The Burden of the National Debt:

Evidence from Mergers and Acquisitions*

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Abstract

Increases in government debt are associated with a reduction in the yield spread between high-grade corporate bonds and long-term Treasuries and an increase in fiscal uncertainty. Consequently, increases in government debt significantly reduce the acquisition likelihood for firms. The effect is stronger among firms whose debt is a closer substitute for Treasuries and firms with greater exposure to fiscal uncertainty. A positive change in government debt motivates acquirers to avoid cash financing or more irreversible deals. The average deal quality is lower during periods of rising public debt, consistent with heightened fiscal uncertainty impeding monitoring and fostering "bad" deals. (*JEL* D80, E22, E62, G18, G34, G38)

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"an increase [in the national debt] will generally place a "gross burden" on those living beyond that time through a reduction in the aggregate stock of private capital." — Franco Modigliani (1961, p. 731)

1. Introduction

The Covid-19 stimulus spending, largely financed through debt, has rekindled the debate on the likely impact of upsurges in national debt on the economy. Much concern is focused on whether expanding government debt can bring about an increase in interest rates and a corresponding reduction in private investment.[1] We take a fresh approach to this classical query by examining the impact of national debt on mergers and acquisitions (M&As) — one of the most important forms of corporate investments. As a primary tool used by firms to grow, M&A plays a vital role in the allocation of resources within and across industries. For instance, the year 2015 alone has seen $0.83 trillion worth of M&As domestically, amounting to almost 4.6% of the gross domestic product (GDP) in the U.S.[2] Consequently, M&A is an important factor affecting the efficient functioning and long-term growth of the economy.

To understand why national debt matters for M&As, we explore two distinct, but not mutually exclusive, channels. The first is the debt substitutability channel. Modigliani (1961) contends that government debt places a burden on future generations through a reduction in the current capital stock.[3] Follow-up studies show that increases in government borrowing "crowd out" corporate debt and hence investment through competition for the limited pool of investor funds (McDonald 1983; Benninga and Talmor 1988; Krishnamurthy and Vissing-Jorgensen 2012; Graham et al. 2014; Graham et al. 2015). As

[1] There is much debate in news media about the impact of rising debt. See, for example, "As Debt Rises, the Government Will Soon Spend More on Interest Than on the Military", *The New York Times* (25 September 2018) and "Federal Budget Would Raise Spending by $320 Billion", *The New York Times* (22 July 2019).
[2] Source: Thomson Reuters.
[3] A contrasting literature on the Ricardian equivalence posits that government debt has no effect on interest rates and private investments (Barro 1989; Seater 1993; Barro and Sala-i-Martin 1990; Carmichael 1982; Barro 1974). This literature argues that the present value of national debt is equal to the value of the future taxes, and hence, rational agents proceed as usual. This results in the government debt having a trivial effect on private-sector investment.

national debt increases, investors absorb the excessive supply by holding a large fraction of their wealth in Treasury securities and, by necessity, a smaller fraction in competing securities such as corporate bonds (Graham et al. 2015; Elmendorf and Mankiw 1999). The reduced demand for corporate bonds, in turn, pushes up firms' cost of debt capital, leading to weaker M&A activity. However, the effect is unlikely to be uniform across firms. The safer a firm's debt securities, the higher the substitutability they are for Treasuries. All else being equal, firms with safer debt securities are more likely to experience a rise in the cost of capital following an increase in the supply of government bonds (McDonald 1983; Graham et al. 2014; Greenwood et al. 2010; Krishnamurthy and Vissing-Jorgensen 2012). Accordingly, if the substitution between high-grade corporate bonds and Treasury securities is the underlying mechanism through which government debt dampens merger activity, the effect should be stronger for firms whose debt securities are closer substitutes for government bonds.

The second mechanism is the fiscal uncertainty channel. Unexpected movements in national debt increase the uncertainty surrounding the policies of fiscal consolidation that must take place to achieve balanced budget through tax increases, government spending cuts, or both (Corsetti et al. 2010; Croce et al. 2019). Consequently, firms react to heightened fiscal uncertainty by postponing irreversible investments until uncertainty is resolved or abates over time (Bernanke 1983; McDonald and Siegel 1986; Dixit 1989; Pindyck 1991; Rodrik 1991; Dixit 1992; Leahy 1993; Leahy and Whited 1996; Dixit and Pindyck 1994). If so, the variation in government debt should have a more pronounced effect on acquisition decisions for firms with larger exposure to fiscal policy uncertainty.

We empirically test the two channels by examining the impact of a change in the government debt-to-GDP ratio ($\Delta Debt/GDP$) on the aggregate deal value and volume using local projections, as per Jordà (2005) and Auerbach and Gorodnichenko (2012). Using quarterly data from 1981 to 2016, we document a significant reduction in the aggregate M&A activity in terms of both the deal value and volume following

an increase in the debt-to-GDP ratio. Consistent with our expectation that the damping effect of government debt operates through the debt substitution and fiscal uncertainty mechanisms, we find that a positive shock to the debt-to-GDP ratio leads to a significant drop in the spread between AAA corporate bonds and long-term Treasury bonds and a significant rise in economic policy-related uncertainty.

Similar patterns emerge when we study the association between $\Delta Debt/GDP$ and the likelihood of making acquisitions at the firm level. After controlling for a comprehensive set of factors including contemporaneous macroeconomic conditions, industry-level valuation waves, and firm-specific characteristics, we find that a one-standard-deviation increase in $\Delta Debt/GDP$ is related to a 1.97 percent and 3.86 percent decrease in the probability of making a takeover over the next one to three years.[4]

A challenge in our analysis is that certain latent factors may simultaneously increase government debt and discourage M&A activity, creating several alternative explanations for our findings. For instance, the government may increase spending, financed through debt, to stimulate aggregate demand during recessions. Meanwhile, firms may reduce their acquisition activities during low economic growth periods in response to either poor investment opportunities or tightened credit standards for commercial lending. In such cases, the negative correlation between fluctuations in government debt and M&A activity is spurious since the change in government debt merely reflects poor economic prospects. To mitigate this concern, we employ an instrumental variable (IV) approach, using *government spending shocks* as per Blanchard and Perotti (2002), as an instrument of exogenous variation in government debt. The government spending shocks capture the changes in expenditure *unrelated to* the current or prospective state of the economy. Following Blanchard and Perotti (2002), we use the estimated residuals from the structural VAR – the

[4] Based on the idea that business cycles are closely related in the U.S. and Canada (Gulen and Ion 2016; Romalis 2007; Hufbauer et al. 1993), we orthogonalize $\Delta Debt/GDP$ in the U.S. on $\Delta Debt/GDP$ in Canada. Using the estimated orthogonalized residuals as a proxy, we continue to find a strong negative association between the national debt and M&A likelihood. We find that our results are robust to additional controls such as Jurado et al. (2015) macroeconomic uncertainty index, Baker et al. (2016) policy uncertainty index, and VXO stock market volatility index.

portion of spending that is uncorrelated with the changes in GDP, income tax rate, and the Treasury bill rate – to identify government spending shocks. This method can be interpreted as achieving identification through internal instruments (Stock and Watson 2018). We find that the negative effect of $\Delta Debt/GDP$ on acquisition decisions remains highly significant after implementing the IV approach. A one-standard-deviation increase in the exogenous component of $\Delta Debt/GDP$ ratio reduces the M&A likelihood by 2.36 percent over the next year. The effect is economically sizable compared to the unconditional yearly M&A probability of 9.92 percent.

We explore the cross-sectional heterogeneity of firms to test whether national debt reduces M&As through the debt substitution mechanism. Specifically, we use panel regressions to estimate the impact of national debt on M&A likelihood *across* firms with different levels of credit worthiness. We expect that credit-worthy firms — whose debt securities are closer substitutes for government bonds — are more impacted by increases in national debt. Consistent with this prediction, we find the interaction term between $\Delta Debt/GDP$ and a firm's credit worthiness – defined as those with high debt ratings or firms with low default risk – is negative and statistically significant.

Turning to the fiscal uncertainty channel, we use the Baker et al. (2016) uncertainty index to measure the aggregate economic policy uncertainty (EPU hereinafter). This index is an ex-ante measure of economic policy related uncertainty that captures three different components: 1) the frequency of newspaper articles containing key words related to policy uncertainty; 2) the uncertainty about future changes in the tax code using the dollar impact of tax provisions set to expire in the near future; and 3) the dispersion in economic forecasts of the CPI and government spending to proxy for uncertainty about fiscal and monetary policy. To gauge a firm's sensitivity to policy-related uncertainty, we compute the stock return beta coefficient on the overall EPU index. We find that the variation in government debt has a stronger negative effect on M&A decisions of firms with greater sensitivity to policy-related uncertainty.

Importantly, we find that not all types of policy uncertainty matter in times of increasing national debt. The negative effect of Δ*Debt/GDP* on deal activity is concentrated on firms that are more sensitive to uncertainty surrounding fiscal policies such as taxes, government spending, and entitlement programs.[5] In contrast, uncertainties related to monetary policy, regulation, financial regulation, and trade policy have no effect on M&A decisions.

As our final inquiry, we examine how changes in government debt impact the characteristics of *announced deals*. Since deal outcomes are only observed if a deal occurs, the observed sample may not represent a random sample from the entire population of firms. We address the sample selection bias using a Heckman two-stage model with the mutual fund trading pressure indicator developed by Khan et al. (2012) as our exclusion restriction. Consistent with the debt substitutability channel, we find that in times of increasing national debt where the cost of debt is higher, firms are less likely to use cash for M&A payment. In addition, a positive change in Δ*Debt/GDP* has a more pronounced (negative) effect on deals in which target firms represent more irreversible investments and, hence, deals in which the real option to delay investments is more valuable. Finally, we find that the average deal is of lower quality following an increase in Δ*Debt/GDP*, as indicated by lower total synergistic gains and poorer acquirer cumulative abnormal returns (CARs). The deterioration in deal quality is partially driven by elevated levels of fiscal uncertainty, which reduces the quality of external monitoring and allows firms with weaker governance to pursue bad deals.

The remainder of the paper proceeds as follows. Section 2 provides a literature review. Section 3 presents the baseline findings. Section 4 examines the mechanisms. Section 5 examines the characteristics of announced M&A deals. Section 6 concludes the paper.

[5] Baker et al. (2016) measures fiscal uncertainty by counting the frequency of fiscal policy related words such as federal budget, budget battle, balanced budget, fiscal stimulus, budget deficit, federal debt, national debt, debt ceiling, and balance the budget.

2. Related Literature

This study has direct implications for the literature on the drivers of M&A activity, e.g., industry shocks (Mitchell and Mulherin 1996), profitable reallocation opportunities (Jovanovic and Rousseau 2002), stock overvaluation (Shleifer and Vishny 2003; Rhodes-Kropf and Viswanathan 2004), and industry connections through customer-supplier relationships (Ahern and Harford 2014). We add to this strand of literature by documenting that government borrowing is a key determinant of acquisition decisions of firms.

Our analysis highlights the role of government debt in affecting the cost of capital across highly credit-worthy firms. In this regard, our work is related to a growing stream of literature that examines the impact of the cost of capital on corporate takeovers. Harford (2005), for instance, finds that M&A waves occur, in part, because of the ease of raising external capital (e.g., commercial or industrial credit). Erel et al. (2012) find that increases in relative valuation, either through country-level stock return increases or currency appreciation, reduce the cost of capital, leading to higher cross-border activity. Other studies have explored the link between the cost of capital and M&As through the lens of capital market imperfections. The evidence is generally consistent with market frictions, which cause an increase in the cost of external funds, impeding firms' ability to undertake M&As.[6] We study another friction — unexpected movements in government debt — and its implications for firms' cost of capital and M&A decisions. While prior studies emphasize the detrimental effect of market frictions on financially constrained firms, we show that a surge in government debt is particularly deleterious for large, credit-worthy firms, and these firms are important enough for government borrowing to adversely affect the overall market for corporate control.

