrate a higher government-spending multiplier.

2.2. Measure of Consumer Indebtedness

The core independent variable of interest in this study is consumer indebtedness. To capture the leverage of individual consumers, we utilize the 2006 (and for robustness, 2007) consumer debt-to-income ratios offered by Mian, Rao, and Sufi (2012) at the county level. When appropriate, we aggregate this measure to larger economic geographies (CBSA or state) using population-weighted averages.

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over the period of time between the original contract date and the de-obligation date. Such an approach, however, is difficult to implement for two reasons. First, the data start in 2000, which prevents us from effectively filtering out de-obligations that are close to the sample start date. Second, despite the presence of unique contractor IDs, it is impossible to identify prior contracts that were de-obligated if the de-obligation amount is well below the original contract amount. We have conducted multiple empirical experiments in an attempt to account for de-obligations in full. While none of the approaches we implemented even closely achieves this goal, each produced similar core results of interest, leading us to conclude that not fully excluding de-obligations does not bias our analysis.

Using the pre-recession leverage offers a number of advantages in our setting. First, considering consumer leverage pre-recession mitigates the traditional reverse-causality concerns. It is highly unlikely that the depth of the economic downturn in the 2008–2009 period can affect the pre-determined consumer leverage in 2006 (2007). Second, the pre-crisis leverage is measurable at the start of the recession, making it an actionable measure for fiscal policymakers. However, the consumer leverage measure is not perfect. In contrast to the household net-worth shock introduced by Mian, Rao, and Sufi (2013), it does not fully capture the state of household balance sheets during the crisis. The decline in housing prices drastically affected the consumers' credit constraints and forced households to delever. We fully ignore the heterogeneity in consumer leverage stemming from differences in house price decline in the 2008–2009 period.

We intentionally abstain from using the household net worth shock advocated by Mian, Rao, and Sufi (2013), and Mian and Sufi (2015). While it better captures consumer leverage during the crisis, it is much harder to measure pre-crisis, and thus is impossible to use in designing a fiscal policy. It is also without question endogenous to local economic growth. In addition, recent literature questions if Saiz elasticity is a valid instrument for housing price changes (Davidoff, 2015). We argue that that simple pre-recession consumer-leverage ratios offer a robust and ex ante measurable way to account for the extent of consumer debt overhang during a recession.

2.3. Validating Government-Spending Data

Before we proceed with our analysis of the core question of the paper, we offer validation of the new data on DOD spending. Specifically, in this subsection, we report a baseline analysis of the open-economy fiscal multiplier using our new data and then compare the results to previous findings documented in the literature.

In our validation analysis, we combine empirical approaches from Mian and Sufi (2015) and Nakamura and Steinsson (2014), and implement two types of instrumental variable regressions. First, we implement a cross-sectional analysis of the effects of government spending on real economic output focused on the 2008–2009 recession.

$$\frac{Y_i^{Post} - Y_i^{Pre}}{Y_i^{Pre}} = \alpha + \beta_Y \frac{G_i^{Post} - G_i^{Pre}}{Y_i^{Pre}} + Controls_i + \epsilon_i, \qquad \textbf{(1)}$$

where Y_i^{Post} is 2009 income (employment or GDP) in the geography i, and Y_i^{Pre} is 2007 income (employment or GDP) in the geography i. Given that government spending in both 2008 and 2009 affected the local real economy in 2009, we consider growth in government spending over the 2008–2009 period by evaluating the increase in government spending from the 2006–2007 period (G_i^{Pre}) to the 2008–2009 period (G_i^{Post}).[11]

Second, to evaluate the robustness of the documented multipliers, we implement panel regression specifications similar to one reported by Nakamura and Steinson (2014):

$$\frac{Y_i^t - Y_i^{t-2}}{Y_i^{t-2}} = \alpha + \beta_Y \frac{G_i^t - G_i^{t-2}}{Y_i^{t-2}} + Controls_{i,t-2} + \alpha_i + \gamma_t + \epsilon_i \qquad \textbf{(2)}$$

In this analysis, we evaluate the relationship between year-to-year changes in real economic output and similarly timed changes in government spending. The sample covers annual data from 2002 to 2013. The panel-level analysis allows us to include geography and time-fixed effects.

In either analysis, to make the β_Y coefficient tractable, we normalize both the dependent variable (difference in real economic output) and the core variable of interest (difference in government spending) by the same pre-recession measure of economic output. Specifically, we normalize the change in government spending by the total income (in cases of income or employment regression specifications) or total GDP (in cases of GDP specifications). The coefficients β_{Income}, β_{Empl}, and β_{GDP} capture the government-spending multiplier for different real economic variables of interest.

To accommodate differences in industry structure across geographies, we control for the 2006 share of 19 different industries in local employment as reported by the Bureau of Labor Statistics. Following Mian and Sufi (2015), we also control for the pre-recession (2006) percentage of white people in the local population, median household income, the percentage of owner-occupied housing units, the percentage of the population that has earned less than a high school diploma, the percentage of the population that has not earned more than a high school diploma, the unemployment rate, the dummy for urban areas, and the poverty rate at respective geographic level.

[11] We conducted a battery of robustness tests and find our results robust to various definition of the recession period and DOD spending horizons. The results are available upon request.

It is likely that the allocation of DOD contracts is endogenous to local economic conditions. Politicians from more recession-prone or deeper-recession geographies might lobby larger DOD allocation for their constituencies. To address this endogeneity problem, we use the standard Bartik-style instrument approach proposed in Nakamura and Steinsson (2014):

$$\Delta G_i^{Instrument} = Average^{Pre}\left(\frac{G_{it}}{G_t}\right) * \frac{G^{Post} - G^{Pre}}{Y^{Pre}} \quad \textbf{(3)}$$

The instrument is the predicted change in government spending based on a location's average annual 2002–2014 share of national D government spending (G_{it}/G_t) and the total aggregate change in national government spending ($G^{Post} - G^{Pre}$) over a respective period of time (annual changes in case of panel-level analysis).[12] The instrument relies on the aggregate variation in government spending while eliminating the ability of the appropriation process to reallocate DOD spending in response to local economic conditions. Note that the instrument changes with each specification depending on (a) the normalization variable (income or GDP), and (b) whether the specification utilizes a DOD-obligations-based measure of government spending or a DOD-spending-based measure.

Table 1 presents summary statistics of our core variables of interest. Specifically, we report the growth in various characteristics between the 2006–2007 and 2008–2009 periods using CBSA-level aggregates. We find that over this period, consumer income declined on average by 0.91%. We observe significant heterogeneity, with some CBSAs experiencing declines in wages as high as 26%, and some growing at a 31% rate. The average change in defense spending as a fraction of pre-recession income is 1.1% with a standard deviation of 5%. On average, defense spending is 2.7% of CBSA income, with a standard deviation of 6.5%. The heterogeneity indicates that while for some CBSAs, DOD spending negligibly contributes to the local economy, the other CBSAs rather heavily depend on DOD spending.

Table 2 presents the first set of results that validate our data and empirical approach. Panel A reports cross-sectional IV analysis while Panel B reports the results of a panel IV

[12] We obtain qualitatively and quantitatively similar results if we exploit the average geography share of DOD spending using only pre-recession years (2000–2007) or DOD spending allocation shares as of 2006.

regression of the effect of DOD obligations and DOD spending on wage-based income growth from 2007 to 2009. We report the core coefficient of interest at county-, CBSA-, and state-level analysis. To eliminate unnecessary crowding in the table, we only report the core coefficient of interest from the first-stage regression as well as the Kleibergen-Paap LM test for weak instruments. Both statistics suggest that all regression specifications are well identified.

Table 2 offers a number of interesting findings. First, we observe that the multiplier coefficients are increasing with the size of the explored geography. The county-level multiplier, for example, is very statistically positive but economically small (0.04 to 0.09), while CBSA-level estimates are considerably larger, and state-level multiplier estimates exceed one. This can be attributed to the fact that our data report only contracts with prime contractors and do not capture the ability of said vendors to subcontract or hire employees across county or CBSA lines. With smaller, less-populous geographies, the government spending dissipates into other (potentially neighboring) geographic areas, thus diluting the magnitude of our estimates.[13] Consistently, the multipliers increase with the size of the geographical unit.

Second, the documented government multiplier exhibits higher magnitudes during a recession (Panel A) compared to the average effect across the 2002–2013 period (Panel B). This is consistent with fiscal stimulus having a larger effect during a recessionary period compared to periods of economic growth.[14]

Third, irrespective of the geographic unit considered and/or the level of analysis, the multiplier estimates based on DOD obligations and DOD spending are of similar magnitudes.

Finally, while admittedly lacking statistical power, the state-level estimates of open-economy multipliers are close in economic magnitude to those reported by recent studies of government-spending multipliers.[15] What is also important for our investigation is that the state-level estimates of above 1 correspond to CBSA-level multiplier estimates of 0.37 and county-level estimates of 0.08 for total income growth. Since the objective of this study is to evaluate the heterogeneity in the government-spending multiplier given local consumer indebtedness we conduct all future analysis at the CBSA level. On the one hand, the county level offers the best

[13] Only 41% of the contracts are implemented in the ZIP code where the primary contractor is located. 74% are implemented within the same state.
[14] See, for example, Auerbach and Gorodnichenko (2012), Bachmann and Sims (2012), Ramey and Zubairy (2015).
[15] See, for example, Blanchard and Perotti (2002); Hall (2009); Monacelli, Perotti, and Trigari (2010); Chodrow-Reich et al. (2012); and Nakamura and Steinsson (2014).

way to capture heterogeneity in consumer debt but prevent us from capturing an economically significant government-spending multiplier. On the other hand, state-level analysis best captures a meaningful government-spending multiplier, but is too coarse to capture meaningful variation in consumer indebtedness. The CBSA level offers a balanced approach.

