Capital Structure and Economic Policy Uncertainty: US versus German Firms

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Abstract

We study the capital structure effects of economic policy uncertainty (EPU) in a market-based system of the US and a bank-based system of Germany, and report different results for the two economies. Based on a sample of 5,360 US firms from 1985 to 2015, we find that both market-value and book-value based financial leverage ratios are positively (negatively) associated with the US EPU News Index in tranquil (crisis) periods in the US; indicating that US firms become more cautious levering up when policy uncertainty is high during crisis periods but not tranquil periods. A similar result is found for the book-value based leverage ratios of 717 German firms from 1993 to 2015. The market-based leverage ratios of German firms, however, respond negatively to an increase in EPU news index in both tranquil and crisis periods; suggesting that German firms tend to borrow less in general when policy uncertainty is high. Furthermore, firm size and asset tangibility have positive effects on financial leverage, while profitability, market-to-book ratio, capital expenditure ratio and cash dividend pay-out are negatively associated with financial leverage in both US and Germany.

1. Introduction

Economic policy uncertainty causes stock prices to fall and increases the cost of equity (Pástor and Veronest, 2012 and Broggard and Detzel, 2015). In addition, corporations reduce capital expenditure on investments when economic policy uncertainties increase (Gulen and Ion, 2015). Although Korajczyk and Levy (2003) claim that macroeconomic conditions affect the capital structure choices of US firms, it is not clear whether economic policy uncertainty affects the capital structure decisions of US firms. To our best knowledge, only a few empirical studies have been done on this topic yet no journal article has been published yet studying the data of the US.

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A recent publication of Zhang, Han, Pan, and Huang (2015) reports that Chinese firms use less debt when external financing environment deteriorates in the face of high EPU. One related study of a working paper by Cao, Duan and Uysal (2013) examines how political uncertainty affects the stability of capital structures of U.S. firms. They argue that "lenders become more cautious" when uncertainty about economic policy is high. They show that highly leveraged firms are more likely to reduce debt while less indebted firms are less likely to lever up during periods of high political uncertainty. Cao et al. (2013), however, does not shed light on the capital structure decisions of US firms as a function of economic policy uncertainty. It is still unclear whether a similar relationship between EPU and debt ratios of Chinese firms reported by Zhang et al. (2015) holds for firms in advanced economies. Our research intends to fill this gap by providing evidence on the capital structure effects of EPU in two different types of advanced economies, namely the market-based economy of the US and the bank-based economy of Germany. Our research question is how does economic policy uncertainty affect the capital structure decisions of US and German firms?

By studying two large panel datasets of 5,360 US firms and 717 German firms over the periods 1985 to 2015 and 1993 to 2015, we make several contributions to the literature. First, our datasets allow us to measure capital structure by both book-based and market-based leverage ratios, whereas Zhang et al (2015) could not study the market-based leverage ratio due to data limitation. Second, we conduct robustness tests to see how global financial crises affect corporate borrowing decisions, by itself and jointly with innovations in EPU, in the two countries of our study. Thirdly, our study employs both News-based EPU and Baseline-overall EPU index data of Baker et al. (2016) as measures for policy uncertainty in the US, whereas only News-based EPU data for US and China are studied by Cao et al. (2013) and Zhang et al. (2015). Our tests using News-based EPU and Baseline-overall EPU produce different results for the US sample.

Economic policy uncertainty may affect a firm's capital structure decision through different channels. First and most directly, firms may become more conservative in debt financing in order to maintain financial flexibility and avoid financial distress in anticipation of a possibly tighter macroeconomic condition going forward when policy uncertainty is high. Second, high economic policy uncertainty depress corporate investments (Kang, Lee and Ratti, 2014; Gulen and Ion, 2015 and Wang, Chen and Huang, 2014). As firms adjusting their debt policies to accommodate the short-term variations in investments (Fama and French, 2002), their demand for external debt financing is reduced. Consequently, debt ratios are reduced

during periods of high economic policy uncertainty. Third, economic policy uncertainty increases the risk of equity investments and predicts positive abnormal equity returns (Brogaard and Detzel, 2015), which in turn may affect the capital structure movements of corporations (Welch, 2004). Pástor and Veronesi (2013) argue that political uncertainty increase the risk premium of equity, and stock prices fall at the announcements of new government policies (Pástor and Veronesi, 2012). The market timing effect of capital structure (Baker and Wurgler, 2002) implies that falling stock prices during periods of high economic policy uncertainty (Pástor and Veronest, 2012) suggest that firms are more likely to lever up during the periods of high policy uncertainty. Finally, firms may increase financial leverage to boost earnings and increase returns to equity in a deteriorating investment environment (Brennan and Kraft, 2015).

