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Corporate risk-taking in developed countries: The influence of economic policy uncertainty and macroeconomic conditions

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ABSTRACT

Using 74,974 firm-year observations covering 15 developed European countries over the time period 1999–2017, this paper explores the effect of economic policy uncertainty on corporate risk-taking. The findings indicate that firms become more risk averse with an economic policy uncertainty shock. The relationship is valid under idiosyncratic and earnings volatility risk measures, regardless of whether the macroeconomic condition is favorable or not. Moreover, the competition level in the industry is a crucial factor moderating the effect of economic policy uncertainty on corporate risk-taking. Firms operating in concentrated industries decrease their risk-taking. Conversely, firms operating in highly competitive industries do not change their risk-taking with an economic policy uncertainty shock, no matter what the market condition is. However, financial constraint affects the risk aversion of firms. In fact, when the macroeconomic outlook is unfavorable, financially constrained firms diminish risk-taking under all competition levels. On the other hand, the favorable stock market conditions encourage managers of financially constrained firms and reduce the impact of economic policy uncertainty on corporate risk-taking. All in all, the results support the negative impact of economic policy uncertainty on risk-taking, conditioned on the macroeconomic outlook in the country and the competition in the industry.

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1. Introduction

With the development of economic policy uncertainty (EPU) index by Baker et al. (2016), which measures the policy-related economic uncertainty according to the newspaper coverage, there is a growing literature on how economic policy uncertainty impacts the macro-economy and the stock market. It is a generally accepted fact that policy-related uncertainty plays a crucial role in decision making. Studies show that economic policy uncertainty causes a reduction in the employment rate, investment, and production level of firms which can be seen as one of the reasons for economy slow down (Baker et al., 2016; Bloom, 2009; Gulen and Ion, 2016; Kang et al., 2014). Some recent literature indicate that policy-related uncertainty adversely affects the banking activity as well, which also negatively influences the macro-economy (Berger et al., 2018; Bernal et al., 2016; Bordo et al., 2016). For example, by reducing the asset-side and increasing the liability-side balance sheet, policy-related uncertainty harms the function of intermediating liquid fund production of banks (Berger et al., 2018). Moreover, recent literature demonstrates the adverse effect of economic policy uncertainty on the bank level credit growth

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and destabilization of sovereign bond markets (Bernal et al., 2016; Bordo et al., 2016). Furthermore, studies on equity markets indicate that policy-related uncertainty adversely affects the stock market by reducing stock prices, increasing stock and commodity price volatilities (Antonakakis et al., 2013; Bakas and Triantafyllou, 2018; Baker et al., 2016; Kang and Ratti, 2013; Liu and Zhang, 2015; Pástor and Veronesi, 2012).

While many studies verify the influence of economic policy uncertainty on the macro-economy and equity markets, there is limited research on the link between economic policy uncertainty and risk aversion in the context of corporate risk-taking. Uncertainty plays a crucial role in the decision-making process of individuals. Many studies in the literature focus on the individuals' decision making process under uncertainty. When it is considered at the corporate level, as Hillary and Hui (2009) stated, 'firms do not make decisions, people do'. Hence, uncertainty will have an impact on the decision making of firms. Prior studies have demonstrated that policy uncertainty affects the financing and investment policies of firms, but surprisingly little attention has been paid to the relationship between corporate risk-taking and economic policy uncertainty. In this paper, we examine the relationship between policy-related uncertainty and corporate risk-taking.

There are several reasons why economic policy uncertainty influences corporate risk-taking. First, the uncertainty of future government policy decisions increases the policy-related uncertainty exposure of firms influencing the firm's risk perception. The change in the firm's risk perception affects corporate decisions. Nguyen et al. (2018) show that the financial derivative usage of a firm rises with an increase in economic policy uncertainty. Firms try to protect themselves against increasing policy uncertainty by using financial derivatives which is an important risk management tool. The findings of Nguyen et al. (2018) support the fact that policy uncertainty changes the risk perception of firms. Second, studies document that political uncertainty increases the cost of external financing (Kim, 2019; Liu and Zhong, 2017; Pástor and Veronesi, 2012, 2013) which could cause difficulty in financing risky projects. Moreover, as a result of the negative effect of uncertainty on the function of intermediating liquid fund production and credit growth, banks become more selective in terms of financing risky investment opportunities of firms. Hence, to have more favorable terms in financial agreements, firms may prefer less risky projects. Finally, the capital investment decreases when economic policy uncertainty is high (Gulen and Ion, 2016), which also could lead the firms to pick less risky investment opportunities during periods of high uncertainty to be on the safe side.

This paper aims to explore the impact of economic policy uncertainty on corporate risk-taking. Firms operate and make financing and investment decisions in an economic and political environment shaped by the government and regulatory agencies through policy changes in law, regulations, and taxes. Firms encounter both political and policy uncertainties. In the literature, studies document how political uncertainty, which is mostly proxied by elections, impacts financing and investment decisions of firms (Akey and Lewellen, 2017; Durnev, 2010; Jens, 2017; Julio and Yook, 2012; Liu and Zhong, 2017). On the other side, with the development of economic policy uncertainty index (Baker et al., 2016), researchers have started to analyze the effect of policy-related uncertainty on firms' financing and investment decisions. Using a continuous policy uncertainty variable instead of an election year dummy provides a more comprehensive understanding in regard to uncertainty effect on a firm's decisions. Election year dummy creates both infrequency and disregards the non-election year policy related uncertainties. Hence, economic policy uncertainty index which is based on monthly newspaper coverage provides a better coverage for uncertainty.

Gulen and Ion (2016) provide strong evidence that there is a negative relationship between the economic policy uncertainty and the capital investments. Also, firms decrease their merger and acquisition activities with an increase in policy-related uncertainty (Bonaime et al., 2018). In periods of high policy uncertainty, firms hold more cash (Demir and Ersan, 2017; Phan et al., 2019). Furthermore, in addition to the increase in the usage of financial derivatives, Nguyen et al. (2018) document that when economic policy uncertainty is high in their home country, firms increase their foreign direct investment level in countries with lower EPU than their country. These findings signal the risk avoidance of firms in periods of high economic policy uncertainty. Hence, we hypothesize that EPU is likely to decrease the risk aversion of firms and reduce the corporate-risk taking.

In addition to the unconditional effect of policy-related economic uncertainty on risk-taking, we also investigate how the macro-economic outlook in the country influence the link between uncertainty and risk-taking. Baker et al. (2003) demonstrate that movements in the stock market have an impact on corporate investment. Moreover, Bolton et al. (2013) provide evidence that during periods with high external financing costs in equity markets, firms decrease their investments and delay their payouts. In fact, firm's risk premium, which is composed of technological and financing risk premium is sensitive to cash holdings especially in poor financing conditions (Bolton et al., 2013). They claim that firms should time the market for their risky investments. Furthermore, using oil price change as an uncertainty for firm's operations, Gupta and Krishnamurti (2018) show that market conditions moderate the relationship between oil price and corporate risk-taking. Hence, unfavorable equity market conditions and increasing uncertainty cause firms to mitigate their investments, delay their payouts, and be more likely to take fewer risks. Based upon the existing literature, we expect that firms become more risk averse in unfavorable market conditions with an increasing economic policy uncertainty.

Besides the macroeconomic outlook, competition within the industry is another crucial factor affecting corporate decision making. Competition imposes pressure on management, and mitigates the agency problems among stakeholders, which makes it a more effective governance mechanism than the market for corporate control and the monitoring effect of institutional owners (Allen and Gale, 2000; Giroud and Mueller, 2010). Also, information asymmetry diminishes in a competitive environment; and the performance of management can easily be compared with the performance of competitors (DeFond and Park, 1999; Grullon and Michaely, 2007). Furthermore, competition is such a powerful governance tool that in highly

competitive industries, corporate governance has no value-increasing effect (Giroud and Mueller, 2011). Besides the disciplinary power of competition on managers, competitive pressure decreases the pricing power of firms and reduces the income and variation in cash flow (Valta, 2012). Raith (2003) theoretically shows that the managerial incentives depend on the level of product market competition. According to Raith's (2003) model, in highly competitive industries, managers have stronger incentives to reduce costs. Moreover, the idiosyncratic volatility of stock returns, cash flows, earnings per share and sales per share increase in a highly competitive environment (Gaspar and Massa, 2006; Irvine and Pontiff, 2008). Hence, in concentrated industries, firms will be in a more comfortable environment to take more risks since they have a higher market power and more capacity to deal with the losses. We expect the risk aversion of managers to change under such a powerful disciplinary force of competition. These arguments lead us to the expectation that firms in concentrated industries will take more risks, especially under favorable market conditions. Thus, we examine the moderating effect of competition on the relationship between the corporate risk-taking and economic policy uncertainty.

In addition to stock market conditions and competition, we expect that easy access to external capital markets will also affect the risk aversion of a manager as it increases the availability of the free-cash flow. Almeida et al. (2011) show that firms facing financial constraints prefer investments that are less risky. For financially constrained firms, it will be hard to find external financing for their risky projects, especially when the stock market conditions are unfavorable. Baker et al. (2003) document that stock price movements in the market have a stronger effect on investment of firms that are in the top quintile of the Kaplan and Zingales (KZ) index which is a commonly used measure of financially constrained firms. Also, economic policy uncertainty enhances the cost of external financing in equity markets (Pástor and Veronesi, 2012). Moreover, economic policy uncertainty reduces the banks' liquidity creation and negatively affects bank credit growth, which would aggravate the cost of external capital through the bank lending channel (Berger et al., 2018). Uncertainty increases both the cost of loan contracting and equity capital (Francis et al., 2014; Li et al., 2018). Furthermore, firms increase their cash holdings in periods of high policy uncertainty to mitigate possible financial constraints (Demir and Ersan, 2017; Phan et al., 2019). All in all, policy-related uncertainty creates conditions that make it tough to access external financing, even for financially unconstrained firms. Under the circumstances, it would be interesting to examine whether financially constrained and unconstrained firms diverge in terms of risk-taking with a rise in policy-related uncertainty, especially when they operate under different competition levels and unfavorable stock market conditions. Based on the findings mentioned above, we expect to have a moderating effect of financial constraints on the link between economic policy uncertainty and corporate risk-taking. We hypothesize that being financially constrained will aggregate the impact of uncertainty on risk-taking.

We use two main corporate risk-taking measures which are commonly used in literature: Earnings volatility and idiosyncratic volatility (Acharya et al., 2011; Bernile et al., 2018; Boubakri et al., 2013; Ding et al., 2015; Faccio et al., 2016; Favara et al., 2017; Gupta, and Krishnamurti, 2018; John et al., 2008; Koirala et al., 2018; Konishi and Yasuda, 2004; Li et al., 2013). Idiosyncratic volatility is a kind of capital market risk measure. It is estimated by the volatility of the error terms of the four-factor market model including Fama-French three factors (Fama and French, 1992, 1993) and Carhart's (1997) momentum factor. Studies show that policy-related uncertainty decreases the stock prices and increases the stock and commodity price volatilities (Antonakakis et al., 2013; Bakas and Triantafyllou, 2018; Baker et al., 2016; Kang and Ratti, 2013; Liu and Zhang, 2015; Pástor and Veronesi, 2012). Although EPU increases the stock price volatility, the idiosyncratic volatility used in this paper is a measure of firm-specific risk, which is not explained by the market portfolio, and is diversifiable. Brogaard and Detzel (2015) state that economic policy uncertainty has market level economic effects, which are non-diversifiable. In this case, we are interested in the effect of EPU on the diversifiable firm-specific risks. In addition to idiosyncratic risks, earnings volatility is the other risk-taking measure used in this paper. Earnings volatility is the variation in firms' cash flows and used as a proxy for the chosen investment projects. In the robustness analyses, in addition to alternative idiosyncratic and earnings volatilities, the annualized standard deviation of daily stock returns, which is a proxy for total capital market risk, is used as well. We consider that both the capital market risk measure and risk-taking in corporate operations will provide a more comprehensive understanding in the relationship between corporate risk-taking and economic policy uncertainty.

We address the gap in the literature regarding the impact of policy-related uncertainty on corporate risk-taking and extend the literature by investigating this relation under different market conditions and competition levels, for financially constrained and unconstrained firms. So far, we know that one very recent study addresses the link between risk-taking and economic policy uncertainty. Tran (2019) provides evidence on an international basis that policy uncertainty decreases the corporate risk-taking mainly due to cultural differences. He focuses on the effect of national culture variables of Hofstede (2001) on the relationship between uncertainty and risk-taking. Although our main evidence on the adverse effect of uncertainty on risk-taking is similar, we extend the understanding of the link between corporate risk-taking and economic policy uncertainty by examining the relation under different market conditions and competition. Instead of national culture, we focus on the moderating effect of macroeconomic outlook and product market competition on the relationship between uncertainty and risk-taking. Moreover, we examine how all these relations change when the firms are financially constrained. We also provide a broader understanding of risk-taking by using five different risk measures including earnings volatility, total market risk, and firm-specific risk (idiosyncratic risk). Furthermore, to improve our understanding of how people get used to the past uncertainty and react to the current change in policy uncertainty, we use economic policy uncertainty shock which is estimated by GARCH (1,1) model. We provide strong econometric analyses with various robustness tests. Our findings are robust to alternative measures for variables (risk-taking, market conditions, competition), alternative sample construction and alternative specification of model to deal with endogeneity.

