The combined effects of Economic Policy Uncertainty and Environmental, Social, and Governance ratings on leverage

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Abstract

This paper examines the combined effects of Economic Policy Uncertainty (EPU) and Environmental, Social, and Governance (ESG) ratings on the level of leverage and its speed of adjustment (SOA). We find that both the EPU and ESG ratings are negatively associated with leverage when assessed separately. However, when EPU and ESG ratings are combined, we show that ESG ratings mitigate the detrimental impact of EPU on leverage. Our results also indicate that higher EPU levels force firms to increase their speed of adjustment due to tighter financing requirements, while ESG ratings overcome that issue and enable firms to maintain lower SOA. These results are robust to various robustness checks and are mainly driven by environmental and social factors. Our paper contributes to the growing ESG literature in showing that ESG ratings can alleviate the adverse effects of EPU on leverage and SOA.

Keywords: EPU, ESG ratings, leverage ratio, speed of adjustment.

JEL Classification: D81, G24, G32, Q56

1 Introduction

The Economic Policy Uncertainty (EPU) hinders economic development through firms' financial decisions and activities. It does not only adversely affects firms' investments (Julio and Yook, 2012; Kang et al., 2014; Gulen and Ion, 2016) and innovation (Bhattacharya et al., 2017; Cong and Howell, 2021), but also prevents firms from accessing capital markets. The difficulty of raising external funding is mainly manifested in higher financing costs (Gungoraydinoglu et al., 2017; Ashraf and Shen, 2019), lower equity issuance (Çolak et al., 2017; Chan et al., 2021), and debt supply (Berger et al., 2022). In addition to external financing, firms' internal retained earnings, i.e. cash flows, are volatile with the shock of heightened EPU (Nguyen and Phan, 2017). In this case, firms are forced to adjust their leverage and associated speed of adjustment. Prior literature finds inconsistent results. For example, firms tend to decrease their leverage under high EPU (Zhang et al., 2015; Gungoraydinoglu et al., 2017; Li and Qiu, 2021), while Bajaj et al. (2021) argue that the EPU is positively associated with leverage. Moreover, firms exhibit lower speed of adjustment (Çolak et al., 2018; Bajaj et al., 2021) due to the higher intermediation fees.

In contrast to the EPU's negative impact on accessing the financial markets, the Environmental, Social, and Governance (ESG) ratings reduce information asymmetry and provide better access to financial markets (Cheng et al., 2014). In more detail, the ESG rating measures firms' environmental and corporate social responsibility. It has been shown that firms with an ESG rating experience lower cost of borrowing in both bank lending and bond issuing (Sharfman and Fernando, 2008; Goss and Roberts, 2011; El Ghoul et al., 2011; Ng and Rezaee, 2015; Li and Qiu, 2021), and more relaxed other financial market frictions that prohibit firms from investing in projects with positive net present values (Cheng et al., 2014). For instance, banks prefer ESG-rated firms as borrowers since the ESG rating mitigates the information asymmetry and reduces banks' monitoring costs (Asimakopoulos et al., 2021b).

Motivated by the aforementioned opposite implications of EPU and ESG ratings, we are interested in the following question: How do ESG-rated firms modify their leverage position and how do they change the associated speed of adjustment under higher EPU? On the one hand, EPU strengthens financing requirements and there is a shortage of financial provision from banks due to precautionary motives. On the other hand, ESG

ratings enable firms to be more active in deciding whether or not to borrow more. Therefore, the aim of this paper is to assess the interaction of EPU and ESG on firms leverage decision making.

Using 135,059 firm-year observations of 15,960 unique U.S. firms from 1986 to 2020, we investigate the above research question. Our findings show that in terms of the level of leverage, firstly, the EPU is negatively related to the leverage ratio, which is statistically and economically significant. As a one-standard-deviation increase in EPU, leads to a decrease of the market leverage by 15.6%, controlling for other firm characteristics and macroeconomic uncertainty factors. Secondly, the ESG rating exhibits a negative impact to leverage. A one-standard-deviation increase in ESG leads to lower leverage ratio by 1.1%. Finally, when we introduce both EPU and ESG ratings to examine the joint effects, our results suggest that their interaction term is positive, indicating that under high EPU, firms with ESG ratings can actively increase access to external financing.

Next, we examine the role of EPU and ESG ratings on the leverage speed of adjustment. The results indicate that EPU accelerates firms' leverage speed of adjustment, while ESG-rated firms tend to decelerate the leverage speed of adjustment. Both findings are determined by the access to external financing. A higher EPU level makes it harder to access financial markets to borrow money, so firms are pushed to cut their leverage ratios. In contrast, ESG-rated firms experience easier access to external financing, making it easier for them to maintain their leverage position and have a smoother SOA. Combining both EPU and ESG effects, we find that the speed of adjustment decreases, implying that the ESG rating mitigates the negative effects of EPU on firms' access to external finance and as a consequence their leverage speed of adjustment.

To the best of our knowledge, we are the first to examine the combined effects of EPU and ESG ratings on the leverage and speed of adjustment. The closest related studies are Lee et al. (2017), Bajaj et al. (2021), and Li and Qiu (2021). Some of them focus on estimating the pure EPU effects (Bajaj et al., 2021), and others study the joint effects of EPU and bank/firm characteristics on the leverage and the SOA of financial institutions (Lee et al., 2017) and firms (Li and Qiu, 2021). However, in our work we take ESG ratings, which measure whether and how firms engage in environment-friendly, society-friendly, and governance-friendly activities, into account together with EPU to explore their combined effect on the level of leverage and associated SOA.

We also contribute to the growing ESG literature. Although previous studies investigate the role of ESG ratings in capital markets (Sharfman and Fernando, 2008; El Ghoul et al., 2011; Goss and Roberts, 2011; Cheng et al., 2014; Ng and Rezaee, 2015), only a few papers examine how firms' ESG activities affect leverage ratio (Bae et al., 2011; Do et al., 2018; Ho et al., 2021; Asimakopoulos et al., 2021b). Our paper extends that literature and focuses on the ESG effects on the leverage speed of adjustment, as well as the role of ESG rating for firms' leverage decision-making under the presence of EPU.

The remainder of this paper is as follows. Section 2 provides the literature review and hypotheses development. Section 3 provides data analysis details. Section 4 introduces the models. Section 5 reports the empirical results and discussion. Section 6 includes various robustness checks, and section 7 concludes the paper.

2 Literature review and hypotheses development

In this section, we review prior literature about Economic Policy Uncertainty (EPU) and Environmental, Social, and Governance (ESG) ratings. Furthermore, we develop our hypotheses regarding the individual and joint effects of EPU and ESG on firms' leverage and speed of adjustment (SOA).

2.1 Economic Policy Uncertainty (EPU)

Economic Policy Uncertainty (EPU) indicates the degree of uncertainty surrounding economic policy. Its concentration is on policy uncertainty, and is different from broad macroeconomic uncertainty (Datta et al., 2019; Berger et al., 2022; D'Mello and Toscano, 2020), such as the financial crisis, GDP dispersion, and stock market return volatility.

The EPU's impact on economic activities has been studied previously. For instance, capital investment drops significantly during periods with high EPU (Julio and Yook, 2012; Baker et al., 2016), lasting for eight quarters (Gulen and Ion, 2016). One of the components of EPU, namely, the news-based economic uncertainty also reduces investment for a long term (Kang et al., 2014). The Mergers and Acquisitions (M&A) also decrease by 5.8 percentage points in the acquisition probability with a one standard deviation increase in EPU index and takes longer time to complete the deals (Nguyen and Phan, 2017). The innovation, no matter the quantity or quality, is reduced during

and after policy uncertainty shocks (Cong and Howell, 2021). The dividend payout is positively associated with a high level of EPU, suggesting that dividends are used to mitigate agency problems when firms face high EPU (Attig et al., 2021). Furthermore, EPU amplifies stocks' risk premium (Pástor and Veronesi, 2013), reduces employment in policy-related sectors (Baker et al., 2016), enlarges investor information asymmetry (Nagar et al., 2019), and affect cash holdings (Hankins et al., 2020; Duong et al., 2020).

In addition, heightened EPU affects the supply and demand in financial markets. Correspondingly, firms are pressured to change their borrowing decisions as a form of reaction to higher EPU level. From the perspective of supply, market frictions become more severe (Gungoraydinoglu et al., 2017). Due to the rising information asymmetry under high EPU (Zhang et al., 2015; Nagar et al., 2019), investors are reluctant to lend money. In particular, banks raise loan interest rates (Ashraf and Shen, 2019) and reduce the total number of loans (Barraza and Civelli, 2020; Berger et al., 2022). New bond issuance is also charged higher financial intermediation fees resulting from a smaller issuance size (Gungoraydinoglu et al., 2017). From the demand point of view, because internal retained earnings are volatile under higher EPU (Nguyen and Phan, 2017), firms are willing to seek more borrowing from banks and bondholders to maintain daily operations. However, even if firms prefer to borrow money, it is difficult for them to get funding from the financial markets. As a result, firms exhibit lower leverage ratios when facing high EPU levels (Zhang et al., 2015; Gungoraydinoglu et al., 2017; Li and Qiu, 2021). On the contrary, Bajaj et al. (2021) find that EPU is positively related to the leverage ratio, resulting from the fact that equity becomes much more expensive compared to the cost of debt under higher EPU periods. They also suggest that EPU decreases leverage SOA due to the rise of adjustment costs, even though their SOA is measured towards the target leverage ratio and not the current level. In our work, we try to provide new evidence on the EPU effects on current leverage ratio and the associated speed of adjustment, when considered together with the ESG score.