[6] See, among others, leverage deficit (Uysal 2011), public versus private firms (Maksimovic et al. 2013), access to public debt markets (Harford and Uysal 2014).

Our evidence on the link between government debt and M&A decisions of firms that are sensitive to fiscal policy-related uncertainty complements recent research on uncertainty and corporate investments. Theoretical work on this topic points out the value of the real option to delay irreversible investments in times of high uncertainty (Bernanke 1983). Consistent with this prediction, Bhagwat et al. (2016) find that rises in market volatility, as proxied by the VIX index, increase the interim risk of deal renegotiation and termination, thus decreasing subsequent merger activity. In contrast, Garfinkel and Hankins (2011) find that increases in firm-level cash flow uncertainty drive the decision to merge vertically, leading to the start of merger waves. Duchin and Schmidt (2013) show that elevated levels of uncertainty during merger waves increase the volume of agency-driven deals because of reduced external monitoring. These studies point to the idea that not all types of uncertainty affect M&A decisions in the same manner.

Perhaps the most closely related papers to ours are Nguyen and Phan (2017) and Bonaime et al. (2018). Using the Baker et al. (2016) index to quantify policy uncertainty, both studies document a negative association between the *overall* policy uncertainty and M&A activity via a real option channel. Our work shares with theirs the perspective that policy uncertainty retards investment. However, instead of investigating the uncertainty itself which is tied to a broad range of policy-relevant events, we focus on a specific, underlying *source* of fiscal uncertainty that emerges because of unexpected changes in national debt.[7] Our study, therefore, identifies a potential transmission mechanism of public debt, other than interest rates and the cost of capital. Importantly, we show that the effect is exacerbated for firms with greater sensitivity to uncertainty surrounding *fiscal* policies, but not for those with greater exposure to *non-fiscal* uncertainties, e.g., monetary policy, economic regulation, and financial regulation, which are traditionally important for acquisition decisions but unlikely to be affected by changes in government debt. These

[7] Bonaime et al. (2018) show that uncertainties related to fiscal policy, monetary policy, economic regulation, and financial regulation depress M&A activity.

findings highlight the complex relation between policy uncertainty and M&A decisions, which varies depending on firms' exposure to a *specific* policy driven uncertainty.

More broadly, our work is related to a growing literature on the interaction between government debt and corporate policies, e.g., the choice of corporate debt maturity (Greenwood et al. 2010), capital expenditure (Graham et al. 2014), and leverage (Graham et al. 2015). M&As represent one of the most important forms of corporate investments that effect massive capital reallocations across the economy. By linking government debt to M&As, we shed light on another important channel through which government debt affects the real economic activity. In addition, Croce et al. (2019) stress tax policy uncertainty that drives the negative link between government debt and firms' innovation decisions. We focus on uncertainty regarding fiscal "exit" strategies through either tax hikes or spending cuts and show that both tax- and expenditure-related uncertainties matter for acquisition decisions. We go further to understand the effect of public debt on the quality of corporate takeovers, i.e., payment method, target choice, takeover premium, and synergy gains. Our findings suggest that the variation in government debt influences not only the level but also the nature of a firm's investments.

Our study has timely implications for policy makers. The government debt has grown to a record $19.6 trillion in 2021, underscoring the government's continuing support to the economy during the COVID-19 pandemic.[8] However, our research analysis indicates that elevated levels of public debt are detrimental to the efficient allocation of resources through M&As, which can have a profound impact on the economy's productivity and output capacity in the long run.

[8] See "US Government Debt Rose $2.8 Trillion in 2020 to a Record $19.6 Trillion Amid Fight Against Covid-19", *Business Wire,* April 19, 2021 (https://www.businesswire.com/news/home/20210419005119/en/US-Government-Debt-Rose-2.8-Trillion-in-2020-to-a-Record-19.6-Trillion-Amid-Fight-Against-Covid-19).

3. Empirical Findings

3.1 Sample and data

We form the sample for our study using the universe of firms included in the Compustat database. We obtain accounting data from Compustat and stock return data from the Centre for Research in Security Prices (CRSP) database. We use the Thomson Reuters database to collect data on the U.S. M&A transactions announced between January 1981 and December 2016.[9] We then match the M&A data with the Compustat data to form the full sample. Following the literature, we require M&A deals that have: 1) transaction value above $1 million and more than 1 percent of the acquirer market capitalization; and 2) acquiror's ownership less than 10 percent before acquisition and more than 50 percent after the deal. Our final sample consists of 155,123 firm year observations and 15,638 deal years.[10]

It is difficult to reject a unit root in the time-series of real debt and the time-series of debt-to-GDP ratio (Bohn 1998, 1991). To mitigate this concern, we use the changes in government debt-to-GDP ratio to measure innovations in government debt. The quarterly federal government debt data is obtained from the U.S. Department of the Treasury, and the quarterly GDP data is from the U.S. Bureau of Economic Analysis. Table 1 presents the summary statistics for the variables employed in our baseline analysis. Panel A reports aggregate time-series descriptive statistics. In total, our data span over 36 years. The average annual change in debt to GDP ratio (ΔDebt/GDP) is 3.529 percent and the standard deviation is 5.082 percent. Hence, there is considerable variation in ΔDebt/GDP for our sample period.

Panel B reports the full sample panel data statistics, and Panel C shows statistics for the subsample of acquirors.[11] The average firm size (total book assets in natural logarithm) is 3.622 (or 37.4 million). The acquiring firms are relatively larger with an average size of 4.780 (or 119.084 million). In addition, mean

[9] We exclude the rumored deals from the sample.
[10] Our results remain qualitatively unchanged when excluding the utility and financial industries.
[11] The Appendix Table A1 contains a full description of variable definitions.

market to book ratio (M/B) for the full sample is 0.920, while acquiring firms have a higher market to book ratio (M/B) of 1.307. Acquirors also tend to be more profitable than average firms, as indicated by their higher ROA and sales growth. This highlights the importance of controlling these firm characteristics in our regression framework.

[Please Insert Table 1 Here]

In Figure 1, we plot the quarterly change in the government debt-to-GDP ratio and the total volume and value of M&A deals in the US between January 1981 and December 2016. The national debt increased in the early 1980s with the Economic Recovery Tax Act of 1981. Along with the deficit funded military spending, the fiscal deficit increased during the Reagan presidency. The national debt also increased during early 1990s with the unanticipated military spending for the Gulf War. The deficit continually fell in the mid to late 1990s because of a series of Budget Reconciliation Acts during Bill Clinton's second term as the president. The national debt increased in late 2000s because of increased deficit financed military spending on wars in Afghanistan and Iraq as well as the new entitlement Medicare D program.

The aggregate M&A activity displays a large amount of variability around the movements in national debt. The growth of national debt is followed by a decrease in M&A activity. For example, from the year 2003 to 2007, the public debt in the U.S. continued to increase as result of the deficit financed wars in Afghanistan and Iraq. Despite the sustained economic growth during this period, the M&A activity remained relatively low for the entire duration. While not a formal test, this evidence suggests that the pattern in the figure is likely driven by the variation in national debt and is unlikely due to a change in the economic conditions or the seasonality in merger activity.

[Please Insert Figure 1 Here]

3.2 Industry-level local projections

We start our empirical analysis by examining the aggregate effects of government debt on M&A activity. We estimate impulse response functions using local projections (LPs) as per Jordà (2005). Unlike vector autoregressions (VARs), LPs do not impose the implicit dynamic restrictions involved in (Owyang et al. 2013). Following Auerbach and Gorodnichenko (2013) and Jordà et al. (2015), we modify the traditional LPs to estimate a panel structure.[12] Specifically, we estimate the following model:

$$y_{i,t+h} = \alpha_{i,h} + \Delta Debt/GDP_t\, \beta_h + X_{i,t}\gamma_h + \mathrm{K}_{i,t-1}\phi_h + \varepsilon_{i,t+h}, \quad (1)$$

where $y_{i,t+h}$ is the variable of interest, including the natural logarithm of M&A deal numbers, the natural logarithm of deal volumes, spread between AAA bonds and 10-Year Treasury bond, and the natural logarithm of news index of economic policy-related uncertainty as per Baker et al. (2016).

$X_{i,t}$ includes a vector of all variables in the system observed at time *t* for industry *i;* $\mathrm{K}_{i,t-1}$ contains six lags of all the elements in $X_{i,t}$, $y_{i,t+h}$, and $\Delta Debt/GDP_t$. We use a rich set of controls to isolate the effects of government debt based on observables. The vector of controls include the index of macroeconomic uncertainty as per Jurado et al. (2015), 3-month Treasury bill rate to control for monetary policy, the real per capita GDP growth rate, and the average one-year ahead GDP growth forecast from the Livingstone Survey of Professional Forecasters.

The coefficient β_h corresponds to the response of y at time $t + h$ to the shock at time t. The impulse responses are the sequence of all estimated β_h. The standard errors are estimated using the approach by Newey and West (1987).

Figure 2 presents the local projections and the corresponding 95 percent confidence intervals. We find that an unanticipated increase in Δ*Debt/GDP* has a significant negative impact on both the log of total

[12] The literature shows that data aggregation discards important information and testing power (Orcutt et al. 1968; Fei 1956; Morimoto 1970). We use industry categories based on the Fama and French 12 industries. Our results are robust to other industry classifications.

deal volume and the log of total deal value. The decrease in merger activity is highly persistent, lasting for more than ten quarters following the shock. These findings provide industry level evidence that a positive movement in government borrowing deters takeover activity.

Consistent with the idea that government deficit reduces the yield spread between high rated corporate bonds and Treasury securities (Krishnamurthy and Vissing-Jorgensen 2012), we observe a decline in the spread between AAA corporate bonds and 10-Year Treasury bonds following an increase in government debt. Meanwhile, higher government debt is accompanied by an increase in subsequent economic policy uncertainty. The finding is consistent with the literature showing that an increase in the national debt increases fiscal policy-related uncertainty (Alesina and Tabellini 1989, 1990; Croce et al. 2019).

[Please Insert Figure 2 Here]

3.3 Firm-level panel regressions

We examine the average effect of changes in national debt on M&As using firm-level regressions. We estimate the following Probit regressions:

$$y_{i,t+1\ to\ t+k} = \alpha + \beta_1 \cdot \Delta Debt/GDP_t + \gamma \cdot X_{i,t} + \varepsilon_{i,t+k}, \quad (2)$$

where $y_{i,t+k}$ is the likelihood of being an acquirer for firm *i* in the next *k* years. We use *k=1* to capture relatively short-term effects, and *k* = 3 to capture long-run effects. $\Delta Debt/GDP_t$ is the change in the ratio of government debt to gross domestic product (GDP) in year *t*; $X_{i,t}$ is a vector of aggregate and firm-level controls introduced below. The term α denotes the industry fixed effects and $\varepsilon_{i,t+k}$ is the error term. In all cases, we cluster the standard errors by firm and year.

Any observed relation between movements in government debt and M&A likelihood could be driven by time-varying macroeconomic conditions or investment opportunities, both of which are shown to affect takeover decisions (Maksimovic and Phillips 2001; Harford 2005). We mitigate this concern by controlling for a comprehensive set of factors including: 1) the real GDP growth rate, a proxy for current investment opportunities; 2) return on the three-month Treasury bill, designed to capture the level of interest rates that may affect the financing and investment environments (Graham et al. 2014); and 3) the inflation rate which affects the price level.

Expectations about future economic conditions may also simultaneously influence the government debt policy and M&A decisions Following Bonaime et al. (2018), we include the first principal component (PC1) of the following four economic indicators as an additional control: 1) the University of Michigan index of consumer confidence; 2) the Conference Board's proprietary Leading Economic Indicator; 3) the National Activity Index from the Chicago Federal Reserve Board; and 4) the average one-year ahead GDP growth forecast from the Livingstone Survey of Professional Forecasters.