With this observation in mind, we further validate our data and empirical approach by conducting a wide array of robustness tests at the CBSA level. Table 3 reports IV analysis using cross-section and panel data and various measures of local economic output: income growth, employment growth, and GDP growth. It shows that the government-spending multiplier for employment is 0.23 and below the income-based multiplier of 0.36. It further adds to the validity of our data and approach as government spending affects both wages and employment levels. While wage-based income captures both, the employment level only captures one dimension of this equation. The GDP multiplier is significantly larger, varying from 0.54 to 1.2, but is not precisely estimated. The latter can be attributed to the small number of CBSAs for which the GDP estimates are available.

Combined, Table 2 and Table 3 establish baseline estimates of open-economy multipliers at the CBSA level and confirm the validity of the new data on government spending in the context of evaluating the effect of fiscal stimulus on economic output.

3. Consumer Indebtedness and the Government-Spending Multiplier

3.1. CBSA-level Analysis and Results

Armed with validated data, we turn to the core question of this study. In this section, we investigate whether government spending can *mitigate* the adverse effects of consumer leverage on real economic growth or if it *becomes ineffective* when consumers are forced to delever. To disentangle these alternatives, we alter the baseline specification (1) by incorporating the effect of consumer debt pre-recession and allowing for a consumer-debt-dependent government-spending multiplier:

$$\frac{Y_i^{Post}-Y_i^{Pre}}{Y_i^{Pre}} = \alpha + \beta_1 \frac{G_i^{Post}-G_i^{Pre}}{Y_i^{Pre}} + \gamma DTI_i^{06} + \beta_2 \frac{G_i^{Post}-G_i^{Pre}}{Y_i^{Pre}} \times DTI_i^{06} + Controls_i + \epsilon_i, \qquad \textbf{(4)}$$

where DTI_i^{06} is the debt-to-income ratio in CBSA i in 2006.[16] Notably, DTI_i^{06} is predetermined and exogenous to the change in economic growth during the recessionary period. β_2 is a core coefficient of interest in this study. A positive coefficient estimate ($\beta_2 > 0$) would indicate that expansionary fiscal policy can mitigate the adverse effects of consumer debt overhang during a recession. $\beta_2 < 0$ would suggest that fiscal policy is less effective in areas with high consumer debt, and that policymakers cannot "cure (consumer) debt with government spending financed by more (public) debt."

Given the potential endogenous nature of government spending, we instrument both the direct effect of government spending as well as the interaction term of the change in government spending and debt-to-income ratio. Specifically, we employ two instruments: a Bartik instrument described in equation (3) as well as its interaction with the 2006 debt-to-income ratio.

Table 4 reports the results of this IV analysis for different measures of real economic output. Similar to Table 3, we control for local industry structure pre-recession and a wide set of pre-recession CBSA-level economic conditions.

The results suggest that government spending creates significantly more economic growth in areas with higher consumer leverage. We document a statistically significant and positive coefficient β_2 irrespective of the real economic variable considered: employment, income, or GDP. The effect is also economically significant. In case of income growth, a standard deviation increase in the debt-to-income ratio (0.6) is associated with a marginal effect on the DOD spending multiplier of 0.6 * 0.59 = 0.354, or about the average CBSA fiscal income multiplier (0.36).

One can also look at the economic significance from a perspective of fiscal stimulus being able to counteract the adverse effects of consumer debt overhang. The direct coefficient on consumer leverage is negative, very economically significant, and estimated rather precisely. These results are qualitatively and quantitatively consistent with Mian and Sufi (2015), who document that weakness in consumer balance sheets contributed to local economic slumps. In the case of income multipliers, our results suggests that a 1% increase in government spending will reduce the direct effect of consumer leverage by 0.006, or about 16% of the DTI coefficient of negative 0.033.

[16] The results are nearly identical using the average debt-to-income ratio between 2006 and 2007.

Table 5 summarizes the economic significance of the estimates documented in Table 4 by presenting the implied magnitudes of the government-spending multiplier for different levels of consumer debt and different measures of economic activity. The local income multiplier ranges from 0.22 at the 25th percentile of the debt distribution, to 0.60 (almost twice as large as the average) at the 75th percentile. The summary presented in Table 5 suggests that the consumer-leverage-driven heterogeneity in the open-economy fiscal multiplier is economically significant.

3.2. Falsification Tests

In our core results, we document the relationship between real economic growth and a combination of consumer indebtedness and government spending. It is possible that the relationship we document is purely spurious in nature and is not driven by recessionary pressure on consumers to delever. In this section, we conduct a falsification analysis by evaluating whether the government-spending multiplier also varies with consumer leverage during periods of economic boom.

Most of the theories of the effect of consumer leverage on economic growth in a recessionary environment (e.g., Eggertsson and Krugman, 2012) are based on the assumption that an economic decline leads to a discreet jump in the acceptable level of consumer leverage and thus makes a significant share of consumers credit constrained. In contrast, during periods of economic growth, leverage is not binding and deleveraging is not forced by the market. In fact, during periods of economic growth, higher consumer leverage is likely to contribute to economic growth as agents borrow against their future (expectedly higher) wages to finance their current consumption. In such an environment, individual consumption and employment are not constrained by the level of indebtedness. As such, finding a positive correlation between household leverage and the government-spending multiplier would suggest a spurious relationship that cannot be attributed to individual consumption, leverage, or credit constraints.

To evaluate this hypothesis, we implement a cross-sectional analysis following regression equation (4) during the period of economic growth between 2002 and 2005. Specifically, we use 2002 economic indicators as measures of pre-boom activity and 2004–2005 indicators as measures of (post-)boom activity. For consistency purposes, we conduct the analysis at the CBSA level and utilize the 2002 consumer debt-to-income ratio.

Table 6 presents the results. The average fiscal multiplier in the 2002–2005 period is nearly identical to the multiplier during the recession period for income and employment. The coefficients for GDP are larger than those reported in Table 4, above one, and precisely estimated. The coefficients on consumer leverage are positive and significant, consistent with debt stimulating economic growth during boom periods (see, e.g., Loutskina and Strahan, 2013). Yet we do not observe that consumer leverage affects the government-spending multiplier. If anything, high debt is associated with lower fiscal multipliers (although the estimates lack statistical significance), which may reflect the fact that the abundance of consumer debt and the associated increase in leverage reduces the importance of government spending in stimulating a local economy. Overall, the results presented in Table 6 allow us to credibly refute the hypothesis that the state-dependent multiplier we document is spurious in nature.

4. What Contributes to Heterogeneity in the Government-Spending Multiplier?

While it is important to know whether fiscal stimulus is effective during consumer-debt-overhang induced recessions, it is no less important to understand what economic mechanisms contribute to or drive the heterogeneity in the fiscal multiplier we document.

Existing economic literature offers a number of channels through which government spending can affect real output, as well as how this effect might be state dependent. In these theories, the efficacy of fiscal stimulus depends on its net effect on aggregate demand and whether aggregate supply can accommodate any increases in aggregate demand.

Changes in *aggregate demand* are associated with changes in investment and consumption. Private investments, for example, tend to respond to changes in interest rates associated with fiscal stimulus (see, e.g., Murphy and Walsh, 2016, for a review), as well as to changes in the expected future marginal product of capital caused by productive public investment (Baxter and King, 2003).

A number of studies document that fiscal stimulus can affect consumption. Some theories argue that it can *decrease* consumption through expectations of higher future taxes (the Ricardian equivalence channel discussed in Barro, 1974) and increases in real interest rates (Baxter and King, 1993). Others point to *increases* in consumption through increases in expected income (Murphy, 2015; Rendahl, 2015), presence of credit-constrained hand-to-mouth

consumers (e.g., Galí et al., 2007; Eggertsson and Krugman, 2012), or declines in the real interest rate (e.g., Eggertsson, 2010; Christiano, Eichenbaum, and Rebelo, 2011).

How do these theories inform the mechanisms that might be responsible for the debt-dependent multipliers we document? Theories that rely on interest-rate channels cannot explain the evidence presented in Table 4 since cities in the U.S. face identical interest rates. Similarly, our focus on defense spending rules out local public investment as a cause of heterogenous multipliers. Our evidence is also inconsistent with arguments based on Ricardian equivalence. It is unlikely that the current level of consumer leverage leads to a heterogeneous effect on individual future taxes. The remaining demand-side channels rely on heterogeneity in the number of credit-constrained hand-to-mouth consumers with unique MPC.

Counteracting the effect of increases in aggregate spending on output are *aggregate supply* constraints. In the simplest one-period Ricardian endowment economy, government spending causes a price increase such that private consumption declines one-for-one with government purchases. In the presence of sticky prices and/or other frictions in goods and labor markets that lead to excess capacity, government spending need not fully crowd out private spending, thus permitting output and income to increase in response to government spending.