Table 1
Sample description.

Countries	Firms	Firm-Years	% of sample	Average EPU shock	Average EPU change
Austria	46	874	1.17	0.122	0.033
Belgium	87	1653	2.20	0.122	0.033
Denmark	101	1919	2.56	0.122	0.033
Finland	109	2071	2.76	0.122	0.033
France	644	12236	16.32	0.160	0.094
Germany	623	11837	15.79	0.169	0.081
Ireland	26	494	0.66	0.219	0.208
Italy	207	3933	5.25	0.145	0.055
Netherland	80	1520	2.03	0.157	0.062
Norway	168	3192	4.26	0.122	0.033
Portugal	47	893	1.19	0.122	0.033
Spain	121	2299	3.07	0.189	0.111
Sweden	380	7220	9.63	0.074	0.014
Switzerland	151	2869	3.83	0.122	0.033
United Kingdom	1156	21964	29.30	0.172	0.054
Total	3946	74974	100		

This table reports sample description including the number of firms, firm-year observations, the average Economic Policy Uncertainty shock and the 12-month average change of a country's economic policy uncertainty index.

In a European environment, using 74,974 firm-year observations covering the time period between 1999 and 2017 for 15 developed European countries, and using country, year, and firm fixed-effects panel data estimation, the findings indicate that economic policy uncertainty mitigates the corporate risk-taking. This suggests that with an increase in policy-related uncertainty, managers become more risk averse. The negative effect of economic policy uncertainty does not change when we condition the sample based on the macro-economic outlook. Interestingly, when we consider the competition within the industry, the adverse impact of uncertainty on risk-taking becomes insignificant for a highly competitive environment. On the other hand, firms operating in concentrated industries alleviate their risk-taking in periods of high economic policy uncertainty. However, financially constrained firms diminish their-risk taking for all levels of competition when the stock market is bearish, which supports the view that financially constrained firms have difficulty accessing external financing when market conditions are unfavorable.

This paper contributes to the literature in several ways. The main contribution of this paper to the literature is to explore the effect of policy-related economic uncertainty on corporate risk-taking. We extend our understanding of how the economic policy uncertainty impacts risk-taking by investigating the relation under a macro-economic outlook and product market competition. Specifically, our contribution to the literature is to explore how the economic policy uncertainty affects corporate risk-taking when macro-economic conditions are favorable and unfavorable. To the best of our knowledge, this will be the first study investigating the effect of policy-related economic uncertainty on risk aversion in the context of corporate risk-taking from the perspective of macro-economic outlook and competition within the industry. Next, this study extends our understanding of how people get used to the past uncertainty and react to the current change in policy uncertainty by using EPU shock instead of using simple average EPU change.

Finally, this study extends the literature by examining the impact of a country-level variable on corporate risk-taking. Previous literature mostly focuses on firm-level characteristics such as culture (Li et al., 2013), CEO gender (Faccio et al., 2016), board diversity (Bernile et al., 2018), ownership structure (Boubakri et al., 2013), large shareholder diversification (Bauguess et al., 2012), debt enforcement (Favara et al., 2017), employee's risk attitude (Guan and Tang, 2018) and corporate governance (John et al., 2008). This study focuses on a country-level factor, namely policy-related economic uncertainty, as a risk-taking determinant under different market conditions and competition levels for both financially constrained and unconstrained firms.

The rest of the paper is organized as follows: Section 2 presents the data and the empirical model. In Section 3, we present the results, and the following section provides the robustness checks. Section 5 summarizes the findings and concludes.

2. Data and empirical method

2.1. Data

As reported in Table 1, the sample covers 15 developed European countries, spanning 1999–2017. We study the link between economic policy uncertainty and corporate risk-taking in a European context for the following reasons. First, even though there is a growing literature on economic policy uncertainty since Baker et al. (2016) have developed the index, most empirical studies focus on American firms. Research on the effect of EPU on European firms remains relatively scarce. Second, although the sample consists of countries from the European Union except for Switzerland and Norway, and the idea of an integrated Europe mainly aimed at economic integration, differences in economic policies of the members of the

European Union are inevitably existent.[1] In fact, the average EPU shock ranges from 0.074 to 0.219; and the average natural logarithm of EPU change ranges from 0.014 to 0.208, which provides enough economic policy uncertainty change among the countries. Lastly, these countries differ in terms of legal origins, and a political and business environment which allow us to focus on economic policy uncertainty differences to explore informative policy implications for developed European countries.

The sample consists of 3946 unique publicly traded firms whose primary business is not a financial sector with SIC codes between 6000 and 6999. The main analyses are based on panel data consisting of 74,974 firm-year observations. The country list and the corresponding number of firms are shown in Table 1. The United Kingdom firms constitute about 29.30 % of the sample. Also, 16.32 % of the sample is from France; and 15.79 % of the sample is from Germany, which suggests that the results may be influenced by the UK, French and German firms. Nonetheless, the robustness checks shown in the following sections indicate that excluding the UK, Germany, and France does not change the results.

The firm-level data is gathered from Thomson Reuters Eikon and Datastream and the country-level variables are from the World Bank Development Indicators database. Also, for the calculation of some corporate risk-taking measures, we gather daily market model factors data for the European market from the Kenneth R. French website. Moreover, we use the Economic Policy Uncertainty website which mainly presents the index developed by Baker et al. (2016).

2.2. Measuring corporate risk-taking

In this paper, we use two different corporate risk-taking measures. One risk-taking measure depends on the idiosyncratic volatility of stock returns whereas the other risk-taking measure is based on the earnings volatility.

To estimate the idiosyncratic volatility, we use a four-factor market model, including Fama-French three factors (Fama and French, 1992, 1993, 1996, 2012) and Carhart's (1997) momentum factor. The market model we fit individual stocks into can be expressed as,

$$R_{i,t} - r_{f,t} = \alpha_{i,t} + \beta_{1i,t}\left(MRKT_t - r_{f,t}\right) + \beta_{2i,t}SMB_t + \beta_{3i,t}HML_t + \beta_{4i,t}WML_t + \varepsilon_{i,t} \tag{1}$$

The four-factor market model includes the market excess return over the risk-free rate, the return difference between the small and big size portfolios, the return difference between the high and low-value portfolios, and finally the return difference between the winners' and the losers' portfolios.

Following the procedure outlined in Fu (2009); Gaspar and Massa (2006) and Xu and Malkiel (2003), we estimate idiosyncratic volatility as follows: For each month and for each stock, we run a time-series regression of the previous 12 months' daily excess stock returns on four factors. Then, for the current month, we fit the resulting beta estimates to the daily returns and obtain the residuals. The method uses out-of-sample forecasting for beta estimates. Also, we use a 12 months rolling window for the regressions of each month. The idiosyncratic volatility measure is the standard deviation of these residuals across all days and all months for a year which we call RISK 1.

The other corporate risk-taking measure is earnings volatility. Many studies use the earnings volatility as a corporate risk-taking measure (Gupta and Krishnamurti, 2018; Koirala et al., 2018; Favara et al., 2017; Faccio et al., 2016; Ding et al., 2015; Boubakri et al., 2013; Li et al., 2013; Acharya et al., 2011; John et al., 2008). Following Gupta and Krishnamurti (2018) and Koirala et al. (2018), we take operating earnings, estimated by the earnings before interest, taxes, depreciation, and amortization scaled by the total asset (EBITDA/TA) as corporate earnings variable.

Instead of using EBITDA to total asset ratio volatility, following John et al. (2008), corporate risk-taking is defined as the standard deviation of the difference between the firm's earnings to total asset ratio and the country average earnings to total asset ratio for the corresponding year. In fact, to take into consideration the differences between industry characteristics, which may affect the average EBITDA/TA among the industries, we take country-industry average EBITDA/TA for the corresponding year, which differs from the methodology used by John et al. (2008). Thus, the calculation of earnings volatility as a risk-taking measure will be made in three steps. First, according to the Fama-French 10 industry classification, for each country, we calculate the average industry operating earnings to total asset ratio for every year. That is, over the sample period, for 15 European countries, we have 2850 average industry EBITDA/TA measure. Then, we take each individual firm's EBITDA/TA deviation from the country-industry average EBITDA/TA for the corresponding year. Finally, we estimate the standard deviation of the difference between the firm's earnings to total asset ratio and the average country-industry earnings to total asset over a seven-year window. The estimation window covers the last seven years with at least three years of non-missing observations.

We can express the corporate earnings volatility measure as,

$$RISK\ 2 = EarningsVolatility_{j,t} = \sqrt{\frac{1}{T-1}\sum_{t=1}^{T}\left(E_{j,c,i,t} - \frac{1}{T}\sum_{t=1}^{T}E_{j,c,i,t}\right)^2} \tag{2}$$

[1] The United Kingdom is in the European Union during the sample period 1999-2017.

where,

$$Earnings\ deviations_{j,c,i,t} = E_{j,c,i,t} = \frac{EBITDA_{j,c,i,t}}{TA_{j,c,i,t}} - \frac{1}{N_{c,i,t}} \sum_{n=1}^{N_{c,i,t}} \frac{EBITDA_{n,c,i,t}}{TA_{n,c,i,t}} \quad (3)$$

where, $N_{c,i,t}$ represents the number of firms within country c, industry i and year t. $EBITDA_{j,c,i,t}$ is the earnings before interest, taxes, depreciation and amortization and $TA_{j,c,i,t}$ is the total assets.

2.3. Measuring uncertainty in the economy

The uncertainty in the economy is estimated by the Economic Policy Uncertainty (EPU) index developed by Baker et al. (2016). They use news coverage of policy-related economic uncertainty. To develop the index, they take two newspapers for each country and count the number of articles containing some specified uncertainty terms for every month. The frequency of the EPU index is monthly. Instead of taking the natural logarithm of the average of EPU index over a year window, we work with the uncertainty shocks estimated by the GARCH (1,1) model, which gives the lowest Akaike Information Criteria (AIC) score among GARCH (p, q) models for $1 \leq p \leq 3$ and $1 \leq q \leq 3$.

To estimate the economic policy uncertainty shock, we first calculate the change in EPU index, and then apply the GARCH (1,1) model. The GARCH (1,1) modeling framework has a mean equation for the change in EPU index, say u_{EPU} and a conditional standard deviation equation, h^u_{EPU}. Following Kang, Lee and Ratti (2014), we define the economic policy uncertainty shock, σ_{EPU}, as,

$$EPU\ Shocks = \sigma_{EPU} = {}^{u_{EPU}}\!/_{h^u_{EPU}} \quad (4)$$

The definition of the economic policy uncertainty shock allows us to understand how people get used to the past uncertainty and react to the current change in policy-related uncertainty. The monthly shocks are averaged over one year to calculate the annual economic policy uncertainty shocks to match our annual panel data.

2.4. Control variables

In addition to economic policy uncertainty shock variable, following the literature, we use control for some firm and country-level variables to be shown as effective on corporate risk-taking.

First, we use the natural logarithm of total assets to control firm size. In the corporate risk-taking literature, it is shown that large firms are more risk averse than small firms (Bernile et al., 2018; Boubakri et al., 2013; Ding et al., 2015; Faccio et al., 2016; Favara et al., 2017; Koirala et al., 2018). Thus, we expect a negative relationship between risk-taking and firm size.

Next, we control the leverage effect by using the total debt to total asset ratio. Although financial leverage affects the firm's access to external finance (Almeida and Campello, 2007), there are contradictory results about the impact of leverage on risk-taking. Some studies find a positive link between corporate risk-taking and leverage (Bernile et al., 2018; Boubakri et al., 2013; Gupta and Krishnamurti, 2018). In contrast, others indicate a negative impact of leverage on risk-taking (Faccio et al., 2016; Gupta and Krishnamurti, 2018; Koirala et al., 2018). Later, we use control for the profitability with the ratio of earnings before interest and taxes to total. Firms with higher profit can be more risk averse as they already reach their high-profit objective and they have lower earnings volatility. Lower profitability firms might increase their risk-taking to earn more profit (Boubakri et al., 2013). Studies document the adverse effect of profitability on risk-taking (Bernile et al., 2018; Boubakri et al., 2013; Faccio et al., 2016; Gupta and Krishnamurti, 2018). To capture the possible agency conflict between managers and shareholders, we use control for the financial slack, which is estimated by the ratio of cash and short term investments to total assets. It is a general phenomenon that managers with higher financial slack can increase their investments unnecessarily by undertaking negative net present value projects (Jensen, 1986). Hence, parallel to the corporate risk-taking literature, we expect a positive effect of financial slack on risk-taking (Bernile et al., 2018).

