The Burden of the National Debt: Evidence from Mergers and Acquisitions*

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Abstract

We test Modigliani's (1961) proposition that the national debt places a burden on the economy through a reduction in private-sector investment. We document a significant negative association between government debt and merger and acquisition activity at the aggregate and firm levels, consistent with Modigliani's proposition. The effects are more pronounced among more credit-worthy firms whose securities are closer substitutes for government debt and among firms that exhibit greater sensitivity to fiscal policy uncertainty. During times of rising debt, the average announced deal is associated with lower takeover premiums and lower synergistic gains.

"an increase [of 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 recent ballooning of the federal government budget deficit and public debt has rekindled debates about the likely impact of federal borrowing on the economy. Much concern is centered on whether expanding government debt can bring about an increase in interest rates and a corresponding reduction in corporate investment, thus dampening long-run economic growth.[1] With the surge in government borrowing, there is also considerable uncertainty about possible fiscal policy reforms, which can further affect the investment behavior in the private sector.[2] Thus, a natural question is whether government indebtedness affects corporate investment policies, which are sensitive to both changes in the cost of financing and economic policy-related uncertainty. Mergers and acquisitions (M&As hereafter) provide a logical starting point for examining this issue as they represent one of the most significant forms of corporate investment and effect massive reallocation of resources both within and across industries.

The literature has long debated on the implications of the national debt. The Ricardian equivalence hypothesis posits that federal government debt has no effect on the interest rates (Barro 1974; Carmichael 1982; Barro 1989; Barro & Sala-i-Martin 1990; Seater 1993). Since the present value of national debt is equal to the value of the future taxes, rational agents proceed as normal, resulting in the government debt having a trivial effect on private-sector investment.

In contrast, Modigliani (1961) contends that positive changes in the supply of interest-bearing government debt puts upward pressure on interest rates, creating a burden on private investment (Modigliani 1961; McDonald 1983; Benninga & Talmor 1988; Krishnamurthy & Vissing-Jorgensen 2012; Graham *et al.* 2014; Graham *et al.* 2015). The intuition is that the market frictions such as taxes and transaction costs impede the average investor's ability to costlessly exchange return streams from one security for another, resulting in an upward-sloping, imperfectly-elastic demand curve. Therefore, to the extent that different securities are imperfect substitutes in an investor's portfolio, fluctuations in the supply of one security can affect the relative yields and the equilibrium mix of another competing security. In the case where the

[1] "As Debt Rises, the Government Will Soon Spend More on Interest Than on the Military", *The New York Times*, 25 September 2018.

[2] "Federal Budget Would Raise Spending by $320 Billion", *The New York Times*, 22 July 2019.

supply of government bonds increases, investors absorb this excessive supply by holding a larger fraction of their wealth in government bonds and, by necessity, a smaller fraction of other assets. As a result, the demand for corporate bonds (i.e., competing securities) decrease while increasing the difficulty and the cost of raising debt for corporations (Elmendorf & Mankiw 1999; Graham *et al.* 2015). To empirically distinguish between the opposing views, we test whether increases in government debt negatively affect M&A activities. Specifically, if Modigliani's proposition holds, we expect corporations faced with increased cost of financing to undertake fewer M&A activities in periods of rising government debt. We refer to this mechanism as the *interest rate* channel.

In addition to the *interest rate* channel, the literature shows a direct association between national debt and policy-related uncertainty in the equilibrium (Alesina & Tabellini 1989, 1990). The central argument is that the national debt affects the agent's decision making, which is a direct contradiction to the Ricardian equivalence (Buchanan 1976; Feldstein 1988).[3] For instance, uncertainty arises when policy makers disagree on whether to repay the debt by creating more money or levying higher distortionary taxes according to fiscal rules, both of which have direct impacts on inflation and future tax policies (Croce *et al.* 2018). Under this view, firms are discouraged from undertaking substantial capital reallocations through M&As because policy uncertainty exacerbates the uncertainty surrounding the standalone value of the target firm as well as the value of synergistic gains created through the merger. For example, recent literature shows that tax-related policy uncertainty increases the future cash flow volatility and the risk of the combined firm (Nguyen & Phan 2017; Croce *et al.* 2018). Pástor and Veronesi (2012) find that policy-related uncertainty is accompanied by a rise in the stock price volatility, which increases the risk of deal renegotiation or termination during the interim period (i.e., the interim risk) as documented by Bhagwat *et al.* (2016). Furthermore, the exposure to policy shocks is rather difficult to hedge since it is largely outside of a company's control (Gulen & Ion 2016; Bonaime *et al.* 2018). Hence, higher uncertainty increases the value of the option to delay acquisitions, dampening M&A activity (Bloom *et al.* 2007; Bloom 2009; Gulen & Ion 2016;

[3] Feldstein (1988) focuses on uncertainty related to future earnings whereas we focus on policy-related uncertainty. Although the type of uncertainty differs, the same intuition can be applied to show that policy uncertainty changes the intertemporal substitution of resources.

Nguyen & Phan 2017).[4] On the other hand, the body of literature supporting the Ricardian equivalence argues that such uncertainties either have no bearing on the agent's decision making process or have ambiguous implications on the economic activity (Chan 1983; Barro 1989). We test these hypotheses by examining whether firms with higher sensitivity to policy-related uncertainty respond to increases in government debt by undertaking fewer M&A activities. We refer to this mechanism as the *uncertainty* channel.

Our sample consists of U.S. M&A transactions announced over the period between 1980 and 2016. Using a vector autoregression (VAR) approach, we show that an increase in the government debt-to-GDP ratio is associated with a significant decrease in the aggregate M&A activity in terms of both the deal value and volume. Similar patterns emerge when we examine the impact of movements in government debt on acquisitiveness at the firm level. Controlling for contemporaneous macroeconomic conditions, industry-level valuation waves, and a comprehensive set of firm-specific characteristics, we find that for a one-standard deviation increase in the debt-to-GDP ratio, the probability of a firm making a takeover is reduced by 1.61 - 3.52 percent at long horizons (between one and six years). The effect is economically sizable compared to the unconditional M&A probability of 9.92 percent. The sub-sample analysis reveals that the negative relation between government debt and corporate takeovers is present for both regulated and unregulated sectors, i.e., firms other than railroads, telecommunications and utilities, and is not attributable to fiscal stabilization policies adopted in response to the recent recessions that have led to a surge in government debt.

The primary challenge in our analysis is that certain latent factors may simultaneously increase government debt and reduce M&A activity, creating several alternative explanations for our findings. The national debt increases, on average, during recessions because the government increase the spending, financed through debt, to stimulate the shortfall in aggregate demand.[5] 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

[4]Another view is that policy uncertainty instead prompts managers to engage in certain mergers (e.g., cross-border or vertical mergers) to actively reduce the firm's exposure to policy uncertainty risk (Cao *et al.* 2017; Bonaime *et al.* 2018). However, Bonaime, *et al*. (2018) suggest that this risk-management channel is unlikely to be a dominant mechanism given the overall negative association between policy uncertainty and M&A activities.

[5] Some literature even considers the possibility that the government spending multiplier, the change in national income to the change in government spending, is higher than normal during recessions (Barro & Redlick 2011; Auerbach & Gorodnichenko 2012; Auerbach & Gorodnichenko 2013; Fazzari *et al.* 2015). Accordingly, the government can stimulate the economy through an increase in spending during recessions.

lending. In such cases, the correlation between fluctuation in government debt and M&A activity is spurious since the supply of government debt merely captures the effects of poor economic prospects. We use four different strategies to address the omitted variable bias. First, following the prior literature, we augment our regression models with a host of economic factors as additional control variables; specifically, we control for the expected macroeconomic conditions (e.g., forecasted GDP growth rate and consumer confidence), economic recessions, and the general macroeconomic uncertainty (Harford 2005; Baker & Wurgler 2007; Jurado *et al.* 2015; Bonaime *et al.* 2018). To test the Modigliani's proposition against the Ricardian equivalence hypothesis, the econometrician needs to test the consequences of national debt for a given amount of public expenditure.[6] Hence, we also include the contemporaneous changes in government spending and changes in the tax revenues as controls. Our results remain robust to all these controls.

Second, we use an instrumental variable (IV) approach to mitigate the endogeneity concerns. We employ two IVs that are correlated with the government's borrowing but are unlikely to affect a firm's M&A decisions. Based on the idea that military spending is largely exogenous to the business cycle movements (Ramey & Shapiro 1998; Ramey & Zubairy 2018), we employ the change in military expenditure relative to GDP ratio as our first IV in the panel regressions. Using a two-stage least squares approach, we show a that a positive shock to the change in the debt-to-GDP ratio ($\Delta Debt/GDP$) cause a significant reduction in a firm's acquisition probability. As our second IV, we use the foreign exchange interventions by the Japan's Ministry of Finance since a sizable portion of the proceeds from these interventions were invested in U.S. Treasuries over time (Beltran *et al.* 2013). We interpret these interventions as exogenous shocks to the demand of U.S. Treasuries. A positive shock to $\Delta Debt/GDP$ instrumented with the five-year lag of the foreign exchange interventions cause a significant reduction in the acquisition likelihood.

The third approach is based on the idea that the business cycles and macroeconomic uncertainties in the U.S. and Canada are closely related (Gulen & Ion 2016). To remove such confounding macroeconomic factors, we first estimate the residuals by orthogonalizing $\Delta Debt/GDP$ in U.S. on $\Delta Debt/GDP$ in Canada. We then use the estimated orthogonalized

[6] How public spending and tax cuts impact the economy is a different question to that is explored in this paper. For instance, Mountford and Uhlig (2009) show the aggregate effects of tax cuts and public outlays on the economy. The authors show that the method of financing matters for the tax cuts and public spending.

residuals as a proxy of government debt that is uncorrelated with business cycles and macroeconomic uncertainty in the U.S. We continue to find a strong robust negative association between the national debt and acquisitions likelihood.

Fourth, we re-estimate our baseline model using quarterly data. Using quarterly data allows us to include year fixed effects. The year fixed effects allow us to capture aggregate year-specific factors such as investment opportunities and other latent factors. The year fixed effects also subsume part of the effects of the national debt. However, we continue to find a strong negative association between government debt and acquisitions likelihood.

To better understand the reasoning for the Modigliani's proposition, we explore the channels through which government borrowing affects M&A decisions. Building on the cross-sectional heterogeneity, we provide direct evidence of the interest rate channel behind our findings. Specifically, we find that highly credit-worthy firms, as proxied by high debt ratings and low default risk, react strongly to surges in government debt than less credit-worthy firms. These findings are consistent with the existing empirical evidence which shows that more credit-worthy firms, whose securities are closer substitutes for government debt, are more sensitive to variation in the supply of government debt (Friedman 1978; Krishnamurthy & Vissing-Jorgensen 2012; Graham *et al.* 2014). Our findings are difficult to reconcile with the Ricardian equivalence hypothesis. The results are also inconsistent with the explanation of mismeasured investment opportunities since larger, more creditworthy firms exhibit financial and investment policies that are *less* pro-cyclical (Kashyap *et al.* 1994; Korajczyk & Levy 2003).