Recent studies argue that differences in local economic slack may lead to differences in the extent to which local employment responds to government spending. According to theories from Michaillat (2012), Michaillat and Saez (2015), and Murphy (2016), employment is more responsive to demand stimulus when the economy has more excess capacity. How can supply constraints inform the dependence of local fiscal multipliers on local consumer debt? High debt may be associated with different levels of frictions that determine how supply responds to local fiscal stimulus. Mian and Sufi (2015), for example, document that household debt and associated net-worth shocks lead to local economic and employment declines in 2008–2009. Under these conditions, even holding fixed local private spending, local employment multipliers may be higher in areas with more debt overhang because those areas have more excess capacity.

Consistent with this discussion, in the following subsections, we discuss in detail and empirically evaluate potential aggregate demand and aggregate supply-side economic mechanisms that could contribute to a higher government-spending multiplier in geographies with higher consumer leverage pre-recession. In doing so, we exploit a wide array of microdata

from individual consumption and borrowing behavior captured by two credit bureaus to auto registration data provided by R.L. Polk.

4.1. Aggregate Demand Economic Mechanisms

We start our analysis by exploring whether heterogeneity in the MPC of high- and low-debt-to-income-ratio consumers might be a driving factor behind a higher government-spending multiplier. Eggertsson and Krugman (2012) present a Keynesian-style model that demonstrates the efficacy of expansionary fiscal policy in a debt-overhang-driven recession. In their model, the Ricardian equivalence does not hold. All consumers delever as they face a discrete shift in credit constraint. Yet consumption of credit-constrained consumers responds more to government stimulus since these consumers' spending depends on the margin on current income and not on expected future income. In contrasts, households that are not credit constrained exhibit consumption patterns that do not depend on a margin on the local fiscal stimulus. These differences in MPC lead to the debt-dependent fiscal stimulus multiplier. Similarly, Galí et al. (2007) present a model with hand-to-mouth consumers that dedicate all newly found income to consumption.

Empirical literature offers some support to debt-dependent MPC. It is well documented that households increase consumption after both permanent (Aaronson, Agarwal, and French, 2012) and transient (Agarwal, Liu, and Souleles, 2015) increases in wages. These studies also argue that the effects are more pronounced for individuals with high credit utilization rates (ratio of credit card balances to credit card limits), suggesting that consumers who are marginally credit constrained increase consumption more in response to an income shock.

We add to this stream of literature by exploring whether MPC is debt dependent. Such heterogeneity in MPC can lead to higher consumption responses to fiscal stimulus and, by extension, higher government-spending multipliers in areas with higher consumer leverage compared to those with relatively low consumer leverage. To evaluate the validity of the MPC-driven economic rationale for the debt-dependent multiplier, we turn to two sources of consumption data exploited in the prior literature: (a) individual credit card balances (see, e.g., Aaronson, Agarwal, and French, 2012; and Agarwal, Liu, and Souleles, 2015); and (b) auto purchases (Mian, Rao, and Sufi, 2013).

Credit Card Balances

We analyze the individual credit card balances provided by two credit bureaus. First, we utilize the anonymized TransUnion panel data provided by the Federal Reserve Bank of Cleveland. Second, we conduct a set of robustness tests using data from a second major credit bureau in the United States, Equifax, that was provided by the Federal Reserve Bank of New York's Consumer Credit Panel.

The *TransUnion* data cover a random sample of about 10 million individuals and is reported as of February of each year. The data offer a wide range of characteristics of consumers' financial behavior, including total consumer debt balances, credit card balances, foreclosures and delinquencies, etc. It also offers us consumer characteristics including credit score and the ZIP code of an individual's residence. About 67% of the individuals in the TransUnion sample have credit cards and 78% of those exhibit positive credit card balances. As reported by Survey of Consumer Finances, for individuals with credit card accounts, about 67% of their consumption is done via credit cards.

The TransUnion panel is uniquely fitted to evaluate our core question of interest since it reports *individual consumer income* modeled by TransUnion using a proprietary model. To our knowledge, no other dataset offers actual or estimated consumer income for a representative and geographically diverse set of individual consumers. To check the accuracy of the income measure from TransUnion, we aggregated individual-level data to the county level and correlated the resulting measure with county-level income reported by the BEA. The correlation coefficient is 68% and offers considerable confidence in TransUnion estimates.[17] Using the individual total debt balances and individual income, we can build one of the core variables of interest in this study—debt-to-income ratio—at the consumer-level *k*. Specifically, we use these characteristics to build DTI_k^{TU} as of February 2007.

Given the arguably imprecise nature of the individual-consumer-income estimates offered by TransUnion, we supplement the analysis by considering Equifax data. It lacks the information about an individual consumer's income, but still offers a wide range of consumer-credit-related information for a random 5% sample of individuals who have a social security number and a credit report (about 12 million consumers). To supplement this data, we follow

[17] Note that all credit bureaus report information only about individuals who have a social security number and a credit history, so the aggregate income of TransUnion consumers and that reported by and to the BEA are expected to differ.

Mian and Sufi (2009) and use IRS income data at the smallest geographic unit available—namely, ZIP code. We combine consumer-specific debt and average IRS income in the ZIP code in which the consumer resides to build individual consumer debt-to-income ratio, DTI_k^{Eq}, as of the end of 2006.

This approach admittedly is not free from criticism. One can argue that measuring individual consumer debt-to-income ratios using ZIP-code-level income is problematic, because a number of ZIP code residents might not be filing an IRS tax return for a variety of reasons. As such, the IRS average income for a particular ZIP code might exhibit downward bias relative to the true average income in a given geography. We believe, though, that consistency in the results across the different credit bureaus' data reported in Tables 7 through 11 should offer comfort.

To evaluate whether credit card balances increase more for debt-constrained consumers in response to government spending as compared to less debt-constrained consumers, we implement the following regression analysis:

$$Growth\ in\ Credit\ Card\ Balances_k = \beta_1\ DTI_k + \beta_2 DTI_k^* \times \Delta DOD\ Spending_j + CBSA_j + County\ Controls + \varepsilon_i \quad \textbf{(5)}$$

where growth in total credit card balances for an individual *k* is measured from the end of 2007 to the end of 2009 in case of Equifax and from February 2008 to February 2010 in case of TransUnion. While we would like to narrow the window and restrict our analysis to the period after the onset of the crisis in the third quarter of 2007 to the last quarter of 2009, the nature of the data does not offer us this flexibility. Consistently, DTI_k is measured as of the end of 2006 (February 2007) in case of Equifax (TransUnion). To be consistent with prior analysis, we exploit CBSA-level changes in government spending. CBSA fixed effects control for a wide set of local economic conditions during the recession. Note that the direct effect of government spending is absorbed by CBSA fixed effects.

While CBSA fixed effects and the fact that government spending is fully exogenous to individual household financial decisions mitigate potential endogeneity concerns, neither fully eliminates potential bias in the coefficients. Specifically, a negative correlation between

government spending and local income might create unobserved variable bias and push our coefficients of interest β_2 downward.[18] To eliminate the potential bias, (a) we instrument the interaction term in this regression using an interaction between our Bartik-style instrument and individual debt-to-income ratios; and (b) we demean the individual DTI within a CBSA before interacting it with government spending (DTI_i^*) (Balli and Sørensen, 2013).

Finally, similar to the prior analysis, we control for the county-level pre-recession percentage of white people in the local population, median household income, the percentage of owner-occupied housing units, the percentage of the population that has earned less than a high school diploma, the percentage of the population that has not earned more than a high school diploma, the unemployment rate, the dummy for urban areas, and the poverty rate. We winsorize the credit bureau data at a 1% level to eliminate the extreme observations, which are likely erroneous, though we find that this restriction only minimally affects our results.

Panel A of Table 8 reports the analysis using TransUnion data. For compatibility between TransUnion- and Equifax-based results and results presented in Tables 3−5 of this paper, we consider growth in total debt from Q4 of 2007 to Q4 of 2009. Specifically, $Growth\ in\ Debt_i$ is the change in total individual debt across all accounts from February 2008 to February 2010. We also consider two different measures of growth in consumer debt balances: (a) the log growth that discards information about consumers who have zero total debt and (b) the dollar change in respective debt variables normalized by individual consumer income in February 2008. Panel B reports results using Equifax data. Similar to the case of TransUnion, we consider both log growth in consumer debt balances as well as dollar difference normalized by pre-recession average IRS ZIP code income in 2006. For consistency, the debt-to-income ratio is measured as of the end of 2006 (February 2007, in the case of TransUnion).

The instrumental variable-regression specifications reported in Table 8 uniformly suggest that in response to DOD spending, consumers with higher levels of pre-recession leverage

[18] Consider an environment in which each CBSA has high-debt-to-income individuals and low-debt-to-income individuals where (1) high-debt-to-income individuals have a higher MPC, and (2) CBSA-level government spending responds positively to falling CBSA-level income. Now compare two CBSAs: CBSA I with falling aggregate income and an associated influx of government spending, and CBSA II with no change in income or government spending. The falling income in CBSA I negatively affects consumption for all consumers, but more so for high-debt-to-income consumers due to heterogeneous MPC. As such, we might observe that government spending adversely affects consumption due to its negative correlation with growth in local income.

increase their consumption more that households with lower levels of leverage. Notably, we observe that OLS coefficients are indeed downward biased, as they potentially capture the adverse effect of local income drops.

The magnitude of the coefficients of the interaction term with the change in DOD spending is significantly larger than the direct effect of pre-recession consumer leverage. Given that the standard deviation of government spending over this period is 5%, the results in column (2) suggest that a one-standard-deviation increase in government spending mitigates the adverse effect of leverage by about half (0.18 * 5% = 0.01, or about half of the direct DTI coefficient of 0.02).