2.2 Environmental, Social, and Governance (ESG) rating

The Environmental, Social, and Governance (ESG) rating refers to how businesses and investors incorporate environmental, social, and governance concerns into their oper-

ations[1] (Gillan et al., 2021) . There is growing literature that examines the motivations and outcomes of engaging in ESG.

In terms of what drives firms to participate in ESG initiatives, firstly, stakeholders play an important role (Bénabou and Tirole, 2010; Dai et al., 2021). Dai et al. (2021) argue that socially responsible customers tend to cooperate with suppliers that have similar ESG policies. Besides, Ferrell et al. (2016) study the incentives from the agency point of view (managers invest in ESG to pursue personal interests at the cost of shareholders) and well-governance view (well-governed firms use ESG to maximize shareholder interests and achieve firm society goals), and find that well-governed firms engage more in corporate social responsibility (CSR). Shackleton et al. (2021) claim that firms with poor stock market performance put more effort into environmental and social activities to regain the trust of shareholders and stakeholders. In addition, firms' ESG actions are also influenced by market situations (Cai et al., 2016; Liang and Renneboog, 2017), ownership types (McGuinness et al., 2017; Abeysekera and Fernando, 2020; Hsu et al., 2021), and managers' characteristics (Borghesi et al., 2014; Cronqvist and Yu, 2017; Hegde and Mishra, 2019).

Many studies focus on the corporate impact from engaging in ESG. For example, prior literature examines the relationship between ESG and firm financial performance, but without reaching a consensus. Some studies find that ESG increases firm value (Edmans, 2011; Flammer, 2015; Gao and Zhang, 2015; Lins et al., 2017; Albuquerque et al., 2019), but others show the opposite (Di Giuli and Kostovetsky, 2014). Several papers find that the effect of ESG on firm value depends on specific situations. For example, Servaes and Tamayo (2013) argue that CSR and firm value is positively associated for firms with high customer awareness (proxied by advertising fees), but their relationship is negative or insignificant for firms with low customer awareness. Buchanan et al. (2018) show that CSR impact on firm value is determined by economic situations. CSR firms have higher firm value before the financial crisis while decreasing more firm value during the crisis (Bansal et al., 2021). Moreover, prior studies analyse how ESG affects risks (Oikonomou et al., 2012; Lins et al., 2017), media coverage (Cahan et al., 2015), and credit ratings (Oikonomou et al., 2014).

The aim of our study is to examine if ESG influences the access to financial markets,

[1]In this paper, we treat ESG and Corporate Social Responsibility (CSR) terms interchangeably.

and ultimately firms' leverage ratios and speed of adjustment. Previous research has done a great deal to examine the ESG-leverage nexus. It has been shown that the ESG rating not only helps to lower the cost of capital (Sharfman and Fernando, 2008; El Ghoul et al., 2011; Goss and Roberts, 2011; Ng and Rezaee, 2015), but also assist in overcoming other market frictions (Cheng et al., 2014). Specifically, the disclosure of ESG rating reduces agency costs and information asymmetry via expanding stakeholders' participation and the transparency of enterprises' actions, which helps firms gain easier easier access to capital funds (Cheng et al., 2014).[2] Moreover, ESG ratings attract certain types of investors that want to satisfy their social preferences and to improve their social images, even if it indicates paying higher management fees and forgoing financial returns (Riedl and Smeets, 2017). The disclosure of ESG ratings alleviates the information asymmetry (Asimakopoulos et al., 2021b) between banks and borrowers so that banks can reduce their monitoring costs.

However, there are very limited studies assessing the role of ESG on leverage SOA. The most closely related studies to ours are that of Do et al. (2018), Ho et al. (2021), and Asimakopoulos et al. (2021b). Do et al. (2018) and Ho et al. (2021) indicate that socially responsible firms increase their speed of adjustment towards the *target* leverage ratio due to the lower information asymmetry, whereas Asimakopoulos et al. (2021b) examine the relationship between ESG and leverage ratios, focusing more on debt structure. In this paper, we extend this literature by analysing the impact of ESG on the current leverage and associated speed of adjustment, separately and under high EPU levels.

2.3 Hypothesis development

2.3.1 Level of leverage ratio

During increased EPU periods firms face stricter access to financial markets with higher capital costs and less capital supply (Gungoraydinoglu et al., 2017; Ashraf and Shen, 2019; Barraza and Civelli, 2020; Berger et al., 2022). Therefore, firms face a negative supply shock in terms of liquidity provision leading to lower leverage level. Following Zhang et al. (2015); Gungoraydinoglu et al. (2017); Li and Qiu (2021), we derive the hypothesis:

[2]For more studies on the role of information asymmetry reduction in payout policy see, i.e. Asimakopoulos et al. (2017) and Asimakopoulos et al. (2021a)

Hypothesis 1a: *Firms decrease their current leverage ratio under high EPU.*

Unlike the EPU, the ESG ratings reduce firms' financing constraints from accessing capital markets and contribute to boosting debt supply (Sharfman and Fernando, 2008; Goss and Roberts, 2011; El Ghoul et al., 2011; Cheng et al., 2014; Ng and Rezaee, 2015). However, ESG-rated firms might be conservative when making decisions on whether to borrow more. It has been shown that stakeholders face switching costs when a firm is under high financial pressure (Titman, 1984). Therefore, their incentives in terms of firm-specific investments will depend on firms' financial condition and borrowing constraints. As a result, given that ESG-rated firms face higher growth opportunities (Lins et al., 2017), they wish to avoid the underinvestment problem (Myers, 1977; Aivazian et al., 2005) and attract more investors by lowering their leverage position to reduce stakeholders' concerns about their potential liquidation risk. In addition, the demand for borrowing is low for ESG-rated firms because they have higher firm value (Edmans, 2011; Servaes and Tamayo, 2013; Lins et al., 2017). In a nutshell, ESG-rated firms face a convenient financing market but they shy away from debt over-hang. This leads us to the following hypothesis:

Hypothesis 1b: *Firms with ESG rating will decrease their current leverage ratio.*

What are the combined effects of EPU and ESG on leverage ratio? Following our discussion in this section, both EPU and ESG ratings are expected to decrease leverage ratio. However, the economic intuition behind these effects is different for EPU (supply side) and ESG (demand side). Regarding higher EPU levels, creditors refrain from lending due to the increased default risks. As a result, the supply side of the financing markets shrink and firms are forced to lower their leverage ratio. On the contrary, ESG rating leads to a lower demand for loans compared to non ESG-rated firms. As ESG-rated firms face higher growth opportunities, they are proactive to reduce the usage of debt in case of falling into the trap of over-borrowing and avoid an under-investment problem. Given this fundamental difference on the channel through which EPU and ESG affect leverage, we hypothesize that the ESG rated firms will be able to better control their

borrowing position under higher EPU levels. This means that the ESG score will be able to mitigate the detrimental negative effects on firms' financial position under higher EPU levels, leading to the following hypothesis:

Hypothesis 1c: *Firms with ESG rating can mitigate the negative effects of EPU on current leverage.*

2.3.2 Level of speed of adjustment

The speed of adjustment (SOA) measures how fast a firm modifies its current leverage ratio compared to the lagged leverage ratio. Prior literature has not reached an agreement on how EPU affects SOA. Çolak et al. (2018) examine the role of EPU shocks on SOA and find that it lowers firms' speed of adjustment mainly due to higher financial intermediation costs and capital structure adjustments. However, Li and Qiu (2021) show that there is no statistically significant relationship between the EPU and firms' speed of adjustment. Vo et al. (2021) argue that under the Covid-19 economic crisis, firms tend to raise the speed of adjustment because of government's intervention providing better credit availability. Moreover, firms might be forced to adjust their leverage ratio downwards, reduce their borrowing fast and increasing their SOA, due to tighter financial markets and lower supply of funds under higher EPU. (Ashraf and Shen, 2019; Barraza and Civelli, 2020; Berger et al., 2022). Therefore, we form the following hypothesis:

Hypothesis 2a: *EPU increases firms' speed of adjustment.*

As for ESG rated firms, they are in an advantageous position to raise capital (Sharfman and Fernando, 2008; Goss and Roberts, 2011; El Ghoul et al., 2011; Ng and Rezaee, 2015), hence they can access financing markets easier compared to non-ESG rated firms. This means that even if the ESG rated firms want to decrease their leverage position to avoid any under-investment issues and signal lower liquidation risks to stakeholders, they can still keep a smoother borrowing pattern. This *smoothing* pattern is essential to help firms proceed with their daily operations and avoid facing any additional debt adjustment costs. As as result, we form the following hypothesis:

Hypothesis 2b: *The ESG rating lowers firms' speed of adjustment.*

From the above it is assumed that EPU and ESG ratings have opposite effects on SOA. Given that ESG rating provides better access to financial markets and attracts more investors, it is expected that ESG rated firms will be able to mitigate the adverse effects of high EPU levels, compared to non-ESG rated firms. In other words, we assume that ESG rating helps firms maintain a smoother leverage pattern and avoid any unnecessary or even forced adjustment (under high EPU) to their borrowing and, as a consequence, investment decision making. Our work is the first study that aims to shed light on this interesting aspect and we form the following hypothesis:

Hypothesis 2c: *ESG rating enables firms to keep a smoother leverage pattern than non-ESG rated firms, even under high EPU levels.*

3 Data

In this section, we initially introduce our dataset and the process of sample selection. Next, we describe our variables and show some summary statistics.