We use control for the asset structure of a firm by using tangibility. Asset structure shows the firm's earnings strategy. Having enough plant, property, and equipment can alleviate the risk of involving a higher operating leverage (Nguyen, 2011). Studies demonstrate a negative impact of tangibility on risk-taking (Faccio et al., 2016; Nguyen, 2011). Our last firm-level control variable is sales growth which captures the growth opportunities of a firm. Firms with higher growth opportunities tend to invest more; hence, they tend to be more risk-seeking. Although, we expect a positive relationship between growth opportunities and risk-taking, there are contradictory findings on the link between sales growth and risk-taking (Boubakri et al., 2013; Ding et al., 2015; Faccio et al., 2016; Gupta and Krishnamurti, 2018).

Following cross-country corporate risk-taking studies, we also use county-level control variables since the data includes countries across Europe (Acharya, et al., 2011; Favara et al., 2017; Gupta and Krishnamurti, 2018, Li, et al. 2013). To capture the firm's growth opportunities, we include a county level proxy, namely GDP growth, which is the annual percentage growth rate of GDP. We also use the natural logarithm of the real GDP per capita as a control variable

All firm-level variables are winsorized at one percent level from both the top and bottom of the distribution to reduce the impact of outliers. Table 2 displays the brief descriptions of the variables used in the empirical analysis.

Table 2
Variables.

Variable	Definition
Panel A: Firm risk-taking measures	
RISK 1	Annualized idiosyncratic volatility of daily stock returns obtained from a four-factor Fama-French model over a 12 months rolling window for the regressions of each month (out-of-sample forecasting)
RISK 2:	Std dev(EBITDA / Total assets – country-industry average EBITDA / Total asset)
RISK 3:	Annualized idiosyncratic volatility of daily stock returns over a one–year window in a four-factor Fama-French model (in-sample forecasting)
RISK 4:	Std dev (EBITDA / Total assets – country average EBITDA / Total asset)
RISK 5	Annualized standard deviation of daily stock returns
Panel B: Firm-level control variables	
Size	Natural logarithm of total assets
Leverage	Total debt / Total asset
Profitability	EBITDA / Total assets
Tangibility	Plant, property and equipment / Total assets
Sales Growth	The growth of net sales
Financial Slack	(Cash and short-term investments) / Total assets
Financial constraint dummy	Using KZ index (Lamont et al., 2001), assign a firm as a financial constraint if KZ index of the firm is higher than or equal to the sample median KZ index.
Competition (industry level)	Herfindahl-Hirschman Index (HHI)
Panel C: Country level variables	
Economic Policy Uncertainty (EPU) shock	Annual average of monthly EPU shocks which is defined as u_{EPU}/h^u_{EPU} where u_{EPU} is the mean of change in EPU and h^u_{EPU} is the conditional standard deviation equation which is modelled by GARCH(1,1)
Real GDP per capita growth	Annual percentage growth rate of GDP per capita
Real GDP per capita	The natural logarithm of GDP per capita
Market up dummy	If the market's last-year return is nonnegative
Market down dummy	If the market's last-year return is negative

This table presents the list of variables and their brief descriptions. The dependent variable in this paper is corporate-risk-taking. We estimate five different risk-taking measures. The main risk-taking measures are idiosyncratic volatility (RISK1) and earnings volatility (RISK2). In the robustness checks, we estimate the idiosyncratic risk (RISK3) and earnings volatility (RISK4) with different methods. We also use total risk (RISK 5) for robustness. The main independent variable is Economic Policy Uncertainty which is estimated by the EPU shock. Market conditions, industry concentration and financial constraints are the moderating variables. We also include firm-level and country-level control variables.

2.5. Measuring competition in the industry

Competition in the market imposes pressure on management and serves a monitoring role, which reduces the agency conflicts and affects corporate decisions (Allen and Gale, 2000). We use the Herfindahl-Hirschman Index (HHI) to estimate the competition within an industry. HHI is the sum of squared market shares of firms in the industry and can be expressed as follows:

$$HHI_{j,c,t} = \sum_{i=1}^{n_j} s^2_{i,j,c,t} \tag{5}$$

where $s_{i,j,c,t}$ is the market share of firm i, in industry j, in country c for the corresponding year t. Market share of a firm is the ratio of its sales to industry sales. For the industry classification, we use 3-digit SIC code not to be either too narrow or too coarse a partition. After computing HHI for every 3-digit SIC industry within each country for the corresponding year, we define three competition dummies with respect to HHI terciles: High, medium and low competition.

2.6. Measuring financial constraint

In addition to macro-economic conditions that affect access to external finance, we consider firm-specific characteristics that influence the reliance on external financing. KZ index developed by Kaplan and Zingales (1997) is commonly used in the literature to estimate the firm's reliance on external financing. Firms having with a higher KZ index score are more likely to have difficulty in financing their ongoing operations. Following Lamont, Polk, and Saa-Requejo (2001), we estimate the KZ index as follows:

$$KZ_{i,t} = -1.0019 \times {}^{Cash\ Flows_{i,t}}\!/_{K_{i,t-1}} + 0.2826 \times Q_{i,t} + 3.1392 \times {}^{Debt_{i,t}}\!/_{Total\ Capital_{i,t}} - 39.3678 \times {}^{Dividends_{i,t}}\!/_{K_{t-1}} - 1.3147 \times {}^{Cash_{i,t}}\!/_{K_{i,t-1}} \tag{6}$$

where Cash $\text{Flows}_{i,t}$ is income before extraordinary items, plus total depreciation and amortization, $K_{i,t-1}$ is plant, property, and equipment, $Q_{i,t}$ is the ratio of market capitalization, plus total shareholder's equity, minus book value of common equity, minus deferred tax assets to total shareholder's equity, $\text{Debt}_{i,t}$ is total debt, $\text{Dividends}_{i,t}$ is total cash dividends paid; and

Table 3
Summary statistics.

	N	mean	min	50th	75th	max	StdDev.
Panel A: Corporate risk-taking measures							
RISK 1	74974	0.123	0.000	0.039	0.102	2.210	0.294
RISK 2	51701	0.135	0.006	0.053	0.116	2.156	0.282
RISK 3	58335	0.162	0.002	0.057	0.132	2.752	0.362
RISK 4	51701	0.135	0.007	0.052	0.117	2.154	0.282
RISK 5	50755	0.116	0.004	0.046	0.104	1.722	0.233
Panel B: Firm-level control variables							
Size	58482	12.094	6.273	11.964	13.839	18.253	2.547
Leverage	57862	0.212	0.000	0.176	0.324	1.014	0.202
Profitability	56644	0.042	−1.409	0.096	0.151	0.457	0.253
Sales Growth	52285	1.176	0.068	1.058	1.188	6.194	0.702
Tangibility	57869	0.228	0.000	0.159	0.345	0.888	0.222
Financial Slack	58415	0.170	0.000	0.103	0.221	0.890	0.187
Panel C: Country level variables							
EPU shock..	74412	0.150	−0.169	0.137	0.246	0.791	0.156
EPU change	74412	0.060	−0.045	0.046	0.091	0.754	0.064
GDP per capita growth	74974	1.704	−8.269	1.954	2.818	25.557	2.022
Ln(GDP)	74974	27.915	25.315	28.343	28.621	28.990	0.935

This table reports the summary statistics of variables used in the analyses. Panel A provides summary statistics for corporate risk-taking measures. RISK 1 and RISK 3 are two idiosyncratic risk measures. RISK 2 and RISK 4 are earnings volatility measures and RISK 5 is the total risk, which is estimated by the standard deviation of daily stock returns. Panel B provides information on firm-level control variables while Panel C presents summary statistics for country-level variables. EPU shock is estimated by the annual average of monthly EPU shocks which is defined as $^{u_{EPU}}/_{h^{u}_{EPU}}$ where u_{EPU} is the mean of change in EPU and h^{u}_{EPU} is the conditional standard deviation equation, which is modeled by GARCH(1,1). EPU change is the 12-month average of a country's economic policy uncertainty index. Size is the natural logarithm of total assets. Leverage is total debt scaled by total assets. Profitability is the ratio of EBITDA to total assets. Sales growth is the yearly growth rate of sales. Tangibility is the plant, property, and equipment scaled by total assets. Financial slack is cash and short-term investments scaled by total assets. GDP per capita growth and GDP are from the World Bank database.

$Cash_{i,t}$ is cash, plus short-term investments for firm i. After estimating the KZ index for all firms for every year, we classify firms as financially constrained when the KZ index is greater than the sample median.

2.7. Summary statistics

In Table 3, we report the summary statistics for the variables used in the empirical analysis.

The mean and median values for RISK 1 is 0.123 and 0.039, respectively, whereas the mean and median values for RISK 2 is 0.135 and 0.053. Both risk-taking measures have high volatility. The volatility of idiosyncratic risk and earnings volatility are close to each other, 0.294 for idiosyncratic risk, and 0.282 for the country-industry adjusted earnings. European firms are moderately levered with a mean of 0.212. Sales growth has a mean of 1.176; and the profitability of the European firms in the sample is 4.2 %.

The average economic policy uncertainty shock in developed European economies is 0.152 with a volatility of 0.156. As detailed in Table 1, Ireland has the highest average economic policy uncertainty shock with a mean of 0.219 whereas Sweden has the lowest EPU shock with a mean of 0.074.

The pairwise correlation coefficients of the key variables are given in Table A1 in the Appendix. The correlation coefficients are not high, indicating that the possibility of multi-collinearity problem is less likely.

2.8. Empirical method

To explore the effect of an economic policy uncertainty shock on a firm's idiosyncratic volatility and earnings volatility, we use the following panel data estimation model,

$$RISK_{i,c,t} = \beta_0 + \beta_1 x\, EPU\, Shock_{i,c,t} + \sum_{k=1}^{8} \beta_{2,k}\, x\, Controls_{k,i,c,t} + \sum_{c=1}^{14} \beta_{3,c} x\, Countries_c + \sum \beta_{4,i} x\, Firm_i + \sum_{t=1}^{16} \beta_{5,t} x\, Years_t + \varepsilon_{i,c,t} \quad (7)$$

where the RISK is either idiosyncratic volatility or earnings volatility measures. Subscripts i is for firms, c is for countries, and t is for years. $Controls_{k,i,c,t}$ represent firm and country level control variables: size, leverage, profitability, financial slack, sales growth, tangibility, GDP growth and market capitalization to GDP.

The model includes country fixed effects to capture the time-invariant differences across the countries. By including country dummies, we aim to mitigate the effect of unobserved country level factors. We also include year fixed

Table 4
Economic policy uncertainty and corporate risk-taking.

		RISK 1: Idiosyncratic Volatility			RISK 2:Earnings Volatility		
		Baseline	Market up	Market Down	Baseline	Market up	Market Down
		(1)	(2)	(3)	(4)	(5)	(6)
Variables	predicted	RISK 1	RISK 1	RISK 1	RISK 2	RISK 2	RISK 2
L.EPU Shock	–	−0.0207**	−0.0311***	−0.0303**	−0.0176***	−0.0174**	−0.0240**
		(0.0088)	(0.0109)	(0.0150)	(0.0055)	(0.0075)	(0.0096)
L.Size	–	−0.0262***	−0.0259***	−0.0304***	−0.0395***	−0.0380***	−0.0456***
		(0.0043)	(0.0045)	(0.0065)	(0.0043)	(0.0049)	(0.0057)
L.Leverage	+/-	0.1035***	0.0979***	0.1019***	0.0580***	0.0681***	0.0580**
		(0.0161)	(0.0175)	(0.0261)	(0.0144)	(0.0186)	(0.0230)
L.Profitability	–	−0.1726***	−0.1638***	−0.1792***	−0.1575***	−0.1338***	−0.2025***
		(0.0147)	(0.0186)	(0.0226)	(0.0134)	(0.0165)	(0.0211)
L.Sales gwth	+	−0.0057**	−0.0033	−0.0065	0.0152***	0.0172***	0.0136***
		(0.0024)	(0.0031)	(0.0044)	(0.0025)	(0.0033)	(0.0045)
L.Tangibility	–	−0.0127	−0.0443*	0.0059	−0.0065	0.0042	−0.0211
		(0.0211)	(0.0241)	(0.0303)	(0.0187)	(0.0186)	(0.0277)
L.FinSlack	+	−0.0501***	−0.0514***	−0.0495**	0.0834***	0.0841***	0.0826***
		(0.0155)	(0.0183)	(0.0246)	(0.0199)	(0.0211)	(0.0276)
L.Ln(GDP)	+	−0.0051	0.0648***	−0.0896***	0.0323	0.0368	0.0276
		(0.0183)	(0.0222)	(0.0308)	(0.0229)	(0.0296)	(0.0234)
L.GDP gwth	+	−0.0026***	−0.0003	−0.0040**	−0.0015**	−0.0016*	−0.0017
		(0.0010)	(0.0013)	(0.0017)	(0.0007)	(0.0009)	(0.0011)
Constant		0.5994	−1.3594**	3.0034***	−0.3264	−0.4805	−0.1126
		(0.5215)	(0.6231)	(0.8810)	(0.6496)	(0.8360)	(0.6654)
Observation		47,108	29,226	17,507	47,108	29,226	17,507
R-sqr		0.4523	0.4727	0.5419	0.6867	0.7026	0.7153

This table reports the effect of economic policy uncertainty shock on corporate risk-taking. The dependent variable is corporate risk-taking which is estimated by both idiosyncratic risk and earnings volatility. In specification 1, 2 and 3, we use idiosyncratic risk while in specification 4, 5, and 6, we use earnings volatility as the dependent variable. The description of the key variables is given in Table 2. All the independent variables are one-period lagged to mitigate the impact of reverse causality. Columns 1 and 4 show the baseline regression with the whole sample. In Column 2, 3, 5, and 6, the sample is classified according to the market return in the previous year. The market is up if the market return is positive in the previous year whereas the market is down if the market return is negative. We use country, year and firm fixed effects in all the regressions. Error terms are clustered on the firm-level. Robust standard errors in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1.

effects to control for aggregate trends. To deal with the omitted variable bias, we use firm fixed effects in the model. The independent variables are lagged one-period to deal with the possible reverse causality problem. Moreover, we cluster standard errors at firm level and use Huber-White standard errors to deal with the possible heterogeneity problem.