The objective of this study is to find out what effect EPU might have on the corporate capital structure decisions. We do so by studying two panel datasets of 5,360 US firms and 717 German firms over the periods 1985 to 2015 and 1993 to 2015, respectively. We include Germany in this study for two reasons. First, Germany has a bank-based financial system, which is different from the market-based financial system of the US. Second, an influential multi-country study of capital structure by Rajan and Zingales (1995) reports some interesting findings of negative size effect and positive profitability effect on the capital structures of German firms, which contradicts to the signs of these coefficients reported for the US and other countries of their study. Therefore, we believe the German data makes and interesting addition to our sample of study. Due to the availability of EPU data, our study of German dataset uses only the News-based EPU index as a measure for policy uncertainty in Germany; whereas both News-based EPU index and Baseline-overall EPU index are studied for the US dataset. In addition, we follow Rajan and Zingales (1995) to control for the effects of firm size, asset tangibility, profitability, and market-to-book ratio as a measure of long-term growth prospect. Furthermore, we include the ratio of capital expenditure to total book-value of assets as a measure of short-term investment opportunity. Since Lemmon et al. (2008) and Frank and Goyal (2009) report that dividend-paying firms generally have lower financial leverage; we also include a dummy variable for cash dividend in our tests.

Our main finding is that News-based EPU affects capital structure decisions of US and Germany firms in different ways. In US, News-based EPU is positively (negatively) associated with the leverage ratios of US firms in tranquil (crisis) period regardless of what measure of financial leverage (market-based versus book-based). The Baseline-overall EPU

of US, however, has a consistent significant negative effect on the leverage ratios of US firms, in both tranquil and financial crisis periods; although the negative EPU effect during is substantially larger in crisis periods. In Germany, on the other hand, News-based EPU has a negative effect on the market-based leverage ratios in both tranquil and crisis periods. The difference in the effects of News-based EPUs in the two countries reflect different managerial attitudes towards risk, which deserves further investigation in follow-up studies.

The remainder of the paper is organized as follows. Section 2 discusses data and research methodology. Section 3 presents empirical results and discusses our research findings. The results for robustness checks are reported in Section 4. Section 5 provides a summary of our conclusions.

2. Data and Research Methodology

Our US sample includes all active, dead and suspended firms traded on NYSE, NYSE MKT (formerly known as AMEX), or NASDAQ over the period 1985 to 2015. The German sample includes all active, dead and suspended firms traded on the Frankfurt Stock Exchange (Deutsche Börse AG) of over the period 1993 to 2015.[2] Firms that have stocks traded but quoted in currencies other than the US dollar for US firms and the euro for German firms are excluded. We also exclude the rirms in financial, utilities and real estate sectors; and firms that do not have at least five consecutive years of data for total assets, total debt, share price or number of common shares. The final sample has 5,360 US firms and 717 German firms across eight industrial sectors, namely industrials, energy, materials, consumer discretionary, consumer staples, health care, information technology, and telecommunication services. A brief summary of the sample composition is presented in Table A1 in Appendix.

For each firm in our sample, we retrieve the end-of-year share price data (UP) and Worldscope accounting data from Datastream: total assets (WC02999), total debt (WC03255), common shares outstanding (WC03501), net property, plant, and equipment (WC02501), EBIT & depreciation (WC18198), capital expenditure (WC04601), and total cash dividends paid (WC04551). All data series for financial ratios are trimmed at the 1% level in both tails of distribution to reduce outliers. We report the summary statistics of

[2] The starting points of our study are so decided because the US EPU index data starts from 1985 while the Germany EPU index data starts from 1993.

research variables in Table 1. Table A2 in the Appendix presents the pairwise correlation coefficients of firm characteristic variables.

Table 1. Summary statistics

The sample includes 5,360 US firms over the period from 1985 to 2015 and 717 German firms from 1993 to 2015. MLev and BLev are market-value based and book-value-based financial leverage ratios. Size is measured by the natural logarithm of the book value of total assets, in US dollars for US firms and in euro for German firms. Tang measures asset tangibility which is the ratio of net property, plant, and equipment to total assets. Prof is the profitability calculated as EBIT & depreciation divided by total assets. MTB is calculated as the ratio of market-value of total assets to the book-value of total assets. Capex is the ratio of capital expenditure to total assets. Financial, real estate and utility firms are excluded. All financial ratios are trimmed at the 1% level in both tails of the distribution.