Mitchell and Mulherin (1996) show that industry shocks are a key driver of merger waves. Accordingly, we control for industry-level economic shocks, as in Harford (2005) and Gulen and Ion (2016). Several studies also attribute the variation in takeover activity to equity overvaluations (Shleifer and Vishny 2003; Rhodes-Kropf and Viswanathan 2004; Rhodes–Kropf, Robinson, and Viswanathan 2005; Dong et al. 2006). If increases in the national debt coincide with depressed equity valuation, then the true effects of variation in debt on merger activity could be inflated. To address this problem, we control for industry-level valuation waves as proxied by: 1) industry median Tobin's *q* and industry median cumulative returns over the prior three years, with higher Tobin's *q* and higher past returns indicating higher equity valuation (Harford 2005; Garfinkel and Hankins 2011); and 2) industry return volatility, where market timing is more likely to occur in industries with more volatile stock prices (Bonaime et al. 2018).

As for the firm-level variables, we follow prior literature (Harford and Uysal 2014; Almazan et al 2010; Harford 1999; Almeida and Campello 2007; Bonaime et al. 2018) and control for firm size (log total assets), firm-level investment opportunities (market-to-book ratio), profitability (return on assets and sales growth), book leverage, corporate liquidity (a ratio of cash holding to total assets), and misevaluation (past 12-month returns and return volatility).

Table 2 reports the results from the estimation of Probit regressions of acquisition likelihood on the change in the national debt regression.[13] We observe a strong, negative association between $\Delta Debt/GDP$ and acquisition likelihood in the subsequent years. Converting the point estimates to marginal effects, a one standard deviation increases in the $\Delta Debt/GDP$ is associated with a 1.97 percent (3.86) percent decrease in the probability of being an acquirer over the next one year (three years).[14] The effects are economically sizable considering the unconditional yearly merger probability of 9.92 percent in our sample. The firm level results are therefore consistent with the aggregate panel local projections, suggesting that increases in government borrowing negatively affect takeover activity.

To further alleviate the concern that certain unobservable economic forces are driving both movements in government debt and deal activity, we apply a strategy exploiting the similarities between the U.S. and Canadian economies. Based on the idea that the two economies have significant integrations in areas such as regulation of investment, transportation and financial services, intellectual property, competition policy, and the temporary entry of business persons (Hufbauer et al. 1993; Romalis 2007), we expect many of the shocks affecting the U.S. economy to also affect the general economy in Canada, albeit to a lesser extent. Accordingly, we construct an alternative measure of $\Delta Debt/GDP$ by extracting the component of variation in the U.S. government debt that is orthogonal to changes in the Canadian

[13] We also find consistent results using quarterly data. Results are available upon request.
[14] The economic magnitude is calculated by multiplying marginal effect and one standard deviation in $\Delta Debt/GDP$ ratio (5.082). The marginal effects for Table 2, Model 1 and 2 are -0.389 percent and -0.760 percent, respectively.

government debt. This measure captures the component of Δ*Debt/GDP* unrelated to macroeconomic forces common to both countries. We continue to find a negative and highly significant association between the orthogonalized U.S. government debt and the subsequent deal activity.[15]

Another potential concern with our main measure of changes in government debt (Δ*Debt/GDP*) is that the effects could be driven by movements in the denominator, GDP, or trends in government debt. We therefore create two additional proxies for changes in government debt: 1) the change in the real federal government debt, Δ*Real Debt*; and 2) the cyclical component of government debt filtered using the Hamilton (2018) procedure, *Debt Cyclicality*. As shown in the Appendix Table A3, we find consistent results using both measures of government debt.

[Please Insert Table 2 Here]

3.4 Instrumental variable approach

The movements in government debt may correlate with latent economic forces, e.g., aggregate investment opportunities, and capital liquidity, which in turn affect firms' acquisition decisions. For instance, the extant literature shows that M&A decisions tend to be pro-cyclical (Maksimovic and Phillips 2001). Meanwhile, the federal government may implement fiscal stabilization policies and expand debt during recessions to combat economic downturns. Hence, increases in government borrowing can coincide with weak economic conditions under which firms delay acquisitions because of either poor investment opportunities or a lack of market liquidity.

We mitigate the omitted variable concern by employing an IV approach. We use government spending *shocks*, as per Blanchard and Perotti (2002), as an instrument of exogenous variation in government debt. Blanchard and Perotti use a structural vector autoregression (VAR) to identify government spending shocks that capture changes in expenditure unrelated to the current or prospective

[15] The results are reported in the Appendix Table A2.

state of the economy. We therefore use the estimated residuals from the structural VAR – the portion of spending uncorrelated with the changes in real per capita GDP, the income tax rate, and the Treasury bill rate – as government spending shocks. The method can be interpreted as achieving identification through internal instruments (Stock and Watson 2018).

In the first stage of our estimation, we estimate a time-series regression to extract the exogenous variation in government debt:

$$\Delta Debt/GDP_t = \alpha + \delta_1 \cdot Shock_t + \delta_2 \cdot \overline{X_t} + e_{i,t}, \quad (3)$$

where $Shock_t$ is the identified government spending shock, and $\overline{X_t}$ is a vector of controls. As expected, we find that a positive government spending shock leads to a significant increase in the debt to GDP ratio.[16] In the second stage, we estimate the following panel regression model:

$$y_{i,t+k} = \alpha + \beta_1 \cdot \Delta\widehat{Debt/GDP}_t + \gamma \cdot X_{i,t} + \alpha + \varepsilon_{i,t+k}, \quad (4)$$

where $y_{i,t}$ is the likelihood of being an acquirer for firm *i* over the following *k* years; $\Delta\widehat{Debt/GDP}_t$ is the predicted value of Δ*Debt/GDP* obtained from the first stage regression; α denotes the industry fixed effects; $\varepsilon_{i,t+k}$ is the error term. The coefficient β_1 estimates the marginal change in the firm's likelihood of being an acquirer for the next *k* years following a change in the exogenous portion of government debt.

Table 3 reports the second-stage regression results. We find that a positive shock to government debt leads to a significant reduction in a firm's acquisition likelihood. In fact, the magnitude of the IV estimate is slightly larger than that shown in Table 2. A one-standard-deviation increase in $\Delta\widehat{Debt/GDP}_t$, ratio is associated with a 2.33 percent and 4.74 percent decrease in the probability of being an acquirer over the next one and three years, respectively.

[Please Insert Table 3 Here]

[16] The first-stage results are reported in the Appendix Table A4.

3.5 Omitted variables

The body of evidence so far is consistent with the view that increases in government debt negatively affect merger activity. In this subsection, we conduct a battery of robustness tests to verify the validity of our results. First, the IV approach employed in Table 3 helps alleviate endogeneity concerns arising from the strategic interaction between the government and the rest of the economy. It, however, does not consider the influence of political parties. For instance, the Democratic and Republican parties demonstrate fundamentally different approaches in how they deal with economic issues. While the Democrat approach to governing is often described as "tax and spend," the Republican party tends to favor smaller government, lower taxes, and less government interference in the economy (Alesina 1987; Schlesinger 1975; Hibbs 1977; Wittman 1983). The differences in political parties may, therefore, have a profound influence on the country's appetite for government spending, taxes, and debt and their effects on firms' incentives to acquire.

To rule out the possibility that our results are driven by variation in the partisan political cycle, we perform several robustness tests. First, we control the political effects of the White House. We create an indicator variable, *Republican President*, which equals one if the President is Republican and zero otherwise. Second, we control for the effects of a Republican Congress. We create an indicator variable equals to one if the Senate and the House of Representatives are controlled by the Republican party, and zero otherwise. Third, we control for the effects of a Democratic Congress, which takes the value of one if both the Senate and the House of Representatives are controlled by Democratic party, and zero otherwise. We augment the IV regressions by including each of the political cycle variables - *Republican President*, *Republican Congress*, and *Democratic Congress* - both individually and combined as additional controls. As shown in Appendix Table A5, our results are robust to the inclusion of political cycle variables.

Another possibility is that increasing government debt may coincide with periods of high government spending and macroeconomic uncertainty. To test this possibility, we control for: 1)

government spending, measured by the level of government expenditure to GDP ratio; 2) the macroeconomic uncertainty index developed by Jurado et al. (2015); and 3) stock market volatility, captured by the Chicago Board Options Exchange's VXO volatility index. The results are reported in Appendix Table A6. We find none of the additional controls significantly changes our results.

4. The Mechanisms

The results presented so far are consistent with the notion that increases in government debt depress corporate takeovers. In this section, we explore the mechanisms through which changes in government debt impact corporate M&As.

4.1 The substitution between high-grade corporate bonds and Treasury securities

Graham et al. (2015) show that government borrowing crowds out corporate debt financing through competition for investor funds.[17] The idea is that when the government increases the supply of debt, the demand curve for corporate bonds is pushed up and to the left, resulting in a rise in the cost of corporate debt capital. Consequently, firms are less likely to acquire because increases in the supply of public debt crowd out corporate financing. We therefore conjecture that the safer a firm's debt securities are, the higher the substitutability they have for long-term Treasuries and, all else being equal, the more likely the firm's cost of capital will rise relative to the yields on more distant substitutes following an increase in the supply of government bonds (McDonald 1983; Graham et al. 2014; Greenwood et al. 2010; Krishnamurthy and Vissing-Jorgensen 2012). Accordingly, the effects of increases in government debt on deal activity should be larger for safer, more credit-worthy firms.

To test this mechanism, we estimate the following model:

[17] Since market frictions such as taxes and transaction costs prevent the average investor from costless exchanging return streams from one security for another, the demand curve is upward-sloping, imperfectly-elastic. To the extent that different securities are imperfect substitutes in an investor's portfolio, fluctuation in the supply of government debt alters the relative yields on competing securities such as corporate equity and debt securities.

$$y_{i,t+k} = \alpha_i + \beta_1 \, \Delta\widehat{Debt/GDP}_t + \beta_2 \left(\Delta\widehat{Debt/GDP}_t \cdot I_t^{High\ Cred}\right) + \beta_3 \, I_t^{High\ Cred} + \beta_4 \, X_{i,t} + \alpha + \varepsilon_{i,t+k}, \quad (5)$$

where $y_{i,t+k}$ is the likelihood of being an acquirer for firm *i* in the next *k* years. $\Delta\widehat{Debt/GDP}_t$ is the exogenous component of changes in government debt using the government spending shocks as an instrument. $I_t^{High\ Cred}$ is an indicator variable equal to one if the acquirer's debt is less risky and hence a closer substitute for Treasuries, and zero otherwise. The debt substitution channel predicts that highly rated corporate credit is more sensitive to variation in the supply of Treasuries. Hence, β_2 in Equation (5) is expected to have a negative sign if increases in the government debt have a greater adverse effect on highly credit worthy firms.

We use two proxies of credit-worthiness: 1) $I_t^{A\ rating}$, an indicator for firm whose debt is rated A or above by a credit rating agency in a given year (Shivdasani and Zenner 2005; Harford and Uysal 2014); and 2) $I_t^{Low\ default}$, an indicator for firm's with default risk is in the lowest quartile and zero otherwise (Hillegeist et al. 2004). Following Hillegeist et al. (2004), we estimate a firm's default risk as the probability that a firm's market value of assets is lower than the face value of the liabilities for the year using the Black-Scholes-Merton (BSM) model.

Table 4 reports the results. Panel A presents the results using $I_t^{A\ rating}$. On average, firms with better credit ratings have higher acquisition likelihood. However, during times of increasing government debt, these firms are significantly less likely to make a deal over the three-year window, as evidenced by the negative and significant coefficient on the interaction term between the exogenous shock to government debt and $I_t^{A\ rating}$ indicator (Column 2). A similar pattern emerges when the $I_t^{Low\ default}$ indicator is used to proxy for credit quality (Panel B). Overall, these cross-sectional findings lend support to the debt substitutability mechanism.