3.1 Dataset

3.1.1 Leverage ratio

Annually merged CRSP-Compustat (CCM) dataset from Wharton Research Data Services (WRDS)[3] provides stock prices and accounting information. Based on these data we generate our dependent variable, the firms' market leverage ratio. It is calculated as the sum of short-term debt (#34)[4] and long term debt (#9) divided by the sum of total debt and market equity (stock price (#199) times shares outstanding (#54)).

[3]Merged CRSP-Compustat dataset: https://wrds-www.wharton.upenn.edu/pages/get-data/center-research-security-prices-crsp/annual-update/crspcompustat-merged/fundamentals-annual/

[4]This is the item number, more details see: https://www.crsp.org/products/documentation/annual-data-industrial

3.1.2 Economic Policy Uncertainty index

The Baker, Bloom, and Davis (BBD) index[5] measures economic policy uncertainty (Baker et al., 2016). The BBD index is the most comprehensive indicator in this dataset, which is a weighted average of four components: news-based uncertainty (weight=1/2), temporary tax code (weight=1/6), the disagreement of CPI (weight=1/6), and dispersion of federal/state/local government spending (weight=1/6). The news-based uncertainty is obtained by searching the term about economic policy uncertainty in the 10 leading U.S. journals: *USA Today*, *Miami Herald*, *Chicago Tribune*, *Washington Post*, *Los Angeles Times*, *Boston Globe*, *San Francisco Chronicle*, *Dallas Morning News*, *New York Times*, and *Wall Street Journal*. Tax code dispersion shows the temporary federal tax code provisions. Both the dispersion of CPI and government spending explain the economic forecaster disagreement. To annualize the EPU index, we take the arithmetic average of the monthly data, followed by taking the natural logarithm of the annual EPU index.

3.1.3 Environmental, Social and Governance rating

The Refinitiv ESG (Thomson Reuters Asset4) dataset[6] captures firms' Environmental, Social, and Governance (ESG) ratings. With the use of publicly available information, such as firms' annual reports, company websites, stock exchange filings, this dataset covers more than 80% of worldwide market capitalization and 76 nations. Moreover, it applies over 450 ESG metrics to produce a variety of ESG scores ranging from 0 to 100. The ESG combined score (ESGC) is the broadest score, encompassing both positive and negative ESG behaviour. Within the positive ESG score, three E-S-G pillar scores demonstrate firms' performance in environmental, social, and governance respectively.

The Refinitiv ESG database is widely employed to investigate ESG effects on firms' financing actions (Cheng et al., 2014; Dhaliwal et al., 2014; Stellner et al., 2015; Flammer, 2021). Following prior studies, we use this dataset to measure S&P 1500 and North American firms' ESG performance.[7]

[5]BBD index: www.policyuncertainty.com

[6]This dataset is downloaded from Refinitiv Datastream.

[7]We have also performed our main empirical analysis using KLD ESG ratings and we found that our key results remain valid.

3.1.4 Firm characteristic and macroeconomic uncertainty factors

Firm characteristics and macroeconomic conditions also play a role in determining corporations' funding sources. In terms of firm characteristics, firm size, capital expenditure, dividend, tangibility, R&D expense, profitability, and Market-to-Book ratio are used (Asimakopoulos et al., 2019; Duong et al., 2020; Li and Qiu, 2021). We create these variables by using the CCM dataset (see Appendix).

Taking into account that economic policy uncertainty and macroeconomic uncertainty are highly associated (Gulen and Ion, 2016; Berger et al., 2022), we employ the Business cycle index (BCI) [8] and the realized S&P stock market volatility (VOL)[9] to express the whole economic uncertainty, following Li and Qiu (2021)[10]. Specifically, we take the natural logarithm of weekly BCI to obtain Ln(BCI). For the calculation of the VOL index we first obtain the daily standard deviation by taking the square root of the realized daily return times 100. Next, the daily standard deviation is multiplied by $\sqrt{252}$ and then is squared to get the annual variance. Finally, the Ln(VOL)[11] is the natural logarithm of the annual variance.

3.2 Sample selection

After merging the above datasets to get our initial sample (231,326 firm-year observations), we clean it following Bae et al. (2011). Firstly, we eliminate financial (sic 6000-6999) and utility (sic 4900-4949) firms due to their special regulation requirements (163,240 observations left). Secondly, we eliminate observations whose values of assets or debt are missing or equal to zero (137,667 observations left). Thirdly, we drop observations when cash holdings ratio or market (book) leverage ratio is negative or more than 1 (135,059 observations left). In addition, to alleviate the effects of outliers, we winsorize observations at the 1st and 99th percentiles. Finally, we get 135,059 firm-year observations from 15,960 firms between 1986 and 2020.

[8] BCI index: https://imarketsignals.com/

[9] VOL index: https://wrds-www.wharton.upenn.edu/pages/get-data/center-research-security-prices-crsp/annual-update/stock-security-files/daily-stock-file/

[10] In this paper, authors also use Chicago Board Options Exchange (CBOE) 100 implied volatility as a measurement of economic uncertainty. However, the link they provided is not active and we cannot access these data.

[11] Ln(VOL)=$\ln\left((\sigma_{Return*100} * \sqrt{252})^2\right)$

3.3 Descriptive statistics

Table 1 shows the descriptive statistics of essential variables. The market leverage ratio, on average, is 26.1% of the sum of the total debt and market equity. This leverage ratio also has a wide range of values, with the 25th and the 75th percentiles being 0.063 and 0.403, respectively. The mean values of EPU indexes, such as the overall EPU index (4.689) and the new-based EPU index (4.730) are very similar. This is in line with Li and Qiu (2021). Regarding ESG indicators, all ESG metrics have a mean above 0.3 excluding the environmental pillar score. As for firm characteristics and macroeconomic uncertainty, the results show that both the firm size and the Market-to-Book ratio have a large imbalance between observations. The Business Cycle Index (Ln(BCI)) has a mean value of 5.015 and the realized S&P stock market volatility (Ln(VOL)) is, on average, 5.456.

[Insert Table 1 here]

4 Model

4.1 Leverage ratio

According to the trade-off theory, firms balance the net benefits of tax deduction with the associated bankruptcy (distress) costs to determine the target leverage ratio. Generally, there is a gap between a firm's actual and target leverage ratio, however, firms cannot mitigate this gap immediately because of the adjustment costs. Therefore, we employ a partial (incomplete) adjustment model (Flannery and Rangan, 2006; Cook and Tang, 2010; Faulkender et al., 2012; Flannery and Hankins, 2013; Do et al., 2020), which indicates that firms can partially adjust to their target leverage ratio. Specifically, the difference of a firm's current and lagged actual leverage ratio equals to the speed of adjustment (SOA) multiplied by the gap between target and lagged leverage ratio.

$$Lev_{i,t} - Lev_{i,t-1} = \lambda(Lev^*_{i,t} - Lev_{i,t-1}) + \nu_{i,t} \tag{1}$$

where $Lev_{i,t}$ and $Lev_{i,t-1}$ are leverage ratios in period t and period t-1. λ indicates the speed of adjustment within the [0,1] interval. $Lev^*_{i,t}$ is a firm's target leverage ratio and $\nu_{i,t}$ is the error term.

4.1.1 EPU individual effects

The target leverage ratio $Lev^*_{i,t}$ is formed by a set of firm characteristics $\mathbf{X}$ (Im et al., 2020) and it is the fitted value from regressing it on firm characteristics (Hovakimian and Li, 2011; Zhou et al., 2016; Do et al., 2020). In our model, $\mathbf{X}$ consists of firm size, capital expenditure, dividend (dummy), tangibility, profitability, and Market-to-Book ratio, similar to Li and Qiu (2021). Furthermore, since our key interest is the EPU effects on the leverage ratio as previous studies (Cao et al., 2013; Zhang et al., 2015; Gungoraydinoglu et al., 2017; Bajaj et al., 2021), we also include the EPU index to estimate the target leverage ratio.

$$Lev^*_{i,t} = \alpha_0 + B^{'}\mathbf{X}_{i,t-1} + \phi_1 EPU_{t-1} \tag{2}$$

Next, we insert equation (2) into equation (1) to obtain the reduced-formed equation as follows:

$$Lev_{i,t} = \beta_0 + \beta_1 Lev_{i,t-1} + \beta_2 EPU_{t-1} + \beta^{'}\mathbf{X}_{i,t-1} + \nu_{i,t} \tag{3}$$

where the speed of adjustment is: λ = 1-β_1.

We further control for macroeconomic uncertainty and include time and firm fixed effects:

$$Lev_{i,t} = \beta_0 + \beta_1 Lev_{i,t-1} + \beta_2 EPU_{t-1} + \beta^{'}\mathbf{X}_{i,t-1} + \eta^{'}\mathbf{Z}_{t-1} + \gamma_t + \theta_i + \nu_{i,t} \tag{4}$$

where $\mathbf{Z}_{t-1}$ measures macroeconomic uncertainty proxied by the business cycle index (BCI) and the S&P 500 realized stock volatility index (VOL). γ_t captures the time-invariant effects and θ_i captures the firm-invariant effects.