Variables	N	Mean	Median	St. Dev.	Min.	Max.
			Panel A: US data			
$Log(EPU_{News})$	166,190	4.6544	4.6513	0.2406	4.2067	5.0624
$Log(EPU_{Overall})$	166,190	4.6496	4.6770	0.2413	4.2673	5.1489
Lev(MLev)	65,780	0.2277	0.1478	0.2343	0.0000	0.9745
Lev(BLev)	69,753	0.2520	0.2220	0.2009	0.0000	1.1250
Size	83,506	19.5173	19.4420	1.9397	14.4579	24.5001
Tang	82,404	0.2682	0.2047	0.2277	0.0010	0.9085
MTB	78,271	2.6137	1.4171	3.6246	0.0713	32.7113
Prof	79,605	0.0782	0.1212	0.2143	-1.4612	0.4898
Capex	79,965	0.0580	0.0403	0.0568	0.0000	0.3567
			Panel B: German data			
$Log(EPU_{News})$	16,491	4.6902	4.6362	0.2684	4.3724	5.2538
Lev(MLev)	8,281	0.2468	0.1730	0.2412	0.0000	0.9473
Lev(BLev)	9,055	0.2279	0.1955	0.1873	0.0000	0.9001
Size	10,543	18.7564	18.6016	2.0825	13.5722	24.4199
Tang	10,380	0.2286	0.1853	0.2000	0.0000	0.8375
MTB	9,618	2.4693	1.0183	4.9376	0.0701	57.4034
Prof	10,277	0.0835	0.1087	0.1625	-0.9151	0.4819
Capex	9,969	0.0539	0.0389	0.0524	0.0000	0.3413

We construct the annual time series data for the News-based EPU index (EPU_{News}) for the US and Germany, and the Base-line Overall EPU index ($EPU_{Overall}$) for the US, from the corresponding monthly EPU data constructed and published on their website by Baker,

Bloom and Davis[3]. For each year, we take the arithmetic average of twelve monthly EPU index data in that year. The Base-line Overall EPU index is composite index incorporating not only uncertainties reflected in newspaper article counts but also uncertainties in expected federal tax code provision expiration ($EPU_{tax\ codes}$) and economic forecasters' disagreement over inflation (EPU_{CPI}) and fiscal policy decisions (EPU_{fiscal}). Since the overall EPU index data is unavailable for Germany, we present empirical findings of the effects of EPU overall index only for the US dataset. For detailed description and development of the EPU index, Baker et al. (2016) provides an excellent reference.

We examine the effects of economic policy uncertainty on financial leverage (Lev) using panel regression specified in Equation (1). EPU is measured by EPU_{News} for the US and Germany, and in addition $EPU_{Overall}$ for the US, using the logarithm of corresponding EPU index data of Baker et al. (2016). We take two measures of financial leverage, book leverage (TDA) calculated as either the ratio of total debt to total assets, and market-leverage (TDM) calculated as total debt divided by the sum of total debt and unadjusted share price multiplied by the number of shares outstanding. The discussion of our main findings, however, will focus on the leverage ratios measured in market-value terms. We include control variables to control for the effects of firm characteristics and the effects of financial crisis.

$$Lev_{i,t} = \alpha + \beta_1 \log(EPU_{i,t-1}) + \beta_2 Size_{i,t-1} + \beta_3 Tang_{i,t-1} + \beta_4 Prof_{i,t-1} + \beta_5 MTB_{i,t-1} + \beta_6 Capex_{i,t} + \beta_7 Div_{i,t-1} + e_{i,t} \quad (1)$$

where $Lev_{i,t}$ denotes the financial leverage ratio of firm i in year t, measured by either the total debt to total market-value of assets ratio (TDM), or the ratio of total debt to total book-value of assets (TDA); and log(EPU) is the logarithm of an EPU index (EPU_{News} for the US and Germany, and $EPU_{Overall}$ for the US in addition) developed by Baker et al. (2016).

Control variables representing firm characteristics are defined as following. Size is measured by the natural logarithm of total assets. Asset tangibility (Tang) is the ratio of net property, plant, and equipment to total assets. We define profitability (Prof) as EBIT & depreciation divided by total assets. Market-to-book ratio (MTB) is a proxy for long-term growth prospect, calculated as the ratio of market-value of total assets to the book-value of total assets (Fama and French, 2002; and Frank and Goyal, 2009). In addition, we calculate the ratio of capital expenditure to total assets (Capex) to capture the effect of a firm's short-term

[3] EPU data is downloaded from http://www.policyuncertainty.com.

investment opportunity. Dividend (Div) is a dummy variable, which takes the value of one if a firm paid a cash dividend and zero otherwise. Following Frank and Goyal (2009), Lemmon et al. (2008), and Rajan and Zingales (1995), Size, Tang, Prof and MTB are lagged by one year. However, the current-year data for Capex is used to proxy for the capital budget of a firm prepared in the previous year.