[Please Insert Table 4 Here]

4.2 Fiscal policy-related uncertainty

The second mechanism we test is the fiscal policy-related uncertainty. The value of the option to delay corporate investments such as acquisitions is higher in periods of increasing national debt since there is greater uncertainty about potential changes in fiscal policies (Alesina and Tabellini 1989, 1990). Firms defer acquisitions until such uncertainties are resolved in the future (Bloom 2009; Bloom et al. 2007; Nguyen and Phan 2017; Gulen and Ion 2016; Jurado et al. 2015). If this mechanism is at play, firms with higher sensitivity to fiscal policy uncertainty should react more strongly to changes in public debt, all else being equal.

To test this hypothesis, we construct a variable that measures a firm's stock return sensitivity (beta) to economic policy uncertainty. Without loss of generality, we assume that the Fama and French (1993) three-factor model explains the cross-section of returns. We add the Baker et al. (2016) policy uncertainty index as a non-traded factor to the three-factor model. The index is constructed based on the following three components: 1) newspaper coverage of policy-related economic uncertainty; 2) the number of federal tax code provisions set to expire in future years; and 3) disagreement among economic forecasters as a proxy for uncertainty.[18] We estimate the following time-series regression:

$$r_{i,t} - r_{f,t} = \alpha_{i,t} + \beta_{i,t}^{mkt}\left(r_{mkt,t} - r_{f,t}\right) + \beta_{i,t}^{smb} r_{smb,t} + \beta_{i,t}^{hml} r_{hml,t} + \beta_{i,t}^{epu} epu_t + \epsilon_{i,t}, \qquad (6)$$

where $r_{i,t}$ is firm i's return; $r_{f,t}$ is the risk-free rate; $r_{mkt,t}$ is the returns on the market portfolio; $r_{smb,t}$ is the return on a well-diversified portfolio of small minus big firms; $r_{hml,t}$ is the return on a well-diversified portfolio of high minus low book-to-market firms, and epu_t is the economic policy uncertainty (EPU) index. Following Fama and French (1992), we use a standard 60-month rolling window for estimation and

[18] The first component is an index of search results from 10 large newspapers including the USA Today, Miami Herald, Chicago Tribune, Washington Post, Los Angeles Times, Boston Globe, San Francisco Chronicle, Dallas Morning News, New York Times, and Wall Street Journal. Using these newspapers, the authors construct a normalized index of the volume of news articles discussing economic policy uncertainty.

require at least 24 observations to be included in the sample. The estimated parameter $\widehat{\beta_{i,t}^{epu}}$ is the firm *i*'s exposure to policy uncertainty at time *t*. In each year, we classify firms in the top quartile of $\widehat{\beta_{i,t}^{epu}}$ as those that are highly sensitive to policy uncertainty and construct an indicator variable, $High\ \beta^{epu}$, accordingly. We then estimate the following model:

$$y_{i,t+k} = \alpha_i + \beta_1\ \Delta\widehat{Debt/GDP}_t + \beta_2\ \left(\Delta\widehat{Debt/GDP}_t \cdot\ High\ \beta^{epu}\right) + \beta_3\ \widehat{High\ \beta}^{epu} + \beta_4\ X_{i,t} + \varepsilon_{i,t+k}, \quad (7)$$

where $y_{i,t+k}$ is the likelihood of being an acquirer for firm *i* over the next *k* years, α_i are industry fixed effects, and $\Delta\widehat{Debt/GDP}_t$ is the exogenous shock to government debt. The fiscal policy uncertainty mechanism predicts that increases in the national debt will have adverse effects on firms with high exposure to fiscal policy related uncertainty. Hence, the uncertainty mechanism predicts a negative sign for the β_2 coefficient in Equation (7).

Column 1 of Table 5 reports the results. The sensitivity measure by itself, $High\ \beta^{epu}$, has an insignificant effect on a firm's acquisition likelihood. However, the interaction term between the instrumented $\Delta\widehat{Debt/GDP}_t$ and the firm's sensitivity to overall economic policy uncertainty is negative and significant. This finding suggests that the dampening effect of government debt on the probability of acquisitions is stronger among firms with high exposure to policy-related uncertainty.

To explore which policy uncertainties matter, we narrow down on the firm's exposure to uncertainty related to specific types of policy. To this effect, we reconstruct the beta measure with respect to each of the sub-category of the EPU index: fiscal policy, health care, national security, entitlement programs, monetary policy, regulations (including financial regulations), and trade policy. Fiscal policy uncertainty is related to the sub-categories of fiscal policy, health care, national security, entitlement programs, whereas other policies such as monetary, international trade, and regulatory policies are unlikely

to be affected by changes in government debt.[19] To examine a firm's exposure to specific types of policy uncertainty, we replace epu_t in Equation (6) with each component of policy uncertainty, one at a time. As before, we construct an indicator variable that identifies firms in the top quartile of exposure to uncertainty surrounding a particular policy.

The results are provided in columns 2 through 10 of Table 5. We find that the negative effects of government borrowing are largely concentrated among firms with greater sensitivity to fiscal policy uncertainty. In contrast, uncertainties related to monetary policy, economic regulation, financial regulation, and trade policy do not appear to have a significant impact on the acquisition likelihood. The findings are therefore consistent with the fiscal policy related uncertainty mechanism, suggesting that elevated levels of public debt increase the uncertainty about changes in future fiscal policy, thus encouraging firms to exercise the option to delay acquisitions.

[Please Insert Table 5 Here]

5. Characteristics of Announced M&As

We have shown that increases in government debt imped M&A activity by increasing either the cost of debt financing or uncertainty about fiscal consolidation policies. In this section, we provide more insight on the two channels by exploring a different dimension of heterogeneity along the characteristics of *announced* deals, including the acquirer's choice of payment methods, target types, and deal quality.

The sample here contains only announced deals. Because not all firms undertake a deal and the decision to make a deal is unlikely random, a simple OLS regression analysis is subject to a potential sample selection bias, in addition to the endogeneity problem discussed before. To address this concern, we

[19] Most of the tax revenues are spent on entitlement programs such as Social Security and veterans' compensation and pensions. Financing of entitlement programs rely on taxes from workers.

implement the following procedure suggested by Wooldridge (2010). We first estimate the selection model which predicts the probability of a firm making an acquisition, as in Column 1 of Table 2. To identify the model, we use the exogenous indicator of mutual fund trading pressure, developed by Khan et al. (2012), as our exclusion restriction. Substantial buying pressure by mutual funds experiencing large capital inflows can lead to overvalued stocks, thereby increasing the likelihood of the firm engaging in M&A activity. The variable is excluded in that it is associated with unanticipated capital inflows from mutual funds with excess liquidity, which are unlikely to significantly influence the characteristics of deals that a firm intends to make.

From the probit estimates, we compute the inverse Mills ratio (IMR). This variable is then included as an additional regressor in a two-stage IV regression model to correct for any potential bias resulting from sample selection. As in Equations (3) and (4), the first stage of the IV model predicts Δ*Debt/GDP*, using *government spending shocks* as an instrument; the second stage estimates the impact of instrumented Δ*Debt/GDP* on a specific characteristic of announced deals. Since certain firms make more than one acquisition in a year, the unit of observation is deal-acquirer-year.[20]

5.1 Payment methods

If a rise in government debt increases the cost of debt financing, then acquiring firms are less likely to use cash as M&A currency, which is costlier than stock. We therefore investigate the impact of changes in public debt on payment method for a sample of deals announced between 1981 and 2016. We construct two variables to capture an acquirer's choice of payment method: 1) the percentage of cash payment for a deal, ranging between 0 percent and 100 percent; and 2) a dummy variable which equals one if the deal is financed with 100 percent cash and zero otherwise.

[20] Our results remain unchanged if we average the deal characteristics for acquirers announcing multiple deals per year.

Table 6 reports the results from the second stage of IV regression models augmented with the selection term, IMR, to account for sample selection.[21] Column 1 shows the results using a two-stage least squares (2SLS) estimation in which the dependent variable is the percentage of cash payment for a deal. Column 2 shows the results using an IV probit regression in which the dependent variable is an indicator for all cash financed deal. The results indicate a positive selection effect, evidenced by the positive and statistically significant coefficient on IMR. Δ*Debt/GDP* is negative and significant at the 5 percent level in both specifications. Thus, consistent with our expectation, an increase in government debt is associated with a lower probability of cash financing.

[Please Insert Table 6 Here]

5.2 Target type

The fiscal uncertainty mechanism posits that uncertainty about future policies of fiscal consolidation increases the value of the option to wait during increasing government debt times. Firms are likely to postpone investments until uncertainty is resolved, especially when investments are less reversible (Bernanke 1983; McDonald and Siegel 1986; Dixit 1989; Pindyck 1991; Rodrik 1991; Dixit 1992; Leahy 1993; Leahy and Whited 1996; Dixit and Pindyck 1994). If so, the decline in M&A activity should be mainly driven by the reduction in acquisitions of targets representing more irreversible investments for which the option to delay is more valuable.

We employ three proxies to capture the degree of target investment irreversibility. The first proxy is sunk cost at the target's industry level. Prior work shows that industries with lower sunk costs are more reversible since they can lease capital more easily, have a ready second-hand market, and depreciate capital faster (Kessides 1990; Farinas and Ruano 2005). Following Gulen and Ion (2016), we use accounting data

[21] The selection and first-stage results are reported in Appendix Table A7. The price pressure indicator in the selection model (column 1) is positive and highly significant at the 1 percent level, indicating that it is a relevant variable explaining the probability of firms making a deal.

to measure a firm's rent expense, depreciation expense, and the sale of property, plant and equipment (PPE) over the past 12 quarters, all scaled by PPE at the beginning of the current year. We then compute the industry average of each measure to construct a single sunk-cost index for each target industry and year. [22] The index takes: 1) the value of two if all three proxies of the target industry are below the median across all industries in that year, 2) the value of one if the three industry proxies are at the median, and 3) the value of zero if all three industry proxies are above the median. Hence, a higher value of the sunk-cost index indicates a greater degree of investment irreversibility. Our second proxy is the target firm's tangibility ratio, measured as the firm's tangible assets (total net PPE) scaled by total assets.[23] All else being equal, firms with higher tangibility should be more reliant on physical assets and therefore less reversible. The third proxy is based on the intuition that asset liquidation values are correlated with the cyclicality of a firm's sales (Shleifer and Vishny 1992; Almeida and Campello 2007). During bad times, firms operating in highly cyclical industries face a greater difficulty liquidating assets, since other firms in that industry are likely negatively affected by the same economic shock. Gomes et al. (2009) show that durable industries have more procyclical cashflows than nondurable firms. We classify industries as durables at the Fama–French 12 industry level, based on the SIC code.

Table 7 shows the impact of a change in government debt on each of the three target irreversibility measures, using the procedure outlined before to address sample selection bias involved in the IV analysis. For brevity, we report only the coefficient estimates for Δ*Debt/GDP* and the selection term IMR from the second stage of IV regression models. Δ*Debt/GDP* produces a negative and significant effect on both the sunk cost index of the target industry (column 1) and the degree of target firm's tangibility (column 2). Similarly, Δ*Debt/GDP* negatively affects the acquisitions of targets operating in durables industries,

[22] Industries are defined at the three-digit SIC level.
[23] For target firm without tangibility ratio data, we replace it with its industry (four-digit SIC) average tangibility ratio of the year.

although the effect is not statistically significant (column 3). Overall, the findings lend further support to the fiscal uncertainty mechanism, suggesting that firms are less likely to acquire targets representing more irreversible investments when government debt increases.

[Please Insert Table 7 Here]

5.3 Deal quality

Whether the change in the national debt impacts the quality of announced deals is an important question for both academics and policy makers. To shed light on this issue, we consider two competing hypotheses. The first hypothesis is that, faced with higher costs of capital, firms are more cautious about M&A investments and thus pursue M&As only if the deals are expected to be value-creating. If so, deals announced during periods of rising government debt should be of higher quality. An alternative hypothesis is that unexpected movements in public debt and the consequent fiscal uncertainty may reduce the quality of monitoring, enabling firms to engage in lower-quality deals (Duchin and Schmidt 2013). Specifically, fiscal uncertainty can exacerbate the uncertainty surrounding the standalone value of the target and the value of synergistic gains created through the merger. Thus, monitors such as shareholders need to incur higher costs to obtain more informative signals to better infer the quality of the deal. This may, in turn, lead to poor monitoring and worse deal quality during periods of increasing public debt.