Therefore, equation (3) and equation (4) are employed to investigate EPU individual effects on the level of the leverage ratio.

4.1.2 ESG individual effects

Similarly, we incorporate the ESG indicator instead of the EPU variable, similar to Asimakopoulos et al. (2021b), and we get the following equation:

$$Lev_{i,t} = \beta_0 + \beta_1 Lev_{i,t-1} + \beta_3 ESG_{t-1} + \beta^{'}\mathbf{X}_{i,t-1} + \nu_{i,t} \tag{5}$$

Next, we further control for macroeconomic uncertainty factors ($\mathbf{Z}$), firm (θ_i), and year (γ_t) fixed effects:

$$Lev_{i,t} = \beta_0 + \beta_1 Lev_{i,t-1} + \beta_3 ESG_{t-1} + \beta^{'}\mathbf{X}_{i,t-1} + \eta^{'}\mathbf{Z}_{t-1} + \gamma_t + \theta_i + \nu_{i,t} \tag{6}$$

We use equation (5) and equation (6) to examine the ESG individual effects on the leverage ratios.

4.1.3 EPU and ESG joint individual effects

To estimate the joint effects of EPU and ESG, we combine the above equations and we further introduce their interaction term to get:

$$\begin{aligned} Lev_{i,t} = \beta_0 + \beta_1 Lev_{i,t-1} + \beta_2 EPU_{t-1} + \beta_3 ESG_{t-1} \\ +\beta 4 EPU_{t-1} ESG_{t-1} + \beta^{'}\mathbf{X}_{i,t-1} + \nu_{i,t} \end{aligned} \tag{7}$$

We further control for macroeconomic uncertainty ($\mathbf{Z}$), firm (θ_i), and year (γ_t) fixed effects:

$$\begin{aligned} Lev_{i,t} = \beta_0 + \beta_1 Lev_{i,t-1} + \beta_2 EPU_{t-1} + \beta_3 ESG_{t-1} + \beta 4 EPU_{t-1} ESG_{t-1} \\ +\beta^{'}\mathbf{X}_{i,t-1} + +\eta^{'}\mathbf{Z}_{t-1} + \gamma_t + \theta_i + \nu_{i,t} \end{aligned} \tag{8}$$

It is worth noting that the effects of EPU (ESG) are captured by both the coefficients of EPU_{t-1} (ESG_{t-1}) and $EPU_{t-1}ESG_{t-1}$. This means that the EPU (ESG) impact is measured by the sum of β_2 (β_3) and $\beta_4\mu_{ESG}$ ($\beta_4\mu_{EPU}$), where the μ_{ESG} (μ_{EPU}) is the mean of ESG (EPU). This shows how EPU (ESG) influence a firm's leverage ratio, given a firm's ESG ratings (EPU shocks). Here, equation (7) and equation (8) are used to examine the joint effects of EPU and ESG on firms' leverage ratios.

4.2 Speed of Adjustment (SOA)

In this subsection we show how the speed of adjustment (SOA) is affected with the introduction of EPU and ESG separately and jointly.

4.2.1 EPU effects on SOA

Prior literature does not provide a clear result on the role of EPU on SOA (Çolak et al., 2018; Li and Qiu, 2021). To evaluate firms' SOA with EPU, we incorporate the interaction term: $EPU_{t-1}Lev_{i,t-1}$. Therefore, based on equation (1) we have:

$$Lev_{i,t+1} = Lev_{i,t} + \lambda(Lev^*_{i,t+1} - Lev_{i,t} - EPU_t Lev_{i,t}) + \psi_{i,t+1} \tag{9}$$

By inserting equation (2) into equation (9), we get:

$$Lev_{i,t} = \beta_0 + \beta_1 EPU_{t-1} + \beta_2 Lev_{i,t-1} + \beta_3 EPU_{i,t-1} Lev_{i,t-1} + \beta^{'}\mathbf{X}_{i,t-1} + \psi_{i,t} \tag{10}$$

If we further control for macroeconomic uncertainty, and firm-year fixed effects:

$$Lev_{i,t} = \beta_0 + \beta_1 EPU_{t-1} + \beta_2 Lev_{i,t-1} + \beta_3 EPU_{i,t-1} Lev_{i,t-1} + \beta^{'}\mathbf{X}_{i,t-1} + \eta^{'}\mathbf{Z}_{t-1} + \gamma_t + \theta_i + \psi_{i,t} \tag{11}$$

Consequently, equations (10) and (11) are the models we incorporate to examine the EPU effects on SOA. In these models, the speed of adjustment (λ) equals to 1-β_2-$\beta_3\mu_{EPU}$. Note that λ now includes the μ_{EPU} which is the mean value of EPU index. This shows the connection between EPU and SOA.

4.2.2 ESG effects

Following the above approach, we now consider how ESG affects SOA:

$$Lev_{i,t} = \beta_0 + \beta_1 ESG_{t-1} + \beta_2 Lev_{i,t-1} + \beta_3 ESG_{i,t-1} Lev_{i,t-1} + \beta^{'}\mathbf{X}_{i,t-1} + \psi_{i,t} \tag{12}$$

After controlling for macroeconomic uncertainty, and firm-year fixed effects we get:

$$Lev_{i,t} = \beta_0 + \beta_1 ESG_{t-1} + \beta_2 Lev_{i,t-1} + \beta_3 ESG_{i,t-1} Lev_{i,t-1} + \beta^{'}\mathbf{X}_{i,t-1} + \eta^{'}\mathbf{Z}_{t-1} + \gamma_t + \theta_i + \psi_{i,t} \tag{13}$$

In our empirical estimations we use equations (12) and (13) to study the ESG effects on SOA. In this case, SOA (λ) equals to 1-β_2-$\beta_3\mu_{ESG}$, where μ_{ESG} is the mean of ESG.

4.2.3 EPU and ESG combined effects

To measure the combined effects of EPU and ESG on SOA, we add these two items and their interaction term in equation (1) and then insert these to equation (2) to get:

$$\begin{aligned} Lev_{i,t} = \beta_0 + \beta_1 EPU_{t-1} + \beta_2 ESG_{t-1} + \beta_3 EPU_{t-1} ESG_{t-1} \\ + \beta_4 Lev_{i,t-1} + \beta_5 EPU_{i,t-1} Lev_{i,t-1} + \beta_6 ESG_{i,t-1} Lev_{i,t-1} \\ + \beta_7 EPU_{i,t-1} ESG_{i,t-1} Lev_{i,t-1} + \beta' \mathbf{X}_{i,t-1} + \psi_{i,t} \end{aligned} \tag{14}$$

Controlling for macroeconomic uncertainty, and firm-year fixed effects we get:

$$\begin{aligned} Lev_{i,t} = \beta_0 + \beta_1 EPU_{t-1} + \beta_2 ESG_{t-1} + \beta_3 EPU_{t-1} ESG_{t-1} \\ + \beta_4 Lev_{i,t-1} + \beta_5 EPU_{i,t-1} Lev_{i,t-1} + \beta_6 ESG_{i,t-1} Lev_{i,t-1} \\ + \beta_7 EPU_{i,t-1} ESG_{i,t-1} Lev_{i,t-1} + \beta' \mathbf{X}_{i,t-1} + \eta' \mathbf{Z}_{t-1} + \gamma_t + \theta_i + \psi_{i,t} \end{aligned} \tag{15}$$

Equations (14) and (15) are used for the estimation of the combined effects of EPU and ESG on SOA. In this case, the speed of adjustment (λ) equals to 1-β_4-$\beta_5\mu_{EPU}$-$\beta_6\mu_{ESG}$-$\beta_7\mu_{EPU}\mu_{ESG}$.

5 Results

In this section, we present our benchmark estimations of EPU and/or ESG effects on the leverage ratio and the associated speed of adjustment.

5.1 The effects on the level of the leverage ratio

We begin with the estimation of the individual and combined effects of EPU and ESG on the level of the leverage ratio. Table 2 reports the relevant results. Our findings suggest that firms do exhibit lower market leverage ratios under higher EPU, as shown in columns 1 and 2. These results are both statistically and economically significant. In more detail, a one-standard-deviation increase in EPU decreases the leverage ratio by 15%[12] and by 15.6%, before and after controlling for general macroeconomic uncertainty respectively. This negative relationship is in line with prior literature (Cao et al., 2013;

[12]=$\hat{\beta}_{EPU_{t-1}} \times \sigma_{EPU}/\mu_{Lev}$=$-0.144\times0.271/0.261$=15%

Zhang et al., 2015; Gungoraydinoglu et al., 2017; Li and Qiu, 2021). Under higher EPU, investor information asymmetry becomes more severe (Nagar et al., 2019). Correspondingly, bondholders and banks conduct a set of actions to protect themselves, such as requesting higher risk premium (Gungoraydinoglu et al., 2017) and lower debt provision (Bordo et al., 2016; Berger et al., 2022). Finally, firms are exposed to more stringent financing market circumstances, resulting in reduced leverage.