Our second cross-sectional analysis investigates the uncertainty channel, which predicts that unexpected changes in government borrowing increases the level of policy-related uncertainty and, hence, the value of option to delay acquisitions. Supporting this prediction, we find that variation in government debt has a stronger effect on M&A decisions of firms with greater sensitivity to policy-related uncertainty, as reflected by their higher stock return beta coefficient on the overall economic policy uncertainty (EPU) index created by Baker *et al.* (2016). Importantly, we find that not all types of policy uncertainty matter. The detrimental effect of growing government debt on deal activity is concentrated on firms that are more sensitive to uncertainty surrounding fiscal policies (tax and government spending), healthcare, national security, and entitlement programs. In contrast, uncertainty related to monetary policy, regulation (including financial regulation), and trade policy does not appear to affect M&A

decisions. Overall, these findings support the idea that unexpected movement in government debt is a risk characteristic factored into the merger decisions, such that acquirers are hesitant to undertake acquisitions in times of rising debt during which policy uncertainty is high.

There are some advantages in using M&As, as opposed to capital expenditure or R&D expenditure, to test the Modigliani's proposition. One advantage is that we can engage in a counterfactual analysis. In addition to examining whether firms reduce investment, we are also interested in inquiring how an average firm would have fared *if* the firm engaged in acquisitions following a positive shock to $\Delta Debt/GDP$.[7] Hence, we ask how changes in government debt affect the characteristics of *announced deals*. We address the sample selection problem by employing a Heckman two-stage model where the Khan *et al.* (2012) measure of price pressure resulting from purchases is used as an instrumental variable. We find that, on average, firms pay significant lower takeover premiums for target firms. There is evidence that the average announced deal is of lower quality, as indicated by lower synergistic gain and unfavourable acquirer cumulative abnormal returns (CARs) around the deal announcement, following a positive shock to $\Delta Debt/GDP$. This indicates that the national debt places a "burden" on the private sector through a crowding out effect of private capital.

The remainder of the paper proceeds as follows. Section 2 provides a review of the related literature. Section 3 describes the data and variables used in our empirical analysis. In Section 4, we present cross-sectional tests in the data. Section 5 addresses endogeneity concerns and performs other robustness tests. Section 6 examines the mechanisms through which government debt impacts M&A decisions. Section 7 shows the impact of changes in government debt on acquisition outcomes, and Section 8 concludes the paper.

2. Related Literature

Our paper contributes to different strands of literature. This paper contributes to the debate on the validity of the Ricardian equivalence hypothesis. Specifically, we use M&A data to test whether the government debt has no effect on the interest rates and investment (Barro 1989; Barro & Sala-i-Martin 1990; Seater 1993) or a significant effect on interest rate, which puts a burden on investment (Modigliani 1961; Friedman 1978; Krishnamurthy & Vissing-Jorgensen

[7] This is more difficult to analyse with capital expenditure. It is difficult to separate the implications (i.e., firm value) from the incremental increase in capital expenditure (investment) and the existing capital, during times of high debt. We overcome this issue by examining the M&A data.

2012; Graham *et al.* 2014). Friedman (1978) argues that when wealth effects are present in investors' portfolio decisions, government debt financing will alter the relative returns on assets in a manner that depends on the substitutability of the assets. Consistent with this view, Friedman finds that an increase in the supply of long-term government bonds leads to an increase in the cost of government bonds and corporate debt securities that are close substitutes. McDonald (1983) shows that firms reduce debt financing following an increase in the supply of taxable government bonds. Greenwood *et al.* (2010) argue that when the government issues more long-term Treasuries, firm's cost of long-term debt increases. Firms react by deviating from their target debt mix and issuing less (more) long-term (short-term) debt securities. Graham *et al.* (2015) argue that government deficit financing "crowds out" corporate debt financing through competition for investor funds and document a negative effect of government borrowing on corporate leverage. We are the first paper to establish a negative link between the national debt on corporate merger and acquisition decisions. In addition to the traditional crowding out effect via interest rates, we also introduce a government debt crowding out effect through policy-related uncertainty.

Closer to our setting, Graham *et al.* (2014) study the impact of government debt on corporate debt financing and investment decisions. Using aggregate time-series data, they find that government debt depresses corporate leverage and capital expenditures. Croce *et al.* (2018) investigate whether variation in government debt is priced as a risk factor in the cross section of U.S. stock returns. Using asset pricing models, they show that a rise in government debt is accompanied by an increase in risk premium (i.e., or equivalently a higher cost of capital) and a decline in R&D investments over the subsequent periods, especially for innovation-intensive firms. Different from these two studies, we explore the impact of changes in government debt on corporate takeovers, which differ from other investments along important dimensions such as frequency, magnitude, and economic importance.

Our research is also related to the large literature on the dynamics of M&A activity (Mitchell & Mulherin 1996; Maksimovic & Phillips 2001; Jovanovic & Rousseau 2002; Shleifer & Vishny 2003; Rhodes-Kropf & Viswanathan 2004; Harford 2005; Rhodes–Kropf *et al.* 2005; Dong *et al.* 2006; Garfinkel & Hankins 2011; Netter *et al.* 2011; Duchin & Schmidt 2013; Maksimovic *et al.* 2013; Ovtchinnikov 2013; Ahern & Harford 2014; Bhagwat *et al.* 2016; Dessaint *et al.* 2017). Mergers cluster in time and industry. Mitchell and Mulherin (1996)

attribute merger waves to industry shocks such as deregulation or technological advancements that alter industry structure. Jovanovic and Rousseau (2002) build a theoretical model based on the Q-theory of investment and show that the waves in the 1900s, the 1920s, the 1980s and the 1990s were responses to profitable reallocation opportunities. Shleifer and Vishny (2003), Rhodes-Kropf and Viswanathan (2004), and Rhodes–Kropf *et al.* (2005) contend that merger waves are driven by managerial timing of overvaluation in the stock market. Harford (2005) finds that specific industry shocks alone are not enough to propagate a wave. Instead, there must be sufficient macro-level capital liquidity to enable a wave of mergers. Garfinkel and Hankins (2011) consider risk management as a driver of merger waves. They posit that firms facing more volatile cash flows use vertical mergers as a tool to hedge against uncertainty. Consistent with this prediction, they find that a wave is more likely to start following periods in which firms in an industry experience increasing cash flow uncertainty. Ahern and Harford (2014) characterize the economy as a network of industries connected through customer-supplier relationships. They document that industries characterized by stronger customer-supplier relationships have a higher incidence of cross-industry mergers. Furthermore, merger activity diffuses across the industry network in a wave-like pattern, and an aggregate wave is driven by merger activity in the most central industries in the network. Bhagwat *et al.* (2016) report that rises in market volatility increase the interim risk of deal renegotiation and/or termination, thus decreasing subsequent merger activity. Finally, Nguyen and Phan (2017) and Bonaime *et al.* (2018) document a negative effect of policy uncertainty on merger activity at the macro and firm levels. We add to this strand of literature by offering fresh evidence that government borrowing curbs M&A activity through its impact on the average cost of debt financing and uncertainty about different government policies. Our results complement prior studies which show the cost of external financing and policy uncertainty are important drivers for merger activities (Pástor & Veronesi 2012; Maksimovic *et al.* 2013; Nguyen & Phan 2017; Bonaime *et al.* 2018).

3. Data and Research Design

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 Financials Securities Data Collection Platinum* (SDC) database to collect data on U.S. M&A transactions announced

between January 1981 and December 2016.[8] 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 transaction value above $1 million and more than 1% of the acquirer market capitalization, acquiror's ownership less than 10% before acquisition and more than 50% after the deal. Our final sample consists of 155,123 firm year observations and 15,638 deal years.

3.2. Research Design

3.2.1. Industry-level tests

We begin by examining how unexpected movements in government debt affect takeover activity at the industry level, both in terms of the deal numbers and volumes, using a panel vector autoregression (VAR). To compute the parameters, we use the generalized method of moments (GMM) estimator developed for panel VAR setting (Holtz-Eakin *et al.* 1988). Estimation using panel data, that is pooled cross-section across industries and time-series data, has several advantages over purely aggregate time-series estimation. Although estimating each industry by GMM estimation yields consistent estimates, estimating the model as a system of equations results in efficiency gains. In a time-series regression, any unobserved industry specific effect would be part of the error term, leading to potentially biased estimates.[9] The panel VAR takes the following form:

$$Y_{i,t} = Y_{i,t-1}A_1 + Y_{i,t-2}A_2 + X_{i,t}B_0 + \eta_{i,t} + \varepsilon_{i,t}, \tag{1}$$

where i indexes industry based on the Fama and French classification, $Y_{i,t}$ is a vector of dependent variables, $X_{i,t}$ is a vector of exogenous variables, $\varepsilon_{i,t}$ is a vector with white-noise disturbances, and A_1, A_2, and B_0 are parameters to be estimated. GMM dynamic panel estimator uses the following moment conditions:

$$\mathbb{E}\left[Y_{i,t-s}\left(\varepsilon_{i,t} - \varepsilon_{i,t-1}\right)\right] = 0 \text{ for } s \geq 2;\ \ t = 3, \dots, T,$$

$$\mathbb{E}\left[X_{i,t-s}\left(\varepsilon_{i,t} - \varepsilon_{i,t-1}\right)\right] = 0 \text{ for } s \geq 2;\ \ t = 3, \dots, T.$$

In similar spirit to Bonaime *et al.* (2018), we impose the following ordering: government debt-to-GDP ratio, Baker *et al.* (2016) index of policy-related uncertainty, Jurado *et al.* (2015) index of macroeconomic uncertainty, returns on the volume-weighted CRSP index, the spread on the Baa rate and the risk-free rate, and merger and acquisition activity. We assume that the

[8] We exclude the rumored deals from the sample.

[9] There is a long history of literature that show data aggregation discards important information and testing power (Fei 1956; Orcutt *et al.* 1968; Morimoto 1970). Hence, we have more information using industry level data relative to a single average time-series.

current level of government debt-to-GDP ratio is unlikely to be affected by other contemporaneous variables.[10] We impose this ordering and fit a multivariate panel regression of each dependent variable on four lags of itself and four lags of all other dependent variables. We use the natural logarithm of the aggregate cash holdings obtained from the most recent Compustat annual data to control for the availability of internally generated funds and a linear time trend as our exogenous variables.[11] This approach allows us to compute the impulse response functions (IRF) of M&A activity corresponding to a shock to government debt that is orthogonal to contemporaneous shocks in all the other system variables.

3.2.2. Firm-level tests

For the firm-level tests, we estimate the following using probit regressions:

$$y_{i,t+1\ to\ t+k} = \beta \times \Delta Gov.Debt_t + \gamma \times X_{i,t} + \alpha + \varepsilon_{i,t+k}, \quad (2)$$

where $y_{i,t}$ 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. $\Delta Gov.Debt_t$ is the change in the government debt in year *t*, which we proxy using the change in government debt scaled by the gross domestic product (GDP) ratio *(ΔDebt/GDP)*; $X_{i,t}$ is a vector of macro-level 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 at the firm and year level.

We do not include year fixed effects since they would mechanically absorb the explanatory power of our government debt variable, which varies only across time. Nevertheless, we are aware of the general concern that in the absence of year fixed effects, 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 & Phillips 2001; Harford 2005). To mitigate such concerns, we follow prior literature and control for a comprehensive set of macroeconomic forces that may affect M&A likelihood. Specifically, we include the real GDP growth rate to control for investment opportunities and the return on the three-month Treasury bill to capture the level of interest rates that may affect the financing and investment environments (Graham *et al.* 2014). The inflation rate is included in our model because the government debt is measured in

[10] We verify that our results are robust to using a wide array of other causal orderings. Results are available upon request.