To test these two competing hypotheses, we examine the effect of $\Delta Debt/GDP$ on acquirer's CAR over a five-day window surrounding the announcement date. If the variation in government debt affects deal quality, then the effect should be reflected in announcement returns. Table 8, column 1 reports the regression results from the second stage of IV regression models augmented with the IMR to mitigate sample selection and endogeneity concerns. We find a negative and significant (at the 5 percent level) association between $\Delta Debt/GDP$ and acquirer CARs, indicating that deals announced in times of increasing national debt generally destroy the value of acquirer shareholders.

Such value destruction could occur either because acquiring firms overpay for targets or choose targets with lower synergies. We therefore investigate the impact of Δ*Debt/GDP* on 1) the takeover premium, defined as the *percentage* premium of offer price over target market value four weeks before the deal announcement, and 2) the total synergistic gains, measured by the combined announcement abnormal returns received by the acquirer and the target shareholders over a five-day event window. As shown in columns 2 and 3 of Table 8, Δ*Debt/GDP* negatively affects both the takeover premium and total synergies; the effect is significant at the 10 percent and 1 percent level, respectively. Thus, although acquirers pay lower takeover premiums, the average deal is less synergistic, consistent with the idea that deal quality deteriorates in periods of rising public debt, possibly due to reduced monitoring.

[Please Insert Table 8 Here]

To provide further evidence on reduced monitoring, we compare the average quality of corporate governance in acquiring firms that announced deals in times of "high" (above-median) versus "low" (below-median) Δ*Debt/GDP*, similar to Duchin and Schmidt (2013). If fiscal uncertainty indeed impedes the quality of monitoring and fosters "bad" acquisitions, then the average acquirer should have weaker governance during times of growing public debt.

We use a number of corporate governance measures including*:* 1) CEO/chairman duality, which is equal to one if the CEO is also the chairman of the board and zero otherwise; 2) CEO equity ownership, defined as the percentage of shareholding by the CEO; 3) CEO equity-based compensation (EBC), which is the proportion of equity-based pay, i.e., option grants and stock awards, of total compensation (Kini and Williams 2012); [24] 4) *E*-index, which captures the degree of managerial entrenchment as a result of antitakeover provisions including classified board, limits to shareholder bylaw amendments, poison pill,

[24] ExecuComp reports the fair values of EPC calculated by firms themselves for the post-2005 period due to the passage of FAS 123R in 2004. To make EPC comparable across firms, we follow Kini and Williams (2012) and recalculate EBC for all firms in the post-2005 period.

golden parachute, supermajority requirements for mergers, and charter amendments (Bebchuk et al. 2008); and 5) large shareholder monitoring, i.e., *Block ownership*, defined as the total proportion of the firm in the hands of institutions holding at least 5 percent of the firm (Duchin and Schmidt 2013). We use the data from Institutional Shareholder Services to construct the CEO/chairman duality and *E*-index. The data on CEO equity ownership and EBC are collected from the ExecuComp database, while the institutional holdings data are from the 13-F filings by Thomson/Refinitiv.

In Panel A of Table 9, we present the averages of the governance measures for the full sample of announced deals and for the sample split by high versus low Δ*Debt/GDP*. Consistent with our expectations, acquirers in high Δ*Debt/GDP* periods are, on average, associated with poorer governance than those in low Δ*Debt/GDP* periods. While CEO/chairman duality does not differ meaningfully between the two groups, acquirers in high Δ*Debt/GDP* periods have lower CEO ownership and EBC which can help align the CEO's interest with that of shareholders. They also tend to have greater managerial entrenchment, as measured by the *E*-index, and lower block ownerships than their counterparts in low Δ*Debt/GDP* times. The differences in means are all statistically significant at the 1 percent level.

In Panel B, we regress each of the corporate governance measures on Δ*Debt/GDP* and industry fixed effects. Standard errors are double-clustered at the firm and year level. We find that Δ*Debt/GDP* is statistically significant at the 1 percent level in four out of the five regression models. Firms announcing deals during high Δ*Debt/GDP* times are associated with lower CEO equity ownership, lower CEO equity-based compensation, higher *E*-index, and lower block ownership. The result for the CEO/Chairman duality is not statistically significant. Overall, the findings support the argument that increases in public debt, *via* the fiscal uncertainty mechanism, reduce the quality of external monitoring, allowing firms with weaker governance to pursue deals of lower quality.

[Please Insert Table 9 Here]

6. Conclusion

The U.S. national debt has surged over last few decades and is expected to rise following the Covid-19 pandemic. Using post-1980 data in the U.S., we document novel insights on how changes in government debt impacts M&As, which play an important role in the allocation of capital.

Using an instrumental variable approach, we show that increases in government debt are followed by a significant reduction in takeover activity. There are two mechanisms through which movements in government debt affect the probability of a firm making acquisitions. First, increases in government borrowing crowd out corporate debt financing through competition for investor funds. Consistent with this debt substitutability mechanism, we document that the effects government debt on deal activity is significantly stronger for safer, more credit-worthy firms. Second, unexpected changes in public debt increase uncertainty surrounding the potential changes in fiscal agenda needed to fund the fiscal deficits. We find that the impact of government debt on M&A activity is indeed greater for firms with greater sensitivity to fiscal policy related uncertainty. Specifically, changes in government debt have a more pronounced effect on firms with high degree of sensitivity to uncertainty regarding taxes and entitlement programs policies.

We further explore how changes in government debt affect the characteristics of announced deals. Consistent with the debt substitutability mechanism, we find that firms are less likely to use cash for M&A payment in times of increasing national debt when the cost of debt is higher. Using the tangibility ratio, industry sunk costs, and cyclicality of a sales as proxies of investment irreversibility at the target level, we document a larger drop in the acquisition of targets representing a more irreversible investment. Although acquirers pay significantly lower takeover premiums for target firms, the average announced deal is of lower quality during periods of growing national debt. The effect is partially driven by elevated levels of

fiscal uncertainty, which worsens the quality of external monitoring and allows firms with weaker governance to pursue bad deals.

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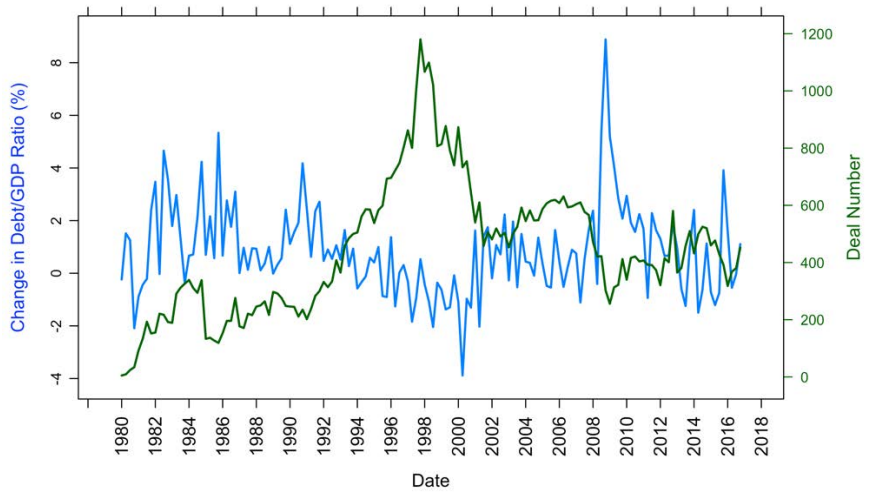
Figure 1. Changes in Government Debt and Aggregate M&A Activity

The figure shows the quarterly deal number (top panel) and deal value (bottom panel) for a sample of acquisitions conducted by US-based, public firms, together with the change in debt to GDP ratio, from January 1980 to December 2016. Total number and deal value, reported in billions of 2015 US dollars, correspond to the solid lines and left axes; change in debt to GDP ratio corresponds to the dashed lines and right axes.

Panel A: Change in government debt and aggregate deal number



Panel B: Change in government debt and aggregate deal value

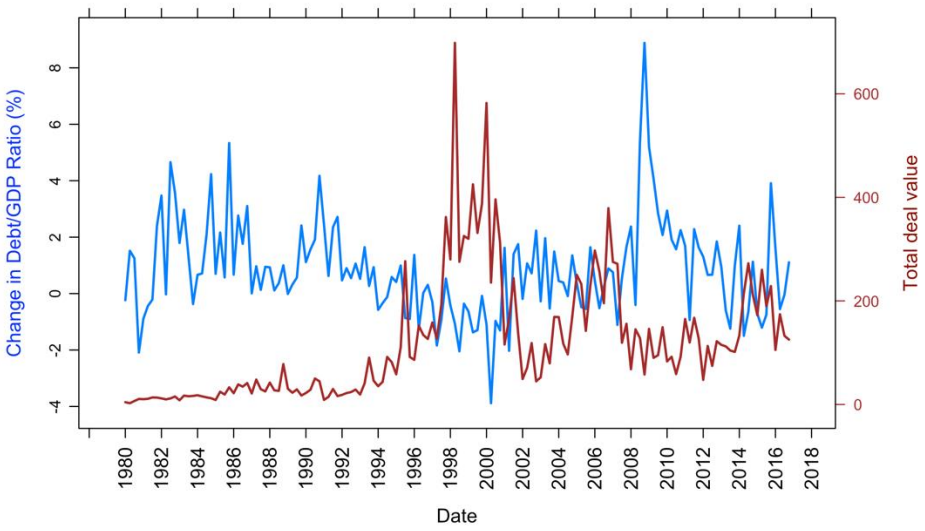


Figure 2. The Effect of a Shock to Debt to GDP Ratio on Acquisitions by U.S. Public Firms

The figure shows the impulse responses, estimated using local projections (LPs) as per Jordà (2005), following a positive *shock* to the change in debt to GDP ratio. We estimate local projections in (1) using a Fama and French 12 industry level quarterly panel dataset. The variable of interests (dependent variables) are the natural logarithm of M&A deal numbers, the natural logarithm of M&A deal volume, the spread between AAA bonds and 10-Year Treasury bond, and the natural logarithm of news index of economic policy-related uncertainty (EPU) as per Baker et al. (2016). The vector of controls include the index of macroeconomic uncertainty as per Jurado et al. (2015), 3-month treasury bill rate to control for monetary policy, the real per capita GDP growth rate, and the average one-year ahead GDP growth forecast from the Livingstone Survey of Professional Forecasters. In addition, we control for six lags of all elements in the control vector, the dependent variable, and the change in debt to GDP ratio. The shaded areas represent 95 percent confidence intervals computed using Newey and West (1987) adjusted standard errors.

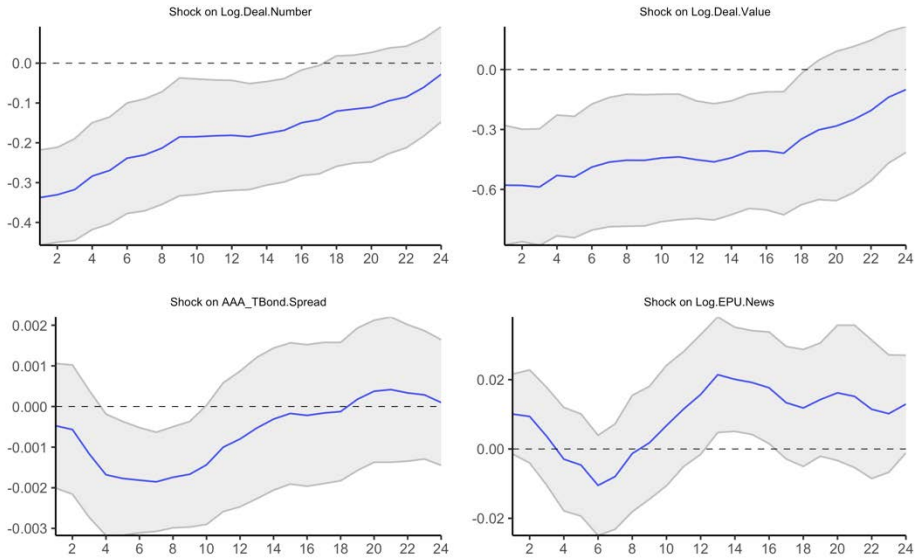


Table 1. Summary Statistics

This table presents the summary statistics. The sample includes all Compustat firm-year observations between 1981 and 2016, except firms not incorporated in the U.S. and firm- years with non-positive values for book value of total assets or book value of common equity. Variables are defined in Appendix Table A1.