Since global financial crises may affect the stability of financial markets, they may have profound effects on corporate finance decisions. Pástor and Veronesi (2013) suggest that EPU tends to be higher in weak economies, while Baker et al. (2016) report that EPU index value increased by more than 50% during the Great Recession of 2007 to 2009. Iqbal and Kume (2014) report that financial leverage ratios of European firms increase during the financial crisis of 2008 and 2009. As a robustness test, we investigate whether global financial crisis plays a role in the capital structure decisions of US or German firms, and how does financial crisis affects the capital structure effect of EPU. The robustness test is specified in Equation (2), which includes a Crisis Dummy and an interaction dummy variable to capture the joint effect of EPU and crisis.

$$Lev_{i,t} = \alpha+\beta_1 \log(EPU_{i,t-1})+\beta_2 Size_{i,t-1}+\beta_3 Tang_{i,t-1}+\beta_4 Prof_{i,t-1}+\beta_5 MTB_{i,t-1}+\beta_6 Capex_{i,t}+\beta_7 Div_{i,t-1}$$
$$+Crisis\ Dummy_{i,t-1}+\beta_8 \log(EPU_{i,t-1})\times Crisis\ Dummy_{i,t-1}+e_{i,t} \quad (2)$$

We include a set of six episodes of global financial crisis identified by Fry-McKibbin et al. (2014) in the robustness test for the sample of German firms. While some of the six crisis episodes were originated in the U.S. and some were originated in other countries, Fry-McKibbin et al. (2014) claim that they are "true" global financial crises by because they had all exerted profound contagion effects on the stability of equity markets in many countries around the world. The six global financial crisis episodes are: the Asian Financial Crisis from 1997 to 1998; the Brazilian Currency Crisis in 1999; the Argentine Crisis from 2001 to 2002, the Subprime Mortgage Crisis from 2007 to 2008; the Great Recession from 2008 to 2009 and the European Debt Crisis from 2010 to 2013. For crisis periods, we follow the start and the end date determined by Fry-McKibbin et al. (2014) using a regime switching model. In addition to these six crisis episodes, we also include the 1987 US Stock Market Crash as the seventh crisis episodes in the robustness test for the sample of US firms. The Crisis Dummy takes the value of one in a crisis year and the value of zero in tranquil years.

To start with, use conduct Hausman test for model selection, which yields results suggesting of the use of cross-sectional fixed effect models. In model specification, we use cross-sectional weights for panel corrected standard errors (PCSE) and covariance for estimating test statistics to avoid statistical bias caused by heteroscedasticity and serial correlation in the panel dataset (Becks and Katz, 1995). In the next two sections, we report and discuss our results of panel regression analysis.

3. Discussion of Empirical Results

The main results from panel regression analysis for the EPU news effects on capital structure, along with the coefficient estimates for firm characteristic variables, are presented in Table 2. The results in Panel A suggests that a one percentage increase in the US news index of EPU reduces the market leverage ratio of US firms (TDM) by 3.62 percent, and reduces the total book leverage ratio (TDA) by 2.44 percent. The negative coefficients of the EPU variable are both statistically significant at the one percent level. It is worth mentioning that the stronger negative effect of EPU reported for the market-value based financial leverage is not likely a result driven by stock-price movements, since higher EPU depresses stock price which leads to higher market-value based debt ratio holding other things equal. The results in Panel B, on the other hand, show that economic policy uncertainty does not have any significant effect on the capital structure decisions of German firms. The effects of firm characteristic variables examined for the German firms, on the other hand, are consistent with those reported for the study of US data.

As one robustness check, we repeat the analysis of US data by replacing the US EPU news index with the US EUP overall index and report the results in Panel A of Table 3. While these results are largely consistent with the results discussed above for the EPU news index effects, policy uncertainty measured by the overall index have greater economic significance than uncertainty measured by the news index. In particular, a one percentage increase in the US overall index of EPU reduces the market leverage ratio (TDM) and the total book leverage ratio (TDA) by 4.67 and 3.19 percent, respectively. The results of negative EPU, measured by both EPU news index and EPU overall index, effects on debt ratio are consistent with Cao et al. (2013), which claim that firms increase cash holdings to build up financial flexibility when policy uncertainty is high. The results for firm characteristic effects are in line with the findings of existing literature in that size and asset tangibility have statistically

significant positive impact on financial leverage. On the other hand, profitability, growth and dividend-paying firms use less financial leverage.

Table 2. EPU news effects on financial leverage: US versus Germany

Figures presented are estimated from the fixed-effect panel regression model $Lev_{i,t} = \alpha+\beta_1 log(EPU_{i,t-1}) +\beta_2 Size_{i,t-1}+\beta_3 Tang_{i,t-1}+\beta_4 Prof_{i,t-1}+\beta_5 MTB_{i,t-1}+\beta_6 Capex_{i,t}+\beta_7 Div_{i,t-1}+e_{i,t}$. The depend variable financial leverage ($Lev_{i,t}$) is measured in two ways: total debt to the market-value of total assets ratio (TDM), and total debt to the book-value of total assets ratio (TDA). Independent variables are lagged by one year. In addition, current-year capital expenditure ratio is included as an independent variable to proxy for the capital budget in the previous year. Test statistics are presented in parentheses and are calculated based on cross-sectional weights panel corrected standard errors (PCSE) and covariance. Symbols *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