[11] In the spirit of Bonaime *et al.* (2018), we use industry level aggregate cash holdings as an exogenous source of variation. However, our results are robust to endogenizing aggregate cash holdings.

nominal terms. Recognizing the limitation of this approach, we explore cross-sectional heterogeneity in the estimated effect later in the study.

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 variation in takeover activity to acquirer and target equity overvaluations (Shleifer & Vishny 2003; Rhodes-Kropf & Viswanathan 2004; Rhodes–Kropf *et al.* 2005; Dong *et al.* 2006). If increases in the national debt coincide with depressed equity valuation, we may inflate the true effect of variation in debt on merger activity. 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 & Hankins 2011); (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 1999; Almeida & Campello 2007; Almazan *et al.* 2010; Harford & Uysal 2014; Bonaime *et al.* 2018) and control for firm size (log total assets), 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), misevaluation (past 12-month returns and return volatility).

Table 1 presents the summary statistics for all the variables employed in our baseline analysis. Panel A reports aggregate time-series descriptive statistics and Panel B shows the panel data statistics.[12]

[Please Insert Table 1 Here]

4. Baseline Results

According to the Modigliani (1961) proposition, an increase in the supply of the national debt reduces corporate investment through a "crowding out" effect. The government borrowing "crowds out" corporate debt financing, increasing the cost of capital necessary for funding an M&A transaction. In addition, we propose that an increase in the national debt raises the uncertainty surrounding the government policies that are associated with funding the fiscal deficit, which induce firms to postpone acquisitions. In this section, we examine whether

[12] Appendix Table A.1 provides a full description of variable definitions.

government debt policy affects takeover activity at the aggregate and firm levels, holding all else constant.

4.1. Aggregate M&A Activity

Figure 1 depicts the national debt and the aggregate M&A activity for U.S. public firms. Panels A and B plot the quarterly total deal number and deal volume, respectively. In both panels, we observe a clear inverse association between the M&A activity and the level of government borrowing. For example, in the seven-year economic expansion period of 2001-2007, the U.S. government spending skyrocketed partially due to the 9/11 attacks in 2001, leading to a sharp rise in public debt. Meanwhile, M&A activity remained depressed during the expansion period. While not a formal test, this figure indicates that the effect of variation in government debt on merger activity is unlikely to a mere reflection of changes in economic conditions. While not a formal test, this figure indicates that the effects of government debt on the merger activity is unlikely to be a mere reflection of changes in economic conditions.

[Please Insert Figures 1 Here]

In Figure 2, we present the impulse response of aggregate merger activity corresponding to a change in government debt, obtained by estimating the VAR model specified in Equation (1). We use merger activity aggregated at the industry level defined based on Fama and French 12 industries.[13] We find that an unanticipated increase in $\Delta Debt/GDP$ has a significant negative impact on both the log of total deal number and the log of total deal volume. The decrease in merger activity is highly persistent, lasting for more than ten quarters following the shock. These findings provide preliminary evidence that a positive movement in government borrowing deters takeover activity. It is difficult to fully control for all the confounding forces in the panel VAR procedure. We thus proceed to conduct firm-level analyses in the following section.

[Please Insert Figures 2 Here]

4.2. Firm-level M&A Decisions

Table 2 reports the results from the probit regression of the probability of being an acquirer on the change in government debt and a set of macro- and firm-level control variables introduced above. We observe a strong, negative association between $\Delta Debt/GDP$ and acquisition likelihood in the subsequent years. Converting the point estimates to marginal effects,

[13] The industries include consumer non-durables, durables, manufacturing, oil and gas, chemicals and allied products, business equipment, telephone and television transmission, utilities, wholesale and retail services, healthcare, finance, and others. We find that our results are robust to other industry classifications.

a one standard deviation increase in the Δ*Debt/GDP* is associated with a 1.61%, 2.73%, and 3.52% decrease in the probability of being an acquirer over the next one, two, and three years, respectively. [14] The effects are economically sizable considering the unconditional merger announcement probability of 9.92% in our sample.

[Please Insert Table 2 Here]

If the reduction in M&A activity following an increase in the national debt is a temporary delay instead of a permanent reduction in investment as implied by Modigliani's (1961) proposition, then we should see a subsequent reversal in the long-run. We explore this possibility by examining whether the dampening effect of government debt is related to a long-term reversal over a longer time horizon. Table 3 re-estimates the baseline regression with the dependent variable being replaced with the probability of being an acquirer for up to 10 years following an increase in government debt. The results show that the Δ*Debt/GDP* continues to generate a negative and significant (at the 1% level) impact on merger likelihood for up to six years. We find no evidence that the effects reverse over the longer horizon. Thus, the dampening effect of government borrowing on takeover activity does not appear to be short-lived, but rather, significant enough to cause a permanent loss of certain deals.

[Please Insert Table 3 Here]

5. Robustness Tests

Our baseline results are consistent with the view that increases in government borrowing negatively affect takeover activity at the aggregate and firm levels. In this section, we verify the validity of our results by conducting a battery of robustness tests. We begin by investigating whether our baseline findings continue to hold when alternative measures of government debt are employed. We then consider the omitted variable bias problem using four different strategies. First, we explicitly control for factors that could potentially confound our results. Second, we use a two-stage least squares (2SLS) analysis, which allows us to extract exogenous variation in the supply of government debt using an instrumental variable. Third, we orthogonalize the U.S. government debt with respect to Canadian government debt and use the residuals in the in our baseline model. Finally, we re-estimate our entire results using quarterly data which allows us to

[14] The economic magnitude is calculated by multiplying marginal effect and one standard deviation of Δ*Debt/GDP* ratio (5.082). The marginal effects for Table 2, Model 1, 2, and 3 are -0.318%, 0.536% and -0.693%, respectively.

control for year fixed effects and therefore unobservable macroeconomic forces that may drive our results.

5.1. Alternative Measures of Government Debt

A potential concern with the measure Δ*Debt/GDP* is that the effects can be driven by variations in the denominator, GDP. To mitigate this concern, we use the real change in the government debt, which is independent of GDP. Specifically, we convert the nominal dollar values of the total public federal debt, obtain from the U.S. Department of the Treasury, to the real values using the implicit price deflator for gross domestic purchases, obtained from the U.S. Bureau of Economic Analysis. We use this yearly change in the real value of government debt (Δ*Real Debt*) as our first alternative measure.

Another concern with our primary measure is the time trends in the national debt, i.e., changes in government debt could be purely driven by trends. We address this issue by using the filter introduced by Hamilton (2018) to decompose real public debt into the trend and cyclical components.[15] Hamilton's filter uses a simple linear projection of y_{t+h} on a constant and the four most recent values of y as of date t. To generate the cyclical component of debt, we apply the filter to the log of real federal government debt. The yearly cyclical component of real debt (*Debt Cyclicality*) is then used as our second proxy for government debt changes.

Table 4 reports the baseline regression results using the two alternative proxies. In the case where Δ*Real Debt* is employed, results are almost identical to our baseline findings, in terms of both statistical significance and magnitude (columns 1, 3 and 5). Similarly, the filtered measure does not significantly alter our results. The coefficient on *Debt Cyclicality* continues to be negative and significant in all specifications, albeit smaller in magnitude.

[Please Insert Table 4 Here]

5.2. Controlling for Omitted Macroeconomic Variables

An important concern with our main analysis is that movements in government debt may correlate with some observable or unobservable economic forces, e.g., economic conditions, investment opportunities and capital liquidity, which in turn affect firms' acquisition decisions. For instance, the extant evidence shows that M&A decisions tend to be highly pro-cyclical (Maksimovic & Phillips 2001). Meanwhile, the federal government may implement fiscal

[15] Hamilton shows that the commonly used Hodrick and Prescott (1997) (HP) filter may not successfully remove the trend. Some limitations of the HP filter include the spurious dynamic relations that have no basis in the underlying data-generating process and filtered values at the end of the sample being different from those in the middle.

stabilization policies and expand debt during recessions to combat economic downturns. In such cases, periods of high 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.

Although we have already controlled for a wide array of macroeconomic factors, we aim to further alleviate this omitted variable concern by including a set of additional controls in our model. Specifically, following Bonaime *et al.* (2018), we perform a principal component analysis (PCA) to identify the first principal component of the following four variables: (1) the University of Michigan index of consumer confidence, (2) the Conference Board's proprietary Leading Economic Indicator, and (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. [16] The first principal component (*PC1*) is designed to capture expectations about future economic downturns that could potentially influence both the government debt policy and M&A decisions. As an additional robustness check, we re-run the regressions excluding recession years, as defined by the NBER.[17]

The results, reported in Panel A of Table 5, indicate that our results are unaffected by including *PC1* of the additional macroeconomic proxies. In Panel B, we report the results using the sub-sample of M&A deals excluding recession years. The coefficient on the Δ*Debt/GDP* remains negative and significant at the 1% level in all specifications, suggesting that the reduction in takeover attempts following a rise in government debt is unlikely to be explained by contemporaneous or expected macroeconomic conditions.

Another possible explanation for our main results is that increases in government borrowing may coincide with periods of high macroeconomic uncertainty, which induce firms to delay corporate investments such M&As (Bloom *et al.* 2007; Bloom 2009; Jurado *et al.* 2015; Gulen & Ion 2016; Nguyen & Phan 2017). To rule out this possibility, we argument our baseline regression model by including the Jurado *et al.* (2015) monthly index of macroeconomic uncertainty constructed from the common volatility in the unforecastable component in a large panel of macroeconomic variables. The macroeconomic variables include, but not limited to, the

[16] The first principal component is used to avoid any multicollinearity issues in the data.
[17] NBER defines a recession as a period of significant decline in economic activity spread across the economy, lasting more than a few months, normally visible in real GDP, real income, employment, industrial production, and wholesale-retail sales.

real output and income, employment and hours, real retail, manufacturing and trade sales, consumer spending, housing starts, inventories and inventory sales ratios, compensation and labor costs, capacity utilization measures, price indexes, bond and stock market indexes, and foreign exchange measures.[18]

Table 5, Panel C, reports the regression results. Consistent with prior studies, we find that the coefficient on uncertainty is negative, indicating that macroeconomic uncertainty discourages firms from undertaking expansionary investments. Controlling for macroeconomic uncertainty, we continue to find a strong, negative association between national debt and M&A likelihood in the next one to three years.

Our sample covers firms in both regulated and unregulated sectors. However, since institutional environment and investment policies are fundamentally different for these two sectors (Frank & Goyal 2008; Graham *et al.* 2014), regulated firms may react differently to a rise in government debt than do firms from the unregulated sector. To explore this possibility, we interact Δ*Debt/GDP* with an indicated variable, *Regulated Industry*, which equals one if a firm operates in the following three regulated industries: utilities, telecommunications and railroads, similar to Graham *et al.* (2014).

Table 5, Panel D, reports the results. We find that the negative relation between government debt and corporate takeovers is present for both regulated and unregulated sectors. *Regulated Industry* and the interaction term, *Regulated Industry* × Δ*Debt/GDP*, are both statistically insignificant, whereas Δ*Debt/GDP* is negative and significant at the 1% level in all specifications. These results suggest that the phenomenon we have documented is not specific to any sector but the entire economy.

The Ricardian equivalence states that for a given level of government spending, the economy is impervious to the financing mix between tax and debt (Barro 1974; Carmichael 1982). Although we control for general macroeconomic conditions, the baseline model does not explicitly control for changes in government spending. For instance, the government may issue more public debt in response to calls for greater spending or lower taxes. Thus, it is possible that firms are in fact reacting to changes in government spending or distortionary corporate tax rates instead of movements in government debt.