The ESG rating is also inversely related with the leverage ratio, as indicated in columns 3 and 4. ESG-rated firms tend to borrow less compared to non-ESG rated firms, similar to Asimakopoulos et al. (2021b). A one-standard-deviation increase of ESG rating leads to a reduction in the leverage ratio by 1.1%[13]. It is worth mentioning that although both the EPU and ESG are negatively related to the leverage ratio, the driving forces of that outcome are different in each case. In contrast to the restrictive financial market conditions caused by increased EPU levels, ESG-rated firms benefit from ESG ratings when borrowing money. For example, banks are willing to build a lender-borrower relationship with ESG-rated firms as the disclosure of ESG rating reduces banks' monitoring costs. The lower leverage ratios for these ESG-rated firms is due to the demand side rather than the supply side, due to the fact that ESG-rated firms face higher growth opportunities (Lins et al., 2017), they will avoid over-borrowing to prevent falling into an underinvestment problem.

To examine the combined EPU and ESG effects on the leverage ratio, we introduce an interaction term of EPU and ESG in columns 5 and 6. We find that even if the EPU and ESG separate effects on leverage are negative, the interaction term is positive. In more detail, when controlling for macroeconomic uncertainty, a one-standard-deviation increase in EPU, ceteris paribus, leads to a decrease of market leverage by 16.6%[14]. Similarly, a one-standard-deviation increase in ESG leads to a drop of the leverage ratio by 2.4%[15]. These findings suggest that, given the level of EPU, the higher the ESG rating, the lower the level of borrowing.

The findings of the combined effects are consistent with previous studies. Athey and Stern (1998) mentioned that two corporate practices or policies can be positively related and substitutable at the same time. They show that more than one corporate

[13] $=\hat{\beta}_{ESG_{t-1}} \times \sigma_{ESG}/\mu_{Lev}$

[14] $=\hat{\beta}_{EPU_{t-1}} \times \sigma_{EPU}/\mu_{Lev} + \hat{\beta}_{EPU*ESG_{t-1}} \times \sigma_{EPU} \times \mu_{ESG}/\mu_{Lev}$

[15] $=\hat{\beta}_{ESG_{t-1}} \times \sigma_{ESG}/\mu_{Lev} + \hat{\beta}_{EPU*ESG_{t-1}} \times \sigma_{ESG} \times \mu_{EPU}/\mu_{Lev}$

practice is complementary (substitutes) to each other if the magnitude of their combined effect is larger (smaller) than the aggregate marginal effect of the individual practices (Ichniowski et al., 1997). Although diversified CSR structure influence a firm's value positively compared to CSR specialization (Bouslah et al., 2022), the relationship between various CSR components affect firm value differently. For instance, responsible behaviours towards employees and towards customers and suppliers are complementary inputs of financial performance, while responsible behaviours towards the environment and towards customers and suppliers are substitutable inputs of financial performance (Cavaco and Crifo, 2014).

Following the above argument, we find that ESG rating and EPU index have the same effect on the level of leverage, but they might still act as substitutes. This can be driven from the fact that EPU and ESG affect leverage differently. For example, higher EPU reduces leverage due to a supply (liquidity) shortage, whereas an ESG rating leads to a lower level of leverage due to a decrease in demand for borrowing to avoid the underinvestment problem (Myers, 1977). By comparing the marginal effects of the two policies on leverage separately with the magnitude of their aggregate effect (interaction term) on leverage, we find that EPU and ESG are indeed substitutable.

In every estimation provided in Table 2, we find that the SOA falls in the range of 37.5% (=1-0.625)[16] to 37.6% (=1-0.624), that is similar to Flannery and Rangan (2006). The coefficient and signs of the other firm characteristics and macroeconomic uncertainty indicators are in line with previous studies. For instance, we find that larger firms with more tangible assets exhibit a higher leverage ratio (Frank and Goyal, 2009; Cao et al., 2013; Li and Qiu, 2021). According to the trade-off theory, these firms can use their assets as collateral to borrow and face fewer financial distress and bankruptcy costs, resulting in higher leverage ratio. Firms with more capital expenditures also have higher leverage ratio. Profitable firms and firms with high growth opportunities borrow less, in line with (Cao et al., 2013).

In conclusion, our results support our three hypotheses regarding the EPU and ESG effects on leverage ratios. Due to the tight supply of loans under higher EPU, firms decrease their leverage ratio. Although the ESG ratings and leverage ratio are also negatively associated, this is due to the demand side and the fact that these firms tend

[16]The speed of adjustment (λ)=1-$\hat{\beta}_{Lev_{t-1}}$

to reduce debt to avoid under-investment issues. When we combined EPU and ESG, our results show that ESG alleviates the inverse relationship between EPU and leverage ratios, enabling ESG-rated firms to borrow more under higher EPU.

[Insert Table 2 here]

5.2 The effects on the speed of adjustment (SOA)

In the previous subsection, we calculated the speed of adjustment solely according to the coefficient values of the lagged leverage ratio (Lev_{t-1}). In this subsection, we move forward to incorporate the interaction terms of EPU and ESG with the lagged leverage ratio to study their combined effects on the speed of adjustment.

Table 3 shows the results. In the first two columns we add the EPU interaction term (EPU*Lev_{t-1}) to investigate how SOA changes with EPU. We find that SOA increases to 37.7%[17] and a one-standard-deviation increase in EPU leads to the SOA increasing by 3.45% (=-(-0.048)×0.271/37.7%)[18]. This finding suggests that during high EPU periods, firms accelerate their speed of adjustment from last period to this period. However, this faster SOA is not a proactive decision of firms, but a result from the difficulty of accessing financing markets. With higher EPU, financing markets become stricter (Gungoraydinoglu et al., 2017; Ashraf and Shen, 2019; Barraza and Civelli, 2020; Berger et al., 2022), and firms are "forced" to reduce their borrowings, leading to higher SOA.

The role of ESG on SOA is shown in columns 3 and 4. The results indicate that the SOA is lower for ESG-rated firms at the level of 37.4%[19]. Specifically, we find that a one-standard-deviation increase in ESG leads to a 3.7%[20] reduction in SOA. This is driven by the easier access to financing markets (Sharfman and Fernando, 2008; El Ghoul et al., 2011; Goss and Roberts, 2011; Ng and Rezaee, 2015) for ESG-rated firms, enabling them to smooth their leverage ratio.

Finally, we examine the joint effect of EPU and ESG on SOA in column 5 and 6. In this case, the speed of adjustment equals to 37.3%, which is smaller compared to the previous cases, after incorporating all interaction terms of EPU, ESG and lagged leverage ratio. In economic terms, a one-standard-deviation increase in EPU increases

[17] SOA=$1-\hat{\beta}_{Lev_{t-1}}-\hat{\beta}_{EPU*Lev_{t-1}} \times \mu_{EPU}$=1−0.848+0.048×4.689=37.7%

[18] =$-\hat{\beta}_{EPU*Lev_{t-1}} \times \sigma_{EPU}/\widehat{SOA}$

[19] SOA=$1-\hat{\beta}_{Lev_{t-1}}-\hat{\beta}_{ESG*Lev_{t-1}} \times \mu_{ESG}$=1−0.622−0.014×0.301=37.4%

[20] =$-\hat{\beta}_{ESG*Lev_{t-1}} \times \sigma_{ESG}/\widehat{SOA}$

SOA by 4.2%[21] and a one-standard-deviation increase in ESG decreases SOA by 5.3%[22]. Therefore, the ESG effect dominates the EPU effect on the speed of adjustment and the net economic significance of ESG is 1.1% (=5.3%-4.2%). This slower SOA states that ESG ratings play an important role in contributing to firms resistance to the adverse EPU shocks and corresponding tense of the financing environment.[23]

Following again Ichniowski et al. (1997) and Athey and Stern (1998) we find that EPU and ESG are again substitutes with respect to the leverage speed of adjustment.

Consequently, our findings of EPU and ESG effects on the SOA are consistent with our *hypothesis 2a* and *hypothesis 2b*. The results indicate that EPU and ESG have opposite effects on SOA, but when we combine them we find that ESG effects on SOA dominate those of EPUs, as stated by our *hypothesis 2c*.

[Insert Table 3 here]

6 Robustness check

In this section, we provide various robustness checks. We delve deeper into the impacts of ESG elements and EPU components on leverage and SOA. We also deal with the endogeneity issue by performing placebo tests and with unbalanced data issues by applying a matching sample procedure.

6.1 ESG sub-components effects

In this subsection we assess how the key components of ESG affect leverage and SOA. Therefore, the overall ESG ratings are substituted by the environmental pillar scores (LEP), the social pillar scores (LSP), and the governance pillar scores (LGP).

In the first three columns of Table 4 we show that all these three E-S-G pillar scores are negatively associated with the leverage ratio. Moreover, during higher EPU periods, each ESG component plays a role in mitigating the negative effects of EPU on leverage. These results are statistically and economically significant and consistent with our benchmark estimation. We further examine how the speed of adjustment is influenced by the ESG

[21] $=-\hat{\beta}_{EPU*Lev_{t-1}} \times \sigma_{EPU}/\widehat{SOA} - \hat{\beta}_{EPU*ESG*Lev_{t-1}} \times \sigma_{EPU} \times \mu_{ESG}/\widehat{SOA}$

[22] $=-\hat{\beta}_{ESG*Lev_{t-1}} \times \sigma_{ESG}/\widehat{SOA} - \hat{\beta}_{EPU*ESG*Lev_{t-1}} \times \sigma_{ESG} \times \mu_{EPU}/\widehat{SOA}$

[23] These results remain valid even if we use book leverage instead of market leverage, see appendix.

components separately. We find that our results at the benchmark estimation are mainly driven by the environmental and social factors, similarly to Asimakopoulos et al. (2021b).