	Lev_t (TDM)	Lev_t (TDA)
Panel A: US firms 1985-2015		
$Log(EPU_{news\ t-1})$	-0.0362 (-16.42***)	-0.0244 (-10.20***)
$Size_{t-1}$	0.0478 (50.02***)	0.0144 (13.33***)
$Tang_{t-1}$	0.1857 (21.74***)	0.1954 (19.64***)
$Prof_{t-1}$	-0.1462 (-27.80***)	-0.1185 (-16.81***)
MTB_{t-1}	-0.0024 (-13.65***)	-0.0018 (-6.78***)
$Capex_t$	-0.2248 (-13.24***)	-0.0993 (-5.03***)
Div_{t-1}	-0.0070 (-3.11***)	-0.0106 (-5.05***)
Adjusted R^2	0.6653	0.6023
AIC stat.	-1.0594	-0.9634
No. of obs.	64,379	64,385
Panel B: German firms 1993 to 2015		
$Log(EPU_{news\ t-1})$	0.0019 (0.27)	-0.0007 (-0.07)
$Size_{t-1}$	0.0730 (18.04***)	0.0080 (1.06)
$Tang_{t-1}$	0.2968 (11.24***)	0.2284 (7.44***)
$Prof_{t-1}$	-0.1938 (-10.80***)	-0.1649 (-5.45***)
MTB_{t-1}	-0.0040 (-11.06***)	-0.0002 (-0.57)
$Capex_t$	-0.1887 (-3.72***)	-0.0989 (-1.92*)
Div_{t-1}	-0.0334 (-6.47**)	-0.0005 (-0.10)
Adjusted R^2	0.6612	0.6578
AIC stat.	-0.9457	-1.7301
No. of obs.	7,712	7,714

In Panel B of Table 3, we present the results for stepwise regression analysis of the German dataset by removing redundant variables one by one. The results confirm our earlier finding that EPU does not affect the capital structure decisions of German firms. We find that the

market-value based debt ratios of German firms increase with firm size and asset tangibility but decrease with profitability, market-to-book ratio, capital expenditure ratio and the recent history of paying cash dividend. Size, growth, capital expenditure ratio and cash dividend, however, do not affect the book-value based debt ratios of German firms. These results are partly in agreement with the findings of Frank & Goyal (2009) and Rajan and Zingales (1995).

Table 3. Effects of EPU overall in US and EPU news in Germany (stepwise regression)

Figures presented are estimated from the fixed-effect panel regression model $Lev_{i,t} = \alpha+\beta_1 log(EPU_{i,t-1}) +\beta_2 Size_{i,t-1}+\beta_3 Tang_{i,t-1}+\beta_4 Prof_{i,t-1}+\beta_5 MTB_{i,t-1}+\beta_6 Capex_{i,t}+\beta_7 Div_{i,t-1}+e_{i,t}$. The depend variable financial leverage ($Lev_{i,t}$) is measured in two ways: total debt to the market-value of total assets ratio (TDM), and total debt to the book-value of total assets ratio (TDA). Independent variables are lagged by one year. In addition, current-year capital expenditure ratio is included as an independent variable to proxy for the capital budget in the previous year. Test statistics are presented in parentheses and are calculated based on cross-sectional weights panel corrected standard errors (PCSE) and covariance. Symbols *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

	Lev_t (TDM)	Lev_t (TDA)
Panel A: US firms 1985-2015		
$Log(EPU_{overall\ t-1})$	-0.0467 (-20.82***)	-0.0319 (-13.13***)
$Size_{t-1}$	0.0478 (50.22***)	0.0144 (13.37***)
$Tang_{t-1}$	0.1849 (21.68***)	0.1949 (19.60***)
$Prof_{t-1}$	-0.1450 (-27.65***)	-0.1177 (-16.74***)
MTB_{t-1}	-0.0024 (-13.50***)	-0.0018 (-6.72***)
$Capex_t$	-0.2269 (-13.40***)	-0.1010 (-5.13***)
$Dividend_{t-1}$	-0.0060 (-2.66***)	-0.0100 (-4.72***)
Adjusted R^2	0.6662	0.6028
AIC stat.	-1.0621	-0.9646
No. of obs.	64,379	64,385
Panel B: Stepwise results for German firms 1993 to 2015		
$Log(EPU_{news\ t-1})$	No significance	No significance
$Size_{t-1}$	0.0732 (18.78***)	No significance
$Tang_{t-1}$	0.2969 (11.26***)	0.2727 (8.29***)
$Prof_{t-1}$	-0.1940 (-10.81***)	-0.1266 (-3.50***)
MTB_{t-1}	-0.0040 (-11.07***)	No significance
$Capex_t$	-0.1902 (-3.77***)	No significance
Div_{t-1}	-0.0333 (-6.45**)	No significance
Adjusted R^2	0.6613	0.4203
AIC stat.	-0.9460	-0.1954
No. of obs.	7,712	9,322

Would the capital structure effect of EPU reported above continue to hold after controlling for the effects of financial crisis? To answer this question, we conduct robustness tests to control for the effects of seven (six) episodes of the global financial crisis on the US (German) dataset. The results are presented and discussed in the next section.