These results are robust to a wide set of regression specifications, data sources used, and approaches to evaluate the credit card balances. Specifically, we implemented the following robustness checks and found qualitatively similar results with varying levels of statistical significance. First, we conducted the analysis for various subsets of consumers in an attempt to isolate individuals who are most likely to channel the majority of their consumption through credit card accounts: (a) only for individuals with at least one credit card account; and (b) only individuals who have positive credit card account balances in all reporting periods considered in our analysis. Second, we attempted to isolate individuals who do not face liquidity constraints in their credit card accounts. Specifically, we only considered individuals who exhibit credit card balances that are at least 10% below their credit card borrowing limit in every reporting period employed in our analysis. Finally, rather than considering change in credit card balances from the end of 2006 to the end of 2009, we evaluated the change in average (monthly) credit card balances from the 2005–2006 pre-recession period to the recession period of 2007–2009. This allows us to capture the cumulative change in consumption over the recession period. All the robustness tests offer results consistent with those reported in Table 8.

One can argue that Table 8 effectively suggests that incremental government spending entices households to *borrow* to finance additional consumption on average. So our evidence is more of a manifestation of relaxation of borrowing constraints rather than increased consumption. Notably, we are indifferent between the two explanations because any additional dollar of debt is financing consumption. Yet to explore the relaxation-of-borrowing-constraints story, we have implemented two types of analysis. First, we conducted the analysis presented in Table 8 for sub-groups of individuals in different credit score categories from the most-credit-

constrained sub-prime borrowers to the least-credit-constrained prime borrowers. Second, we evaluated aggregate consumer indebtedness and its response to DOD spending.

Table 9 reports the results of the seemingly unrelated IV regression, exploring whether our core coefficients of interest vary with individuals' pre-recession credit scores. Deep Subprime, Subprime, Near Prime, Prime, and Super-Prime categories correspond to TransUnion credit scores within the following respective ranges: [501,600], [601,700], [701,800], [801,900], [901,990].[19] Consistent with the idea that DOD spending relaxes credit constraints, we observe that DOD spending has the largest effects on high-debt-to-income consumers if they are also in the Deep Subprime credit score category—that is, the most-credit-constraint group. We observe the effect dissipating as we move to Subprime and Near Prime categories and it is virtually nonexistent economically or statistically in top credit score categories. The results suggest that DOD spending affects consumption of high-leverage consumers by relaxing their credit constraints.

How large is the effect of relaxation of credit constraints overall? Credit cards only represent the immediate, mostly nondurable consumption, and unsurprisingly constitute only 7% of overall consumer debt balances. Does government spending enhance high-leverage individuals' access to other forms of debt?

Table 10 reports the analysis of aggregate consumer indebtedness and its response to DOD spending following regression specification (5), where instead of growth in credit card balances we evaluate the growth in total debt balances. Irrespective of the credit bureau data we use, we find no evidence consistent with government spending relaxing the borrowing constraints of high-leverage households more than that of low-leverage households.

Notably, in Table 10, we also explore the effect of DOD spending on households' ability to continue servicing debt obligations. Specifically, in column (3) of Table 10, we evaluate the effect of debt-to-income ratios and DOD spending on consumers' propensity to be delinquent on any of their debt obligations. Specifically, the dependent variable in column (3) is a dummy equal to one if an individual had at least one account 90 days or more past due in the past 24

[19] In this table and the rest of the paper, we only present the results based on TransUnion data to eliminate crowding out the tables. The results based on Equifax data are quantitatively and qualitatively similar to those reported in Tables 9 through 11 and are available upon request.

months as of February 2010. The results suggest that DOD spending helps highly leveraged consumers to avoid delinquency more than consumers with lower leverage, and thus indirectly contributes to the local economic growth of geographies with more-leveraged consumers.

Overall, the analysis of individual credit card and aggregate debt accounts suggests that in response to DOD spending, highly leveraged individuals tend to consume more and continue to service their debt balances better.

Auto Registrations

It is possible that credit card balances do not fully or on average accurately capture household consumption behavior despite our best effort. Hence we also evaluate the ZIP-code–level auto registration data from R.L. Polk initially introduced in Mian, Rao, and Sufi (2013). These data are collected from new automobile registrations and provide information on the total number of new automobiles purchased in a given county-year. The address in the data is derived from registrations, so the county represents the county of a person who purchased the automobile, not that of the dealership.

The auto registration data offer a number of advantages to explore the heterogeneous-MPC hypothesis as a driving factor of debt-dependent multiplier. First and foremost, it captures actual consumption by households at a fairly granular ZIP code level. Second, we can combine the auto registrations with the credit bureau data to evaluate whether the new consumption was funded by debt by exploring the car loan balances.

Table 11 reports the results of the following two regressions:

$$Log\ Growth\ in\ Auto\ Registrations_z = \beta_1^{AR}\ DTI_z + \beta_2^{AR} DTI_z^* \times \Delta DOD\ Spending_j + CBSA_j + County\ Controls + \varepsilon_i \quad \textbf{(6a)}$$

and

$$Log\ Growth\ in\ Car\ Loans_k = \beta_1^{AL}\ DTI_k + \beta_2^{AL} DTI_k^* \times \Delta DOD\ Spending_j + CBSA_j + County\ Controls + \varepsilon_i \quad \textbf{(6b)}$$

where both growth in auto registrations at the ZIP code level and growth in auto loans at the individual level are measured from the end of 2007 to the end of 2009. We maintain the same set of controls as in previous empirical tests. Following Eggertsson and Krugman (2012), we should expect a higher consumption response from debt-constrained households in response to

government spending ($\beta_2^{AR} > 0$). This increase in consumption will not be funded by an increase in debt ($\beta_2^{AL} < 0 \; or = 0$).

Table 11 provides further support to the heterogeneous-MPC hypothesis advocated by Eggertsson and Krugman (2012). Highly levered consumers increase auto registrations in response to DOD spending as compared to less levered consumers. This increase in consumption is not funded with debt. Combined, Tables 10 and 11 offer some evidence that the debt-dependent DOD spending multiplier can be attributed to the higher MPC of debt-constrained households.

4.2. Aggregate Supply Economic Mechanisms

Recent theoretical work argues that demand stimulus might be more effective during high unemployment periods (e.g., Michaillat, 2012; Murphy, 2015). In Michaillat (2012), for example, the increase in government-sector employment increases labor-market tightness and can crowd out private employment, thus diminishing the impact of government spending on economic output. Yet during the periods of high slack in a local economy (high unemployment), the new government-spending-driven jobs have little influence on labor-market tightness, leading to weak crowding out of the private sector. Prior empirical literature documents that fiscal multipliers are higher in times of high unemployment (see, e.g., Auerbach and Gorodnichenko, 2012; Ramey and Zubairy, 2015).

The prior literature also leads us to expect higher economic slack in geographies with higher consumer indebtedness. After all, higher consumer debt in combination with housing price declines contributed to household-net-worth shocks and the local employment slump (Mian and Sufi, 2014) via depressed household consumption (Mian, Rao, and Sufi, 2013).

Implementing direct empirical analysis of the slack channel is challenging. Excess capacity in general is difficult to estimate and unemployment in particular is endogenous to local economic conditions. We approach evaluating this economic mechanism indirectly by looking at the real output in sectors of the economy that do not benefit from household consumption but depend on local labor-market tightness.

First, we implement an analysis similar to that reported in Table 5, focusing on the National Security and International Affairs sector (NAICS 9811). This sector is unique as it cannot directly benefit from increases in household consumption. Any debt-driven heterogeneity

in the government-spending multiplier in this sector, if any, cannot be attributed to individual consumption behavior.

Table 12 reports the results following regression specification (4) with one exception: to make β coefficients tractable, we normalized both DOD obligations/spending and growth in sector income and employment by total CBSA-level income in 2006 (i.e., total and not sector-specific income). This normalization leads to smaller coefficient magnitudes for both tradable and nontradable sectors as compared to those reported in Table 5.

Consistent with the notion that household consumption does not directly affect employment and wages in this industry, we find that high consumer leverage does not have economically or statistically significant effects on this sector of the economy. Yet we find evidence suggesting debt-dependent fiscal-spending multipliers in this sector. In fact, considering the relatively small size of the sector, the magnitude of the cross-effect is significant. Note that in this analysis, the DOD obligations/spending and growth in sector income and employment are still normalized by total CBSA-level income in 2006, which explains lower coefficient magnitudes. This evidence cannot be explained by any consumption-driven economic channel and is consistent with the slack channel.

Second, we conduct additional tests in an attempt to confirm that the debt-dependent multiplier cannot be explained by the consumptions channels (e.g., MPC) alone. Specifically, we turn to broader definitions of sectors that are more/less individual-consumption dependent. Mian and Sufi (2015) isolate the consumption-driven mechanisms behind the adverse effect of consumer debt on real economic growth by focusing on the nontradable sector. Their test primarily relies on local consumer expenditure almost by definition. If only consumption-based mechanisms contribute to the debt-dependent multiplier, then we should only observe debt-dependent multipliers in nontradable sectors of the economy. Similar evidence in the tradable sectors would suggest supply-side mechanisms at work.