3. Results and discussions

Table 4 presents the results of the empirical model given by Eq. (7) with regard to the relationship between economic policy uncertainty and corporate risk-taking. Specifications (1) to (3) show the results for idiosyncratic risk (RISK1), whereas specifications (4) to (6) report the results for earnings volatility. Specifications (1) and (4) report the coefficients for entire sample whereas specifications (2), (3), (5) and (6) document the coefficients for conditional models. The results given in Table 4 show that the coefficients on both corporate risk-taking measures are negative and statistically significant with at least 5 % significance level for conditional and unconditional models, indicating a decrease in risk-taking with an increase in economic policy uncertainty shock. Whether the macro-economic condition is favorable or not, the negative impact of economic policy uncertainty shock on the corporate risk-taking is statistically significant. In terms of economic significance, one standard deviation increase in economic policy uncertainty shock causes a 0.323 units decrease in idiosyncratic risk, and a 0.275 units decrease in earnings volatility.

Large, profitable firms decrease their risk-taking in unconditional and conditional models. In contrast, leverage has a positive impact on risk-taking in all market conditions. Interestingly, although higher financial slack is associated with higher earnings volatility, the idiosyncratic risk of firm decreases with a financial slack increase.

To sum up, whether the macro-economic condition is favorable or not, economic policy uncertainty shock has a significant negative impact on the risk-taking capacity of a firm implying that managers tend to decrease their risk-taking as the economic policy uncertainty increases. In fact, economic policy shock is such a powerful uncertainty that managers reduce their risk-taking even when the macro-economic conditions are favorable in the stock market.

Not only the macroeconomic conditions but also the industry competition level can have an impact on the risk-taking. To test the effect of competition on corporate risk-taking, we employ the following empirical model,

Table 5
Economic policy uncertainty, competition and corporate risk-taking.

Variables	Baseline (1) RISK 1	Market Up (2) RISK 1	Market Down (3) RISK 1
L.EPU Shock * L.High Competition	−0.0112	−0.0141	−0.0145
	(0.0122)	(0.0175)	(0.0194)
L.EPU Shock * L.Medium Competition	−0.0208*	−0.0325**	−0.0338*
	(0.0115)	(0.0160)	(0.0178)
L.EPU Shock * L.Low Competition	−0.0289**	−0.0539***	−0.0364**
	(0.0129)	(0.0186)	(0.0184)
L.Size	−0.0250***	−0.0252***	−0.0294***
	(0.0042)	(0.0045)	(0.0064)
L.Leverage	0.1024***	0.0988***	0.0977***
	(0.0161)	(0.0175)	(0.0261)
L.Profitability	−0.1712***	−0.1622***	−0.1814***
	(0.0146)	(0.0185)	(0.0226)
L.Sales gwth	−0.0060**	−0.0035	−0.0064
	(0.0024)	(0.0030)	(0.0044)
L.Tangibility	−0.0066	−0.0384	0.0106
	(0.0213)	(0.0240)	(0.0304)
L.FinSlack	−0.0525***	−0.0542***	−0.0527**
	(0.0153)	(0.0180)	(0.0245)
L.Ln(GDP)	−0.0013	0.0729***	−0.0914***
	(0.0184)	(0.0224)	(0.0308)
L.GDP gwth	−0.0027***	−0.0002	−0.0042**
	(0.0010)	(0.0013)	(0.0017)
L. High Competition	0.0042	0.0016	−0.0035
	(0.0059)	(0.0082)	(0.0087)
L. Low Competition	−0.0026	0.0041	−0.0096
	(0.0084)	(0.0111)	(0.0120)
Constant	0.4787	−1.5986**	3.0472***
	(0.5237)	(0.6269)	(0.8802)
Observations	47,399	29,412	17,604
R-squared	0.4501	0.4692	0.5402

This table presents the moderating effect of competition (industry concentration) on the relationship between economic policy uncertainty shock and corporate risk-taking. The dependent variable is corporate risk-taking which is estimated by idiosyncratic risk. Specification 1 gives the baseline regression results. In Specification 2 and 3, the sample is classified according to the market return in the previous year. The market is up if the market return is positive in the previous year whereas the market is down if the market return is negative. The description of the key variables is given in Table 2. All the independent variables are one-period lagged to mitigate the impact of reverse causality. We use country, year and firm fixed effects in all the regressions. Error terms are clustered on the firm-level. Robust standard errors in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1.

$$RISK\ 1_{i,j,c,t} = \beta_0 + \sum_{h=1}^{3}\beta_{1,h}\,x\,EPU\ Shock_{i,j,c,t}x\,Competition_h + \sum_{k=1}^{8}\beta_{2,k}\,x\,Controls_{k,i,c,t} + \sum_{c=1}^{14}\beta_{3,c}x\,Countries_c + \sum\beta_{4,i}x\,Firm_i + \sum_{t=1}^{16}\beta_{5,t}x\,Years_t + \sum_{h=1}^{2}\beta_{6,t}x\,Competition_h + \varepsilon_{i,j,c,t} \quad (8)$$

where $Competition_h$ represents the three HHI dummy variables. There are three HHI dummies defined according to whether a firm is located in high HHI industry, medium HHI industry, or low HHI industry. With the definition of Herfindahl-Hirschman index, higher (lower) HHI values indicate that the competition in the industry is low (high). The two dummy variables added in the model (8) will capture the direct effect of high competition and low competition on the risk-taking. The interaction term between the economic policy uncertainty and the three competition dummies will give the slope of EPU shock under different competition levels.

Table 5 displays the results of the empirical model (8). Specification (1) reports the coefficients when the entire sample is used, whereas specification (2) reports for favorable market conditions, and specification (3) for unfavorable market conditions. Consistent with the proposition that competition moderates the relationship between economic policy uncertainty and risk-taking, the interaction term has a statistically significant negative effect on idiosyncratic risk only when the competition is low or medium (at least at 5 % significance level). In fact, for concentrated industries, the interaction term has a greater and more significant effect than for moderate competitive industries. In terms of economic significance, for a firm operating in a concentrated industry, one standard deviation increase in economic policy uncertainty shock causes a decrease of 0.841 units in risk-taking when the stock market is in favorable conditions, and a decrease of 0.568 units when market conditions are unfavorable. EPU shock does not have a significant effect on risk-taking in highly competitive industries. Even if the market conditions are favorable, firms operating in highly competitive industries are reluctant to increase their risk-taking.

Table 6
Economic policy uncertainty, financially constrained firms and corporate risk-taking.

	Financial Constraint			Financial Unconstraint		
	baseline	up market	down market	baseline	up market	down market
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	RISK 1	RISK 1	RISK 1	RISK 1	RISK 1	RISK 1
L.EPU Shock	−0.0236***	−0.0102	−0.0601***	−0.0237*	−0.0302**	−0.0336
	(0.0078)	(0.0093)	(0.0139)	(0.0126)	(0.0140)	(0.0262)
L.Size	−0.0213***	−0.0153***	−0.0247***	−0.0282***	−0.0248***	−0.0394***
	(0.0048)	(0.0053)	(0.0078)	(0.0068)	(0.0063)	(0.0122)
L.Leverage	0.0977***	0.0736***	0.1014***	0.1222***	0.1020***	0.1049**
	(0.0194)	(0.0207)	(0.0326)	(0.0227)	(0.0199)	(0.0413)
L.Profitability	−0.1211***	−0.1069***	−0.1336***	−0.1163***	−0.0639**	−0.1591***
	(0.0179)	(0.0208)	(0.0322)	(0.0207)	(0.0250)	(0.0360)
L.Sales gwth	−0.0024	−0.0052	−0.0001	−0.0052	−0.0056	0.0129
	(0.0036)	(0.0048)	(0.0077)	(0.0043)	(0.0039)	(0.0098)
L.Tangibility	−0.0326	−0.0771*	−0.0338	−0.0185	−0.0256	−0.0506
	(0.0272)	(0.0440)	(0.0512)	(0.0302)	(0.0315)	(0.0425)
L.FinSlack	−0.0463***	−0.0357**	−0.0485	−0.0599**	−0.0607**	0.0081
	(0.0159)	(0.0170)	(0.0306)	(0.0292)	(0.0289)	(0.0557)
L.Ln(GDP)	−0.0199	0.0057	−0.0220	−0.0379	0.0491	−0.0974*
	(0.0165)	(0.0199)	(0.0268)	(0.0274)	(0.0302)	(0.0548)
L.GDP gwth	−0.0028***	−0.0016*	−0.0036**	−0.0038***	−0.0022	−0.0073***
	(0.0008)	(0.0009)	(0.0016)	(0.0013)	(0.0014)	(0.0028)
Constant	0.9286**	0.1398	1.0299	1.5363*	−0.9414	3.3224**
	(0.4684)	(0.5695)	(0.7562)	(0.7979)	(0.8621)	(1.5833)
Observations	18,566	11,312	6,633	18,562	11,281	6,546
R-squared	0.5031	0.5033	0.5704	0.4992	0.5410	0.5773

This table presents the nexus between economic policy uncertainty shock, market condition, financial constraints, and corporate risk-taking. The dependent variable is corporate risk-taking, which is estimated by idiosyncratic volatility. The results given in Columns 1, 2 and 3 are for financially constrained firms, which are estimated by using KZ index (Lamont et al., 2001). They assign a firm as financially constrained if KZ index of the firm is higher than or equal to the sample median KZ index. The results given in Columns 4, 5, and 6 are for financially unconstrained firms, which have lower KZ score than the sample median KZ score. Market condition is also considered in the specification 2, 3, 5 and 6; and the sample is classified according to the market return in the previous year. The market is up if the market return is positive in the previous year whereas the market is down if the market return is negative. The description of the key variables is given in Table 2. All the independent variables are one-period lagged to mitigate the impact of reverse causality. We use country, year and firm fixed effects in all the regressions. Error terms are clustered on the firm-level. Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

To sum up, the findings of the empirical model (8) given in Table 5 indicate that the competition level in the industry is a crucial factor moderating the effect of economic policy uncertainty on the corporate risk-taking. Firms operating in concentrated industries are risk averse. On the other hand, in highly competitive industries, economic policy uncertainty shocks do not affect the risk-taking of a firm no matter what the market condition is.

Table 6 reports the risk-taking behavior of financially constrained firms. Financially constrained firms are more likely to experience difficulty in financing their projects when the market conditions are unfavorable. Specifications (1) to (3) reports the coefficients for financially constrained firms whereas specifications (4) to (6) shows the coefficients for financially unconstrained firms. The results given in specification (3) show that economic policy uncertainty shock has a statistically significant negative effect at 1 % level on risk-taking of financially constrained firms when macro-economic outlook is unfavorable. In terms of economic significance, one standard deviation increase in EPU shock causes a 0.938 units decrease in corporate risk-taking. On the other hand, when the market conditions are favorable, the effect of the economic policy uncertainty becomes insignificant. The findings imply that managers of financially constrained firms may have difficulty in finding external capital for their ongoing operations; and hence, they become more risk averse with unfavorable market conditions. In fact, matching financially constrained and financially unconstrained firms using propensity score matching we provide evidence that financially constrained firms have lower risk-taking scores than financially unconstrained firms.[2]

Interestingly, when we consider both the market conditions and competition, the results given in Table 7 in the specification (4) demonstrate that financially constrained firms reduce their risk-taking for all levels of competition when the market conditions are unfavorable. EPU shock has a statistically significant negative effect on risk-taking for all competition level (at least at 5 % significance level). This is not a coincidence since financially constrained firms are more likely to experience difficulty in gathering external financing, especially when the market conditions are unfavorable. Hence, managers of financially constrained firms become more risk averse as the economic policy uncertainty increases Moreover, the negative effect of policy uncertainty increases as the competition in the market decreases. In terms of economic magnitude, one

[2] Table A3 presents the results of the propensity score matching in Appendix.

Table 7
Economic policy uncertainty, competition, financially constrained firms and risk taking.