In summary, our results suggest that all three ESG components are significantly related to leverage, whereas only the environmental and social components are strongly related to SOA.

[Insert Table 4 here]

6.2 EPU sub-elements effects

The overall EPU score consists of four sub-components: news-based uncertainty (News), dispersion of federal/state/local government spending (Fed), disagreement of CPI (CPI), and temporary tax code uncertainty (Tax). Following Duong et al. (2020), we combine the dispersion of government spending and the disagreement of CPI to Fed-CPI. Next, we replace the overall EPU scores by these three components and re-assess the role of EPU sub-elements on the leverage and SOA.

Table 5 shows that all EPU sub-elements reduce the leverage ratios, similar to our benchmark estimations. In terms of the speed of adjustment, all coefficients of EPU sub-elements are very similar to our benchmark regressions. However, no EPU element appears to affect the SOA significantly on its own. This indicates that the SOA is not affected by a single component of EPU but is a rather overall and combined effect that we uncover in our benchmark estimations.

[Insert Table 5 here]

6.3 Endogeneity tests

Endogeneity issues may lead to biased and inconsistent parameter estimators, weakening our findings. The omitted variables bias, measurement error, and reverse causality are the main sources of endogeneity. In this work, we use placebo tests to examine whether our results suffers from any endogeneity issues and a two stage least squared estimation with lagged industrial average ESG score as an instrument for current firm level ESG score.

We have two key independent variables, EPU and ESG ratings, in our estimations. The endogeneity issue of EPU has been investigated by prior literature using placebo tests (Çolak et al., 2018; Nagar et al., 2019; Attig et al., 2021; Cong and Howell, 2021;

Berger et al., 2022). Therefore, we focus on examining the potential endogeneity problem of ESG ratings. Specifically, we conduct a placebo test and assign random ESG ratings to observations throughout the sample taken from the set of existing ESG ratings. In this case, all ESG ratings are substituted by ESG_placebo in any variables containing ESG ratings in our regressions.

In Table 6 we mimic our benchmark estimations that examine the EPU and ESG combined impacts on leverage ratio and SOA but we have replaced the ESG variable with the newly generated placebo variable. The results indicate that all the variables with the ESG placebo ratings are not statistically significant, which supports our findings. The remaining coefficients and values of the other variables are consistent with those of our benchmark regressions.

[Insert Table 6 here]

Next we perform a two stage least squared estimation using the past industrial average (using 2 digit sic codes) ESG score as an instrument for the current firm level ESG score. We expect that firms are influenced by the level of ESG activities of their direct competitors within their industry. Therefore, they might aim to catch up with the average firm's ESG score within their industry. In addition, given that ESG score enters with a lag in our regression, the instrument will be lagged twice and thus it is not expected to affect firm level leverage two years ahead.[24] The results of the 2SLS-IV estimation remain consistent with the benchmark estimation verifying the mitigating role of ESG on leverage even under high EPU level.

[Insert Table 7 here]

6.4 Matched sample

In our sample, we have about one-quarter of firms with ESG ratings and three-quarters of firms without ESG ratings. In order to reduce this imbalance, we use the propensity score matching (PSM) method. In particular, we perform a one-to-one matching approach and for each ESG-rated firm we match it with a non-ESG rated firm that has the closest firm characteristics. We choose firm size, tangibility, and profitability as firms' controls to match our sample.

[24]The resulted F-statistic for the weak identification test from the first stage is 432.503, confirming the validity of our instrument.

The results are shown in Table 8. We find that all of our key benchmark results remain valid. For instance, both EPU and ESG ratings are negatively associated with leverage ratios. ESG ratings aid to reduce the negative effects of EPU on firms' financing and leverage ratio. Moreover, firms' speed of adjustment is jointly influenced by EPU and ESG ratings. Therefore, we show that the unbalanced panel, in terms of ESG-rated firms, does not distort our key results.

[Insert Table 8 here]

6.5 High-Low ESG score

In this section we assess the importance of the firm level ESG score compared to the average industrial ESG score using 2 digit sic codes. Therefore, we perform an additional estimation where we split the firm level ESG variable to "high" ESG and "low" ESG according to the industrial average ESG score. We also split the firm level ESG score to high and low for every interaction term that enters to our benchmark estimation. This way we will be able to assess if firms with higher ESG score, compared to their industrial average, are less exposed to higher levels of EPU.

The table below shows that our key results hold only for firms that have higher ESG score compared to their industrial average. This means that higher future growth opportunities and better access to financial markets are predominantly present for those firms that perform well in that dimension.

[Insert Table 9 here]

7 Conclusion

In this paper, we examined the combined effects of EPU and ESG ratings on leverage and speed of adjustment.

Our results indicated that firms tend to decrease their leverage ratio under higher EPU levels and ESG ratings. In the first case this is because under higher EPU firms are forced to cut their borrowing since it is more difficult for them to access the financial markets. However, in the case of higher ESG rating, firms cut their leverage to prevent having an underinvestment issue. By examining the combined effects of EPU and ESG on the leverage ratio, we found that ESG ratings give firms opportunities to obtain funds

when they are facing higher EPU periods. In other words, ESG ratings alleviate the adverse effects of EPU on the leverage ratios.

We further studied the effects of EPU and ESG ratings on the speed of adjustment. We found that EPU and ESG have opposite effects on the speed of adjustment. Specifically, higher EPU levels push firms to increase the speed of adjustment, whereas ESG-rated firms tend to lower the speed of adjustment. These results are induced by the financial markets. As the EPU level increases, the debt supply decrease and the financing costs increase. As a result, firms are unable to retain their existing leverage ratio and in turn, increase their SOA. However, ESG ratings help firms to gain easier access to financial markets so that these firms can maintain their previous leverage ratio and speed of adjustment. When we assessed the EPU and ESG combined effects we found that the ESG rating effect dominates the EPU effect and firms tend to lower their speed of adjustment and smooth out their borrowing pattern.

Finally, we explored which component of ESG drives our key results. Although all three ESG components contribute to a lower leverage ratio, only environmental and social elements significantly impact the speed of adjustment. We also found that no single EPU element appears to significantly affect the SOA. Finally, we show that firms with a higher ESG score, compared to the average ESG score of their industry, are able to utilise the benefits of being ESG rated.

Our paper contributes to the related literature by examining the combined effects of EPU and ESG ratings on leverage and SOA. Our findings suggested that when firms are facing higher EPU levels, ESG ratings can play an important role in mitigating the adverse effects of EPU on leverage.

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Table 1: Descriptive Statistics

	N	Mean	P25	Median	P75	Std.Dev.
Leverage						
Market leverage ratio	135059	0.261	0.063	0.197	0.403	0.235
EPU Index						
Ln(EPU)	36	4.689	4.489	4.708	4.790	0.271
Ln(C_news)	36	4.730	4.489	4.738	4.948	0.319
Ln(C_fed)	36	4.490	4.124	4.418	4.903	0.415
Ln(C_CPI)	36	4.540	4.353	4.471	4.704	0.226
Ln(C_tax)	36	4.153	2.614	3.856	5.528	1.660
Ln(fedCPI)	36	4.515	4.266	4.424	4.793	0.298
ESG Indicator						
Ln(ESGC)	135059	0.301	0	0	0	0.990
Ln(EP)	135059	0.193	0	0	0	0.803
Ln(SP)	135059	0.307	0	0	0	1.014
Ln(GP)	135059	0.319	0	0	0	1.055
Firm Characteristic						
Size	135059	5.520	3.781	5.422	7.188	2.344
Capital expenditure	133499	0.064	0.020	0.041	0.080	0.071
Dividend	135059	0.327	0	0	1	0.469
Tangibility	134836	0.300	0.105	0.231	0.443	0.241
Profitability	134683	0.045	0.023	0.103	0.160	0.230
Market-to-Book ratio	130001	1.620	0.779	1.123	1.824	1.514
Economic Uncertainty						
Ln(BCI)	36	5.015	4.783	5.028	5.204	0.266
Ln(VOL)	36	5.456	4.833	5.423	5.911	0.849

Notes. This table shows the descriptive statistics of the main variables. Variables are divided into five categories: leverage, EPU index, ESG indicator, firm characteristics, and economic uncertainty. We scale the leverage ratio by total assets and take the natural logarithm of all EPU indexes, ESG indicators, and economic uncertainty variables (full description of variables see Appendix). N denotes the number of observations. P25 and P75 denote the values of 25th and 75th percentile observations respectively. Std. Dev denotes the standard deviation.