Table 13 presents the result of the analysis following regression equation (5) separately for tradable sectors, nontradable and strict nontradable sectors, as well as construction and other (unclassified) sectors of the economy. Table 13 suggests that the government-spending multiplier increases with the consumer leverage not only in industries affected by local consumer spending such as construction and (strict) nontradables. The evidence suggests that economic mechanisms other than pure consumer spending may be at work. First, the debt-dependent multipliers in

tradable sectors are significantly above zero and similar in magnitude to those for nontradable sectors. The largest β_2 coefficient is documented for other industries that are difficult to classify into tradables, nontradables, or construction.

To summarize, while Tables 12 and 13 do not offer any direct evidence in support of the slack channel, they provide a strong indication that supply-side frictions such as local slack contribute to the debt-dependent multiplier. Our evidence is also difficult to reconcile with other existing theories. The local nature of our analysis and the focus on DOD spending, for example, rule out explanations based on expectations of higher productivity through building infrastructure, as proposed in Bachmann and Sims (2012). Our state-dependent multiplier also does not appear to operate through mechanisms associated with the zero lower bound on interest rates (e.g., Christiano, Eichenbaum, and Rebelo, 2012) since our cross-sectional analysis holds constant the interest rate.

5. Concluding Remarks

The ability of government spending to mitigate recessions has always been a hotly debated topic among academics, practitioners, and policymakers. The 2008 crisis brings new arguments to the table as it acutely highlights the role consumer indebtedness plays in a recession. The dramatic rise in U.S. household leverage from about a 1.2 debt-to-income ratio in late 1990 to about 1.65 in 2006 (Mian and Sufi, 2011) not only set the stage for the Great Recession but also contributed to a decline in aggregate consumption and, ultimately, slowed down the economic recovery.

Consumers' credit constraints and need to delever are frequently invoked to argue that expansionary fiscal policy might be ineffective during consumer-debt-overhang-induced slumps. At the same time, the proponents of demand stimulus argue that "the purpose of fiscal expansion is to sustain output and employment while private balance sheets are repaired and the government can pay down its own debt after deleveraging periods comes to an end" (Eggertsson and Krugman, 2013). While some theoretical literature sheds light on this debate, ours is the first paper to offer an empirical examination of this question.

We utilize new detailed data on DOD spending to evaluate whether government spending stimulates local economic growth differently across geographies with varying levels of pre-recession consumer indebtedness. We find that during the 2007–2009 period, the government-

spending multiplier is higher in CBSAs with higher pre-recession consumer debt-to-income ratios as compared to CBSAs with relatively low pre-recession consumer debt-to-income ratios. The evidence suggests that expansionary fiscal policy is effective in geographies suffering from consumer debt overhang. Expansionary fiscal stimulus has the capacity to mitigate the adverse effects of consumer leverage.

While our core objective is to evaluate the heterogeneity in the DOD's spending multiplier during the 2007–2009 period, we augment these results by offering evidence that sheds lights on economic mechanisms underlying the debt-dependent fiscal multiplier. Specifically, we present evidence consistent with both aggregate demand and aggregate supply-side economic mechanisms. On the aggregate demand side, we find evidence supporting the heterogenous MPC-based explanations. Our results show that in response to increase in DOD spending, households with high debt-to-income ratios tend to increase consumption relative to households with low debt-to-income ratios.

We also find evidence consistent with aggregate supply-side frictions, such as local market slack or excess capacity, contributing to heterogeneity in government-spending multipliers. Higher consumer indebtedness depresses household consumption and contributes to local unemployment. Yet it creates a more fruitful environment for fiscal stimulus because it leads to local excess capacity. In the presence of local economic slack, government spending is unlikely to crowd out the private sector, which in turn leads to higher government-spending multipliers.

Overall, our results not only contribute to the debate about the efficacy of the expansionary fiscal policy, but also add to our understanding of the economic mechanisms through which government spending operates.

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Table 1
Summary Statistics

This table reports summary statistics for core variables of interest used in this study. Panel A sumarize the percentage growth in core economic variables of interst from 2007 to 2009: income, employment, and GDP. Panel B reports the change in DOD spending over the same period as a fraction of 2007 income. It also reports the summary statistics for the instrumental variables we employ. Finally, Panel C report the average dollar volume of DOD spending at the CBSA-year level. The data covers 828 CBSAs.

	N	***Mean***	***StDev***	***p25***	***p50***	***p75***
Panel A: CBSA-level 2007 to 2009 growth						
Personal Income Growth	828	-0.91%	6.12%	-4.52%	-0.65%	2.63%
Personal Income Growth, Nontradables	828	0.19%	0.71%	-0.17%	0.14%	0.56%
Personal Income Growth, Tradables	828	-0.32%	2.41%	-0.62%	-0.06%	0.20%
Personal Income Growth, Construction	828	-0.46%	1.70%	-1.09%	-0.38%	0.35%
Personal Income Growth, All Other Sectors	828	2.10%	3.02%	0.44%	1.82%	3.54%
Employment Growth	828	-4.96%	4.30%	-7.24%	-4.70%	-2.50%
Personal Employment Growth, Nontradables	828	-0.23%	1.15%	-0.81%	-0.29%	0.30%
Personal Employment Growth, Tradables	828	-0.42%	1.60%	-0.63%	-0.15%	0.06%
Personal Employment Growth, Construction	828	-0.90%	1.34%	-1.34%	-0.76%	-0.17%
Personal Employment Growth, All Other Sectors	828	0.19%	2.27%	-1.00%	0.12%	1.32%
GDP Growth	372	0.67%	6.67%	-3.03%	1.23%	4.65%
Panel B: CBSA-level as fraction of CBSA pre-recession income						
CBSA DOD spending	828	2.65%	6.48%	0.15%	0.59%	2.23%
Change in DOD Spending 2007 to 2009	828	1.12%	4.95%	-0.07%	0.07%	0.60%
Instrument for Change in DOD Spending 2007 to 2009	828	0.61%	1.43%	0.05%	0.14%	0.48%
Change in DOD Obligations 2007 to 2009	828	1.01%	6.13%	-0.09%	0.04%	0.54%
Instrument for Change in DOD Obligations 2007 to 2009	828	0.44%	1.05%	0.03%	0.10%	0.35%
Debt to Income 2006	824	1.602	0.597	1.195	1.443	1.834
Panel C: CBSA-year level						
DOD Spending, 2006-2009 ($millions)	3,312	2.900	1.450	1.172	7.49	58.6
DOD Obligations, 2006-2009 ($millions)	3,312	3.060	1.500	1.115	7.62	62.3

Table 2
The Effect of Government Spending on Local Economic Growth

This table presents the results of the IV analysis evaluating the effect of DOD spending on local economic growth. Panel A presents the cross-sectional analysis following regression equation (1). The dependent variable is growth in local income between 2007 and 2009. The core variable of interest is change in DOD spending in a locality from 2006/07 to 2008/09 normalized by local income in 2006. Panel B presents the results of panel regression analysis following regression equation (2) and the sample covers from 2002 to 2013. In both panels DOD spending and DOD obligations are instrumented using the Bartik instrument. In all specifications we control for labor shares of 19 (2-digit NAIC) industries. County and CBSA specifications in Panel A also include controls for pre-recession percentage white, median household income, percentage owner-occupied, percentage with less than high school diploma, percentage with only a high school diploma, unemployment rate, poverty rate, and percentage urban. The core coefficient of interest from the first stage regression as well as the Kleibergen-Paap test for weak instrument are reported at the bottom of each regression specification for brevity. Standard errors are clustered by state in Panel A and by respective geographic unit in Panel B. Absolute values of t-statistics are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

	County		**CBSA**		**State**	
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Cross-Sectional Regressions						
Change in Government Spending$_{07\ to\ 09}$	0.090***		0.365***		1.613	
Normalized by Local Income$_{06/07}$	(12.43)		(3.86)		(1.55)	
Change in Government Obligations$_{07\ to\ 09}$		0.084***		0.353***		1.282
Normalized by Local Income$_{06/07}$		(9.69)		(2.86)		(1.78)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	1743	2410	828	828	51	51
R2	0.35	0.18	0.45	0.40	0.86	0.89
First stage regression coefficient	3.73***	5.74***	2.12***	2.12***	0.793***	0.793***
Kleibergen-Paap ML Test	1.47	1.34	13.25***	8.82***	5.86**	5.63**
Panel B: Panel Regressions						
Change in Government Spending$_{t}$	0.048***		0.248***		1.50	
Normalized by Local Income $_{t-2}$	(3.85)		(3.74)		(1.25)	
Change in Government Obligations$_{t}$		0.035***		0.112***		1.13
Normalized by Local Income $_{t-2}$		(4.42)		(4.26)		(0.64)
CBSA and Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	17,430	22,578	8,280	8,280	510	510
R2	0.72	0.67	0.77	0.78	0.92	0.92
First stage regression coefficient	1.84***	1.83***	1.39***	1.53***	0.67**	0.83***
Kleibergen-Paap ML Test	1.79	1.77	10.62***	15.82***	3.63*	5.23**

Table 3
The Effect of Government Spending on CBSA Economic Growth

This table reports the results of the IV analysis evaluating the effect of DOD spending on local economic growth at the CBSA level. Panel A presents the cross-sectional analysis following regression equation (1). The dependent variables are growth in local income, employment, or GDP between 2007 and 2009. The core variable of interest is change in DOD spending in a locality from 2006/07 to 2008/09 normalized by 2006 local income. Panel B presents the results of panel regression analysis following regression equation (2) and the sample covers from 2002 to 2013. In both panels DOD spending and DOD obligations are instrumented using a Bartik instrument. In all specifications we control for labor shares of 19 (2-digit NAIC) industries. Regressions in Panel A also include controls for pre-recession percentage white, median household income, percentage owner-occupied, percentage with less than high school diploma, percentage with only a high school diploma, unemployment rate, poverty rate, and percentage urban. The Kleibergen-Paap ML test statistics for weak instruments are reported at the bottom of each column. Standard errors are clustered by state in Panel A and by CBSA in Panel B. Absolute values of t-statistics are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