	Market up		Market down	
	Fin. Const = 0	Fin. Const = 1	Fin Const = 0	Fin. Const = 1
	(1)	(2)	(3)	(4)
VARIABLES	RISK 1	RISK 1	RISK 1	RISK 1
L.EPU Shock * L.HCD	0.0149	0.0120	−0.0067	−0.0426**
	(0.0237)	(0.0149)	(0.0355)	(0.0180)
L.EPU Shock * L.MCD	−0.0310	−0.0267*	−0.0370	−0.0646***
	(0.0228)	(0.0141)	(0.0276)	(0.0217)
L.EPU Shock * L.LCD	−0.0610***	−0.0223	−0.0446	−0.0704***
	(0.0210)	(0.0170)	(0.0330)	(0.0156)
L.Size	−0.0246***	−0.0153***	−0.0395***	−0.0252***
	(0.0063)	(0.0053)	(0.0121)	(0.0078)
L.Leverage	0.1015***	0.0728***	0.1048**	0.1007***
	(0.0199)	(0.0209)	(0.0412)	(0.0328)
L.Profitability	−0.0641**	−0.1076***	−0.1592***	−0.1347***
	(0.0249)	(0.0207)	(0.0361)	(0.0320)
L.Sales gwth	−0.0057	−0.0052	0.0130	−0.0000
	(0.0039)	(0.0048)	(0.0098)	(0.0077)
L.Tangibility	−0.0263	−0.0759*	−0.0503	−0.0331
	(0.0313)	(0.0435)	(0.0426)	(0.0514)
L.FinSlack	−0.0598**	−0.0356**	0.0087	−0.0486
	(0.0287)	(0.0171)	(0.0558)	(0.0305)
L.Ln(GDP)	0.0479	0.0045	−0.0999*	−0.0250
	(0.0301)	(0.0199)	(0.0552)	(0.0265)
L.GDP gwth	−0.0020	−0.0016*	−0.0072**	−0.0035**
	(0.0014)	(0.0009)	(0.0028)	(0.0016)
L. HCD	−0.0036	−0.0082	−0.0090	0.0009
	(0.0104)	(0.0081)	(0.0162)	(0.0081)
L. LCD	0.0203	−0.0110	0.0137	−0.0077
	(0.0127)	(0.0105)	(0.0197)	(0.0122)
Constant	−0.9168	0.1823	3.3902**	1.1232
	(0.8607)	(0.5700)	(1.5933)	(0.7456)
Observations	11,281	11,312	6,546	6,633
R-squared	0.5414	0.5037	0.5775	0.5708

This table presents the moderating effect of industry concentration (competition) in the relationship between economic policy uncertainty shock and corporate risk-taking along with the nexus between the market condition and being financially constrained. The dependent variable is corporate risk-taking, which is estimated by idiosyncratic volatility. HCD is the high competition dummy whereas LCD and MCD are low and medium competition dummies, respectively. Columns 1 and 2 present the results when the market has favorable conditions. Columns 3 and 4 show the results when the market conditions are unfavorable. The sample is classified according to the market return in the previous year. The market is up if the market return is positive in the previous year whereas the market is down if the market return is negative. The results given in Columns 2 and 4 are for financially constrained firms, which are estimated by using the KZ index (Lamont et al., 2001). They assign a firm as financially constrained if the KZ index of the firm is higher than or equal to the sample median KZ index. The results given in Columns 1 and 3 are for financially unconstrained firms that have a lower KZ score than the sample median KZ score. The description of the key variables is given in Table 2. All the independent variables are one-period lagged to mitigate the impact of reverse causality. We use country, year and firm fixed effects in all the regressions. Error terms are clustered on the firm-level. Robust standard errors in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1.

standard deviation increase in EPU shock causes a decrease of 1.098 units in risk-taking when a firm operates in a concentrated industry. For highly competitive industries, the decrease in risk-taking is 0.665 units in response to one standard deviation increase in EPU shock. This decrease is 1.01 units for firms operating in a moderately competitive environment. The economic magnitude of the effect of EPU shock on risk-taking is an increasing function of industry concentration for financially constrained firms when the macro-economic outlook is unfavorable. On the contrary, when market conditions are favorable, managers of financially constrained firms can more easily finance their operations; and they do not decrease their risk-taking as the economic policy uncertainty increases.

Summing up, in addition to the industry conditions, being financially constrained is also an important factor affecting the relationship between uncertainty in the economy and the corporate risk-taking. Managers of financially constrained firms can reach external financing more easily when stock market conditions are favorable. Hence, economic policy uncertainty does not have a significant effect when market conditions are favorable. On the other hand, financially constrained firms are more risk averse when the market conditions are unfavorable no matter what the competition level is. The negative effect of economic policy uncertainty increases as the competition in the industry decreases.

4. Robustness checks

We conduct some additional tests to ensure that our main results are robust. The first set of robustness checks focuses on the alternate measure of risk-taking. In Table 8, the results of the first set of robustness test are given.

Table 8
Robustness analyses: Alternative corporate risk-taking measures.

	Idiosyncratic volatility			Earnings volatility			Std. dev.returns		
	baseline	upmarket	downmarket	baseline	upmarket	downmarket	baseline	upmarket	downmarket
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
VARIABLES	RISK 3	RISK 3	RISK 3	RISK 4	RISK 4	RISK 4	RISK 5	RISK 5	RISK 5
L.EPU Shock	−0.0168*	−0.0341***	−0.0185	−0.0158***	−0.0128*	−0.0236**	−0.0684**	−0.1228*	−0.1189***
	(0.0099)	(0.0123)	(0.0175)	(0.0055)	(0.0075)	(0.0096)	(0.0341)	(0.0649)	(0.0461)
L.Size	−0.0375***	−0.0367***	−0.0411***	−0.0410***	−0.0402***	−0.0459***	−0.0486***	−0.0389**	−0.0873***
	(0.0050)	(0.0053)	(0.0078)	(0.0043)	(0.0049)	(0.0057)	(0.0132)	(0.0164)	(0.0208)
L.Leverage	0.1323***	0.1241***	0.1245***	0.0596***	0.0694***	0.0608***	0.3700***	0.2902***	0.4602***
	(0.0184)	(0.0210)	(0.0306)	(0.0143)	(0.0186)	(0.0228)	(0.0535)	(0.0654)	(0.0766)
L.Profitability	−0.1760***	−0.1658***	−0.1904***	−0.1642***	−0.1415***	−0.2077***	−0.5546***	−0.5188***	−0.5981***
	(0.0172)	(0.0227)	(0.0254)	(0.0135)	(0.0167)	(0.0211)	(0.0404)	(0.0585)	(0.0551)
L.Sales gwth	−0.0046*	−0.0028	−0.0046	0.0156***	0.0175***	0.0143***	−0.0236***	−0.0254*	−0.0156
	(0.0026)	(0.0033)	(0.0048)	(0.0025)	(0.0033)	(0.0046)	(0.0087)	(0.0143)	(0.0118)
L.Tangibility	−0.0121	−0.0492*	0.0129	−0.0128	−0.0056	−0.0219	−0.0716	−0.1943**	−0.0339
	(0.0244)	(0.0274)	(0.0351)	(0.0184)	(0.0186)	(0.0273)	(0.0634)	(0.0821)	(0.0889)
L.FinSlack	−0.0667***	−0.0737***	−0.0585**	0.0910***	0.0932***	0.0867***	−0.2057***	−0.2051***	−0.2496***
	(0.0169)	(0.0202)	(0.0274)	(0.0199)	(0.0212)	(0.0277)	(0.0482)	(0.0606)	(0.0715)
L.Ln(GDP)	−0.0137	0.0629***	−0.0864***	0.0261	0.0306	0.0215	−0.1003	0.1924**	−0.3282***
	(0.0191)	(0.0230)	(0.0330)	(0.0233)	(0.0299)	(0.0235)	(0.0673)	(0.0864)	(0.1060)
L.GDP gwth	−0.0036***	−0.0012	−0.0049***	−0.0015**	−0.0016*	−0.0019*	−0.0128***	−0.0004	−0.0276***
	(0.0011)	(0.0014)	(0.0018)	(0.0007)	(0.0009)	(0.0011)	(0.0035)	(0.0046)	(0.0057)
Constant	0.9765*	−1.1734*	3.0394***	−0.1379	−0.2783	0.0600	6.1710***	−2.1141	12.9580***
	(0.5443)	(0.6434)	(0.9471)	(0.6588)	(0.8451)	(0.6688)	(1.8966)	(2.4203)	(3.0017)
Observations	46,212	28,733	17,038	47,108	29,226	17,507	46,336	28,817	17,082
R-squared	0.4341	0.4480	0.5308	0.6826	0.6989	0.7108	0.4371	0.4306	0.6193

This table reports the effect of economic policy uncertainty shock on corporate risk-taking for alternative risk-taking measures. The dependent variable is the corporate risk-taking. In specifications 1, 2 and 3, we use alternative idiosyncratic risk measure (RISK 3), which is estimated by annualized idiosyncratic volatility of daily stock returns over a one–year window in a four-factor Fama-French model (in-sample forecasting). In specifications 4, 5, and 6, we use alternative earnings volatility measure (RISK 4), which is estimated by the firm's earnings deviation from country-industry average earnings. In specifications 7, 8 and 9, we use total risk measure (RISK 5), which is estimated by the annualized standard deviation of daily stock returns. In specifications 1, 4, and 7, we use the whole sample to estimate the baseline regression. In specifications 2, 3, 5, 6, 8, and 9, the sample is classified according to the market return in the previous year. The market is up if the market return is positive in the previous year whereas the market is down if the market return is negative. Columns 2, 5, and 8 give the result when the market conditions are favorable while Columns 3, 6, and 9 present the results for unfavorable market conditions. The description of the key variables is given in Table 2. All the independent variables are one-period lagged to mitigate the impact of reverse causality. We use country, year and firm fixed effects in all the regressions. Error terms are clustered on the firm-level. Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

4.1. Alternate measure of risk-taking

The first robustness check is focused on the dependent variable, corporate risk-taking. Although we use both idiosyncratic and earnings volatilities as risk-taking measures, we also test whether the results are valid under different idiosyncratic and earnings volatility estimations.

In the main analysis, we use out-of-sample forecasting to estimate the idiosyncratic volatility. For the robustness check, we use an additional idiosyncratic volatility risk measure, which will be estimated by in-sample forecasting. To estimate the alternate idiosyncratic volatility, we apply the following procedure:

For each year, daily excess stock returns are run on the four factors of the market model mentioned in Eq. (1) over a one-year window for each individual stock. The time series regressions are run on four factors if the stock has at least 30 daily observations in that year. Then, we fit the resulting beta estimates to the daily stock returns on the current year and obtain the daily residuals. The alternate idiosyncratic volatility measure is the standard deviation of the daily residuals within the calendar year; and we call it RISK 3.

The most important difference between the two idiosyncratic volatility estimation methods is that the first method uses out-of-sample forecasting whereas the second method uses in-sample forecasting. Although both methods use 12-month daily data for the regressions, the first method uses a rolling sample for the previous 12 months whereas the second method uses the calendar year period for each regression.

In the main analysis, to estimate earnings volatility, we use the firm's earnings deviation from country-industry average earnings. But in the literature, generally, country average earnings are used. So, we also check whether our results are valid when we estimate earnings volatility by using the deviations from the country average EBITDA/TA for the corresponding year; and we call this volatility RISK 4.

In addition to alternate idiosyncratic and earnings volatility measures, we also use the annualized standard deviation of daily stock returns. This last risk measure is called RISK 5.

The results given in Table 8 show that economic policy uncertainty negatively affects corporate risk-taking. Thus, we conclude that the results are valid under different corporate risk-taking measures.

4.2. Alternate sample construction

The main sample includes 15 developed European countries, including the UK, Germany, and France. The sample distribution given in Table 1 shows that firms from the UK constitute 29.30 %; from Germany 15.79 %; and from France 16.32 %, which is in total 61.41 % of the sample. This raises the question of whether the firms from these three large European countries dominate the results. Thus, to ensure that the results are valid for the other developed European countries in the sample, we exclude the UK, Germany, and France from the sample, and repeat the empirical analysis. The results given in the specifications (1) - (3) in Table 9 show that economic policy uncertainty has a significant negative effect on corporate risk-taking even when we exclude the UK, Germany, and France from the sample.

4.3. Alternate measures of market conditions

In the main analysis, we use positive (negative) market returns as an indicator of favorable (unfavorable) market conditions. We use three alternate market conditions classification for robustness.

In the first alternate classification, to mitigate the effect of extreme market returns, we winsorize market returns at 5 % on both sides in order to smooth the market returns for the countries first; and then, we classify the market condition as favorable (unfavorable) when the market return is above (below) zero. The results given in the specifications (4) - (5) in Table 9 show that economic policy uncertainty has a significant negative effect on risk-taking under both favorable and unfavorable market conditions.

We also check the long-run market conditions by estimating market conditions with the last two consecutive years of the market return. The market is in favorable (unfavorable) conditions when the last two-year market returns are above (below) zero. The results are given in the specifications (6) - (7). The negative effect of economic policy uncertainty continues. In fact, for long-run unfavorable market conditions, the negative impact is greater.