Variable	N	P5	P25	Mean	Median	P75	P95	Std Dev
Panel A: Aggregate Times Series								
Δ*Debt/GDP*	36	-3.847	0.625	3.529	2.545	6.842	14.931	5.082
PC1	36	-4.218	-1.180	-0.057	0.562	1.142	2.099	1.995
Inflation	36	0.659	1.728	3.209	2.890	3.809	8.912	2.267
Ln(Real GDP growth)	36	-0.014	0.015	0.026	0.027	0.042	0.055	0.020
Tbill Yield	36	0.030	1.045	4.362	4.620	6.255	10.850	3.573
Panel B: Full Sample								
Bidder, t+1	155123	0.000	0.000	0.101	0.000	0.000	0.000	0.301
Bidder, t+1, +3	150036	0.000	0.000	0.212	0.000	0.000	1.000	0.408
Industry Economy Shock	155123	-0.086	-0.028	0.020	0.008	0.051	0.167	0.086
Tobin's Q Industry Median	155123	0.989	1.135	1.457	1.328	1.614	2.534	0.481
Volatility Industry Median	155123	0.067	0.102	0.129	0.126	0.152	0.199	0.040
PR36_Industry Median	155123	-0.358	-0.058	0.235	0.230	0.478	0.898	0.405
Size	155123	1.682	3.622	5.365	5.221	7.006	9.503	2.354
M/B	155123	0.235	0.920	2.481	1.570	2.828	8.453	4.108
ROA	155123	-0.443	-0.001	-0.008	0.054	0.089	0.162	0.225
Sale growth	155123	-0.354	-0.031	0.191	0.083	0.240	0.980	0.605
Leverage	155123	0.000	0.062	0.257	0.226	0.390	0.679	0.221
Cash/TA	155123	0.003	0.021	0.152	0.072	0.205	0.596	0.191
PR12	155123	-0.667	-0.248	0.135	0.047	0.355	1.270	0.634
Volatility	155123	0.012	0.020	0.036	0.030	0.045	0.082	0.023
Panel C: Acquirors								
Industry Economy Shock	15638	-0.088	-0.033	0.019	0.008	0.052	0.167	0.087
Tobin's Q Industry Median	15638	1.028	1.203	1.531	1.394	1.713	2.552	0.481
Volatility Industry Median	15638	0.066	0.100	0.130	0.126	0.154	0.206	0.042
PR36_Industry Median	15638	-0.322	-0.016	0.253	0.263	0.478	0.869	0.389
Size	15638	2.633	4.780	6.337	6.386	7.883	10.087	2.206
M/B	15638	0.588	1.307	2.902	2.051	3.345	8.735	3.833
ROA	15638	-0.226	0.031	0.032	0.065	0.095	0.160	0.168
Sale growth	15638	-0.237	0.020	0.279	0.128	0.325	1.223	0.628
Leverage	15638	0.000	0.075	0.256	0.232	0.386	0.638	0.208
Cash/TA	15638	0.003	0.020	0.147	0.070	0.205	0.561	0.181
PR12	15638	-0.514	-0.095	0.266	0.159	0.454	1.471	0.639
Volatility	15638	0.012	0.018	0.031	0.026	0.039	0.070	0.020

Table 2. Firm-Level Results: The Average Effect

This table presents the results estimating Equation (2) using Probit regressions of acquisition likelihood on the change in the national debt based on a sample of Compustat firms for the period 1981 – 2016. All regressions include industry (Fama French 48 industries) fixed effects. Variables are defined in Section 3 and Appendix Table A1. *t*-statistics in parentheses are based on standard errors adjusted for clustering within firm and year. Observations are the total number of firm-year observations. ***, **, *, indicates significance at the 1%, 5%, and 10% level, respectively.

Probit model	(1)	(2)
Dependent Var= (1, 0)	*Bidder, t+1*	*Bidder, t+1, +3*
Δ*Debt/GDP*	-0.025***	-0.028***
	(-4.440)	(-4.494)
PC1	-0.035**	-0.028*
	(-2.380)	(-1.741)
Inflation	-0.039*	-0.019
	(-1.786)	(-0.847)
Ln (Real GDP growth)	0.409	-2.036
	(0.292)	(-1.233)
T-bill Yield	-0.015	-0.046***
	(-0.907)	(-2.692)
Industry Economy Shock	-0.000	-0.208
	(-0.003)	(-1.221)
Tobin's Q Industry Median	0.156**	0.159**
	(2.396)	(2.447)
Volatility Industry Median	-0.136	0.025
	(-0.154)	(0.027)
PR36_Industry Median	0.016	-0.011
	(0.428)	(-0.262)
Size	0.106***	0.117***
	(12.930)	(12.306)
M/B	0.006***	0.007***
	(3.971)	(4.890)
ROA	0.188***	0.187***
	(5.267)	(4.799)
Sale growth	0.138***	0.114***
	(13.680)	(12.134)
Leverage	-0.118***	-0.162***
	(-3.094)	(-3.782)
Cash/TA	-0.082	-0.119**
	(-1.585)	(-2.063)
PR12	0.130***	0.116***
	(8.348)	(8.395)
Volatility	-1.850***	-1.651***
	(-3.540)	(-2.645)
Trend	-0.005	-0.014***
	(-1.196)	(-3.142)
Industry FE	Yes	Yes

Firm & Year Clustering	Yes	Yes
Observations	155,123	150,036
Log Likelihood	-47206	-72312

Table 3. Instrumental Variable Approach

This table presents the results of estimating Equation (4) for the period 1981 – 2016. We use *government spending shocks* identified using a structural VAR, as per Blanchard and Perotti (2002), as an instrument of government debt. The first stage results are reported in Appendix Table A4. All models contain the same set of controls as in Table 2. All regressions include industry (Fama French 48 industries) fixed effects. Variables are defined in Section 3 and Appendix Table A1. *t*-statistics in parentheses are based on standard errors adjusted for clustering within firm and year. Observations are the total number of firm-year observations. ***, **, *, indicates significance at the 1%, 5%, and 10% level, respectively.

Second Stage with IV: Federal Spending Shock		
Probit model	(1)	(2)
Dependent Var= (1, 0)	*Bidder, t+1*	*Bidder, t+1, +3*
Δ*Debt/GDP (IV: Government Spending Shocks)*	-0.032***	-0.034***
	(-4.997)	(-4.790)
Controls (Macro, Industry, and Firm)	Yes	Yes
Industry FE	Yes	Yes
Firm & Year Clustering	Yes	Yes
Observations	155,123	150,036
Log Likelihood	-47183	-72301

Table 4. The Debt Substitutability Channel

This table presents the results estimating Equation (5) using Probit regressions of acquisition likelihood on the change in the national debt on the sample of Compustat firms for the period 1981 – 2016. We use *government spending shocks* identified using a structural VAR, as per Blanchard and Perotti (2002), as an instrument of government debt. $I_t^{A\ rating}$ is an indicator for firm's whose debt is rated A or above by a credit rating agency in a given year, and zero otherwise. $I_t^{Low\ default}$ is an indicator for firm's with default risk is in the lowest quartile in a given year, and zero otherwise. In panel A, our sample starts from 1985 from which the information about credit rating is available. All regressions include industry (Fama French 48 industries) fixed effects and contain the same set of controls in Table 2. Variables are defined in Section 3 and Appendix Table A1. *t*-statistics in parentheses are based on standard errors adjusted for clustering within firm and year. Observations are the total number of firm-year observations. ***, **, *, indicates significance at the 1%, 5%, and 10% level, respectively.

Panel A. Credit Rating		
Probit model	(1)	(2)
Dependent Var= (1, 0)	*Bidder, t+1*	*Bidder, t+1, +3*
Δ*Debt/GDP (IV: Government Spending Shocks)*	-0.015**	-0.014
	(-2.168)	(-1.524)
Δ*Debt/GDP (IV: Government Spending Shocks)* × *A Rating*	-0.008	-0.015***
	(-1.429)	(-2.784)
A Rating	0.088**	0.111**
	(2.178)	(2.493)
Controls (Macro, Industry, and Firm)	Yes	Yes
Industry FE	Yes	Yes
Firm & Year Clustering	Yes	Yes
Observations	34,544	32,682
Log Likelihood	-14522	-19324
Panel B. Default Risk		
Probit model	(1)	(2)
Dependent Var= (1, 0)	*Bidder, t+1*	*Bidder, t+1, +3*
Δ*Debt/GDP (IV: Government Spending Shocks)*	-0.030***	-0.032***
	(-4.655)	(-4.627)
Δ*Debt/GDP (IV: Government Spending Shocks)* × *High Credit*	-0.009**	-0.009*
	(-2.115)	(-1.775)
High Credit	0.102***	0.104***
	(3.911)	(3.912)
Controls (Macro, Industry, and Firm)	Yes	Yes
Industry FE	Yes	Yes
Firm & Year Clustering	Yes	Yes
Observations	146,340	141,412
Log Likelihood	-44849	-68647

Table 5. The Economic Policy Uncertainty Channel

This table presents the results estimating Probit regressions of acquisition likelihood on the change in the national debt for the sample of Compustat firms over the period 1985 – 2016. The sample starts in 1985 from which the economic policy uncertainty index starts. We use *government spending shocks* identified using a structural VAR, as per Blanchard and Perotti (2002), as an instrument of government debt. The results are based on firm's sensitivity to the sub-components economy policy uncertainty. *High* β_t^{epu} is an indicator variable taking the value of one if a firm's estimated uncertainty beta is in the top quartile, and zero otherwise. All regressions contain the same set of controls as in Table 2. Variables are defined in Section 3 and Appendix Table A1. *t*-statistics in parentheses are based on standard errors adjusted for clustering within firm and year. Observations are the total number of firm-year observations. ***, **, *, indicates significance at the 1%, 5%, and 10% level, respectively.