[18] The large panel dataset is from Ludvigson and Ng (2010). Jurado *et al.* (2015) use information from all these variables to compute the common volatility in the unforecastable component. We use this measure to control for unanticipated macroeconomic uncertainty.

To directly test whether Ricardian equivalence holds for our sample, we control for both the change in government spending or tax revenues. Table 5, Panel E, presents the baseline results controlling for the changes in both the government spending and tax revenues. We find no evidence to support the Ricardian equivalence hypothesis. After controlling for the contemporaneous change in real government spending and tax revenues, Δ*Debt/GDP* continues to negatively affect the merger likelihood in the subsequent years. The results are more in accordance with the Modigliani (1961) view than the Ricardian equivalence hypothesis.

[Please Insert Table 5 Here]

5.3. Instrumental Variable Approach

To further alleviate the threat of an omitted-variable bias confounding our results and to establish a causal link, we implement a two-stage least squares (2SLS) procedure using two separate IVs. First, following Demirci *et al.* (2018), we use the change in military expenditure relative to GDP ratio (Δ*Defense/GDP*) as a plausibly exogenous instrument.[19] On the one hand, military expenditure accounts for the major variation in federal government spending (Ramey & Shapiro 1998; Burnside *et al.* 2004; Ramey 2011). As borrowing is one of the means the government utilizes to finances its expenditure, we expect a positive association between changes in defense spending and government debt. On the other hand, literature documents that defense spending, which is motivated by imperatives of foreign policy, is less likely to be affected by the current or prospective state of the economy (Ramey & Shapiro 1998; Fisher & Peters 2010; Barro & Redlick 2011; Ramey 2011; Berndt *et al.* 2012; Dissanayake 2017; Dissanayake *et al.* 2017; Demirci *et al.* 2018; Ramey & Zubairy 2018). Thus, using variation in military expenditure as an instrument permits us to extract variation in the level of government debt that is plausibly exogenous with respect to macroeconomic conditions.

Table 6, Panel A reports the second stage results from the 2SLS regression where Δ*Debt/GDP* is instrumented with the changes to military expenditures relative to GDP. In the first stage, we run a time-series regression of Δ*Debt/GDP* on Δ*Defense/GDP*, controlling for year-average of all industry and firm level control variables in our baseline model. The results, reported in Appendix Table A.2, show that Δ*Defense/GDP* has a significant positive effect on

[19] Military spending is unlikely to be perfectly exogenous to business cycle variation. However, military spending is less affected by investment opportunities than other forms of government spending such as taxes and transfer payments.

Δ*Debt/GDP*, suggesting that military spending is a relevant instrument for public debt.[20] In the second stage, we regress the probability of being an acquirer over the next one to three years on the predicted value of Δ*Debt/GDP* obtained from the first stage, and a full set of controls. Using Δ*Debt/GDP* as an instrument, we find that a positive shock to Δ*Debt/GDP* cause a significant reduction in a firm's acquisition decisions.

As our second IV, we use the foreign exchange interventions by the Japan's Ministry of Finance. The interventions totalled approximately $760 billion between 1991 to 2018. The largest interventions were in 2003 and 2011 as the Japanese Ministry of Finance attempted to slow the yen's appreciation. Since a sizable portion of the proceeds from these interventions were invested in U.S. Treasuries (Beltran *et al.* 2013), we treat these interventions as exogenous shocks to the *expected demand of U.S. Treasuries*. Since the interventions are likely to increase the U.S. national debt over the medium to long run, we use the 5-year lag of the U.S. dollar amount of the foreign exchange intervention as the IV. Table 6, Panel B shows that a positive shock to Δ*Debt/GDP*, instrumented with the five-year lag of the foreign exchange interventions by the Japan's Ministry of Finance, cause a significant reduction in the acquisition likelihood.

[Please Insert Table 6 Here]

5.4. Canadian Debt to GDP

As our third approach to mitigate endogeneity concerns, we propose a method that exploits the integrated nature of the U.S. and the Canadian economies. There is ample evidence that the two economies are highly interlinked (Romalis 2007). Canada is the largest U.S. trading partner and the North American Free Trade Agreement (NAFTA) remains the largest free trade pact outside of the European Union. In addition, the Canadian and the U.S. economies have significant integrations in areas such as regulation of investment, transportation and financial services, intellectual property, government purchasing, competition policy, and the temporary entry of business persons (Hufbauer *et al.* 1993). Given the similarities, we expect many of the shocks affecting the general economy in the U.S to also affect the general economy in Canada, albeit to a lesser extent (Gulen & Ion 2016). By extracting the component of variation in U.S. government debt that is orthogonal to the Canadian government debt, we can remove the business cycle driven movements in the national debt. Towards this end, we run the following regression:

[20] The first-stage results are reported in the Appendix, Table A2.

$$\Delta\text{Debt/GDP}_{US,t} = \beta_1\ \Delta\text{Debt/GDP}_{CAN,t} + \beta_2\ X_t + \alpha + \varepsilon_t, \qquad (3)$$

where $\Delta\text{Debt/GDP}_{US,t}$ and $\Delta\text{Debt/GDP}_{CAN,t}$ 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, and T-bill yield. We employ the estimated residuals, $\widehat{\varepsilon_t} = \widehat{\Delta\text{Debt/GDP}}_{US,t}$, as a measure of change in the national debt, which is plausibly exogenous to macroeconomic forces common to both countries. The residuals, $\widehat{\varepsilon_t}$, should capture the government's choice to finance through debt rather than the macroeconomic conditions.

Table 7 reports the baseline model using the residuals from equation (3). The effect of changes in national debt on firm acquisitiveness remains negative and highly significant in all specifications. Thus, our baseline results are unlikely to be driven by economic forces that may affect M&A decisions.

[Please Insert Table 7 Here]

5.5. Year Fixed-Effects

As our fourth approach to mitigate endogeneity concerns, we re-estimate our baseline model using quarterly data with the addition of year fixed effects. An advantage of this set-up is that the year fixed effects capture aggregate year-specific factors such as business cycle variation and macroeconomic uncertainty. A clear disadvantage is that the fixed effects may also subsume part of the effect of the national debt on expansionary investments.

Table 8 presents the acquisition probability for the next quarter controlling for year fixed effects. In addition to adding fixed year fixed effects in specification (2), we also include state fixed effects in specification (3) to absorb any state related factors that may influence M&A activity. The results controlling year fixed effects and state fixed effects are consistent with the baseline results. The results continue to support the Modigliani's proposition.

[Please Insert Table 8 Here]

6. Cross-Sectional Heterogeneity

The body of evidence so far indicates that an increase in the government debt depress the M&A activity. We delve further by examining the underlying mechanisms behind our results. Modigliani (1961) theorizes that the national debt reduce investment through an increase in interest rates. In addition to the interest rate channel, we also propose that increases in the national debt reduce investment through an increase in policy-related uncertainty. In this section,

we explore heterogeneity in the public debt-M&A decision relation that is consistent with the interest rate and uncertainty channels.

6.1. The Interest Rate Channel

The existing evidence on government debt affecting the interest rates is mixed in the literature.[21] Some studies find no evidence for a positive correlation between the national debt and interest rates (Barro 1989; Barro & Sala-i-Martin 1990). Others show a significant effect of government debt on 5-year Treasury yields (Elmendorf 1993), the spread between the 10-year Treasury rate and the 3-month Treasury yield (Kitchen 2002), the 10-year forward rate (Laubach 2009), and the corporate bond yields (Cebula & Koch 1988). Graham *et al.* (2014) show that an increase in government debt reduces the spread between the BAA grade and the AAA grade corporate debt.

We start our analysis by directly testing the effects of a rise in national debt on debt yields. According to the crowding-out hypothesis, government debt should have a larger impact on long-term interest rates than on shorter-term interest rates (Engen & Hubbard 2004). Furthermore, the government debt should have a larger impact on lower grade corporate bonds than high grade corporate bonds (Graham *et al.* 2014). We test whether a rise in the national debt increases the spread between the 10-year and the 3-month Treasury yield and the spread between the BAA grade and the AAA grade corporate debt.

Table 9 reports the results from the time-series regressions. Consistent with Kitchen (2002), we find that the spread between the 10-year Treasury rate and the 3-month Treasury yield increases as the debt-to-GDP ratio increases. Consistent with Graham *et al.* (2014), we find that an increase in the debt-to-GDP ratio reduces the spread between the BAA grade and the AAA grade corporate debt. The results are consistent with the crowding-out hypothesis.

[Please Insert Table 9 Here]

The advances in corporate finance indicate that government borrowing adversely affects debt financing policies (McDonald 1983; Greenwood *et al.* 2010; Krishnamurthy & Vissing-Jorgensen 2012; Graham *et al.* 2014). Graham *et al.* (2015), for example, document that government borrowing crowds out corporate debt financing through competition for investor

[21] See Engen and Hubbard (2004) for a survey of this literature.

funds.[22] When there is an increase in the supply of government debt, the demand curve for corporate bonds (i.e., competing securities) is pushed up and to the left, resulting in a rise in the cost of corporate debt capital. The interest rate channel predicts that a rise in the national debt deters M&A decisions because the increase in the supply of public debt crowds out corporate financing. The costs increase to finance a deal in times of growing national debt. However, such an effect is unlikely to be uniform across firms. The safer a firm's debt securities are, the higher the substitutability they have for 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; Greenwood *et al.* 2010; Krishnamurthy & Vissing-Jorgensen 2012; Graham *et al.* 2014). Accordingly, we expect that the negative effect of growing government debt on deal activity to be stronger for safer, more credit-worthy firms.

To test this conjecture, we construct two alternative measures of a firm's credit-worthiness: (1) a dummy variable indicating whether a firm's debt is rated A or above by a credit rating agency in year *t* (Shivdasani & Zenner 2005; Harford & Uysal 2014), and (2) a dummy variable indicating whether a firm's default risk is in the lowest quintile 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 year *t* using the Black-Scholes-Merton (BSM) model.

Panels A and B of Table 10 report the results in which our baseline model is augmented with the above two proxies and their interaction with change in the government debt. In Panel A, we observe a negative and significant coefficient on the interaction term, $\Delta Debt/GDP \times Rating\ A\ or\ above$, over the next two-year and three-year window. The negative effect of government debt on M&A likelihood is indeed more pronounced among high credit quality firms. Converting the magnitude of the coefficient estimate into marginal effects, a one-standard-deviation increase in $\Delta Debt/GDP$ is associated with an additional 1.42% and 1.59% decrease in the merger likelihood among high rated firms over the next two years and three years, respectively.

A similar pattern emerges with the default risk as a proxy for credit quality. The results presented in Panel B reveals that the firms whose default risk falls in the bottom quintile are

[22] Since market frictions such as taxes and transaction costs prevent the average investor from costlessly 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.

associated with a significantly lower acquisition probability following an increase in the national debt. In summary, these cross-sectional findings lend strong support for the Modigliani (1961) proposition that increases in the national debt have adverse implications on investment, and in this case a firms' decision to undertake takeovers, through the interest rate channel.

[Please Insert Table 10 Here]

6.2. The Uncertainty Channel

In addition to the interest rate channel proposed by Modigliani (1961), we propose that government debt hinders M&A activity through policy-related uncertainty. This channel works in the same direction as the interest rate channel. It posits that the option to delay corporate investments such as acquisitions is more valuable in periods of increasing national debt since there is greater uncertainty about fiscal policy changes. Firms defer acquisitions until such uncertainties are resolved in the future (Bloom *et al.* 2007; Bloom 2009; Jurado *et al.* 2015; Gulen & Ion 2016; Nguyen & Phan 2017). If this is the case, we expect firms with higher sensitivity to policy uncertainty are more likely to be adversely affected from an unexpected change in public debt.