One other concern is whether taking above and below zero is a good indicator of market condition classification. We use a ±15 % market return as a cut-off point for favorable and unfavorable market conditions. According to the results given in specifications (8) - (9) in Table 9, the significant negative effect of uncertainty on risk-taking is valid under the new classification cut-off level. Moreover, when we take -15 % as the cut-off level, the economic policy uncertainty is more detrimental to risk-taking. It is -0.0789, which is the highest negative value through all the analyses in this paper.

4.4. Alternate model specification

The nested level nature of the data used in this study allows us to use a hierarchical model. The data is at firm level, which is nested at country level as well as industry level. Following Li, Griffin, Yue, and Zhao (2013), we use the longitudinal hierarchical model. The hierarchical model allows us to mitigate the effect of uneven sample distribution within the country level. The results given in the specification (10) in Table 9 show that the hierarchical model also supports the negative effect of economic policy uncertainty on corporate risk-taking. The R-square difference between model 1, which does not include economic policy uncertainty shock, and model 2, which includes EPU shock, is statistically significant at five percent level revealing that adding economic policy uncertainty to the model improves the model.

4.5. Alternate competition measures

We address the concern that the competition measure used in the main empirical analyses is not a good proxy for product market competition. Following the literature, we use two additional competition measures: Herfindahl-Hirschman index based on assets, and the pricing power of a firm measured by price margin.

Large firms can create not only entry barriers for new firms (Benoit, 1984), but also benefit from the economies of scales (Bolton and Scharfstein, 1990). Using assets instead of sales for the HHI calculation is an alternate measure of competition used in the literature. The estimation procedure of HHI (assets) is the same as the calculation of HHI (sales), but instead of using sales, we will use total assets.

Our second alternate competition measure is the pricing power, which is estimated by the price margin, and mostly used in organization literature as the Lerner index. Firms with a high pricing power have monopoly power and face lower market pressure (Lerner, 1934). Following Datta et al. (2011) and Datta et al. (2013), we use the price-cost margin to measure the pricing power of a company. Following the literature, we estimate the price margin as follows:

$$Price\ Margin_{i,j,c,t} = {}^{Net\ Income_{i,j,c,t}}\!/_{Sales_{i,j,c,t}} \tag{9}$$

where i represents for firm, j for industry, c for country and t for year. After evaluating price margin for each firm, for every year, we define three competition dummies: High competition (low pricing power), moderate competition (moderate pricing power) and low competition (high pricing power).

According to the results given in Table 10, both competition measures support the negative effect of economic policy uncertainty shock on corporate risk-taking when firms operate in industries where the competition is low. Moreover, the results given in Table 10 support the previous findings that financially constrained firms become more risk averse as the economic policy uncertainty increases when the market conditions are unfavorable.

Table 9
Robustness analyses: Alternate sample construction, market classification and model specification.

	exclude UK&DE&FR			Winsorized market return		Long run	Long run -	> = 15 %	<=-15 %	hierarchical
	baseline	upmarket	downmarket	upmarket	downmarket	upmarket	downmarket	upmarket	downmarket	baseline
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Variables	RISK 1	RISK 1	RISK 1	RISK 1	RISK 1	RISK 1	RISK 1	RISK 1	RISK 1	RISK 1
L.EPU Shock	−0.0330**	−0.0350*	−0.0389*	−0.0355***	−0.0354**	−0.0347**	−0.0541*	−0.0286**	−0.0789***	−0.0237**
	(0.0134)	(0.0181)	(0.0199)	(0.0105)	(0.0166)	(0.0135)	(0.0323)	(0.0139)	(0.0279)	(0.0102)
L.Size	−0.0334***	−0.0289***	−0.0452***	−0.0278***	−0.0256***	−0.0300***	−0.0256**	−0.0262***	−0.0201*	−0.0258***
	(0.0077)	(0.0073)	(0.0116)	(0.0047)	(0.0063)	(0.0054)	(0.0116)	(0.0056)	(0.0104)	(0.0006)
L.Leverage	0.1221***	0.1258***	0.1275***	0.0980***	0.0944***	0.0849***	0.1277***	0.0832***	0.0722**	0.1095***
	(0.0268)	(0.0297)	(0.0388)	(0.0172)	(0.0290)	(0.0197)	(0.0480)	(0.0230)	(0.0358)	(0.0092)
L.Profitability	−0.2162***	−0.2091***	−0.2363***	−0.1701***	−0.1730***	−0.1175***	−0.2017***	−0.1559***	−0.2134***	−0.2640***
	(0.0294)	(0.0326)	(0.0472)	(0.0180)	(0.0234)	(0.0226)	(0.0395)	(0.0233)	(0.0336)	(0.0108)
L.Sales gwth	−0.0020	0.0001	−0.0009	−0.0043	−0.0047	−0.0080**	−0.0062	−0.0020	0.0045	0.0014
	(0.0042)	(0.0046)	(0.0076)	(0.0029)	(0.0047)	(0.0039)	(0.0074)	(0.0040)	(0.0067)	(0.0030)
L.Tangibility	0.0616*	0.0358	0.0611	−0.0282	−0.0056	−0.0022	−0.0173	−0.0297	0.0758*	−0.0287***
	(0.0355)	(0.0380)	(0.0465)	(0.0233)	(0.0332)	(0.0298)	(0.0692)	(0.0295)	(0.0406)	(0.0057)
L.FinSlack	−0.0390	−0.0284	−0.0486	−0.0469**	−0.0829***	−0.0708***	−0.0272	−0.0505**	0.0034	−0.0758***
	(0.0287)	(0.0344)	(0.0388)	(0.0182)	(0.0256)	(0.0232)	(0.0515)	(0.0232)	(0.0344)	(0.0086)
L.Ln(GDP)	−0.0334	0.0329	−0.0868*	0.0684***	−0.1172***	0.0547**	−0.2479***	0.0651**	−0.1681***	−0.0192***
	(0.0353)	(0.0473)	(0.0469)	(0.0223)	(0.0376)	(0.0264)	(0.0634)	(0.0319)	(0.0431)	(0.0014)
L.GDP gwth	−0.0006	0.0012	−0.0001	0.0004	−0.0069***	0.0024	−0.0099**	0.0011	−0.0004	0.0015
	(0.0014)	(0.0019)	(0.0022)	(0.0012)	(0.0020)	(0.0016)	(0.0045)	(0.0016)	(0.0024)	(0.0010)
Constant	1.4408	−0.4100	3.0297**	−1.4414**	3.7257***	−1.0539	7.3403***	−1.3731	4.9964***	0.9803***
	(0.9537)	(1.2616)	(1.2811)	(0.6238)	(1.0613)	(0.7485)	(1.7807)	(0.8978)	(1.2423)	(0.0426)
Observations	19,347	11,503	7,746	31,883	15,089	19,154	6,471	18,180	8,331	43,039
R-squared	0.5012	0.5430	0.5552	0.4626	0.5449	0.5182	0.6273	0.4858	0.6242	0.1730

This table presents robustness analyses with alternative sample construction, market condition classification, and method specification. In specifications 1, 2 and 3, we use an alternate sample construction to mitigate the possible dominance of three large European countries. We exclude the United Kingdom, France, and Germany since they constitute 61.41 % of the sample. In specifications 4, 5, 6, 7, 8, and 9, we use alternative market condition classification. In specifications 4 and 5, to mitigate the effect of extreme market returns, we winsorize market returns at 5 % on both sides to smooth the market returns for the countries first; and then, we classify the market condition as favorable (unfavorable). In specifications 6 and 7, we classify market conditions according to the last two consecutive years of market return to take into account the long-run market conditions. In specifications 8 and 9, we use ±15 % market return as a cut-off point for favorable and unfavorable market conditions. In specification 10, we use the longitudinal hierarchical model to mitigate the effect of uneven sample distribution within the country level. The description of the key variables is given in Table 2. All the independent variables are one-period lagged to mitigate the impact of reverse causality. We use country, year and firm fixed effects in all the regressions. Error terms are clustered on the firm-level. Robust standard errors in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1.

Table 10
Robustness analyses: Alternate competition measures.

	HHI(assets)			Price margin		
	baseline	upmarket	downmarket	baseline	upmarket	downmarket
	(1)	(2)	(3)	(4)	(5)	(6)
Variables	RISK 1	RISK 1	RISK 1	RISK 1	RISK 1	RISK 1
L.EPU Shock*L.HCD	−0.0061	−0.0226	−0.0023	0.0036	−0.0724***	0.0276
	(0.0125)	(0.0179)	(0.0197)	(0.0158)	(0.0244)	(0.0244)
L.EPU Shock*L.MCD	−0.0196	−0.0298*	−0.0414**	−0.0230**	−0.0080	−0.0469***
	(0.0125)	(0.0165)	(0.0195)	(0.0096)	(0.0127)	(0.0153)
L.EPU Shock*L.LCD	−0.0327***	−0.0464***	−0.0388**	−0.0404***	−0.0281**	−0.0663***
	(0.0118)	(0.0174)	(0.0169)	(0.0093)	(0.0132)	(0.0149)
L.Size	−0.0254***	−0.0255***	−0.0300***	−0.0251***	−0.0255***	−0.0296***
	(0.0042)	(0.0045)	(0.0065)	(0.0042)	(0.0044)	(0.0064)
L.Leverage	0.1023***	0.0988***	0.0977***	0.1027***	0.1001***	0.0912***
	(0.0160)	(0.0175)	(0.0261)	(0.0163)	(0.0176)	(0.0259)
L.Profitability	−0.1712***	−0.1622***	−0.1816***	−0.1598***	−0.1640***	−0.1500***
	(0.0147)	(0.0185)	(0.0226)	(0.0170)	(0.0212)	(0.0265)
L.Sales gwth	−0.0059**	−0.0034	−0.0062	−0.0055**	−0.0023	−0.0066
	(0.0024)	(0.0030)	(0.0044)	(0.0024)	(0.0029)	(0.0042)
L.Tangibility	−0.0062	−0.0379	0.0114	−0.0035	−0.0275	0.0092
	(0.0213)	(0.0239)	(0.0304)	(0.0202)	(0.0229)	(0.0297)
L.FinSlack	−0.0527***	−0.0546***	−0.0521**	−0.0524***	−0.0526***	−0.0506**
	(0.0153)	(0.0180)	(0.0246)	(0.0153)	(0.0181)	(0.0245)
L.Ln(GDP)	−0.0005	0.0741***	−0.0897***	−0.0077	0.0669***	−0.0954***
	(0.0184)	(0.0222)	(0.0306)	(0.0185)	(0.0222)	(0.0305)
L.GDP gwth	−0.0026**	−0.0002	−0.0040**	−0.0024**	−0.0003	−0.0038**
	(0.0010)	(0.0013)	(0.0017)	(0.0010)	(0.0013)	(0.0017)
L. HCD	0.0069	0.0082	−0.0050	0.0188***	0.0270***	0.0177***
	(0.0066)	(0.0077)	(0.0106)	(0.0038)	(0.0056)	(0.0063)
L. LCD	−0.0162*	−0.0117	−0.0299**	0.0154***	0.0174***	0.0096*
	(0.0095)	(0.0110)	(0.0131)	(0.0033)	(0.0041)	(0.0053)
Constant	0.4655	−1.6261***	3.0124***	0.6443	−1.4431**	3.1432***
	(0.5229)	(0.6226)	(0.8748)	(0.5257)	(0.6245)	(0.8718)
Observations	47,399	29,412	17,604	47,192	29,271	17,551
R-squared	0.4503	0.4693	0.5406	0.4504	0.4720	0.5384

This table shows robustness analyses for the moderating effect of competition in the relationship between economic policy uncertainty and corporate risk-taking with two alternative competition measures: Herfindahl-Hirschman Index based on assets and pricing power of a firm. In specifications 1, 2, and 3, we use HHI(assets), which are estimated by the sum of squared market shares of firms in the industry. The market share of a firm is estimated by the total assets of a firm scaled by the total assets of all the firms in that industry. In specifications 4, 5, and 6, we use the pricing power of a firm to measure the competitiveness of a firm. Pricing power is estimated by the price margin which is estimated by the ratio of net income to sales. Specifications 1 and 4 give the baseline regression results. In Specifications 2, 3, 5, and 6, the sample is classified according to the market return in the previous year. The market is up if the market return is positive in the previous year whereas the market is down if the market return is negative. The description of the key variables is given in Table 2. All the independent variables are one-period lagged to mitigate the impact of reverse causality. We use country, year and firm fixed effects in all the regressions. Error terms are clustered on the firm-level. Robust standard errors in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.

The results given in Table A2 in Appendix also support the previous findings of financially constrained firms under competition with alternative competition measures.

Summing up, under alternate corporate risk-taking measures, alternate market condition classifications, alternate sample construction, alternate model specification, and alternate competition measures, we show that the results are robust.