4. Robustness Tests Results

We expand the tests for both market-value and book-value based debt ratios as dependent variables by including a Crisis Dummy variable, which takes the value of one in any year when that had an occurrence of global financial crisis and the value of zero in other years. For the German dataset, we consider the six global financial crisis identified by Fry-McKibbin et al. (2014) as "true" global financial crises having profound contagion effects on the stability of the equity markets of the US and other countries around the world. The six crisis episodes include the Asian Financial Crisis, the Brazilian Currency Crisis, the Argentine Crisis, the Subprime Mortgage Crisis, the Great Recession and the European Debt Crisis. For the US dataset, we also consider the 1987 US Stock Market Crash in addition to the aforementioned six crises. The results for the EPU news effects in US and Germany are presented in Table 4.

The results for US firms presented in Panel A of Table 4 suggest that US firms generally increase their use of financial leverage during crisis periods. In addition, EPU news has significantly positive effects on financial leverage, with a one percentage increase in EPU news index leads to a 2.22 percent (0.74 percent) increase in the market-value based (book-value based) debt ratios of US firms. While this result contradicts the negative EPU news effect we reported earlier in the previous section, having a closer look at the other results in Panel A tells us a different story as the joint effects of EPU news and financial crisis are significantly negative, both economically and statistically. In particular, a one percentage increase in EPU news index value is associated with a 13.07 (5.83) percent decrease in market-value (book-value) based debt ratio of US firms during crisis periods. Therefore, EPU news effects on financial leverage are positive during tranquil periods but substantially more negative during crisis periods. These results also suggest that the negative EPU news effects reported in the previous section are driven by the dominance of its significant negative effects over the crisis periods. Since the results for the effect of control variable are broadly

consistent with what we have reported earlier in the previous section, we do not repeat the discussion for the sake of succinctness.

Table 4. Robustness check: EPU news index US versus Germany

Figures presented in this table are estimated from the fixed-effect panel regression model $Lev_{i,t} = \alpha + \beta_1 \log(EPU_{news,t-1}) + \beta_2 Size_{i,t-1} + \beta_3 Tang_{i,t-1} + \beta_4 Prof_{i,t-1} + \beta_5 MTB_{i,t-1} + \beta_6 Capex_{i,t} + \beta_7 Div_{i,t-1} + Crisis\ Dummy_{i,t-1} + \beta_8 \log(EPU_{news,t-1}) \times Crisis\ Dummy_{i,t-1} + e_{i,t}$. The crisis dummy captures the effects of six episodes of global financial crisis identified by Fry-McKibbin, Hsian and Tang (2014) for Germany, and an additional US Stock market Crash of 1087 for the US. The Crisis Dummy takes the value of one in a year that falls into a crisis period, and the value of zero otherwise. The depend variable financial leverage ($Lev_{i,t}$) is measured in two ways: total debt to the market-value of total assets ratio (TDM), and total debt to the book-value of total assets ratio (TDA). Independent variables are lagged by one year. In addition, current-year capital expenditure ratio is included as an independent variable to proxy for the capital budget in the previous year. Test statistics are presented in parentheses and are calculated based on cross-sectional weights panel corrected standard errors (PCSE) and covariance. Symbols *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

	Lev_t (TDM)	Lev_t (TDA)
Panel A: US firms 1985 to 2015		
$Log(EPU_{news,t-1})$	0.0222 (5.57***)	0.0074 (1.76*)
$Crisis\ Dummy_{t-1}$	0.6275 (26.20***)	0.2728 (10.73***)
$Log(EPU_{news,t-1}) \times Crisis\ Dummy_{i,t-1}$	-0.1307 (-25.08***)	-0.0583 (10.53*)
$Size_{t-1}$	0.0487 (49.78***)	0.0155 (13.84***)
$Tang_{t-1}$	0.1766 (20.81***)	0.1910 (19.15***)
$Prof_{t-1}$	-0.1437 (-27.46***)	-0.1184 (-16.79***)
MTB_{t-1}	-0.0026 (-14.70***)	-0.0019 (-7.15***)
$Capex_t$	-0.2352 (13.98***)	-0.1026 (-5.20***)
Div_{t-1}	-0.0058 (-2.59***)	-0.0104 (-4.95***)
Adjusted R^2	0.6710	0.6031
AIC stat.	-1.0766	-0.9654
No. of obs.	64,379	64,385
Panel B: German firms 1993 to 2015		
$Log(EPU_{news,t-1})$	-0.0257 (-1.63)	0.0268 (1.33)
$Crisis\ Dummy_{t-1}$	0.0994 (1.26)	0.1909 (1.97**)
$Log(EPU_{news,t-1}) \times Crisis\ Dummy_{i,t-1}$	-0.0131 (-0.76)	-0.0406 (-1.92)
$Size_{t-1}$	0.0725 (18.04***)	0.0080 (1.07)
$Tang_{t-1}$	0.3076 (11.66***)	0.2294 (7.43***)
$Prof_{t-1}$	-0.1922 (-10.73***)	-0.1634 (-5.41***)
MTB_{t-1}	-0.0038 (-10.57***)	-0.0002 (-0.58)
$Capex_t$	-0.1935 (-3.82***)	-0.0983 (-1.90*)
Div_{t-1}	-0.0328 (-6.40***)	-0.0005 (-0.92)
Adjusted R^2	0.6659	0.5710
AIC stat.	-0.9593	-0.7758
No. of obs.	7,712	7,714