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, which incorporates the market, size, and value risk factors, explains the cross-section of returns. We add the Baker *et al.* (2016) policy uncertainty (EPU, hereafter) index as a non-traded factor to the three-factor model. The EPU 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.[23] We estimate the following time-series regression:

$$r_{i,t} - r_{f,t} = \alpha_{i,t} + \beta_{i,t}^{mkt}\left(r_{mkt,t} - r_{f,t}\right) + \beta_{i,t}^{smb} r_{smb,t} + \beta_{i,t}^{hml} r_{hml,t} + \beta_{i,t}^{epu} epu_t + \upsilon_{i,t}, \quad (4)$$

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 policy

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

uncertainty index. Following Fama and French (1992), we use the standard 60-month rolling window and require at least 24 observations to be included in the sample. The parameter $\beta_{i,t}^{epu}$ captures firm i's exposure to policy uncertainty. For each year, we classify firms in the top quartile as those that are highly sensitive to EPU and construct an indicator variable, *High_EPU_Beta*, accordingly.

We expect an increase in the national debt to reduce expansionary investments in high *High_EPU_Beta* relative to other firms. To test whether firms with higher exposure to EPU reduce M&A activities more so than others, we introduce an interaction term between *High_EPU_Beta* and Δ*Debt/GDP*. In Table 11, Panel A shows the results. We find that the sensitivity measure, *High_EPU_Beta,* have an insignificant effect on acquisition likelihood. However, the interaction term, *High_EPU_Beta* x Δ*Debt/GDP*, is negative and significant. The results imply a dampening effect of government borrowing on the probability of acquiring among firms with a high level of sensitivity to policy-related uncertainty.

We further investigate how firms react to rising government debt when their sensitivity to policy uncertainty differs by policy types. To this effect, we reconstruct the stock beta measure with respect to each of the sub-category of the EPU index: taxes, government spending, health care, national security, entitlement programs, monetary policy, regulations (including financial regulations), and trade policy. We replace epu_t in equation (4) with each category of EPU index at a time. We then construct indicator variables based on firms in the top quartile in terms of the sensitive to category of EPU.

Panel B reports the results for each category of EPU. The negative effects of government borrowing are largely concentrated among firms with greater sensitivity to policy uncertainty related to taxes, government spending, health care, national security, and entitlement programs. All these categories are related to the broader fiscal policies, which impacts the national debt. In contrast, uncertainty related to monetary policy, economic regulation, financial regulation, and trade policy does not appear to impact the M&A decisions. These findings are consistent with the uncertainty channel that elevated levels of public debt increase the policy related uncertainty surrounding government budgeting, thus encouraging firms to exercise the real option to delay acquisitions.

We find that the interest rate channel from the Modigliani's proposition and the newly discovered policy uncertainty channel operate independently.[24] The policy uncertainty mechanism strengthens the Modigliani (1961) conclusion that the national debt places a burden on the economy through a reduction in private-sector investment.

[Please Insert Table 11 Here]

7. Government Debt and M&A Outcomes

So far, we have clearly shown that firms reduce investment in times of high the national debt, holding all else constant. In this section, we examine the counterfactuals; we examine the firm outcomes *if* the firm engaged in M&As during times of high national debt. We expect both the acquiring firms and target firms to have negative outcomes if they engaged in M&A activity in times of rising debt. The rational is as follows. If a positive change in government debt increases the cost of corporate debt financing and policy uncertainty, then firms should act more cautiously. Unless the synergies associated with the merger outweigh the associated costs of financing and risks associated with uncertainties, the deal will have catastrophic consequences.

To test these possibilities, we begin by examining the impact of $\Delta Debt/GDP$ on acquirer's cumulative abnormal returns (CAR) over a five-day window surrounding the announcement date. All else being equal, we expect markets to react unfavorably to acquirers announcing lower quality deals. An important concern here is that not all firms undertake acquisitions and a firm's decision to complete a deal is nonrandom. Thus, a simple OLS regression is subject to potential sample selection bias which arises because our sample contains only announced deals but not those unannounced transactions. We address this issue by using a two-stage Heckman model. To identify the model, in the first stage, we require an instrument that significantly influences the likelihood of becoming an acquirer but does not affect the type of target selected. Hence, the instrument is not part of the variables explaining acquisition likelihood in the second stage. As our instrument, we use the exogenous mutual fund trading pressure indicator developed by Khan *et al.* (2012). The purchases by mutual funds with large capital inflows can affect firm valuation and thus increase future M&A activity. The instrument is relatively exogenous as it is associated with buyers with excess liquidity rather than what is being purchased (i.e., the type of target).

[24] The results using both channels are reported in the Appendix. We find that the interest rate and uncertainty channels appear to have independent, albeit not mutually exclusive, impacts on acquisition decisions.

Table 12 reports both the first-stage and the second-stage regression results. The second-stage estimates the effect of changes in government debt on acquirer CAR controlling for the same set of variables in the baseline framework. We report the results for the acquirer, the target firm, and the combined firm. We find that the price pressure indicator is a significant relevant instrument in all specifications. The results, reported in column 2, reveal a negative effect of a rise in the national debt on acquirer CAR. We also find a negative effect on target CAR, as reported in column 4, following an increase in the national debt.

Next, we investigate in the relation between changes in government debt and synergistic gains, measured by the combined CAR received by the acquirer and the target shareholders over a five-day window surrounding the announcement date. [25] The results are reported in columns 6. We find that Δ*Debt/GDP* exhibit a negative and significant impact on the combined announcement returns. Thus, there is evidence that, on average, both the acquiring and the target firm experience negative outcomes when they engage in M&A activity during times of rising national debt.

Finally, the last columns shows the results for the deal premium, defined as a *percentage* premium of offer price over target market value four weeks before the deal announcement (Officer *et al.* 2009; Golubov *et al.* 2012). [26] We find that a strong negative coefficient on the Δ*Debt/GDP*, indicating that changes in government debt lowers the bid premium. Hence, during periods of high cost of capital and high policy uncertainty, targets are unable to negotiate good deals.

Overall, the results paint a gloomy picture for both the acquirers and the target firms in times of rising national debt. With the rising costs of debt, target firms have low negotiating power. Even though the acquirer on average negotiates low bid premiums, the rising cost of debt and heightened policy uncertainty results in synergistic losses.

[Please Insert Table 12 Here]

[25] Following Bradley *et al.* (1988), we estimate the market model over -240 to -11 trading days prior to deal announcement date and calculate the cumulative abnormal return (CAR) over the window of [-2, +2] for acquirer and target firms. We then calculate the value-weighted combined CAR based on the market capitalization 6 trading days prior to announcement, where the target firm value is adjusted for toeholds.

[26] As an alternative measure, we use target cumulative five-day cumulative abnormal return (CAR) around the deal announcement and find similar results.

8. Conclusion

The government debt has surged over last few decades. A vast literature has been devoted to examining its consequence on economy. In this paper, we contribute to the debate on the crowding-out hypothesis and the Ricardian equivalence hypothesis. In particular, we test whether the Modigliani's (1961) proposition holds and that the national debt places a burden on the economy through a reduction in private-sector investment.

Using the M&A deals announced between 1980 and 2016 in the U.S, we show a robust negative association between changes in the national debt and M&A activity at both the aggregate and firm levels. The impact is both statistically and economically significant. It appears to be a permanent reduction in M&A activities, rather than transitory change. We find that the impact cannot be driven away by macroeconomic conditions, variation in the business cycles, and other macroeconomic frictions. We use four different methodologies to address the endogeneity concerns. First, we control for known factors that could potentially confound our results. Second, we use a two-stage least squares analysis to extract the exogenous variation in the supply of government debt using changes in defense spending as an instrumental variable. Third, we orthogonalize the U.S. government debt with respect to Canadian government debt to extract the exogenous variation in the national debt. Fourth, we estimate our model using quarterly data controlling for year fixed effects.

We further explore the potential channels through which that government borrowing may affect firm's M&A activities. We find that the negative impact of government debt on M&A activity is more pronounced among more credit-worthy firms whose securities are closer substitutes for government debt. It suggests that firms reduce their investment on M&A in response to the rising cost of debt financing, which is consistent with the Modigliani's (1961) proposition.

We also find that the impact of government debt on M&A activity is greater for firms with greater sensitivity to policy-related uncertainty. This implies that unexpected movements in public debt increase the policy uncertainty surrounding the potential changes in fiscal policies needed to fund the fiscal deficits. The additional fiscal policy uncertainty discourages firms from engaging in expansionary investments as the real option of delay is more valuable while the uncertainty is high.

Finally, we investigate how government borrowing might affect the characteristics of M&A deals. Though acquirers pay lower premiums, the average announced deal is associated with lower synergistic gains and unfavourable acquirer announcement abnormal returns during periods of rising national debt.

Appendix

Table A.1. 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, +2	A dummy variable equals 1 if firm *i* has acquisition in any year between *t+1 and t+2*, 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
ΔDebt/GDP	The change of Debt/GDP ratio as calculated as [(Debt/GDP, *t*)/ (Debt/GDP, *t-1*)-1].	U.S. Office of Management and Budget
ΔDebt_Real	The change of Real Debt as calculated as [(Debt_Real, *t*)/ (Debt_Real, *t-1*)-1].	U.S. Department of the Treasury
Debt_Cyc	Cyclical portion of the debt-to-GDP ratio using Hamilton (2018) filter.	
Inflation	Consumer price index for all urban consumers for all items.	U.S. Bureau of Labor Statistics
Ln(Real GDP growth)	Natural logarithm of change in the real GDP.	U.S. Bureau of Economic Analysis
Tbill 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 principle component from the calculated seven median absolute change variables for each industry.	Compustat
TobinQ_Industry Median	Fama French 48 Industry median annual Tobin'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
A_Rating	An indicator variable of 1 if S&P domestic long term issuer credit rating (SPLTICRM) is '-A' or above, and zero otherwise. The variable is only available from 1985 as Compustat starts to report credit rating from that year.	Compustat
High_Credit	An indicator variable of 1 if the default risk of firm *i* in year *t* is in the lowest quartile, and zero otherwise. We follow Hilegeist, Keating, Cram and Lundstedt (2004) to compute default risk from each firm year using the Black-Scholes-Merton (BSM)model. Under the BSM model, the probability of bankruptcy is simply the probability that the market value of assets is less than the face value of the liabilities at time T (assumed to be 1 year).	CRSP, Compustat

Table A.2. First Stage Results from the Two-stage Least Squares Regressions

Note: This table presents the results of first stage of regression of change in government debt to GDP (Δ*Debt/GDP*) on the instrument variable, which is the change in defense spending to GDP (Δ*DEF/GDP*). We take year average of all industry and firm level variables for the regression. Δ*DEF/GDP* is the yearly change of defense spending to GDP. All other variables are defined in Appendix Table A.1. Observations are the total number of firm-year observations. ***, **, *, indicates significance at the 1%, 5%, and 10% level, respectively.