4.6. Alternate modeling to deal with endogeneity

We address the possible endogeneity problem that might arise due to the error-in-measurement problem if the EPU index also includes policy unrelated economic uncertainty. We conduct a 2SLS estimation to mitigate the possible endogeneity concern. Following Gulen and Ion (2016), who use the EPU index of Canada to extract the policy unrelated part of the economic policy uncertainty index, we use the US EPU index to extract the policy unrelated part of the EPU in developed European countries[3] . Gulen and Ion (2016) argue that Canada and the US have a tight relationship regarding international trade which creates a close link between these two economies. Following this argument, we claim that developed European economies are closely related to US economic activity. Following Gulen and Ion (2016), we first regress the EPU shock on the natural logarithm of the average US EPU index and the firm and country control variables. In the first stage time series regression, we include country average of the firm control variables over a year (Gulen and Ion, 2016). For the second stage panel data regression, we use the residuals of the first regression instead of EPU shock. Table 11 presents the results. The

[3] In addition to the US EPU index, we also use the Global EPU index to extract the policy unrelated part of the EPU index for developed European countries. We get similar results.

Table 11
Robustness analyses: Endogeneity.

	Baseline	Fin. Const = 1	Baseline	downmaket & Fin. Const. = 1
	(1)	(2)	(3)	(4)
VARIABLES	RISK 1	RISK 1	RISK 1	RISK 1
L.Residual EPU	−0.00014*	−0.00021***		
	(0.00007)	(0.00005)		
L.Residual EPU * L.HCD			−0.00009	−0.00044***
			(0.00006)	(0.00012)
L.Residual EPU * L.MCD			−0.00014	−0.00053**
			(0.00013)	(0.00020)
L.Residual EPU * L.LCD			−0.00019*	−0.00067***
			(0.00010)	(0.00012)
L.Size	−0.00025**	−0.00021**	−0.00025**	−0.00025*
	(0.00009)	(0.00009)	(0.00009)	(0.00013)
L.Leverage	0.00102***	0.00098***	0.00102***	0.00101***
	(0.00012)	(0.00020)	(0.00012)	(0.00026)
L.Tangibility	−0.00007	−0.00032	−0.00006	−0.00032
	(0.00035)	(0.00020)	(0.00035)	(0.00048)
L.Profitability	−0.00171***	−0.00121***	−0.00171***	−0.00135***
	(0.00030)	(0.00024)	(0.00030)	(0.00040)
L.Sales Gwth	−0.00006**	−0.00002	−0.00006**	−0.00000
	(0.00002)	(0.00003)	(0.00002)	(0.00009)
L.FinSlack	−0.00053***	−0.00046***	−0.00052***	−0.00048
	(0.00015)	(0.00015)	(0.00015)	(0.00040)
L.ln(GDP)	−0.00002	−0.00021*	−0.00002	−0.00026
	(0.00015)	(0.00012)	(0.00015)	(0.00022)
L.GDP gwth	−0.00003*	−0.00003**	−0.00003*	−0.00004
	(0.00002)	(0.00001)	(0.00002)	(0.00002)
L.HCD			0.00006	0.00005
			(0.00005)	(0.00005)
L.LCD			−0.00004	−0.00008
			(0.00006)	(0.00012)
Constant	0.00483	0.00948**	0.00491	0.01152*
	(0.00474)	(0.00345)	(0.00471)	(0.00590)
Observations	47,399	18,566	47,399	6,633
R-squared	0.44998	0.50309	0.45001	0.57048

This table shows robustness analyses for endogeneity concerns. First, EPU shock is regressed on the natural logarithm of yearly average of the US EPU index and country average of the firm control variables. In the second stage panel data regression, EPU index is replaced with the residuals of the first stage time-series regression. This table presents the results with the independent variable EPU residuals. The dependent variable is corporate risk-taking which is estimated by idiosyncratic volatility. HCD is the high competition dummy whereas LCD and MCD are low and medium competition dummies, respectively. In specification 1 the results are for baseline model. Specification 2 gives the results for financially constraint firms which are estimated by using the KZ index (Lamont et al., 2001). They assign a firm as financially constrained if the KZ index of the firm is higher than or equal to the sample median KZ index. Specification 3 and 4 presents results for the moderating effect of competition. Specification 3 is for the baseline model for the moderating effect of industry competition. Specification 4 presents the results for the moderating effect of competition for financially constrained firms when the macroeconomic outlook is unfavorable. The market is down if the last year's market return is negative. The description of the key variables is given in Table 2. All the independent variables are one-period lagged to mitigate the impact of reverse causality. We use country, year and firm fixed effects in all the regressions. Error terms are clustered on the firm-level. Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0$.

negative effect of EPU on corporate risk-taking continues by using the new measure of EPU in Eq. (7). As the results shown in the specification (2) of Table 11 indicate that the negative impact of EPU on risk-taking is stronger for financially constrained firms. The adverse effect of EPU is valid when the firm operates in a highly concentrated industry. On the other hand, for financially constrained firms, the negative impact of EPU is valid for all competition levels in the industry (Specification 4). The results shown in Table 11 demonstrate that our findings are robust when we consider for endogeneity problems.

5. Conclusion

This paper explores the influence of economic policy uncertainty shocks on corporate risk-taking using the index developed by Baker et al. (2016) We demonstrate that no matter what the market condition is, firms alleviate their risk capacity and become more risk averse during periods of high economic policy uncertainty, indicating that managers prefer less risky investment and financing choices during periods of high uncertainty.

Next, we investigate how the industry concentration moderates the relationship between corporate risk-taking and economic policy uncertainty in different market conditions. Consistent with the fact that competition has a disciplinary function on management, we document that firms operating in concentrated industries mitigate their risk-taking during the periods of high policy uncertainty. Studies in the literature show that competition imposes pressure on the management to follow value-increasing projects and not misspend corporate resources (Frésard and Valta, 2015; Ammann et al., 2013; Giroud and Mueller, 2011; Tian and Twite, 2011; Allen and Gale, 2000; Griffith, 2001). In fact, our findings are in line with the literature that support the hypothesis that competition acts as a substitute corporate governance mechanism (Ammann

et al., 2013; Giroud and Mueller, 2011). In highly competitive industries, managers are already under competitive pressure and have to continue undertaking possible investment opportunities to keep their competitive edge in the market. On the contrary, without the disciplinary force of competition, firms can undertake unnecessarily risky projects in concentrated industries. Hence, firms with high market power can easily diminish their risk-taking as they are free of competitive pressure. In contrast, managers in highly competitive industries have to follow their ongoing strategy to keep their market share, and they do not reduce their risk-taking during periods of high policy uncertainty.

Finally, we examine the financially constrained firms as they are more likely to suffer from uncertainty when macro-economic outlook is unfavorable. The findings support the view that financially constrained firms are more likely to have difficulty in accessing external financing when the market conditions are unfavorable. In periods of high economic policy uncertainty, financially constrained firms mitigate their risk capacity especially when the stock market conditions are unfavorable. Further, financially constrained firms decrease their risk capacity, no matter what the competition level is. In fact, the economic magnitude of the effect of EPU shock on risk-taking is an increasing function of industry concentration for financially constrained firms when the macro-economic outlook is unfavorable. This reveals that financially constrained firms have difficulty in getting external financing for their projects, which may increase their earnings volatility or idiosyncratic volatility.

All in all, our empirical findings document an adverse impact of economic policy uncertainty shock on corporate risk-taking. This negative effect is more severe when the competition in the market is low and for firms having difficulty accessing external financing. Hence, during the periods of high policy uncertainty, implementing policies to improve and increase competition in the market would alleviate a firm's risk avoidance. Furthermore, the risk avoidance of financially constrained firms during the periods of unfavorable stock market conditions implies the difficulty of accessing external financing in the stock market. Thus, implementing policies to facilitate the access to external financing through the banking channel would mitigate the risk avoidance of financially constrained firms during the unfavorable macro-economic outlook and will help them seize the value-increasing investment opportunities.

Appendix A

Table A1
Correlations.

	RISK 1	RISK 2	EPU Shock	Size	Lev.	Profit.	Sales Gwth	Tang.	FinSlack
Panel A: Firm-level variables									
(1) RISK 1	1								
(2) RISK 2	0.259*	1							
(3) EPU shock	0.016*	0.009*	1						
(6) Size	−0.282*	−0.366*	−0.044*	1					
(7) Leverage	0.000	−0.009	−0.010*	0.211*	1				
(8) Profitability	−0.277*	−0.486*	0.008	0.354*	−0.042*	1			
(9) Sales Grwth	0.022*	0.143*	0.034*	−0.087*	−0.043*	−0.051*	1		
(10) Tangibility	−0.103*	−0.150*	−0.009*	0.286*	0.316*	0.154*	−0.042*	1	
(11) Fin Slack	0.069*	0.240*	0.002	−0.285*	−0.340*	−0.246*	0.092*	−0.320*	1
		EPU shock		GDP growth		Ln(GDP)			
Panel B: Country-level variables									
EPU shock	1								
GDP growth	0.118*			1					
ln(GDP)	0.151*			−0.1409		1			

This table reports the correlations between key variables. In Panel A we report the correlations between firm-level variables and in Panel B we report the correlations between country-level variables. RISK1 is the annualized idiosyncratic volatility of daily stock returns obtained from a four-factor Fama-French model over a 12 months rolling window for the regressions of each month (out-of-sample forecasting). RISK 2 is the earnings volatility estimated by the standard deviation of country-industry adjusted earnings. RISK 2 is estimated by the standard deviation of (EBITDA / Total assets – country-industry average EBITDA / Total asset). EPU shock is estimated by the annual average of monthly EPU shocks which is defined as u_{EPU}/h^{u}_{EPU} where u_{EPU} is the mean of change in EPU and h^{u}_{EPU} is the conditional standard deviation equation which is modeled by GARCH(1,1). The description of the key variables is given in Table 2. * shows significance at the 0.05 level.

Table A2
Robustness analyses: Financially constrained firms and alternate competition measures.

	HHI(assets)				Price Margin			
	Market up		Market down		Market up		Market down	
	Fin. Const = 0	Fin. Const = 1	Fin Const = 0	Fin. Const = 1	Fin. Const = 0	Fin. Const = 1	Fin Const = 0	Fin. Const = 1
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	RISK 1	RISK 1	RISK 1	RISK 1	RISK 1	RISK 1	RISK 1	RISK 1
L.EPU Shock * L.HCD	0.0075	−0.0058	−0.0114	−0.0339**	−0.0564*	0.0239	0.0302	−0.0067
	(0.0259)	(0.0152)	(0.0361)	(0.0171)	(0.0321)	(0.0298)	(0.0413)	(0.0316)
L.EPU Shock * L.MCD	−0.0270	−0.0015	−0.0413	−0.0753***	−0.0123	−0.0031	−0.0740***	−0.0588***
	(0.0225)	(0.0127)	(0.0294)	(0.0224)	(0.0161)	(0.0100)	(0.0261)	(0.0157)
L.EPU Shock * L.LCD	−0.0574***	−0.0259*	−0.0378	−0.0668***	−0.0354*	−0.0309***	−0.0584**	−0.0916***
	(0.0207)	(0.0152)	(0.0304)	(0.0153)	(0.0186)	(0.0114)	(0.0263)	(0.0165)
L.Size	−0.0249***	−0.0155***	−0.0404***	−0.0253***	−0.0253***	−0.0156***	−0.0400***	−0.0236***
	(0.0063)	(0.0053)	(0.0122)	(0.0079)	(0.0061)	(0.0054)	(0.0122)	(0.0077)
L.Leverage	0.1017***	0.0741***	0.1060**	0.1014***	0.0973***	0.0807***	0.1041**	0.0964***
	(0.0198)	(0.0207)	(0.0412)	(0.0326)	(0.0199)	(0.0200)	(0.0414)	(0.0331)
L.Profitability	−0.0632**	−0.1067***	−0.1589***	−0.1350***	−0.0667**	−0.1008***	−0.1339***	−0.1087***
	(0.0251)	(0.0207)	(0.0362)	(0.0321)	(0.0271)	(0.0217)	(0.0418)	(0.0370)
L.Sales gwth	−0.0056	−0.0052	0.0136	−0.0002	−0.0049	−0.0037	0.0132	0.0004
	(0.0039)	(0.0048)	(0.0098)	(0.0076)	(0.0039)	(0.0047)	(0.0099)	(0.0078)
L.Tangibility	−0.0257	−0.0760*	−0.0511	−0.0292	−0.0281	−0.0397	−0.0464	−0.0284
	(0.0313)	(0.0433)	(0.0427)	(0.0506)	(0.0313)	(0.0279)	(0.0427)	(0.0507)
L.FinSlack	−0.0592**	−0.0360**	0.0076	−0.0482	−0.0663**	−0.0367**	0.0159	−0.0502
	(0.0288)	(0.0171)	(0.0561)	(0.0305)	(0.0290)	(0.0172)	(0.0553)	(0.0308)
L.Ln(GDP)	0.0484	0.0071	−0.0916*	−0.0239	0.0421	−0.0039	−0.1030*	−0.0247
	(0.0300)	(0.0200)	(0.0534)	(0.0267)	(0.0305)	(0.0201)	(0.0545)	(0.0265)
L.GDP gwth	−0.0020	−0.0015	−0.0069**	−0.0036**	−0.0022	−0.0016*	−0.0067**	−0.0035**
	(0.0014)	(0.0009)	(0.0028)	(0.0015)	(0.0014)	(0.0009)	(0.0028)	(0.0016)
L. HCD	0.0059	0.0140**	0.0117	−0.0074	0.0197***	0.0040	0.0115	0.0101
	(0.0099)	(0.0069)	(0.0226)	(0.0102)	(0.0069)	(0.0059)	(0.0100)	(0.0076)
L. LCD	−0.0105	−0.0110	−0.0426**	−0.0255**	0.0156***	0.0090**	0.0041	0.0126**
	(0.0157)	(0.0089)	(0.0210)	(0.0126)	(0.0052)	(0.0037)	(0.0087)	(0.0057)
Constant	−0.9190	0.1017	3.1899**	1.1016	−0.7481	0.3991	3.4773**	1.0810
	(0.8583)	(0.5709)	(1.5402)	(0.7547)	(0.8700)	(0.5743)	(1.5769)	(0.7507)
Observations	11,281	11,312	6,546	6,633	11,254	11,296	6,539	6,627
R-squared	0.5415	0.5041	0.5783	0.5716	0.5409	0.5113	0.5792	0.5679