Table 5. The US EPU overall index effect and stepwise regression results for Germany

Figures presented are the estimates of the fixed-effect panel regression model $Lev_{i,t}=\alpha+\beta_1 log(EPU_{i,t-1})+\beta_2 Size_{i,t-1}+\beta_3 Tang_{i,t-1}+\beta_4 Prof_{i,t-1}+\beta_5 MTB_{i,t-1}+\beta_6 Capex_{i,t}+\beta_7 Div_{i,t-1}+Crisis\ Dummy_{i,t-1}+\beta_8 log(EPU_{overall,t-1})\times Crisis\ Dummy_{i,t-1}+e_{i,t}$. The crisis dummy captures the effects of six episodes of global financial crisis identified by Fry-McKibbin, Hsian and Tang (2014) for Germany, and an additional US Stock market Crash of 1087 for the US. The depend variable financial leverage ($Lev_{i,t}$) is measured in two ways: total debt to the market-value of total assets ratio (TDM), and total debt to the book-value of total assets ratio (TDA). Independent variables are lagged by one year. In addition, current-year capital expenditure ratio is included as an independent variable to proxy for the capital budget in the previous year. Test statistics are presented in parentheses and are calculated based on cross-sectional weights panel corrected standard errors (PCSE) and covariance. Symbols *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

	Lev_t (TDM)	Lev_t (TDA)
Panel A: US firms 1985-2015		
$Log(EPU_{overall,\ t-1})$	-0.0066 (-1.79*)	-0.0152 (-3.96***)
$Crisis\ Dummy_{t-1}$	0.4946 (21.96***)	0.1693 (7.13***)
$Log(EPU_{overall,t-1})\times Crisis\ Dummy_{i,t-1}$	-0.1013 (-20.79***)	-0.0354 (-6.89***)
$Size_{t-1}$	0.0479 (48.98***)	0.0149 (13.31***)
$Tang_{t-1}$	0.1795 (21.17***)	0.1930 (19.37***)
$Prof_{t-1}$	-0.1437 (-27.44***)	-0.1180 (-16.73***)
MTB_{t-1}	-0.0026 (-14.57***)	-0.0019 (-7.02***)
$Capex_t$	-0.2396 (-14.24***)	-0.1053 (-5.34***)
Div_{t-1}	-0.0056 (-2.50**)	-0.0101 (-4.68**)
Adjusted R^2	0.6709	0.6032
AIC stat.	-1.0762	-0.9656
No. of obs.	64,379	64,385
Panel B: Stepwise regression, German firms 1993-2015		
$Log(EPU_{news,\ t-1})$	-0.0360 (-4.64***)	0.0347 (1.95*)
$Crisis\ Dummy_{t-1}$	0.0395 (10.36***)	0.1975 (2.11**)
$Log(EPU_{overall,t-1})\times Crisis\ Dummy_{i,t-1}$	No significance	-0.0424 (-2.08**)
$Size_{t-1}$	0.0725 (18.03***)	No significance
$Tang_{t-1}$	0.3077 (11.66***)	0.2723 (8.30***)
$Prof_{t-1}$	-0.1926 (-10.76***)	-0.1251 (-3.43***)
MTB_{t-1}	-0.0038 (-10.55***)	No significance
$Capex_t$	-0.1939 (-3.83***)	No significance
Div_{t-1}	-0.0328 (-6.39***)	No significance
Adjusted R^2	0.666	0.4204
AIC stat.	-0.9595	-0.1952
No. of obs.	7,712	9,322

The results from the examination of the German dataset are presented in Panel B of Table 4, which suggest that neither EPU news nor the interaction of EPU news with financial crisis have any statistical significant influence on the capital structure decisions of German firms,

although German firms do generally increase their use of financial leverage during crisis period to a lesser degree as compared to that of the US firms.