	(1)	(2)
Dependent Var=	Δ*Debt/GDP*	
Δ*Defense/GDP*	53.682**	
	(2.631)	
Japanese interventions $_{t-5}$		0.005**
		(2.274)
Inflation	-0.764	-0.607
	(-1.548)	(-1.186)
Ln(Real GDP growth)	-39.589	-88.760**
	(-0.863)	(-2.286)
Tbill Yield	-0.653	-0.788
	(-1.401)	(-1.566)
Industry Economy Shock	-1.894	14.316
	(-0.072)	(0.549)
TobinQ_Industry Median	-13.302	-21.893***
	(-1.545)	(-3.018)
Volatility_Industry Median	-102.084**	-43.757
	(-2.139)	(-0.773)
PR36_Industry Median	-5.682*	-4.435
	(-1.731)	(-1.305)
Size	-3.249	-6.463***
	(-1.432)	(-3.282)
M/B	0.180	0.027
	(0.924)	(0.143)
ROA	17.504	11.270
	(0.764)	(0.469)
Sale growth	-0.721	-0.702
	(-0.802)	(-0.754)
Leverage	-42.116	-42.465
	(-0.965)	(-0.941)
Cash/TA	4.485	91.470
	(0.049)	(1.206)
PR12	3.923	9.178**
	(1.012)	(2.612)
Volatility	-28.709	-327.643*
	(-0.213)	(-2.024)
Constant	71.517***	88.856***
	(3.192)	(3.966)
Observations	37	37
F(16, 20)	6.66	6.15
Prob > F	0.0001	0.0001
R-squared	0.842	0.831
Adjusted R-squared	0.716	0.696
Root MSE	2.727	2.8203

Table A.3. Combining the Channels

Note: presents the results of estimating probit regressions of acquisition likelihood on the change in the national debt (Δ*Debt/GDP*). We interact Δ*Debt/GDP* with both the interest rate channel and the policy uncertainty channel. The sample is Compustat firms for the period 1980 – 2016. All regressions include industry (Fama French 48 industries) fixed effects. All variables are defined in section 3 and Appendix Table A.1. The *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)
Dependent Var= (1, 0)	*Bidder, t+1*	*Bidder, t+1, +2*	*Bidder, t+1, +3*
Δ*Debt/GDP*	0.004	0.004	0.003
	(0.667)	(0.656)	(0.432)
Δ*Debt/GDP*High EPU Beta*	-0.008**	-0.009**	-0.009**
	(-2.199)	(-2.394)	(-2.524)
High EPU Beta	0.035	0.036*	0.044**
	(1.644)	(1.867)	(2.370)
Δ*Debt/GDP*High Credit*	-0.009**	-0.010*	-0.011**
	(-2.242)	(-1.941)	(-2.395)
High Credit	0.114***	0.129***	0.121***
	(3.927)	(4.093)	(4.228)
Macro level controls	Yes	Yes	Yes
Industry level controls	Yes	Yes	Yes
Firm level controls	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Firm & Year Clustering	Yes	Yes	Yes
Observations	105,131	101,964	98,836
Log Lik	-35889	-47122	-52062

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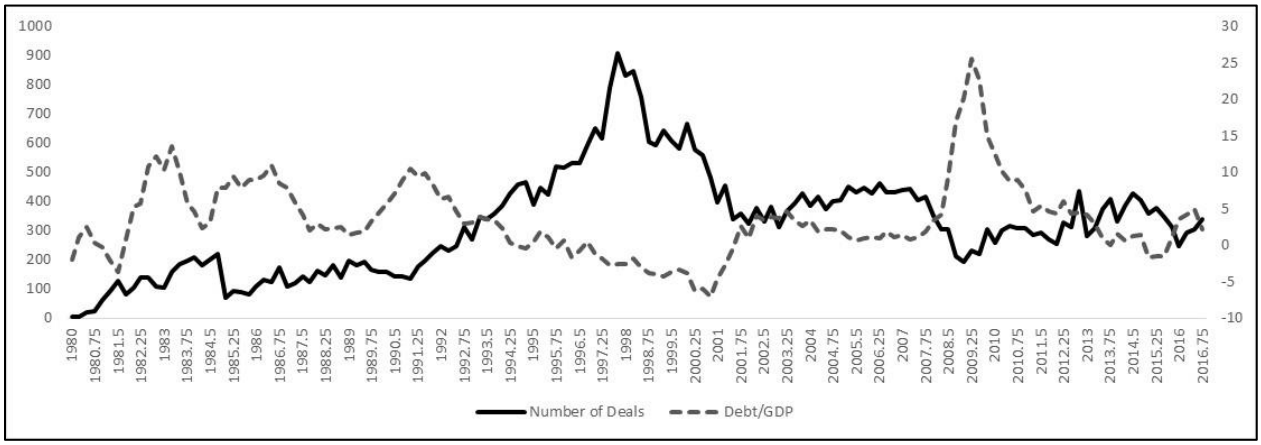
Figure 1. Aggregate volume and value of corporate acquisitions by U.S. public firms

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



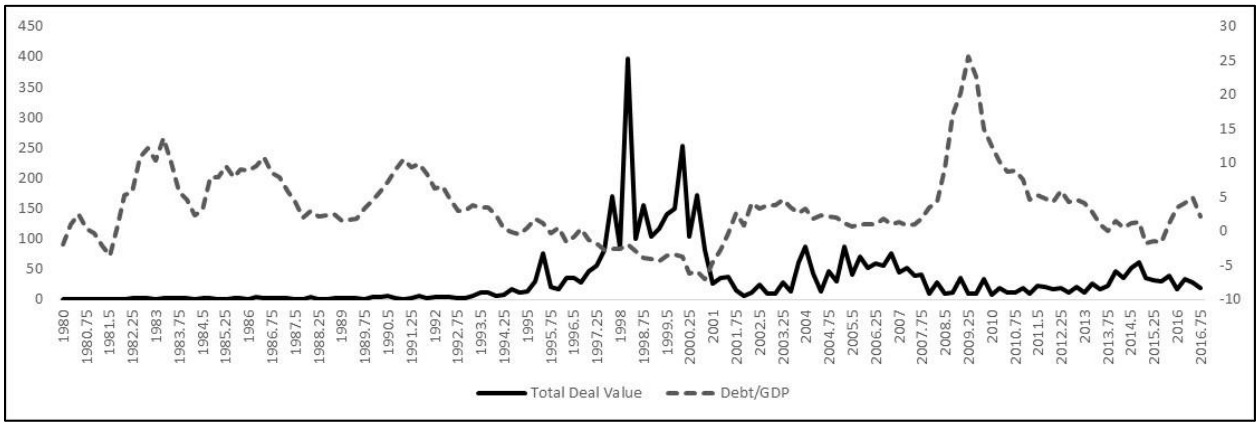
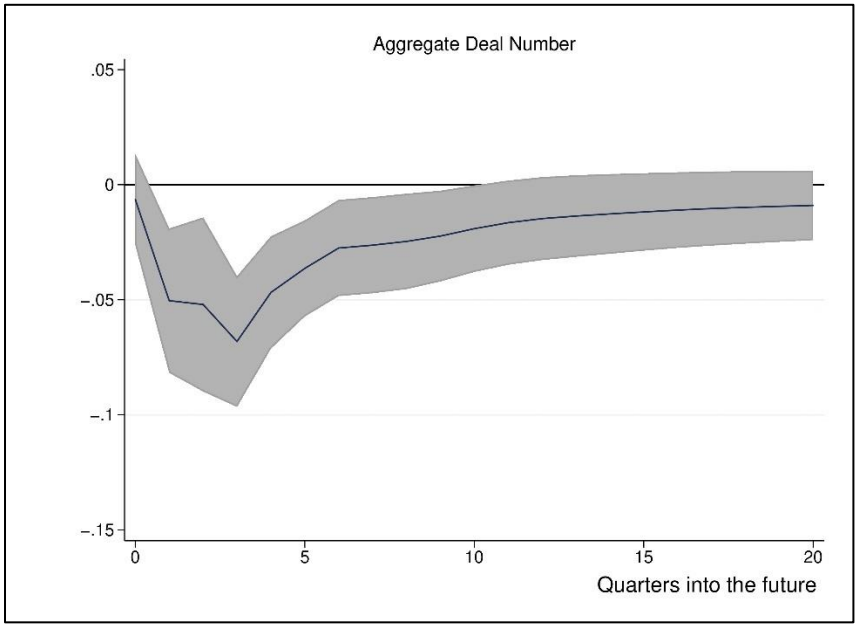


Figure 2. Effect of a shock to debt to GDP ratio on acquisitions by U.S. public firms

Note: The figure shows the impulse response functions (IRFs) of merger and acquisition activity to a positive shock to the debt to GDP ratio. We use the industry level panel VAR in (1) to generate the IRFs. We impose the following ordering on the IRF: Change in government debt to GDP ratio, Baker *et al.* (2016) policy uncertainty index, Jurado *et al.* (2015) macroeconomic uncertainty index, returns on the CRSP index, the spread on the Baa rate and the risk-free rate, and merger and acquisition activity.



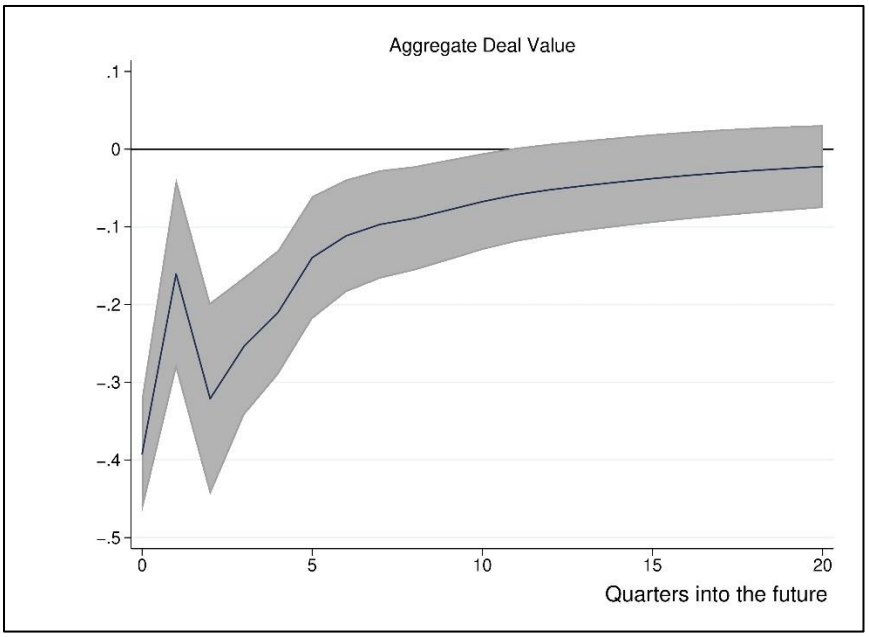


Table 1. Summary Statistics

Note: This table presents the summary statistics. The sample includes all Compustat firm-year observations between 1980 and 2016 (MA deals from 1981 to 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. All variables are defined in Appendix Table A.1.