Table 2: The relations between EPU, ESG, and the leverage ratio

	(1) Lev_t	(2) Lev_t	(3) Lev_t	(4) Lev_t	(5) Lev_t	(6) Lev_t
Lev_{t-1}	0.625***	0.625***	0.624***	0.624***	0.624***	0.624***
	(131.103)	(131.103)	(130.957)	(130.957)	(130.959)	(130.959)
EPU_{t-1}	-0.144***	-0.150***			-0.112***	-0.161***
	(-4.473)	(-9.051)			(-3.306)	(-9.493)
ESG_{t-1}			-0.003***	-0.003***	-0.025***	-0.025***
			(-4.974)	(-4.974)	(-3.953)	(-3.953)
$(EPU*ESG)_{t-1}$					0.004***	0.004***
					(3.444)	(3.444)
$Size_{t-1}$	0.023***	0.023***	0.024***	0.024***	0.024***	0.024***
	(23.243)	(23.243)	(23.586)	(23.586)	(23.578)	(23.578)
$Capex_{t-1}$	0.142***	0.142***	0.143***	0.143***	0.142***	0.142***
	(14.080)	(14.080)	(14.093)	(14.093)	(14.083)	(14.083)
Div_{t-1}	0.001	0.001	0.001	0.001	0.001	0.001
	(0.372)	(0.372)	(0.450)	(0.450)	(0.454)	(0.454)
$Tang_{t-1}$	0.016**	0.016**	0.015**	0.015**	0.015**	0.015**
	(2.409)	(2.409)	(2.338)	(2.338)	(2.339)	(2.339)
$Profit_{t-1}$	-0.039***	-0.039***	-0.039***	-0.039***	-0.039***	-0.039***
	(-9.534)	(-9.534)	(-9.608)	(-9.608)	(-9.608)	(-9.608)
MB_{t-1}	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***
	(-5.840)	(-5.840)	(-5.445)	(-5.445)	(-5.444)	(-5.444)
$Ln(BCI)_{t-1}$		-0.001		-0.034***		0.006
		(-0.146)		(-5.266)		(1.147)
$Ln(VOL)_{t-1}$		0.004**		0.039***		0.004**
		(1.974)		(7.839)		(1.969)
Constant	0.677***	0.690***	-0.017***	-0.042	0.521***	0.709***
	(4.396)	(9.138)	(-3.010)	(-1.640)	(3.208)	(9.150)
Firm FEs	Yes	Yes	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes	Yes	Yes
N	109,124	109,124	109,124	109,124	109,124	109,124
Adj.R^2	0.439	0.439	0.439	0.439	0.439	0.439

Notes. This table investigates the individual and joint effects of EPU and ESG on firms' leverage ratio. Column (1) to (6) correspond to equations (4), (5), (7), (8), (10), and (11) respectively. We control firm and year fixed effects for all regressions. Numbers in parentheses are robust t-statistics. 1%, 5%, 10% significance levels are denoted by ***, **, and * respectively.

Table 3: The relations between EPU, ESG, and the speed of adjustment (SOA)

	(1)	(2)	(3)	(4)	(5)	(6)
	Lev_t	Lev_t	Lev_t	Lev_t	Lev_t	Lev_t
Lev_{t-1}	0.848***	0.848***	0.622***	0.622***	0.870***	0.870***
	(18.580)	(18.580)	(129.124)	(129.124)	(18.047)	(18.047)
EPU_{t-1}	-0.130***	-0.137***			-0.096***	-0.142***
	(-4.027)	(-8.289)			(-2.842)	(-8.386)
$(EPU*Lev)_{t-1}$	-0.048***	-0.048***			-0.053***	-0.053***
	(-4.925)	(-4.925)			(-5.169)	(-5.169)
ESG_{t-1}			-0.007***	-0.007***	-0.036***	-0.036***
			(-8.313)	(-8.313)	(-4.382)	(-4.382)
$(ESG*Lev)_{t-1}$			0.014***	0.014***	0.095**	0.095**
			(4.710)	(4.710)	(2.568)	(2.568)
$(EPU*ESG)_{t-1}$					0.006***	0.006***
					(3.533)	(3.533)
$(EPU*ESG*Lev)_{t-1}$					-0.016**	-0.016**
					(-2.147)	(-2.147)
$Size_{t-1}$	0.023***	0.023***	0.024***	0.024***	0.024***	0.024***
	(23.172)	(23.172)	(23.793)	(23.793)	(23.745)	(23.745)
$Capex_{t-1}$	0.142***	0.142***	0.142***	0.142***	0.141***	0.141***
	(13.986)	(13.986)	(14.047)	(14.047)	(13.925)	(13.925)
Div_{t-1}	0.001	0.001	0.001	0.001	0.001	0.001
	(0.284)	(0.284)	(0.532)	(0.532)	(0.435)	(0.435)
$Tang_{t-1}$	0.016**	0.016**	0.015**	0.015**	0.016**	0.016**
	(2.504)	(2.504)	(2.320)	(2.320)	(2.426)	(2.426)
$Profit_{t-1}$	-0.039***	-0.039***	-0.039***	-0.039***	-0.039***	-0.039***
	(-9.500)	(-9.500)	(-9.554)	(-9.554)	(-9.504)	(-9.504)
MB_{t-1}	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***
	(-5.375)	(-5.375)	(-5.278)	(-5.278)	(-4.707)	(-4.707)
$Ln(BCI)_{t-1}$		-0.001		-0.035***		0.006
		(-0.119)		(-5.377)		(1.094)
$Ln(VOL)_{t-1}$		0.004**		0.039***		0.003*
		(2.026)		(7.715)		(1.692)
Constant	0.608***	0.626***	-0.017***	-0.037	0.446***	0.622***
	(3.956)	(8.347)	(-3.037)	(-1.448)	(2.750)	(8.074)
Firm FEs	Yes	Yes	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes	Yes	Yes
N	109,124	109,124	109,124	109,124	109,124	109,124
Adj.R^2	0.439	0.439	0.439	0.439	0.440	0.440

Notes. This table evaluates the individual and combined effects of EPU and/or ESG on the speed of adjustment. Column (1) to (6) correspond to equations (14) to (19) respectively. Numbers in parentheses are robust t-statistics. The significance levels of 1%, 5%, and 10% are marked by ***, **, and * respectively.

Table 4: E-S-G elements effects on leverage ratio and the SOA

	(1) E	(2) S	(3) G	(4) E	(5) S	(6) G
Lev_{t-1}	0.625***	0.624***	0.624***	0.877***	0.869***	0.886***
	(131.040)	(130.949)	(130.989)	(18.440)	(18.028)	(19.130)
EPU_{t-1}	-0.162***	-0.161***	-0.160***	-0.144***	-0.142***	-0.142***
	(-9.599)	(-9.485)	(-9.440)	(-8.623)	(-8.382)	(-8.369)
LEP_{t-1}	-0.041***			-0.049***		
	(-6.105)			(-5.384)		
$(EPU*LEP)_{t-1}$	0.008***			0.008***		
	(5.729)			(4.529)		
LSP_{t-1}		-0.024***			-0.035***	
		(-3.903)			(-4.452)	
$(EPU*LSP)_{t-1}$		0.004***			0.006***	
		(3.405)			(3.612)	
LGP_{t-1}			-0.021***			-0.014**
			(-3.668)			(-2.334)
$(EPU*LGP)_{t-1}$			0.004***			0.002
			(3.186)			(1.232)
$(EPU*Lev)_{t-1}$				-0.055***	-0.053***	-0.057***
				(-5.381)	(-5.147)	(-5.742)
$(LEP*Lev)_{t-1}$				0.083**		
				(2.126)		
$(EPU*LEP*Lev)_{t-1}$				-0.013		
				(-1.557)		
$(LSP*Lev)_{t-1}$					0.095***	
					(2.622)	
$(EPU*LSP*Lev)_{t-1}$					-0.016**	
					(-2.208)	
$(LGP*Lev)_{t-1}$						-0.002
						(-0.217)
$(EPU*LGP*Lev)_{t-1}$						0.003**
						(2.153)
Constant	0.722***	0.709***	0.706***	0.646***	0.623***	0.623***
	(9.425)	(9.153)	(9.123)	(8.486)	(8.083)	(8.079)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm FEs	Yes	Yes	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes	Yes	Yes
N	109,124	109,124	109,124	109,124	109,124	109,124
Adj.R^2	0.439	0.439	0.439	0.440	0.440	0.440

Notes. This table examines the effects of the ESG components on the leverage ratio and SOA. ESG components are indicated by environmental pillar score (LEP), social pillar score (LSP), and governance pillar score (LGP). Columns (1) to (3) correspond to equation (11). Columns (4) to (6) correspond to equation (19). For all regressions, we control firm and year fixed effects. Controls include all firm characteristics and macroeconomic uncertainty indicators, as in the benchmark regression. Numbers in parentheses are robust t-statistics. The significance levels of 1%, 5%, and 10% are marked by ***, **, and * respectively.