	DOD Spending			**DOD Obligations**		
	Total Income Growth (1)	Total Employment Growth (2)	Total GDP Growth (3)	Total Income Growth (4)	Total Employment Growth (5)	Total GDP Growth (6)
Panel A: Cross-Sectional Regressions						
Change in DOD Spending/Obligations$_{07\ to\ 09}$ Normalized by Local Income$_{06/07}$	0.365***	0.234***		0.353***	0.228***	
	(3.86)	(3.60)		(0.004)	(0.004)	
Change in DOD Spending/Obligations$_{07\ to\ 09}$ Normalized by Local GDP$_{06/07}$			0.777			0.539
			(1.31)			(0.342)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	828	828	372	828	828	372
R2	0.45	0.40	0.44	0.40	0.37	0.41
Kleibergen-Paap ML Test	13.25***	13.25***	5.60***	9.10***	9.10***	2.32
Panel B: Panel Regressions						
Change in DOD Spending/Obligations$_{t}$ Normalized by Local Income$_{t-2}$	0.248***	0.163***		0.112***	0.074***	
	(0.066)	(0.043)		(0.026)	(0.018)	
Change in DOD Spending/Obligations$_{t}$ Normalized by Local GDP$_{t-2}$			1.292			0.491**
			(0.761)			(0.150)
CBSA and Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	8,280	8,280	3,720	8,280	8,280	3,720
R2	0.77	0.52	0.44	0.78	0.52	0.50
Kleibergen-Paap ML Test	10.62***	10.62***	5.42**	15.82***	15.82***	11.66***

Table 4
Government Spending, Consumer Leverage, and Economic Growth

This table reports the results of CBSA-level cross-sectional IV analysis of income growth, employment growth, and GDP growth between 2007 and 2009. Panel A reports results based on DOD spending, and Panel B reports results based on DOD obligations. Both change in DOD spending (normalized by pre-recession income or GDP) as well as the interaction term between change in DOD spending and CBSA-level consumers' debt-to-income ratio are instrumented using the Bartik instrument and its interaction with debt-to-income ratio. In all specifications we control for labor shares of 19 (2-digit NAIC) industries, pre-recession percentage white, median household income, percentage owner-occupied, percentage with less than high school diploma, percentage with only a high school diploma, unemployment rate, poverty rate, and percentage urban. The Kleibergen-Paap ML test statistics for weak instruments are reported at the bottom of each column. Standard errors are clustered by state. Absolute values of t-statistics are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

	Total Income Growth				***Employment Growth***				***GDP Growth***			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Panel A: DOD Spending												
Change in DOD Spending$_{07 \text{ to } 09}$	0.365***		0.370***	-0.507*	0.234***		0.239***	-0.252	0.777		0.740	-2.857**
	(3.86)		(3.86)	(1.66)	(3.60)		(3.64)	(1.16)	(1.31)		(1.31)	(2.48)
Debt to Income$_{2006}$		-0.033***	-0.031***	-0.038***		-0.028***	-0.027***	-0.031***		-0.023**	-0.023**	-0.036***
		(6.22)	(5.79)	(6.50)		(5.72)	(5.65)	(5.65)		(2.08)	(2.00)	(3.41)
Change in DOD Spending$_{07 \text{ to } 09}$ * Debt to Income$_{2006}$				0.608**				0.340**				2.536***
				(2.36)				(2.01)				(2.89)
CBSA Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	828	824	824	824	828	824	824	824	372	372	372	372
R2	0.45	0.48	0.47	0.47	0.40	0.45	0.43	0.44	0.44	0.45	0.45	0.44
Kleibergen-Paap ML Test	13.25***	n/a	13.21***	8.73***	13.25***	n/a	13.21***	8.73***	5.60***	n/a	5.54***	8.02***
Panel B: DOD Obligations												
Change in DOD Obligations$_{07 \text{ to } 09}$	0.353***		0.357***	-1.037*	0.228***		0.232***	-0.576	0.539		0.508	-5.006**
	(2.91)		(2.89)	(1.72)	(2.91)		(2.91)	(1.55)	(0.95)		(0.94)	(2.26)
Debt to Income$_{2006}$		-0.033***	-0.030***	-0.039***		-0.028***	-0.026***	-0.032***		-0.023**	-0.023*	-0.035***
		(6.22)	(5.43)	(5.83)		(5.72)	(5.56)	(5.33)		(2.08)	(1.93)	(2.75)
Change in DOD Obligations$_{07 \text{ to } 09}$ * Debt to Income$_{2006}$				1.025**				0.595*				4.346**
				(1.98)				(1.90)				(2.12)
CBSA Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	828	824	824	824	828	824	824	824	372	372	372	372
R2	0.40	0.48	0.42	0.36	0.37	0.45	0.40	0.37	0.41	0.44	0.42	0.32
Kleibergen-Paap LM Test	9.10***	n/a	9.06***	5.36**	9.10***	n/a	9.06***	5.36**	2.32	n/a	2.31	3.76**

Table 5
Marginal Effects of Consumer Leverage on Government Spending Multiplier

This table reports the relative DOD spending multipliers of income, employment, and GDP at different levels of the pre-recession debt-to-income distribution. Column (1) shows the average multipliers across CBSAs. Columns (2) through (4) show the multipliers at different levels of the debt distribution along with the multiplier as a percentage of the average multiplier displayed in column (1). Column (5) shows the difference in the multiplier when comparing different points in the distribution of debt-to-income across CBSAs. All reported numbers are based on estimates documented in Table 4.

		Debt to income ratio			
	Aggregate Multiplier (1)	1.19 *p25* (2)	1.44 *p50* (3)	1.83 *p75* (4)	*p75-p25* (5)
Income	0.365	0.222	0.370	0.600	0.378
		60.8%	101.3%	164.3%	103.5%
Employment	0.234	0.155	0.240	0.372	0.218
		66.1%	102.4%	159.1%	93.0%
GDP	0.777	0.202	0.745	1.591	1.389
		26.0%	95.9%	204.8%	178.7%

Table 6
Government Spending and Consumer Leverage During 2003-2005

This table reports the results of CBSA-level cross-sectional IV analysis of income growth, employment growth, and GDP growth between 2003 and 2005. Panel A reports results based on DOD spending, and Panel B reports results based on DOD obligations. Both change in DOD spending (normalized by pre-recession income or GDP) as well as the interaction term between change in DOD spending and CBSA-level consumers' debt-to-income ratio are instrumented using the Bartik instrument and its interaction with debt-to-income ratio. In all specifications we control for labor shares of 19 (2-digit NAIC) industries, pre-recession percentage white, median household income, percentage owner-occupied, percentage with less than high school diploma, percentage with only a high school diploma, unemployment rate, poverty rate, and percentage urban. The Kleibergen-Paap ML test statistics for weak instruments are reported at the bottom of each column. Standard errors are clustered by state. Absolute values of t-statistics are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

	Total Income Growth				***Employment Growth***				***GDP Growth***			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Panel A: DOD Spending												
Change in DOD Spending$_{02/03 \text{ to } 04/05}$	0.419**		0.308**	2.089	0.232*		0.233*	1.782	1.789***		1.821***	0.155
	(2.14)		(1.98)	(1.32)	(1.75)		(1.72)	(1.37)	(2.75)		(2.80)	(0.05)
Debt to Income$_{2002}$		0.036**	0.036**	0.044**		0.039***	0.039***	0.046***		0.028	0.029	0.026
		(2.35)	(2.34)	(2.38)		(3.34)	(3.33)	(3.31)		(1.22)	(1.29)	(1.19)
Change in DOD Spending$_{02/03 \text{ to } 04/05}$ *				-1.257				-1.165				1.255
Debt to Income$_{2002}$				(1.12)				(1.27)				(0.52)
CBSA Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	828	824	824	824	828	824	824	824	372	372	372	372
R2	0.20	0.24	0.23	0.18	0.15	0.20	0.19	0.15	0.42	0.44	0.42	0.43
Kleibergen-Paap LM Test	6.47**	n/a	6.18**	9.69***	6.47**	n/a	6.18**	9.69***	6.47**	n/a	6.18**	9.69***
Panel B: DOD Obligations												
Change in DOD Obligations$_{02/03 \text{ to } 04/05}$	0.512		0.327	8.272	0.283		0.285	6.279	5.008		5.083	7.147
	(1.61)		(1.63)	(1.13)	(1.41)		(1.39)	(1.15)	(1.57)		(1.60)	(0.31)
Debt to Income$_{2002}$		0.036**	0.034**	0.051**		0.039***	0.037***	0.051***		0.028	0.022	0.025
		(2.35)	(2.20)	(2.14)		(3.34)	(3.14)	(2.83)		(1.22)	(0.93)	(0.71)
Change in DOD Obligations$_{02/03 \text{ to } 04/05}$ *				-5.576				-4.307				-1.529
Debt to Income$_{2002}$				(1.10)				(1.13)				(0.10)
CBSA Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	828	824	824	824	828	824	824	824	372	372	372	372
R2	0.15	0.24	0.21	0.20	0.13	0.20	0.16	0.15	0.15	0.44	0.14	0.10
Kleibergen-Paap LM Test	3.18*	n/a	3.63*	2.12	3.18*	n/a	3.63*	2.12	3.24*	n/a	3.27*	0.48

Table 7

Summary Statistics for Individual Consumer Data

This table reports summary statistics for the individual-level data from TransUnion and Equifax. The credit categories are based on consumers' credit scores in TransUnion data. Deep Subprime, Subprime, Near Prime, Prime, and Super Prime are based on borrowers' credit scores measured in February 2007 in the following ranges: [501,600), [601,700), [701,800), [801,900), [901,990], respectively.