Variable	N	25th Pctl	Mean	Median	75th Pctl	Std Dev
Panel A: Aggregate Times Series						
ΔDebt/GDP	36	0.625	3.529	2.545	6.842	5.082
Inflation	36	1.728	3.209	2.890	3.809	2.267
Ln(Real GDP growth)	36	0.015	0.026	0.027	0.042	0.020
Tbill Yield	36	1.045	4.362	4.620	6.255	3.573
Panel B: Panel Data						
Bidder_dum, t+1	155123	0.000	0.101	0.000	0.000	0.301
Bidder_dum, t+1, +2	151577	0.000	0.166	0.000	0.000	0.372
Bidder_dum, t+1, +3	148122	0.000	0.213	0.000	0.000	0.409
Industry Economy Shock	155123	-0.028	0.020	0.008	0.051	0.086
TobinQ_Industry Median	155123	1.135	1.457	1.328	1.614	0.481
Volatility_Industry Median	155123	0.102	0.129	0.126	0.152	0.040
PR36_Industry Median	155123	-0.058	0.235	0.230	0.478	0.405
Size	155123	3.622	5.365	5.221	7.006	2.354
M/B	155123	0.920	2.481	1.570	2.828	4.108
ROA	155123	-0.001	-0.008	0.054	0.089	0.225
Sale growth	155123	-0.031	0.191	0.083	0.240	0.605
Leverage	155123	0.062	0.257	0.226	0.390	0.221
Cash/TA	155123	0.021	0.152	0.072	0.205	0.191
PR12	155123	-0.248	0.135	0.047	0.355	0.634
Volatility	155123	0.020	0.036	0.030	0.045	0.023

Table 2. Baseline Results

Note: This table presents the results of estimating probit regressions of acquisition likelihood on the change in the national debt based on a sample of Compustat firms for the period 1980 – 2016. All regressions include industry (Fama French 48 industries) fixed effects. All variables are defined in Section 3 and Appendix Table A.1. The *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)
Dependent Var= (1, 0)	*Bidder, t+1*	*Bidder, t+1, +2*	*Bidder, t+1, +3*
ΔDebt/GDP	-0.020***	-0.023***	-0.025***
	(-3.599)	(-4.041)	(-4.310)
Inflation	-0.028	-0.024	-0.015
	(-1.250)	(-1.121)	(-0.713)
Ln(Real GDP growth)	-0.805	-2.328*	-3.144**
	(-0.651)	(-1.736)	(-2.301)
Tbill Yield	-0.028*	-0.041***	-0.052***
	(-1.765)	(-2.680)	(-3.293)
Industry Economy Shock	0.005	-0.059	-0.169
	(0.029)	(-0.321)	(-0.975)
TobinQ_Industry Median	0.161**	0.146**	0.143**
	(2.252)	(2.088)	(2.128)
Volatility_Industry Median	0.413	0.074	-0.068
	(0.468)	(0.081)	(-0.074)
PR36_Industry Median	0.012	0.004	-0.005
	(0.323)	(0.087)	(-0.130)
Size	0.107***	0.116***	0.120***
	(12.854)	(12.661)	(12.595)
M/B	0.006***	0.006***	0.007***
	(3.771)	(4.713)	(4.897)
ROA	0.187***	0.189***	0.187***
	(5.280)	(4.801)	(4.697)
Sale growth	0.135***	0.124***	0.108***
	(13.122)	(12.658)	(11.710)
Leverage	-0.120***	-0.149***	-0.157***
	(-3.119)	(-3.792)	(-3.645)
Cash/TA	-0.086*	-0.097*	-0.108*
	(-1.658)	(-1.685)	(-1.881)
PR12	0.140***	0.130***	0.121***
	(9.109)	(8.939)	(8.638)
Volatility	-1.662***	-1.397**	-1.461**
	(-2.923)	(-2.248)	(-2.346)
Trend	-0.007	-0.011**	-0.013***
	(-1.629)	(-2.507)	(-3.096)
Industry FE	Yes	Yes	Yes
Firm & Year Clustering	Yes	Yes	Yes
Observations	155,123	151,577	148,122
Log Lik	-47260	-63420	-71507

Table 3. The National Debt on M&A Activity: Longer Horizon

Note: This table presents the results of estimating probit regressions of acquisition likelihood on the change in the national debt based on a sample of Compustat firms for the period 1980 – 2016. *Bidder, t+k (k=4 to 10)* is an indicator variable of value equals 1 if the firm made acquisition in year *t+k*, and zero otherwise. *Bidder, t+j, +k (j=1 or 5, k=5 or 10)* is an indicator variable of value equals 1 if the firm made acquisition in any year between *t+j and t+k*, and zero otherwise. All regressions include industry (Fama French 48 industries) fixed effects. All variables are defined in section 3 and Appendix Table A.1. The *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)
Dependent Var= (1, 0)	*Bidder, t+4*	*Bidder, t+5*	*Bidder, t+6*	*Bidder, t+7*	*Bidder, t+8*	*Bidder, t+9*	*Bidder, t+10*
Δ*Debt/GDP*	-0.016***	-0.015***	-0.012***	-0.008*	0.001	0.007	0.004
	(-3.576)	(-3.853)	(-3.041)	(-1.712)	(0.165)	(0.965)	(0.568)
Macro level controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry level controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm level controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm & Year Clustering	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	144,758	141,329	137,825	134,299	130,633	126,784	122,896
Log Lik	-38468	-35856	-33722	-31577	-29748	-27766	-25852

Table 4. Alternative Measures for Government Debt

Note: 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 1980 – 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 variables are defined in Section 3 and Appendix Table A.1. The *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)
Dependent Var= (1, 0)	*Bidder, t+1*		*Bidder, t+1, +2*		*Bidder, t+1, +3*	
Δ*Real Debt*	-0.021***		-0.023***		-0.025***	
	(-3.830)		(-4.159)		(-4.464)	
Debt Cyclicality		-0.009**		-0.010**		-0.012***
		(-2.373)		(-2.539)		(-2.855)
Macro level controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry level controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm level controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm & Year Clustering	Yes	Yes	Yes	Yes	Yes	Yes
Observations	155,123	155,123	151,577	151,577	148,122	148,122
Log Lik	-47233	-47296	-63394	-63500	-71492	-71617

Table 5. Controlling for Omitted Variables

Note: This table presents the results of estimating probit regressions of acquisition likelihood on the change in the national debt controlling for potential omitted variables. The sample consists of Compustat firms for the period 1980 – 2016. Panel A reports the results controlling for investment opportunities, which is proxied using the first principle component (*PC1*) of four macro variables: consumer confidence 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 principle component at monthly frequency and compute the average for the year. Panel B reports the results for the sample excluding recession months as defined by the NBER. Panel C reports the baseline results controlling for macroeconomic uncertainty, proxied by the index developed by Jurado *et al.* (2015). Panel D reports the results examining the differences in regulated industries and unregulated industries. *Regulated IND* is an indicator variable of value equals 1 if a firm belongs to a regulated industry and zero otherwise. Regulated industries include railroads (SIC code 4011) through 1980, trucking (between 4210 and 4213) through 1980, airlines (4512) through 1978, telecommunications (4812 and 4813) through 1982, and gas and electric utilities (between 4900 and 4939). Panel E reports the results controlling for the change in government tax revenues to GPD and the change in government expenditure to GPD ratio. All regressions include industry (Fama French 48 industries) fixed effects. All variables are defined in section 3 and Appendix Table A.1. The *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. Investment Opportunity			
Probit model	(1)	(2)	(3)
Dependent Var= (1, 0)	*Bidder, t+1*	*Bidder, t+1, +2*	*Bidder, t+1, +3*
Δ*Debt/GDP*	-0.025***	-0.027***	-0.028***
	(-4.440)	(-4.707)	(-4.867)
PC1	-0.035**	-0.034**	-0.027*
	(-2.380)	(-2.376)	(-1.815)
Controls (Macro, Industry, and Firm)	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Firm & Year Clustering	Yes	Yes	Yes
Observations	155,123	151,577	148,122
Log Lik	-47206	-63357	-71467
Panel B. Excluding Recessions			
Probit model	(1)	(2)	(3)
Dependent Var= (1, 0)	*Bidder, t+1*	*Bidder, t+1, +2*	*Bidder, t+1, +3*
Δ*Debt/GDP*	-0.034***	-0.036***	-0.037***
	(-4.133)	(-4.247)	(-4.453)
Controls (Macro, Industry, and Firm)	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Firm & Year Clustering	Yes	Yes	Yes
Observations	119,016	115,470	112,015
Log Lik	-37877	-49609	-54923

Panel C. Macroeconomic Uncertainty			
Probit model	(1)	(2)	(3)
Dependent Var= (1, 0)	*Bidder, t+1*	*Bidder, t+1, +2*	*Bidder, t+1, +3*
Δ*Debt/GDP*	-0.015***	-0.017***	-0.020***
	(-2.777)	(-3.367)	(-3.787)
Macroeconomic Uncertainty	-0.752*	-0.872**	-0.815*
	(-1.844)	(-2.095)	(-1.939)
Controls (Macro, Industry, and Firm)	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Firm & Year Clustering	Yes	Yes	Yes
Observations	155,123	151,577	148,122
Log Lik	-47200	-63324	-71422
Panel D. Regulated VS. Unregulated Industries			
Probit model	(1)	(2)	(3)
Dependent Var= (1, 0)	*Bidder, t+1*	*Bidder, t+1, +2*	*Bidder, t+1, +3*
Δ*Debt/GDP*	-0.020***	-0.023***	-0.025***
	(-3.583)	(-4.016)	(-4.262)
Δ*Debt/GDP*Regulated IND*	-0.001	-0.003	-0.004
	(-0.089)	(-0.351)	(-0.595)
Regulated IND	-0.018	-0.013	-0.001
	(-0.119)	(-0.076)	(-0.006)
Controls (Macro, Industry, and Firm)	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Firm & Year Clustering	Yes	Yes	Yes
Observations	155,123	151,577	148,122
Log Lik	-47241	-63400	-71498
Panel E. Changes in Tax and Real Government Expenditure			
Probit model	(1)	(2)	(3)
Dependent Var= (1, 0)	*Bidder, t+1*	*Bidder, t+1, +2*	*Bidder, t+1, +3*
Δ*Debt/GDP*	-0.018***	-0.020***	-0.022***
	(-2.982)	(-3.298)	(-3.564)
Δ*Tax Revenue/GDP*	-0.947	-1.013	-1.261*
	(-1.175)	(-1.285)	(-1.673)
Δ*GovExp/GDP*	-2.054	-2.493	-2.861*
	(-1.297)	(-1.566)	(-1.718)
Controls (Macro, Industry, and Firm)	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Firm & Year Clustering	Yes	Yes	Yes
Observations	155,123	151,577	148,122
Log Lik	-47223	-63366	-71446

Table 6. An Instrumental Variable Approach

Note: This table presents the second-stage results of estimating probit regressions of acquisition likelihood on the change in the national debt using a two stage least squares approach. The sample of Compustat firms for the period 1980 – 2016. The first instrumental variable is the change in defense spending to GDP ratio (Δ*DEF/GDP*). The second instrumental variable is the foreign exchange interventions by Japan's Ministry of Finance (*Japanese interventions* $_{t-5}$). The first stage results are reported in Appendix Table A.2. All regressions contain the same set of macro level controls in the baseline. All regressions include industry (Fama French 48 industries) fixed effects. All variables are defined in section 3 and Appendix Table A.1. The *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. Instrumental Variable: Change in Defense Spending to GDP			
Probit model	(1)	(2)	(3)
Dependent Var= (1, 0)	*Bidder, t+1*	*Bidder, t+1, +2*	*Bidder, t+1, +3*
Δ*Debt/GDP (IV:* Δ *Defense/GDP)*	-0.025***	-0.028***	-0.031***
	(-3.632)	(-3.647)	(-4.124)
Macro level controls	Yes	Yes	Yes
Industry level controls	Yes	Yes	Yes
Firm level controls	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Firm & Year Clustering	Yes	Yes	Yes
Observations	155,123	151,577	148,122
Log Lik	-47233	-63397	-71481