	Overall EPU	**Fiscal Expenditure Related Policies**					**Other Policies**			
Probit model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Dependent Var= (1, 0), Bidder *t+1*	Overall	Taxes	Government spending	Health care	National security	Entitlement programs	Regulation	Financial Regulation	Trade policy	Monetary policy
Δ*Debt/GDP (IV: Government Spending Shocks)*	0.003	0.003	0.002	0.003	0.003	0.003	0.001	0.001	0.000	0.002
	(0.349)	(0.409)	(0.302)	(0.338)	(0.346)	(0.388)	(0.154)	(0.125)	(0.027)	(0.187)
Δ*Debt/GDP (IV: Government Spending Shocks)* × *High* β_t^{epu}	-0.008***	-0.010**	-0.006*	-0.007*	-0.008*	-0.010***	-0.001	-0.000	0.003	-0.003
	(-2.605)	(-2.569)	(-1.676)	(-1.711)	(-1.943)	(-2.742)	(-0.246)	(-0.008)	(0.747)	(-0.757)
High β_t^{epu}	0.031	-0.007	-0.031*	-0.022	0.035**	-0.018	-0.014	-0.018	0.012	0.019
	(1.504)	(-0.390)	(-1.808)	(-1.103)	(1.985)	(-1.243)	(-0.806)	(-1.263)	(0.633)	(0.900)
Controls (Macro, Industry, and Firm)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm & Year Clustering	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	108,327	108,327	108,327	108,327	108,327	108,327	108,327	108,327	108,327	108,327
Log Likelihood	-36577	-36572	-36573	-36574	-36576	-36571	-36581	-36581	-36580	-36581

Table 6. Changes in Government Debt and Payment Method

This table presents the regression results from the second stage of IV regression models that investigate the effect of Δ*Debt/GDP* on the choice of payment method for M&A deals announced between 1981 – 2016. We start by estimating a probit model which predicts the probability of a firm making an acquisition, as in Column 1 of Table 2, with an addition of a proxy for the price pressure resulting from mutual funds experiencing large capital inflows, as per Khan et al. (2012). Based on the probit estimates, we compute the inverse Mills ratio (IMR) which is then included as an additional regressor in a two-stage IV regression model to account for the sample selection bias. The first stage of the IV regression predicts Δ*Debt/GDP*, using *government spending shocks* as an instrument (the results are reported in Appendix Table A7). For brevity, we report only the second stage of the IV regression results of the percentage of cash payment in column 1, and the second stage of the IV probit regression results of all cash in column 2. The unit of observation is deal-acquirer-year. All models contain the same set of controls as in Table 2. The *z*-statistics in parentheses are based on standard errors adjusted for clustering within firm and year. ***, **, *, indicates significance at the 1%, 5%, and 10% level, respectively.

	Payment Method	
	(1)	(2)
IV augmented with the IMR	Percentage of Cash (%)	All Cash
Δ*Debt/GDP (IV: Government Spending Shocks)*	-3.745**	-0.107**
	(-2.372)	(-2.270)
IMR	109.313**	3.336***
	(2.541)	(2.593)
Controls (Macro, Industry, and Firm)	Yes	Yes
Industry FE	Yes	Yes
Observations	18,363	18,363

Table 7. Changes in Government Debt and Target Type

This table presents the regression results from the second stage of IV regression models which examine the effect of Δ*Debt/GDP* on the type of target firms for M&A deals announced between 1981 – 2016. We start by estimating a probit model which predicts the probability of a firm making an acquisition, as in Column 1 of Table 2, with an addition of a proxy for the price pressure resulting from mutual funds experiencing large capital inflows, as per Khan et al. (2012). Based on the probit estimates, we compute the inverse Mills ratio (IMR) which is then included as an additional regressor in the two-stage IV regression model to account for the sample selection problem. The first stage of the IV regression model predicts Δ*Debt/GDP*, using *government spending shocks* as an instrument. The second-stage regression examines whether a firm acquires a target representing a more irreversible investment, as proxied by the target firm's sunk cost index (column 1), tangibility (column 2), or operations in durable industries (column 3). Sunk cost is based on three measures: rent expense, depreciation expense, and PP&E sales over the prior 12 quarters, scaled by lagged PP&E. Tangibility ratio is measured as the firm's total net property, plant and equipment scaled by total assets. Durable industry is a dummy variable equal to one if the target Fama-French 12 industry is classified as durable goods industry and zero if it is a non-durable goods industry. The unit of observation is deal-acquirer-year. All models contain the same set of controls as in Table 2. The *z*-statistics in parentheses are based on standard errors adjusted for clustering within firm and year. ***, **, *, indicates significance at the 1%, 5%, and 10% level, respectively.

	Target Irreversibility		
	(1)	(2)	(3)
IV augmented with the IMR	Sunk Cost Index	Tangibility Ratio	Durable Industry Indicator
Δ*Debt/GDP (IV: Government Spending Shocks)*	-0.125***	-0.017***	-0.183
	(-7.895)	(-2.593)	(-0.759)
IMR	3.305***	0.455**	5.871
	(7.689)	(2.473)	(0.787)
Controls (Macro, Industry, and Firm)	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Observations	18,182	18,743	1,075

Table 8. Changes in Government Debt and Deal Quality

This table presents the regression results from the second stage of IV regression models which examine the effect of Δ*Debt/GDP* on the quality of M&A deals announced between 1981 – 2016. We start by estimating a probit model which predicts the probability of a firm making an acquisition, as in Column 1 of Table 2, with an addition of a proxy for the price pressure resulting from mutual funds experiencing large capital inflows, as per Khan et al. (2012). Based on the probit estimates, we compute the inverse Mills ratio (IMR) which is then included as an additional regressor in the two-stage IV regression model to account for the sample selection problem. The first stage of the IV regression model predicts Δ*Debt/GDP*, using *government spending shocks* as an instrument. The second-stage regression examines the quality of announced deals, as measured by the acquirer five-day CAR (column 1), takeover premium (column 2), and total synergistic gain (column 3). Following Bradley et al. (1988), we estimate market model over -240 to -11 trading days prior to deal announcement date and calculate the CAR over the window [-2, +2] around the deal announcement. Takeover premium is defined as a *percentage* premium of offer price over target market value four weeks before the deal announcement reported by SDC. Total synergistic gain is estimated as the value weighted five-day CAR of the acquirer and target firm. The unit of observation is deal-acquirer-year. All models contain the same set of controls as in Table 2. The *z*-statistics in parentheses are based on standard errors adjusted for clustering within firm and year. ***, **, *, indicates significance at the 1%, 5%, and 10% level, respectively.

	Deal Quality		
	(1)	(2)	(3)
IV augmented with the IMR	Acquirer CAR	Premium (%)	Combined CAR
Δ*Debt/GDP (IV: Government Spending Shocks)*	-0.009**	-3.022*	-0.015***
	(-2.560)	(-1.922)	(-3.036)
IMR	0.253**	78.434**	0.452***
	(2.518)	(1.981)	(3.203)
Controls (Macro, Industry, and Firm)	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Observations	19,228	2,809	2,950

Table 9. Government Debt and Corporate Governance

This table examines whether the poor quality of deals announced during rising public debt periods is attributable to reduced quality of monitoring. Column 1 of Panel A presents averages of different governance measures for the full sample of M&As announced between 1981 and 2016. Columns 2 and 3 report the averages for the subsample of deals announced in high versus low changes in public debt times, where "*High* Δ*Debt/GDP*" indicates that Δ*Debt/GDP* is above the sample median and "*Low* Δ*Debt/GDP*" indicates otherwise. We test the significance of the mean differences between the two columns and report the associated *p*-values in brackets in Column 4. Panel B presents results from the OLS regression of each of the governance measures on Δ*Debt/GDP* and industry fixed effects. CEO/chairman duality is an indicator variable with value of one if the CEO is also the chairman of the board and zero otherwise; CEO equity ownership is defined as the percentage of shareholding by the CEO. CEO equity-based compensation (EBC) is the proportion of equity-based pay, i.e., option grants and stock awards, of total compensation (Kini and Williams 2012). *E*-index captures the degree of managerial entrenchment as a result of antitakeover provisions including classified board, limits to shareholder bylaw amendments, poison pill, golden parachute, supermajority requirements for mergers, and charter amendments (Bebchuk et al. 2008). Block ownership is the total proportion of the firm in the hands of institutions holding at least 5 percent of the firm (Duchin and Schmidt 2013). *t*-statistics in parentheses are based on standard errors adjusted for clustering within firm and year. The unit of observation is acquirer-year. ***, **, *, indicates significance at the 1%, 5%, and 10% level, respectively.

Panel A: Summary Statistics of Governance Measures				
	All	High Δ*Debt/GDP*	Low Δ*Debt/GDP*	High–Low
CEO/Chairman Duality	0.677	0.672	0.681	-0.009
				(0.494)
CEO Equity Ownership	0.020	0.017	0.022	-0.005***
				(0.007)
CEO Equity-based Compensation	0.367	0.349	0.384	-0.035***
				(0.000)
E-index	1.559	1.673	1.507	0.166***
				(0.000)
Block Ownership	0.208	0.201	0.212	-0.011***
				(0.000)

Panel B: Regressions of Governance Measures					
OLS model	(1)	(2)	(3)	(4)	(5)
Dependent Var	CEO/Chairman Duality	CEO Equity Ownership	CEO Equity-based Compensation	E-index	Block Ownership
High Δ*Debt/GDP*	0.004	-0.005***	-0.035***	0.180***	-0.011***
	(0.312)	(-2.761)	(-3.613)	(4.821)	(-4.307)
Industry FE	Yes	Yes	Yes	Yes	Yes
Observations	5,588	3,300	3,197	4,370	11,371
R-squared	0.043	0.062	0.047	0.063	0.023

Appendix

Table A1. Variable Description

Variable	Definition	Data source
Bidder, t+1	A dummy variable equals 1 if firm *i* has acquisition in year *t+1*, 0 otherwise.	Thomson Reuter
Bidder, t+1, +3	A dummy variable equals 1 if firm *i* has acquisition in any year between *t+1 and t+3*, 0 otherwise.	Thomson Reuter
Δ*Debt/GDP*	The change of Debt/GDP ratio as calculated as [(Debt/GDP, *t*)/ (Debt/GDP, *t-1*)-1] in percentage.	U.S. Office of Management and Budget
Δ*Real Debt*	The change of Real Debt as calculated as [(Debt_Real, t)/ (Debt_Real, t-1)-1].	U.S. Department of the Treasury
Debt Cyclicality	Cyclical portion of the debt-to-GDP ratio using Hamilton (2018) filter.	U.S. Department of the Treasury
PC1	The first principal component (*PC1*) of four macro variables: consumer confidence index by the University of Michigan, OECD composite leading indicator, the Chicago Fed national activity index and the average one-year-ahead GDP forecast from the bi-annual Livingstone Survey of Professional Forecasters. We compute the principal component at monthly frequency and compute the average for the year. We use it as a proxy for macro investment opportunities.	http://www.sca.isr.umich.edu/ https://data.oecd.org/ https://www.chicagofed.org/ https://www.philadelphiafed.org/
Ln(Real GDP growth)	Natural logarithm of change in the real GDP.	U.S. Bureau of Economic Analysis
T-bill Yield	3-Month Treasury Bill: Secondary Market Rate	Board of Governors of the Federal Reserve System
Industry Economy Shock	Following Harford (2005), Industry Economy Shock is the first principal component calculated separately for each industry (Fama French 48 industries) using the following seven firm-level variables: net income to sales (IB/SALE), sales to assets (SALE/AT), R&D to assets (XRD/AT), capital expenditures to assets (CAPX/AT), employment growth (percentage change in employment (EMP)), return on assets (IB/AT) and sales growth (percentage change sales (SALE)). The median absolute change in each of above variables is computed for each industry-year. Finally, we extract the first principal component from the calculated seven median absolute change variables for each industry.	Compustat
Tobin's Q Industry Median	Fama French 48 Industry median annual Tobin's *Q*.	Compustat
Volatility Industry Median	Fama French 48 Industry median return volatility. The return volatility is calculated as the standard deviation of past 36 monthly returns lead up to fiscal year end.	CRSP
PR36_Industry Median	Fama French 48 Industry median past 36 months returns. The past 36 months return is the cumulative return over past 36 monthly returns lead up to fiscal year end.	CRSP
Size	Natural logarithm of total book assets (AT).	Compustat
M/B	Ratio of market equity to book equity at fiscal year-end (CSHO*PRCC_F/CEQ).	Compustat
ROA	Ratio of income before extraordinary items (IB) plus interest and related expense (XINT) to total book assets (AT).	Compustat
Sale growth	Annual growth rate of sales.	Compustat
Leverage	Leverage ratio as calculated as the sum of (DLTT+DLC) to total book assets (AT).	Compustat
Cash/TA	Ratio of cash (CHE) to total book assets (AT).	Compustat
PR12	Firm's past 12-month cumulative return calculated with CRSP past monthly return 12 months leading up to the fiscal year end month.	CRSP
Volatility	Firm's return volatility calculated using CRSP daily return over past 12 months leading up to 2 months prior to fiscal year end.	CRSP