Table 5: EPU components effects on leverage and SOA

	(1) News	(2) FedCPI	(3) Tax
Lev_{t-1}	0.893***	0.784***	0.616***
	(20.271)	(18.114)	(78.187)
$News_{t-1}$	-0.124***		
	(-7.825)		
$(News*Lev)_{t-1}$	-0.058***		
	(-6.183)		
$(News*ESG)_{t-1}$	-0.000		
	(-0.198)		
$(News*ESG*Lev)_{t-1}$	-0.004		
	(-0.435)		
$FedCPI_{t-1}$		-1.083***	
		(-9.068)	
$(FedCPI*Lev)_{t-1}$		-0.036***	
		(-3.800)	
$(FedCPI*ESG)_{t-1}$		0.007***	
		(4.140)	
$(FedCPI*ESG*Lev)_{t-1}$		-0.007	
		(-1.084)	
Tax_{t-1}			-0.094***
			(-9.379)
$(Tax*Lev)_{t-1}$			0.001
			(0.871)
$(Tax*ESG)_{t-1}$			0.002***
			(6.595)
$(Tax*ESG*Lev)_{t-1}$			-0.007***
			(-4.684)
ESG_{t-1}	-0.006	-0.038***	-0.019***
	(-0.712)	(-4.830)	(-8.791)
$(ESG*Lev)_{t-1}$	0.036	0.044	0.049***
	(0.884)	(1.461)	(5.934)
Constant	0.199***	9.763***	-0.726***
	(4.962)	(9.117)	(-8.679)
Controls	Yes	Yes	Yes
Firm FEs	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes
N	109,124	109,124	109,124
Adj. R^2	0.440	0.440	0.440

Notes. This table examines the EPU sub-components (News, FedCPI, Tax) effects on the leverage ratio and SOA. We use equation (19) in our estimations and control for firm and year fixed effects. Controls also include all firm characteristics and macroeconomic uncertainty indicators. Numbers in parentheses are robust t-statistics. The significance levels of 1%, 5%, and 10% are marked by ***, **, and * respectively.

Table 6: ESG Placebo Tests

	(1)	(2)
	Lev_t	Lev_t
Lev_{t-1}	0.625***	0.845***
	(131.115)	(18.049)
EPU_{t-1}	-0.150***	-0.136***
	(-9.017)	(-8.278)
$ESG\_placebo_{t-1}$	0.008	0.004
	(1.069)	(0.397)
$(EPU*ESG\_placebo)_{t-1}$	-0.002	-0.001
	(-1.059)	(-0.306)
$(EPU*Lev)_{t-1}$		-0.047***
		(-4.706)
$(Lev*ESG\_placebo)_{t-1}$		0.012
		(0.301)
$(EPU*Lev*ESG\_placebo)_{t-1}$		-0.003
		(-0.385)
Constant	0.688***	0.625***
	(9.104)	(8.334)
Controls	Yes	Yes
Firm FEs	Yes	Yes
Year FEs	Yes	Yes
N	109,124	109,124
Adj. R^2	0.439	0.439

Notes. This table shows the result of ESG placebo tests. We assign random ESG ratings to observations throughout the sample, where all ESG ratings are replaced by ESG_placebo. We control for firm characteristics and macroeconomic uncertainty factors. We also control for firm and year fixed effects. Numbers in parentheses are robust t-statistics. 1%, 5%, 10% significance levels are denoted by ***, **, and * respectively.

Table 7: Estimating the ESG-EPU effects on leverage using 2SLS with IV

	Lev_t
Lev_{t-1}	0.614***
	(8.013)
EPU_{t-1}	-0.282***
	(-9.410)
$(EPU*Lev)_{t-1}$	0.002
	(0.106)
ESG_{t-1}	-0.314***
	(-5.405)
$(ESG*Lev)_{t-1}$	1.502***
	(6.203)
$(EPU*ESG)_{t-1}$	0.063***
	(5.055)
$(EPU*ESG*Lev)_{t-1}$	-0.310***
	(-6.014)
Controls	Yes
Firm FEs	Yes
Year FEs	Yes
N	106,958
Adj.R^2	0.365

Notes. This table evaluates the individual and combined effects of EPU and ESG ratings on the level of leverage and associated speed of adjustment using a 2SLS with IV. The IV used is the past industrial average (using 2 digit sic codes) ESG score and the resulted F-statistic from the first stage is 432.503. Numbers in parentheses are robust t-statistics. The significance levels of 1%, 5%, and 10% are marked by ***, **, and * respectively.

Table 8: EPU and ESG combined effects on leverage and SOA via matched samples

	(1)	(2)
	Lev_t	Lev_t
Lev_{t-1}	0.685***	0.948***
	(111.101)	(15.616)
EPU_{t-1}	-0.105***	-0.085***
	(-5.750)	(-4.649)
ESG_{t-1}	-0.011*	-0.024***
	(-1.668)	(-2.664)
$EPU*ESG_{t-1}$	0.002*	0.005**
	(1.628)	(2.437)
$EPU*Lev_{t-1}$		-0.057***
		(-4.379)
$ESG*Lev_{t-1}$		0.090**
		(2.224)
$EPU*ESG*lev_{t-1}$		-0.017**
		(-2.054)
Constant	0.487***	0.394***
	(5.899)	(4.795)
Controls	Yes	Yes
Firm FEs	Yes	Yes
Year FEs	Yes	Yes
N	54,256	54,256
Adj.R^2	0.509	0.510

Notes. This table reports EPU and ESG combined effects on the leverage ratios and the speed of adjustment by using a propensity scored matching approach. We choose firm size, tangibility and profitability with 5%, 10%, and 10% interval respectively to match ESG-rated firms with non-ESG rated firms. We control firm fixed effects, year fixed effects and other independent variables. Numbers in parentheses are robust t-statistics. 1%, 5%, 10% significance levels are denoted by ***, **, and * respectively.

Table 9: High and Low ESG rating interactions with EPU and leverage

	Lev_t
Lev_{t-1}	0.870***
	(18.044)
EPU_{t-1}	-0.142***
	(-8.395)
$(EPU*Lev)_{t-1}$	-0.053***
	(-5.167)
$ESG^{High}{}_{t-1}$	-0.035***
	(-4.341)
$ESG^{Low}{}_{t-1}$	-0.271
	(-1.146)
$(ESG^{High}*Lev)_{t-1}$	0.094**
	(2.546)
$(ESG^{Low}*Lev)_{t-1}$	0.710
	(0.590)
$(EPU*ESG^{High})_{t-1}$	0.006***
	(3.491)
$(EPU*ESG^{Low})_{t-1}$	0.055
	(1.110)
$(EPU*ESG^{High}*Lev)_{t-1}$	-0.016**
	(-2.124)
$(EPU*ESG^{Low}*Lev)_{t-1}$	-0.145
	(-0.576)
Constant	0.623***
	(8.078)
Controls	Yes
Firm FEs	Yes
Year FEs	Yes
N	109,124
Adj.R^2	0.440

Notes. This table evaluates the individual and combined effects of EPU and high/low levels of ESG compared to the industry on the level of leverage and associated speed of adjustment. Numbers in parentheses are robust t-statistics. The significance levels of 1%, 5%, and 10% are marked by ***, **, and * respectively.

A Appendix

Table A.1: Variable description

Variable	Description	Source
A. Leverage Ratio		
Market leverage (%)	(Short-term debt (34) + long-term debt (9)) / ((Short-term debt (34) + long-term debt (9)) + (Stock price (199) * shares outstanding (54)))	CCM
B. Economic Policy Uncertainty (EPU)		
Ln(EPU)	Logarithm of economic policy uncertainty	BBD
Ln(C_news)	Logarithm of news coverage	
Ln(C_fed)	Logarithm of the Federal/state/local purchases disagreement measure	
Ln(C_CPI)	Logarithm of the CPI forecast disagreement measure	
Ln(C_tax)	Logarithm of tax expirations index	
Ln(fedCPI)	(Ln(C_fed) + Ln(C_CPI)) / 2	
C. Environmental, Social and Governance (ESG)		
Ln(ESGC)	Logarithm of ESG combined score	Refinitiv
Ln(EP)	Logarithm of environmental pillar score	
Ln(SP)	Logarithm of social pillar score	
Ln(GP)	Logarithm of governance pillar score	
D. Firm Characteristics		
Size	Natural logarithm of assets (6)	CCM
Capital expenditure	Capital expenditures (128) / assets (6)	
Dividend	=1, if dividends (21) 0; =0, otherwise	
Tangibility	Net property, plant, and equipment (8) / assets (6)	
R&D expense	R&D cost (46) / sales (12) =0, if R&D cost is missing	
Market-to-Book ratio	(Stock price (199) * shares outstanding (54) + debt + preferred stock liquidating value (10) – deferred taxes and investment tax credits (35)) / assets (6)	
E. Economic Uncertainty		
Ln(BCI)	Logarithm of Business cycle index	imarketsignals
Ln(VOL)	Logarithm of S&P 500 realized stock market volatility index	WRDS

Notes. This table shows variables' information. The data sources are annually merged CRSP-Compustat (CCM) dataset, Baker, Bloom, and Davis (BBD) index, Refinitiv ESG dataset, iMarketSignals, and Warton Research Data Services (WRDS) dataset.

Table A.2: EPU and ESG effects on book leverage and the speed of adjustment

	BookLev_t
BookLev_{t-1}	0.515***
	(10.582)
EPU_{t-1}	-0.098***
	(-6.407)
$(\text{EPU*BookLev})_{t-1}$	0.023**
	(2.222)
ESG_{t-1}	-0.029***
	(-2.856)
$(\text{ESG*BookLev})_{t-1}$	0.088**
	(2.340)
$(\text{EPU*ESG})_{t-1}$	0.006***
	(2.621)
$(\text{EPU*ESG*BookLev})_{t-1}$	-0.015*
	(-1.939)
Constant	0.414***
	(5.916)
Controls	Yes
Firm FEs	Yes
Year FEs	Yes
N	109,124
Adj.R^2	0.411

Notes. This table evaluates the individual and combined effects of EPU and ESG on the level of book leverage and associated speed of adjustment. Numbers in parentheses are robust t-statistics. The significance levels of 1%, 5%, and 10% are marked by ***, **, and * respectively.