Panel B. Instrumental Variable: Foreign Exchange Interventions by Japan's Ministry of Finance			
Probit model	(1)	(2)	(3)
Dependent Var= (1, 0)	*Bidder, t+1*	*Bidder, t+1, +2*	*Bidder, t+1, +3*
Δ*Debt/GDP (IV: Japanese interventions* $_{t-5}$*)*	-0.028***	-0.031***	-0.035***
	(-3.964)	(-4.000)	(-4.572)
Macro level controls	Yes	Yes	Yes
Industry level controls	Yes	Yes	Yes
Firm level controls	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Firm & Year Clustering	Yes	Yes	Yes
Observations	155,123	151,577	148,122
Log Lik	-47198	-63353	-71418

Table 7. Mitigating Endogeneity Concerns: Orthogonalize with respect to Canadian Debt

Note: This table presents the results of estimating probit regressions of acquisition likelihood on $\Delta\widehat{\text{Debt/GDP}}_{US}$. The instrument $\Delta\text{Debt/GDP}_{US}$ is the estimated residuals from regressing change in debt-to-GDP ratio in the U.S. (Δ*Debt/GDP*) on the change in the debt-to-GDP ratio in Canada. All regressions contain the same set of macro level controls in the baseline. All regressions include industry (Fama French 48 industries) fixed effects. All variables are defined in Section 3 and Appendix Table A.1. The *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: $\Delta\widehat{\text{Debt/GDP}}_{US}$		
Probit model	(1)	(2)	(3)
Dependent Var= (1, 0)	*Bidder, t+1*	*Bidder, t+1, +2*	*Bidder, t+1, +3*
$\Delta\widehat{\text{Debt/GDP}}_{US,t}$	-0.019**	-0.026***	-0.029***
	(-2.561)	(-3.568)	(-3.659)
Macro level controls	Yes	Yes	Yes
Industry level controls	Yes	Yes	Yes
Firm level controls	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Firm & Year Clustering	Yes	Yes	Yes
Observations	151,580	148,034	144,579
Log Lik	-46750	-62559	-70340

Table 8. Baseline Model Estimated Using Quarterly Data with Year Fixed Effects

Note: This table presents the results of estimating probit regressions of acquisition likelihood on the change in the national debt based on a sample of Compustat firms for the period 1980 – 2016 using quarterly data. All regressions include industry (Fama French 48 industries) and quarter fixed effects. Model 2 includes year fixed effects and Model 3 includes year fixed effects and state fixed effects. All variables are defined in Section 3 and Appendix Table A.1 in quarterly frequency, with exception of *Industry Economy Shock*, which is an annual variable constructed in previous year. The *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)
Dependent Var= (1, 0)		*Bidder, t+1*	
Δ*Debt/GDP*	-0.051***	-0.013**	-0.013**
	(-5.214)	(-2.115)	(-2.120)
Industry FE	Yes	Yes	Yes
Year FE	No	Yes	Yes
State FE	No	No	Yes
Qtr FE	Yes	Yes	Yes
Firm & Year Clustering	Yes	Yes	Yes
Observations	464,264	464,264	443,633
Log Lik	-62881	-62351	-60292

Table 9. Government Debt and Credit Spreads

Note: This table reports the estimates from time-series regressions. In specification (1) and (2), the dependent variable is the spread between 10-year treasury bond and 3-month T-bill rate. In specification (3) and (4), the dependent variable is the BAA-AAA yield spread on corporate bonds. The t-statistics in parentheses are computed using Newey and West (1987) adjusted standard errors assuming one non-zero lag. ***, **, *, indicates significance at the 1%, 5%, and 10% level, respectively.

Model	(1)	(2)	(3)	(4)
Dep Var=	T-bond-T-bill $_{t+1}$		BAA-AAA $_{t+1}$	
Ln(Gov Debt / GDP) $_t$	1.780*	1.968**	-1.520***	-1.314***
	(1.81)	(2.03)	(-4.39)	(-4.68)
Equity Volatility $_t$		-0.037		-0.213***
		(-0.25)		(-2.80)
Log Real Growth of GDP $_t$		14.075**		5.591***
		(2.02)		(3.914)
Trend	Yes	Yes	Yes	Yes
Adjusted R^2	0.030	0.055	0.250	0.400
Observations	147	147	147	147

Table 10. The Interest Rate Channel

Note: This table presents the results estimating probit regressions of acquisition likelihood on the change in the national debt on the sample of Compustat firms for the period 1980 – 2016. Panel A reports the results based on firm's credit rating and Panel B reports the results based on default risk. All regressions include industry (Fama French 48 industries) fixed effects. All variables are defined in Section 3 and Appendix Table A.1. The *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)	(3)
Dependent Var= (1, 0)	*Bidder, t+1*	*Bidder, t+1, +2*	*Bidder, t+1, +3*
Δ*Debt/GDP*	-0.006	-0.002	-0.004
	(-0.901)	(-0.342)	(-0.566)
Δ*Debt/GDP*Rating A*	-0.005	-0.014***	-0.014***
	(-1.021)	(-2.888)	(-2.848)
Rating A	0.100***	0.127***	0.133***
	(2.596)	(3.005)	(2.969)
Macro level controls	Yes	Yes	Yes
Industry level controls	Yes	Yes	Yes
Firm level controls	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Firm & Year Clustering	Yes	Yes	Yes
Observations	35,220	33,950	32,682
Log Lik	-14752	-18260	-19398
Panel B. Default Risk			
Probit model	(1)	(2)	(3)
Dependent Var= (1, 0)	*Bidder, t+1*	*Bidder, t+1, +2*	*Bidder, t+1, +3*
Δ*Debt/GDP*	-0.016***	-0.020***	-0.022***
	(-3.218)	(-3.733)	(-4.076)
Δ*Debt/GDP*High Credit*	-0.011***	-0.012***	-0.011***
	(-2.713)	(-2.631)	(-2.653)
High Credit	0.106***	0.117***	0.107***
	(4.110)	(4.210)	(4.070)
Macro level controls	Yes	Yes	Yes
Industry level controls	Yes	Yes	Yes
Firm level controls	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Firm & Year Clustering	Yes	Yes	Yes
Observations	140,337	137,117	133,955
Log Lik	-42933	-57753	-65149

Table 11. The Uncertainty Channel

Note: This table presents the results estimating probit regressions of acquisition likelihood on the change in the national debt on the sample of Compustat firms for the period 1980 – 2016. Panel A reports the results based on firm's sensitivity to economy policy uncertainty (overall EPU). *High EPU Beta* is an indicator variable with value of 1 if a firm's estimated uncertainty beta is in the highest quartile, and zero otherwise. Panel B reports the results based on firm's sensitivity to sub categories of economy policy uncertainty. All regressions include industry (Fama French 48 industries) fixed effects. All variables are defined in section 3 and Appendix Table A.1. The *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. Economic Policy Uncertainty			
	Overall EPU		
Probit model	(1)	(2)	(3)
Dependent Var= (1, 0)	*Bidder, t+1*	*Bidder, t+1, +2*	*Bidder, t+1, +3*
Δ*Debt/GDP*	0.002	0.002	0.001
	(0.341)	(0.339)	(0.105)
Δ*Debt/GDP*High EPU Beta*	-0.007**	-0.008**	-0.008**
	(-1.963)	(-2.215)	(-2.220)
High EPU Beta	0.027	0.024	0.031*
	(1.305)	(1.312)	(1.692)
Macro level controls	Yes	Yes	Yes
Industry level controls	Yes	Yes	Yes
Firm level controls	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Firm & Year Clustering	Yes	Yes	Yes
Observations	108,327	105,073	101,870
Log Lik	-36579	-48125	-53271

Panel B. Economy Policy Uncertainty Categories (EPUC)									
Probit model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Dependent Var= (1, 0), Bidder t+1	Taxes	Government spending	Health care	National security	Entitlement programs	Regulation	Financial Regulation	Trade policy	Monetary policy
Δ*Debt/GDP*	0.002	0.002	0.002	0.002	0.003	0.001	0.000	0.000	0.001
	(0.401)	(0.317)	(0.371)	(0.360)	(0.457)	(0.123)	(0.051)	(0.037)	(0.125)
Δ*Debt/GDP*High EPUC Beta*	-0.009**	-0.006**	-0.008**	-0.007*	-0.010***	-0.001	0.000	0.001	-0.001
	(-2.328)	(-2.147)	(-2.375)	(-1.958)	(-3.880)	(-0.390)	(0.166)	(0.254)	(-0.401)
High EPUC Beta	-0.011	-0.031**	-0.022	0.032**	-0.018	-0.014	-0.019	0.016	0.015
	(-0.749)	(-2.005)	(-1.244)	(2.043)	(-1.322)	(-0.842)	(-1.365)	(0.875)	(0.671)
Macro level controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry level controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm level controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm & Year Clustering	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
Log Lik	-36575	-36574	-36574	-36578	-36571	-36583	-36583	-36583	-36583

Table 12. Change in Government Debt and Deal Outcomes

Note: This table presents the results of Heckman 2-Step Selection Model estimating the Δ*Debt/GDP* on deal quality on the sample of M&A deals completed for the period 1980 – 2016. The first stage (as shown in Model 1, 3, 5, and 7) predicts the likelihood of being selected using same variables and controls as in Table 2 Model 1, with the addition of an exogenous overvaluation indicator (*KKS_Price_Pressure*) based on price pressure resulting from purchases by mutual funds with large capital inflows to the firm as calculated following Khan *et al.* (2012). We calculate the price pressure measure quarterly and then aggregate it annually. We calculate cumulative abnormal returns following Bradley *et al.* (1988). Specifically, we estimate market model over -240 to -11 trading days prior to deal announcement date and calculate the cumulative abnormal return 2 trading days prior and 2 days post the announcement [-2, +2]. The V-Weighted combined CAR is the value weighted cumulative abnormal return 2 trading days prior and post to the deal announcements as calculated below:

$$CARC = W_T \times CART + W_T \times CARA$$

where $W_T = \frac{\%\,UnHolding \times V_T}{\%\,UnHolding \times V_T + V_A}$ and $W_A = \frac{V_A}{\%\,UnHolding \times V_T + V_A}$, $\%\,UnHolding$ is the percentage of share that not held by the acquirer prior to the deal. V_T is the market capitalization of target firm 6 trading days before the deal announcement and V_A is the market capitalization of acquirer firm 6 trading days before the deal announcement. *Deal Premium* is the offer price to target stock price premium 4 weeks prior to announcement. All regressions include industry fixed effects. All variables are defined in section 3 and Appendix I. Observations are the total number of firm-year observations. Selected is the number of observations selected. ***, **, *, indicates significance at the 1%, 5%, and 10% level, respectively.

Heckman 2-Step	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Acquiror		Target		V-Weighted CAR			
[-2,+2] 5 days	Select	CARA	Select	CART	Select	CARC	Select	Deal Premium
KKS_Price_Pressure	6.370***		3.784***		3.806***		4.813***	
	(7.653)		(2.662)		(2.678)		(3.585)	
Δ*Debt/GDP*	-0.020***	-0.001*	-0.022***	-0.018**	-0.022***	-0.011**	-0.031***	-0.026**
	(-15.218)	(-1.770)	(-9.309)	(-2.132)	(-9.287)	(-1.960)	(-12.369)	(-2.474)
Macro level controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry level controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm level controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations First Stage	155,123		155,123		155,123		155,123	
Selected	15490		2,805		2,802		2,697	