Table A2. An Orthogonalized Measure of Changes in Government Debt

This table presents the results of estimating Probit regressions of acquisition likelihood on $\Delta\widehat{\text{Debt}/\text{GDP}}_{US}$. First, we extract the component of variation in U.S. government debt that is orthogonal to the Canadian government debt to remove the common macroeconomic variation. To do so, we estimate the following regression:

$$\Delta\text{Debt}/\text{GDP}_{US,t} = \beta_1\, \Delta\text{Debt}/\text{GDP}_{CAN,t} + \beta_2\, X_t + \alpha + \varepsilon_t,$$

where $\Delta\text{Debt}/\text{GDP}_{US,t}$ and $\Delta\text{Debt}/\text{GDP}_{CAN,t}$ are the change in debt-to-GDP ratio in the U.S. and Canada, respectively. The vector of controls, X_t, consists of the log of real GDP growth, inflation, PC1, and T-bill yield. We then employ the estimated residuals, $\hat{\varepsilon_t} = \Delta\widehat{\text{Debt}/\text{GDP}}_{US,t}$, as an instrument for change in the national debt. In second stage, we estimate the following Probit regressions:

$$y_{i,t+1\ to\ t+k} = \alpha + \beta_1 \cdot \frac{\Delta\text{Debt}}{\text{GDP}}_{US,t} + \gamma \cdot X_{i,t} + \varepsilon_{i,t+k},$$

where $y_{i,t}$ is the likelihood of being an acquirer for firm *i* in the next *k* years. All regressions contain the same set of macro level controls in the baseline. All regressions include industry (Fama French 48 industries) fixed effects. Variables are defined in Section 3 and Appendix Table A1. *t*-statistics in parentheses are based on standard errors adjusted for clustering within firm and year. Observations are the total number of firm-year observations. ***, **, *, indicates significance at the 1%, 5%, and 10% level, respectively.

Instrument: $\Delta\widehat{\text{Debt}/\text{GDP}}_{US}$		
Probit model	(1)	(2)
Dependent Var= (1, 0)	*Bidder, t+1*	*Bidder, t+1, +3*
$\Delta\widehat{\text{Debt}/\text{GDP}}_{US,t}$	-0.021***	-0.025***
	(-2.690)	(-2.825)
Controls (Macro, Industry, and Firm)	Yes	Yes
Industry FE	Yes	Yes
Firm & Year Clustering	Yes	Yes
Observations	151,580	146,493
Log Likelihood	-46736	-71220

Table A3. Alternative Measures of Changes in Government Debt

This table presents the results of estimating Probit regressions of acquisition likelihood on the alternate measures of changes to the national debt. The sample is based on a sample of Compustat firms for the period 1981 – 2016. Δ*Real Debt* is the change in the real federal government debt and *Debt Cyclicality* is the cyclical component of real debt filtered using the Hamilton (2018) procedure. All regressions include industry (Fama French 48 industries) fixed effects. All models contain the same set of controls as in Table 2. Variables are defined in Section 3 and Appendix Table A1. *t*-statistics in parentheses are based on standard errors adjusted for clustering within firm and year. Observations are the total number of firm-year observations. ***, **, *, indicates significance at the 1%, 5%, and 10% level, respectively.

Probit model	(1)	(2)	(3)	(4)
Dependent Var= (1, 0)	*Bidder, t+1*		*Bidder, t+1, +3*	
Δ*Real Debt*	-0.024***		-0.027***	
	(-4.527)		(-4.466)	
Debt Cyclicality		-0.015***		-0.017***
		(-3.498)		(-3.342)
Controls (Macro, Industry, and Firm)	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Firm & Year Clustering	Yes	Yes	Yes	Yes
Observations	155,123	155,123	150,036	150,036
Log Likelihood	-47202	-47243	-72312	-72387

Table A4. First Stage Results from the Two-stage Least Squares Regressions

This table presents the results of first stage of regression of change in government debt to GDP (Δ*Debt/GDP*) on the instrument variable - *government spending shocks* identified using a structural VAR, as per Blanchard and Perotti (2002). We take the yearly average of all industry and firm level variables for the regression. All other variables are defined in Appendix Table A1. Observations are the total number of firm-year observations. *t*-statistics in parentheses are calculated based on Newey and West (1987) standard errors with maximum of five lags. ***, **, *, indicates significance at the 1%, 5%, and 10% level, respectively.

Dependent Var=	(1) Δ*Debt/GDP*
Government Spending Shocks	2.585**
	(2.130)
PC1	-0.404
	(-0.664)
Inflation	-0.906
	(-1.459)
Ln(Real GDP growth)	-79.910
	(-1.414)
T-bill Yield	-0.158
	(-0.317)
Industry Economy Shock	-0.674
	(-0.040)
Tobin's Q Industry Median	-22.176*
	(-1.957)
Volatility Industry Median	-109.214**
	(-2.426)
PR36_Industry Median	-5.220**
	(-2.129)
Size	-3.916
	(-1.259)
M/B	0.174
	(0.791)
ROA	1.186
	(0.027)
Sale growth	-0.935
	(-1.662)
Leverage	-76.121*
	(-1.925)
Cash/TA	63.179
	(0.670)
PR12	8.826
	(1.078)
Volatility	-65.245
	(-0.638)
Constant	85.996***
	(4.511)
Observations	36
F(17, 18)	99.82

Prob > F	0
Adj R-squared	0.688
Newey-West standard errors	Max lag: 5

Table A5. Controlling for Political Influence

This table presents the results of estimating probit regressions of acquisition likelihood on the change in the national debt controlling for political influence. *Republican President* is an indicator variable that equals one if the President is Republican, and zero otherwise. *Republican Congress* is an indicator equal to one if the Senate and the House of Representatives are controlled by the Republican party, and zero otherwise. *Democratic Congress* is an indicator equal to one if both the Senate and the House of Representatives are controlled by Democratic party, and zero otherwise. The sample consists of Compustat firms for the period 1981 – 2016. All regressions include industry (Fama French 48 industries) fixed effects and contain the same set of controls as in Table 2. Variables are defined in section 3 and Appendix Table A1. *t*-statistics in parentheses are based on standard errors adjusted for clustering within firm and year. Observations are the total number of firm-year observations. ***, **, *, indicates significance at the 1%, 5%, and 10% level, respectively.

Probit model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent Var= (1, 0)	*Bidder, t+1*	*Bidder, t+1, +3*	*Bidder, t+1*	*Bidder, t+1, +3*	*Bidder, t+1*	*Bidder, t+1, +3*	*Bidder, t+1*	*Bidder, t+1, +3*
Δ*Debt/GDP*								
(IV: Government Spending Shocks)	-0.037***	-0.040***	-0.027***	-0.031***	-0.032***	-0.034***	-0.033***	-0.039***
	(-4.681)	(-4.425)	(-3.482)	(-3.095)	(-5.196)	(-5.110)	(-3.128)	(-2.878)
Republican President	0.097*	0.120*					0.086	0.117
	(1.821)	(1.789)					(1.460)	(1.569)
Republican Congress			0.086	0.053			0.063	0.018
			(1.327)	(0.556)			(0.760)	(0.152)
Democratic Congress					0.049	0.094*		
					(1.066)	(1.680)		
Controls (Macro, Industry, and Firm)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm & Year Clustering	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	155,123	150,036	155,123	150,036	155,123	150,036	155,123	150,036
Log Likelihood	-47144	-72214	-47162	-72291	-47174	-72252	-47133	-72213

Table A6. Controlling for Government Spending and General Economic Uncertainty

This table presents the results of estimating Probit regressions of acquisition likelihood on the change in the national debt, controlling for: 1) government expenditure to GDP ratio; 2) macroeconomic uncertainty index, as per Jurado et al. (2015); and 3) the CBOE S&P 100 Volatility Index (VXO). We use *government spending shocks* identified using a structural VAR, as per Blanchard and Perotti (2002), as an instrument of government debt. The sample consists of Compustat firms for the period 1981 – 2016. All regressions include industry (Fama French 48 industries) fixed effects and contain the same set of controls as in Table 2. Variables are defined in section 3 and Appendix Table A1. *t*-statistics in parentheses are based on standard errors adjusted for clustering within firm and year. Observations are the total number of firm-year observations. ***, **, *, indicates significance at the 1%, 5%, and 10% level, respectively.

Panel A. Government Expenditure to GDP Ratio		
Probit model	(1)	(2)
Dependent Var= (1, 0)	*Bidder, t+1*	*Bidder, t+1, +3*
Δ*Debt/GDP (IV: Government Spending Shocks)*	-0.033***	-0.037***
	(-3.818)	(-4.008)
Government Expenditure /GDP	0.121	0.460
	(0.141)	(0.510)
Controls (Macro, Industry, and Firm)	Yes	Yes
Industry FE	Yes	Yes
Firm & Year Clustering	Yes	Yes
Observations	155,123	150,036
Log Likelihood	-47182	-72296
Panel B. Macroeconomic Uncertainty		
Probit model	(1)	(2)
Dependent Var= (1, 0)	*Bidder, t+1*	*Bidder, t+1, +3*
Δ*Debt/GDP (IV: Government Spending Shocks)*	-0.021**	-0.021**
	(-2.410)	(-2.338)
MEU	-0.250	-0.292*
	(-1.627)	(-1.800)
Controls (Macro, Industry, and Firm)	Yes	Yes
Industry FE	Yes	Yes
Firm & Year Clustering	Yes	Yes
Observations	136,097	131,010
Log Likelihood	-43683	-65628
Panel C. Volatility Index		
Probit model	(1)	(2)
Dependent Var= (1, 0)	*Bidder, t+1*	*Bidder, t+1, +3*
Δ*Debt/GDP (IV: Government Spending Shocks)*	-0.025***	-0.024**
	(-2.852)	(-2.510)
VXO	-0.004	-0.007
	(-0.876)	(-1.450)
Controls (Macro, Industry, and Firm)	Yes	Yes
Industry FE	Yes	Yes
Firm & Year Clustering	Yes	Yes
Observations	131,885	126,798
Log Likelihood	-42978	-64290

Table A7. Changes in Government Debt and Characteristics of Announced Deals

(Results of Heckman Selection and First Stage of IV Model)

This table presents estimation results of Heckman selection and the first stage of IV regression models which examine the effect of Δ*Debt/GDP* on the characteristics of announced deals between 1981 – 2016. Column 1 presents the results of a probit model which predicts the probability of a firm making an acquisition, as in Column 1 of Table 2, with an addition of a proxy for the price pressure resulting from mutual funds experiencing large capital inflows, as per Khan et al. (2012). Based on the probit estimates, we compute the inverse Mills ratio (IMR) which is then included as an additional regressor in the two-stage IV regression model to account for the sample selection bias. The first stage of the IV regression predicts Δ*Debt/GDP*, using *government spending shocks* as an instrument. The second stage estimates the impact of Δ*Debt/GDP* on various deal characteristics. For brevity, we present only the first-stage regression results from the analysis of payment method in Table 6. Column 2 reports the first stage of the IV regression analysis of the percentage of cash payment. Column 3 presents the first stage of the IV probit regression analysis of all cash, which is a dummy variable equal to one if the deal is 100% cash financed and zero otherwise. The unit of observation is deal-acquirer-year. All models contain the same set of controls as in Table 2. The *z*-statistics in parentheses are based on standard errors adjusted for clustering within firm and year. ***, **, *, indicates significance at the 1%, 5%, and 10% level, respectively.

	Heckman Selection	First-stage of % Cash	First-stage of All Cash
	(1)	(2)	(3)
Dependent Variable	*Bidder, t+1*	Δ*Debt/GDP*	Δ*Debt/GDP*
Price Pressure	8.940***		
	(12.338)		
Government Spending Shocks (IV)		0.440***	0.440***
		(16.399)	(16.428)
IMR (Selection Term)		26.083***	26.083***
		(82.070)	(82.218)
Controls (Macro, Industry, and Firm)	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Observations	160,280	18,363	18,363