In Panel A of Table 5, we report the effects of EPU overall index on the US capital structure, which are consistent with the results discussed in the previous section. In particular, we find that US firms reduce market-value (book-value) based leverage ratios by an average of 0.66 percent (1.52 percent) in general with a further 10.13 percent (3.54 percent) reduction during financial crisis periods. The signs of coefficient estimates for firm characteristic variables are consistent with those reported earlier in the previous section. The average market-value (book-value) based debt ratios of US firms are 49.46 percent (16.93 percent) higher in crisis periods than tranquil periods, suggesting that US firms become more aggressive in using financial leverage in crisis periods.

The results of stepwise regression for the German dataset incorporating financial crisis effects are reported in Panel B of Table 5. We find that market leverage ratios of German firms are on average 3.60 percent lower when EPU news index values increase by one percent; a result in line with the findings discussed in the previous section. In general, a one percentage increase in EPU overall index value is associated with a 3.47 percent increase in book leverage ratio, which is more than offset by a 4.24 percent decrease during financial crisis.

Conclusions

We investigate the capital structure effects of economic policy uncertainty in US and Germany, and report different results for the capital structure decisions of firms based in the two economies. In the market-based economy of US, firms borrow more aggressively in tranquil periods but more cautiously during global financial crisis when news-based policy uncertainties increase. In particular, a one percentage increase in the News-based EPU index of US is associated with a 2.22 percent (0.74 percent) increase in market (book) leverage ratios of US firms in tranquil periods. In crisis periods, however, a one percentage increase in EPU news index leads to a 13.07 percent (5.83 percent) decrease in market (book) leverage ratios of US firms. The effects of the Base-line EPU index of US, however, are consistently negative, with statistical significance, in both tranquil and crisis periods. A one percentage increase in the EPU overall index value reduces the average market (book) leverage ratio by

0.66 percent (1.52 percent) in both periods, with a further reduction of 10.13 percent (3.54 percent) in periods of global financial crises.

In the bank-based financial economy of Germany, however, market leverage ratios respond negatively to an increase in the News-based EPU index of Germany in both tranquil and crisis periods; suggesting that German firms tend to borrow less in general when policy uncertainty in the news is high. The market leverage ratios of German firms reduce by an average of 3.60 percent when EPU news index values increase by one percent. The book leverage ratios of German firms, however, respond positively to an increase in EPU news index in tranquil periods. We find that a one percentage increase in EPU news index value is associated with a 3.47 percent increase in book leverage ratio in tranquil periods which, however, is more than offset by a 4.24 percent decrease in book leverage ratio during crisis periods.

Consistent with the predictions of the trade-off theory, we find that larger firms and firms with more tangible assets rely more heavily on debt financing in both countries we study. Consistent with the predictions of the pecking order theory, more profitable firms, firms with better growth prospects and investment opportunities, and firms made cash dividend payments in the previous year use less debt. These results are consistent with Frank & Goyal (2009), Rajan and Zingales (1995), and the predictions of the dynamic trade-off model of Strebulaev (2007). The positive coefficient of size effect and the negative coefficient of profitability effect for German firms are in contrast to the findings of Rajan and Zingales (1995) but consistent with the results of Dang (2013).

Our study contributes to the literature by providing insights into the capital structure effects of economic policy uncertainty in two advanced economies with different designs of financial systems. One of the key finding from the US data is the positive EPU news effect in tranquil periods in contrasts with the significant negative effect of EPU news in crisis periods in US, suggesting that policy uncertainties have asymmetric effects on US firms' corporate decisions. Since refinancing is a costly practice for corporations, US government should exert more cautiousness in making changes to economic policies in crisis periods. Future studies may extend to examine the capital structure effects of EPU in other countries including both developed and emerging markets to gain better understanding of this relationship in different financial environments.

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Appendix

Table A1. Summary of sample composition

Sector	Active firms	Delisted firms	Total firms
Panel A: US data			
Industrials	367	479	846
Energy	222	231	453
Materials	183	188	371
Consumer discretionary	298	416	714
Consumer staples	313	346	659
Health care	387	471	858
Information technology	485	854	1,339
Telecommunication	29	91	120
All sectors	**2,284**	**3,076**	**5,360**
Panel B: German data			
Industrials	80	59	139
Energy	22	10	32
Materials	46	48	94
Consumer discretionary	59	46	105
Consumer staples	44	58	102
Health care	36	17	53
Information technology	112	66	178
Telecommunication	7	7	14
All sectors	**406**	**311**	**717**

Table A2. Correlation across firm characteristic variables

This table reports the correlation coefficients between each pair of control variables. Symbols *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

	Tang	MTB	Prof	Capex
Panel A: US firms				
Size	0.2081***	-0.0543***	0.2757***	0.0422***
Tang		-0.0548***	0.1962***	0.6216***
MTB			0.1230***	0.0832***
Prof				0.1764***
Panel B: German firms				
Size	0.2390***	-0.0441***	0.2571***	0.0938***
Tang		0.0047	0.1832***	0.4914***
MTB			0.1151***	0.1130***
Prof				0.1998***