	Mean	St.Dev
TransUnion:		
Total Debt Growth (2009-2007).	0.050	1.629
Change in Debt (2007-2009)/Income2007.	0.091	1.367
Credit Card Growth (2009-2007).	-0.127	1.448
Deep Subprime x Credit Card Growth (2009-2007)	-0.102	1.348
Subprime x Credit Card Growth (2009-2007)	-0.153	1.382
Near prime x Credit Card Growth (2009-2007)	-0.107	1.465
Prime x Credit Card Growth (2009-2007)	-0.148	1.469
Super Prime x Credit Card Growth (2009-2007)	-0.161	1.462
Debt-to-Income ratio, 2006	1.239	1.437
Deep Subprime x Debt-to-Income ratio, 2006	0.914	1.353
Subprime x Debt-to-Income ratio, 2006	1.202	1.45
Near prime x Debt-to-Income ratio, 2006	1.461	1.512
Prime x Debt-to-Income ratio, 2006	1.265	1.403
Super Prime x Debt-to-Income ratio, 2006	1.202	1.325
Equifax:		
Total Debt Growth (2009-2007).	0.094	1.657
Change in Debt (2007-2009)/Income2007.	0.103	1.411
Credit Card growth (2009-2007).	-0.024	1.322

Table 8
Government Spending and Consumer Credit Card Balances During Recession

This table reports the results of the OLS and IV regression analysis following the regression equation (5) of the paper. The dependent variable is either log growth of credit card balances between 2007 and 2009 or the dollar change in credit card balances between 2007 and 2009 normalized by pre-recession consumer income. Panel A reports results based on DOD spending, and Panel B reports results based on DOD obligations. The interaction term between DOD spending (obligations) and debt-to-income ratio is instrumented using the respective Bartik instrument's interaction with individual debt-to-income ratio. In case of TransUnion we construct debt-to-income measures using individual-level income and individual total debt as of February 2007. In case of Equifax we use average IRS ZIP code-level income and ZIP code average of the individual total debt as of 2006. In all regressions we control for log consumer income in 2006, CBSA fixed effects, labor shares of 19 (2-digit NAIC) industries, pre-recession percentage white, percentage owner-occupied, percentage with less than high school diploma, percentage with only a high school diploma, unemployment rate, poverty rate, and percentage urban. The Kleibergen-Paap ML test statistics for weak instruments are reported at the bottom of each column. Absolute values of t-statistics are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

	TransUnion			***Equifax***		
	Log Growth in CC Balances	*Log Growth in CC Balances*	*Growth in CC Balances Normalized by Income*	*Log Growth in CC Balances*	*Log Growth in CC Balances*	*Growth in CC Balances Normalized by Income*
	OLS	***IV***	***IV***	***OLS***	***IV***	***IV***
Panel A: DOD Spending						
Debt to Income $_{2006}$	-0.02***	-0.020***	-0.005***	-0.01***	-0.007***	-0.001***
	(15.87)	(16.90)	(23.73)	(7.32)	(7.68)	(6.07)
Change in DOD Spending$_{07\ to\ 09}$ *	-0.04	0.181**	0.045***	-0.012	0.113**	0.028***
Debt to Income$_{2006}$	(1.05)	(2.21)	(3.28)	(0.81)	(2.37)	(3.01)
Controls and CBSA Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Kleibergen-Paap LM Test	--	27.990***	28.485***	--	29.563***	30.340***
No. obs.	3,895,839	3,895,839	6,689,130	5,126,571	5,126,571	9,782,132
Panel B: DOD Obligations						
Debt to Income $_{2006}$	-0.02***	-0.020***	-0.005***	-0.01***	-0.007***	-0.001***
	(17.10)	(17.03)	(23.09)	(6.83)	(7.62)	(5.86)
Change in DOD Obligations$_{07\ to\ 09}$ *	-0.003	0.181*	0.046**	-0.03	0.109**	0.027***
Debt to Income$_{2006}$	(0.16)	(1.95)	(2.36)	(1.02)	(2.07)	(2.64)
Controls and CBSA Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Kleibergen-Paap LM Test	--	7.984***	7.966***	--	11.886***	11.877***
No. obs.	3,895,839	3,895,839	6,689,130	5,126,571	5,126,571	9,782,132

Table 9

The Effect of Government Spending on Consumer Balances by Credit Rating

This table evaluates the heterogeneity in DOD spending effect on individual debt balances between 2007 and 2009. Each panel represents a single IV regression. The coefficients are presented in horizontal rows for ease of comparison of the effects of DOD spending and pre-recession debt on debt balances of different consumer groups. Panel A reports results that utilize data on DOD spending and Panel B, DOD obligations. Individual data are from the TransUnion Panel. In Panel A, columns represent consumers' credit categories, which are interacted with each of the independent variables of interest. The credit categories are based on consumers' credit scores in February 2007. Deep Subprime, Subprime, Near Prime, Prime, and Super Prime correspond to credit scores within the following respective ranges: [501,600), [601,700), [701,800), [801,900), [901,990], respectively. In all specifications we control for labor shares of 19 (2-digit NAIC) industries, pre-recession percentage white, percentage owner-occupied, percentage with less than high school diploma, percentage with only a high school diploma, unemployment rate, poverty rate, and percentage urban. The Kleibergen-Paap ML test statistics for weak instruments are reported at the bottom of each panel. Standard errors are clustered by county. Absolute values of t-statistics are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

	Dependent Variable: log(Credit card balances $_{Feb\ 2010}$/Credit card balances $_{Feb\ 2008}$)				
	Deep Subprime	Subprime	Near Prime	Prime	Super Prime
Panel A: DOD Spending					
Debt to Income$_{Feb\ 2007}$	-0.069***	-0.061***	-0.024***	-0.001	0.003*
	(22.67)	(34.91)	(20.76)	(1.26)	(1.94)
Change in DOD Spending$_{07\ to\ 09}$ *	0.674***	0.138	0.159*	-0.061	0.027
Debt to Income$_{Feb\ 2007}$	(2.66)	(1.25)	(1.85)	(0.65)	(0.21)
Adj. R-sq: 1.4%. Obs: 3,700,662. Kleibergen-Paap LM Test: 27.604***					
Controls: CBSA fixed effects, log of individual income, county industry structure and economic conditions.					
Panel B: DOD Obligations					
Debt to Income$_{Feb\ 2007}$	-0.067***	-0.061***	-0.024***	-0.001	0.003**
	(23.85)	(36.54)	(22.00)	(1.55)	(2.00)
Change in DOD Obligations$_{07\ to\ 09}$ *	0.744**	0.143	0.165*	-0.05	0.03
Debt to Income$_{Feb\ 2007}$	(2.13)	(1.51)	(1.84)	(0.50)	(0.19)
Adj. R-sq: 1.3%. Obs: 3,700,662. Kleibergen-Paap LM Test: 7.312***					
Controls: CBSA fixed effects, log of individual income, county industry structure and economic conditions.					

Table 10
Government Spending and Consumer Debt During 2008 Recession

This table reports the results of the individual-level IV analysis following equation (5) of the paper. Panel A reports results that utilize data on DOD spending and Panel B, DOD obligations. The interaction term between DOD spending (obligations) and debt-to-income ratio is instrumented using the respective Bartik instrument's interaction with individual debt-to-income ratio. In column (1), the dependent variable is log growth in individual consumer total debt balances between the end of 2007 and the end of 2009. In column (2), the dependent variable is dollar change in individual consumer debt balance normalized by the pre-recession consumer income. In column (3), the dependent variable is a dummy variable that equals to one if an individual had at least one account past due 90 days or more in the past 24 months as of February 2010, as reported by TransUnion. In all regressions we control for log consumer income in 2006 (February 2007) from TransUnion, CBSA fixed effects, county level labor shares of 19 (2-digit NAIC) industries, pre-recession percentage white, percentage owner-occupied, percentage with less than high school diploma, percentage with only a high school diploma, unemployment rate, poverty rate, and percentage urban. The Kleibergen-Paap ML test statistics for weak instruments are reported at the bottom of each column. Absolute values of t-statistics are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

	Log Growth in Total Debt (1)	*Growth in Total Debt Normalized by Income* (2)	*Derogatory Events* (3)
Panel A: DOD Spending			
Debt to Income $_{2006}$	-0.101***	-0.138***	0.018***
	(75.79)	(72.28)	(17.53)
Change in DOD Spending$_{07\ to\ 09}$ *	-0.027	0.045	-0.129**
Debt-to-Income$_{06}$	(0.35)	(0.46)	(2.21)
Controls: CBSA fixed effects, log of individual income, county industry structure and economic conditions.			
Kleibergen-Paap LM Test	28.080***	28.485***	28.659***
No. obs.	5,917,526	6,689,130	6,957,277
Panel B: DOD Obligations			
Debt to Income $_{2006}$	-0.101***	-0.138***	0.018***
	(78.91)	(75.65)	(17.92)
Change in DOD Obligations$_{07\ to\ 09}$ *	-0.026	0.051	-0.139*
Debt-to-Income$_{06}$	(0.33)	(0.51)	(1.84)
Controls: CBSA fixed effects, log of individual income, county industry structure and economic conditions.			
Kleibergen-Paap LM Test	7.935***	7.966***	8.036***
No. obs.	5,917,526	6,689,130	6,957,277

Table 11
Government Spending and Consumer Auto Consumption

This table reports the results of the cross-sectional IV regression analysis of car registrations and car loans following regression equation (5). In column (1) the dependent variable ZIP code-level log growth in new auto registrations between 2007 and 2009. Here we utilize debt-to-income ratio from TransUnion aggregated to the ZIP code-level. In column (2) the dependent variable is log growth in individual-level auto loan balances between 2007 and 2009 as reported by TransUnion. Here the debt-to-income ratio is computed at the individual level using TransUnion data. Panel A reports results based on DOD spending and Panel B reports results based on DOD obligations. In all regressions we control for log consumer income in 2006 and CBSA fixed effects. We also control for county local economic conditions via 19 (2-digit NAIC) industry share control, county-level pre-recession percentage white, median household income, percentage owner-occupied, percentage with less than high school diploma, percentage with only a high school diploma, unemployment rate, poverty rate, and percentage urban. The Kleibergen-Paap ML test statistics for weak instruments are reported at the bottom of each column. Standard errors are clustered by county. Absolute values of t-statistics are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

	Auto registrations	*Auto loans*
Panel A: DOD Spending		
Debt to Income $_{2006}$	-0.02**	-0.002***
	(2.08)	(3.89)
Change in DOD Spending$_{07 \text{ to } 09}$ *	1.72***	0.025
Debt to Income$_{2006}$	(3.84)	(0.78)
Controls and CBSA Fixed Effects	Yes	Yes
Adj. R sq.	30.6%	0.3%
Kleibergen-Paap LM Test	21.039***	28.782***
No. obs.	22,509	2,151,057
Panel B: DOD Obligations		
Debt to Income $_{2006}$	-0.02*	-0.002***
	(1.82)	(4.04)
Change in DOD Obligations$_{07 \text{ to } 09}$ *	1.82**	0.028
Debt to Income$_{2006}$	(2.36)	(0.81)
Controls and CBSA Fixed Effects	Yes	Yes
Adj. R sq.	30.1%	0.3%
Kleibergen-Paap LM Test	9.000***	8.604***
No. obs.	22,509	2,151,057

Table 12

State-Dependent Multipliers in the National Security Sector

This table reports the results from the CBSA-level IV regression analysis of income growth (left Panel) and employment growth (right Panel) in the National Security and International Affairs sector (NAIC 9811) between 2007 and 2009. Panel A reports results that utilize data on DOD spending and Panel B, DOD obligations. Both change in DOD spending (obligations) as well as the interaction term between change in DOD spending (obligations) and CBSA-level consumer debt-to-income ratio are instrumented using the Bartik instrument (defined in Section 2.2 of the paper) and its interaction with debt-to-income ratio. In all specifications we control for labor shares of 19 (2-digit NAIC) industries, pre-recession percentage white, median household income, percentage owner-occupied, percentage with less than high school diploma, percentage with only a high school diploma, unemployment rate, poverty rate, and percentage urban. The Kleibergen-Paap ML test statistics for weak instruments is reported at the bottom of the table. Standard errors are clustered by state. Absolute values of t-statistics are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1

	Income Growth in National Security Sector				***Employment Growth in National Security Sector***			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: DOD Spending								
Change in DOD Spending$_{07 \text{ to } 09}$	0.079***		0.079***	-0.141*	0.136**		0.136**	-0.255*
	(2.90)		(2.92)	(1.77)	(2.50)		(2.52)	(1.91)
Debt to Income$_{2006}$		0.001	0.001**	-0.001		0.002	0.002**	-0.001
		(1.56)	(2.28)	(0.99)		(1.63)	(2.31)	(0.78)
Change in DOD Spending$_{07 \text{ to } 09}$ * Debt to Income$_{2006}$				0.152**				0.272**
				(2.28)				(2.39)
CBSA Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	828	824	824	824	828	824	824	824
R2	0.45	0.48	0.47	0.47	0.40	0.45	0.43	0.44
Kleibergen-Paap ML Test	13.25***	n/a	13.21***	8.73***	13.25***	n/a	13.21***	8.73***
Panel B: DOD Obligations								
Change in DOD Obligations$_{07 \text{ to } 09}$	0.076**		0.076**	-0.266*	0.131**		0.132**	-0.476**
	(2.41)		(2.42)	(1.85)	(2.17)		(2.18)	(2.06)
Debt to Income$_{2006}$		0.001	0.001**	-0.001		0.002	0.003**	-0.001
		(1.56)	(2.03)	(1.08)		(1.63)	(2.08)	(0.96)
Change in DOD Obligations$_{07 \text{ to } 09}$ * Debt to Income$_{2006}$				0.252**				0.447**
				(2.06)				(2.29)
CBSA Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	828	824	824	824	828	824	824	824
R2	0.40	0.48	0.42	0.36	0.37	0.45	0.40	0.37
Kleibergen-Paap LM Test	9.10***	n/a	9.07***	5.36**	9.10***	n/a	9.07***	5.36**

Table 13
Effects in Tradable and Non-tradable Sectors

This table reports the results of CBSA-level cross-sectional IV analysis of income growth (left Panel) and employment growth (right panel) across different sectors of the economy between 2007 and 2009. Panel A reports results that utilize data on DOD spending and Panel B, DOD obligations. Both DOD spending (obligations) as well as the interaction term between DOD spending (obligations) and CBSA-level consumers' debt-to-income ratio are instrumented using the Bartik instrument (defined in Section 2.2 of the paper) and its interaction with debt-to-income ratio. In all specifications we control for labor shares of 19 (2-digit NAIC) industries, pre-recession percentage white, median household income, percentage owner-occupied, percentage with less than high school diploma, percentage with only a high school diploma, unemployment rate, poverty rate, and percentage urban. The Kleibergen-Paap ML test statistics for weak instruments is reported at the bottom of each column. Standard errors are clustered by state. Absolute values of t-statistics are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

	Income Growth					***Employment Growth***				
	Strict Non-tradables	Non-Tradable	Tradables	Construction	Other	Strict Non-tradables	Non-Tradable	Tradables	Construction	Other
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A: DOD Spending										
Change in Government Spending$_{07 \text{ to } 09}$	-0.042**	-0.035	-0.075	-0.060	-0.177	-0.070***	-0.061*	-0.034	0.003	-0.044
	(-2.41)	(-1.39)	(-1.63)	(-1.26)	(-1.22)	(-2.74)	(-1.92)	(-1.31)	(0.13)	(-0.45)
Debt to Income$_{2006}$	-0.001	-0.002**	-0.006**	-0.016***	-0.010***	-0.000	-0.001	-0.004***	-0.011***	-0.005**
	(-0.82)	(-2.44)	(-2.21)	(-6.77)	(-3.29)	(-0.23)	(-0.89)	(-2.86)	(-6.60)	(-2.37)
Change in Government Spending$_{07 \text{ to } 09}$ *	0.034**	0.032	0.068*	0.079**	0.223*	0.046**	0.043*	0.036*	0.018	0.101
Debt to Income$_{2006}$	(2.41)	(1.64)	(1.89)	(2.10)	(1.75)	(2.45)	(1.80)	(1.67)	(0.87)	(1.25)
CBSA Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	824	824	824	824	824	824	824	824	824	824
R2	0.10	0.13	0.17	0.42	0.13	0.08	0.09	0.22	0.50	0.10
Kleibergen-Paap ML Test	8.73***	8.73***	8.73***	8.73***	8.76***	8.73***	8.73***	8.73***	8.73***	8.76***
Panel B: DOD Obligations										
Change in Government Obligations$_{07 \text{ to } 09}$	-0.062**	-0.059*	-0.118	-0.134	-0.388	-0.088***	-0.081**	-0.062	-0.026	-0.171
	(-2.51)	(-1.66)	(-1.55)	(-1.60)	(-1.42)	(-2.75)	(-1.99)	(-1.42)	(-0.66)	(-1.04)
Debt to Income$_{2006}$	-0.001	-0.002**	-0.006**	-0.016***	-0.011***	-0.000	-0.001	-0.004***	-0.011***	-0.005**
	(-0.87)	(-2.46)	(-2.20)	(-6.59)	(-3.14)	(-0.25)	(-0.91)	(-2.87)	(-6.59)	(-2.33)
Change in Government Obligations$_{07 \text{ to } 09}$ *	0.051**	0.052*	0.103	0.137*	0.387	0.064**	0.062*	0.058	0.040	0.196
Debt to Income$_{2006}$	(2.38)	(1.77)	(1.60)	(1.85)	(1.61)	(2.29)	(1.79)	(1.50)	(1.11)	(1.36)
CBSA Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	824	824	824	824	824	824	824	824	824	824
R2	0.09	0.12	0.16	0.39	0.06	0.08	0.09	0.21	0.50	0.06
Kleibergen-Paap ML Test	5.36**	5.36**	5.36**	5.36**	8.76***	5.36**	5.36**	5.36**	5.36**	8.76***