This table presents the robustness analyses for the moderating effect of competition in the relationship between economic policy uncertainty and corporate risk-taking with two alternative competition measures Herfindahl-Hirschman Index based on assets and pricing power of a firm. The dependent variable is corporate risk-taking which is estimated by the annualized idiosyncratic volatility of daily stock returns obtained from a four-factor Fama-French model over a 12 months rolling window for the regressions of each month (out-of-sample forecasting). In specifications 1, 2, 3, and 4 we use HHI(assets) which is estimated by the sum of squared market shares of firms in the industry. The market share of a firm is estimated by the total assets of a firm scaled by the total assets of all the firms in that industry. In specification 5, 6, 7, and 8 we use the pricing power of a firm to measure the competitiveness of a firm. Pricing power is estimated by the price margin which is estimated by the ratio of net income to sales. HCD is the high competition dummy whereas LCD and MCD are low and medium competition dummies, respectively. This table reports the nexus between macroeconomic conditions, competition, being financially constrained, economic policy uncertainty shock and corporate risk-taking. The sample is classified according to the market return in the previous year. The market is up if the market return is positive in the previous year whereas the market is down if the market return is negative. The results given in Columns 2, 4, 6, and 8 are for financially constrained firms which are estimated by using the KZ index (Lamont et al., 2001), assign a firm as a financial constraint if the KZ index of the firm is higher than or equal to the sample median KZ index. The results given in Columns 1, 3, 5, and 7 are for financially unconstrained firms that have a lower KZ score than the sample median KZ score. The description of the key variables is given in Table 2. All the independent variables are one-period lagged to mitigate the impact of reverse causality. We use country, year and firm fixed effects in all the regressions. Error terms are clustered on the firm-level. Robust standard errors in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.

Table A3
Propensity Score Matching for Financially Constrained and Unconstrained Firms.

Treatment-Effects Estimation Estimator : Propensity-Score Matching Treatment Model: Logit	Number of observations = 39,834			
RISK 1	Coef.	AI Robust Std. Err.	z	P > |z|
ATET Financially Constrained = 1 vs Financially Unconstrained = 0	−0.0000843	0.0000312	−2.70	0.007

This table provides the test results for propensity score matching of financially constrained and unconstrained firms. Using the logit regression to assign propensity scores for financially constrained and unconstrained firms in the first stage, the treatment test results provide evidence that if the firms are financially constrained then their risk-taking will be lower. ATET represents the average treatment effects on the treated (financially constrained firms) using observational data.

References

Acharya, V.V., Amihud, Y., Litov, L., 2011. Creditor rights and corporate risk-taking. J. Financ. Econ. 102 (1), 150–166, http://dx.doi.org/10.1016/j.jfineco.2011.04.001.

Akey, P., Lewellen, S., 2017. Policy Uncertainty, Political Capital, and Firm Risk-taking., http://dx.doi.org/10.2139/ssrn.2758395.

Allen, F., Gale, D., 2000. Corporate governance and competition. In: Corporate Governance: Theoretical and Empirical Perspectives, 10th ed. Cambridge University Press, London, United Kingdom, pp. 23–94.

Almeida, H., Campello, M., 2007. Financial constraints, asset tangibility and corporate investments. Rev. Financ. Stud. 20 (5), 1429–1460, http://dx.doi.org/10.1093/rfs/hhm019.

Almeida, H., Campello, M., Weisbach, M.S., 2011. Corporate financial and investment policies when future financing is not frictionless. J. Corp. Financ. 17 (3), 675–693, http://dx.doi.org/10.1016/j.jcorpfin.2009.04.001.

Ammann, M., Oesch, D., Schmid, M.M., 2013. Product market competition, corporate governance, and firm value: evidence from the EU area. Eur. Financ. Manag. 19 (3), 452–469, http://dx.doi.org/10.1111/j.1468-036X.2010.00605.x.

Antonakakis, N., Chatziantoniou, I., Filis, G., 2013. Dynamic co-movements of stock market returns, implied volatility and policy uncertainty. Econ. Lett. 120 (1), 87–92, http://dx.doi.org/10.1016/j.econlet.2013.04.004.

Bakas, D., Triantafyllou, A., 2018. The impact of uncertainty shocks on the volatility of commodity prices. J. Int. Money Finance 87, 96–111, http://dx.doi.org/10.1016/j.jimonfin.2018.06.001.

Baker, M., Stein, J.C., Wurgler, J., 2003. When does the market matter? Stock prices and the investment of equity-dependent firms. Q. J. Econ. 118 (3), 969–1005, http://dx.doi.org/10.1162/00335530360698478.

Baker, S.R., Bloom, N., Davis, S.J., 2016. Measuring economic policy uncertainty. Q. J. Econ. 131 (4), 1593–1636, http://dx.doi.org/10.1093/qje/qjw024.

Bauguess, S.W., Slovin, M.B., Sushka, M.E., 2012. Large shareholder diversification, corporate risk taking, and the benefits of changing to differential voting rights. J. Bank. Financ. 36 (4), 1244–1253, http://dx.doi.org/10.1016/j.jbankfin.2011.11.009.

Benoit, J.-P., 1984. Financially constrained entry in a game with incomplete information. Rand J. Econ. 15 (4), 490, http://dx.doi.org/10.2307/2555520.

Berger, A.N., Guedhami, O., Kim, H.H., Li, X., 2018. Economic policy uncertainty and bank liquidity creation. Ssrn Electron. J., http://dx.doi.org/10.2139/ssrn.3030489.

Bernal, O., Gnabo, J.-Y., Guilmin, G., 2016. Economic policy uncertainty and risk spillovers in the Eurozone. J. Int. Money Finance 65, 24–45, http://dx.doi.org/10.1016/j.jimonfin.2016.02.017.

Bernile, G., Bhagwat, V., Yonker, S., 2018. Board diversity, firm risk, and corporate policies. J. Financ. Econ. 127 (3), 588–612, http://dx.doi.org/10.1016/j.jfineco.2017.12.009.

Bloom, N., 2009. The impact of uncertainty shocks. Econometrica 77 (3), 623–685, http://dx.doi.org/10.3982/ECTA6248.

Bolton, P., Scharfstein, D.S., 1990. A theory of predation based on agency problems in financial contracting. Am. Econ. Rev. 80 (1), 93–106.

Bolton, P., Chen, H., Wang, N., 2013. Market timing, investment, and risk management. J. Financ. Econ. 109 (1), 40–62, http://dx.doi.org/10.1016/j.jfineco.2013.02.006.

Bonaime, A., Gulen, H., Ion, M., 2018. J. Financ. Econ. 129 (3), 531–558, http://dx.doi.org/10.1016/j.jfineco.2018.05.007.

Bordo, M.D., Duca, J.V., Koch, C., 2016. Economic policy uncertainty and the credit channel: aggregate and bank level U.S. Evidence over several decades. J. Financ. Stab. 26, 90–106, http://dx.doi.org/10.1016/j.jfs.2016.07.002.

Boubakri, N., Cosset, J.-C., Saffar, W., 2013. The role of state and foreign owners in corporate risk-taking: evidence from privatization. J. Financ. Econ. 108 (3), 641–658, http://dx.doi.org/10.1016/j.jfineco.2012.12.007.

Brogaard, J., Detzel, A., 2015. The asset pricing implications of government economic policy uncertainty. Manage. Sci. 61 (1), 3–18, http://dx.doi.org/10.1287/mnsc.2014.2044.

Carhart, M.M., 1997. On persistence in mutual fund performance. J. Finance 52 (1), 57–82, http://dx.doi.org/10.1111/j.1540-6261.1997.tb03808.x.

Datta, S., Iskandar-Datta, M., Sharma, V., 2011. Product market pricing power, industry concentration and analysts' earnings forecasts. J. Bank. Financ. 35 (6), 1352–1366, http://dx.doi.org/10.1016/j.jbankfin.2010.10.016.

Datta, S., Iskandar-Datta, M., Singh, V., 2013. Product market power, industry structure, and corporate earnings management. J. Bank. Financ. 37 (8), 3273–3285, http://dx.doi.org/10.1016/j.jbankfin.2013.03.012.

DeFond, M.L., Park, C.W., 1999. The effect of competition on CEO turnover. J. Account. Econ. 27 (1), 35–56, http://dx.doi.org/10.1016/S0165-4101(98)00044-5.

Demir, E., Ersan, O., 2017. Economic policy uncertainty and cash holdings: evidence from BRIC countries. Emerging Market Review 33, 189–200, http://dx.doi.org/10.1016/j.ememar.2017.08.001.

Ding, S., Jia, C., Qu, B., Wu, Z., 2015. Corporate risk-taking: exploring the effects of government affiliation and executives' incentives. J. Bus. Res. 68 (6), 1196–1204, http://dx.doi.org/10.1016/j.jbusres.2014.11.014.

Durnev, A., 2010. The Real Effects of Political Uncertainty: Elections and Investment Sensitivity to Stock Prices., http://dx.doi.org/10.2139/ssrn.1549714.

Faccio, M., Marchica, M.-T., Mura, R., 2016. CEO gender, corporate risk-taking, and the efficiency of capital allocation. J. Corp. Financ. 39, 193–209, http://dx.doi.org/10.1016/j.jcorpfin.2016.02.008.

Fama, E.F., French, K.R., 1992. The cross-section of expected stock returns. J. Finance 47 (2), 427–465, http://dx.doi.org/10.1111/j.1540-6261.1992.tb04398.x.

Fama, E.F., French, K.R., 1993. Common risk factors in the returns on stocks and bonds. J. financ. econ. 33 (1), 3–56, http://dx.doi.org/10.1016/0304-405X(93)90023-5.

Fama, E.F., French, K.R., 1996. Multifactor explanations of asset pricing anomalies. J. Finance 51 (1), 55–84, http://dx.doi.org/10.1111/j.1540-6261.1996.tb05202.x.

Fama, E.F., French, K.R., 2012. Size, value, and momentum in international stock returns. J. Financ. Econ. 105 (3), 457–472, http://dx.doi.org/10.1016/j.jfineco.2012.05.011.

Favara, G., Morellec, E., Schroth, E., Valta, P., 2017. Debt enforcement, investment, and risk taking across countries. J. Financ. Econ. 123 (1), 22–41, http://dx.doi.org/10.1016/j.jfineco.2016.09.002.

Francis, B.B., Hasan, I., Zhu, Y., 2014. Political uncertainty and bank loan contracting. J. Empir. Finance 29, 281–286, http://dx.doi.org/10.1016/j.jempfin.2014.08.004.

Frésard, L., Valta, P., 2015. How does corporate investment respond to increased entry threat? Rev. Corp. Financ. Stud., http://dx.doi.org/10.1093/rcfs/cfv015, cfv015.

Fu, F., 2009. Idiosyncratic risk and the cross-section of expected stock returns. J. Financ. Econ. 91 (1), 24–37, http://dx.doi.org/10.1016/j.jfineco.2008.02.003.

Gaspar, J., Massa, M., 2006. Idiosyncratic volatility and product market competition. J. Bus. 79 (6), 3125–3152, http://dx.doi.org/10.1086/505251.

Giroud, X., Mueller, H.M., 2010. Does corporate governance matter in competitive industries? J. Financ. Econ. 95 (3), 312–331, http://dx.doi.org/10.1016/j.jfineco.2009.10.008.

Giroud, X., Mueller, H.M., 2011. Corporate governance, product market competition, and equity prices. J. Finance 66 (2), 563–600, http://dx.doi.org/10.1111/j.1540-6261.2010.01642.x.

Griffith, R., 2001. *Product Market Competition*, Efficiency and Agency Costs: an Empirical Analysis [Working Paper Series]., http://dx.doi.org/10.1920/wp.ifs.2001.0112.

Grullon, G., Michaely, R., 2007. Corporate payout policy and product market competition. Ssrn Electron. J., http://dx.doi.org/10.2139/ssrn.972221.

Guan, Y., Tang, D.Y., 2018. Employees' risk attitude and corporate risk taking: evidence from pension asset allocations. J. Corp. Financ. 48, 261–274, http://dx.doi.org/10.1016/j.jcorpfin.2017.11.001.
Gulen, H., Ion, M., 2016. Policy uncertainty and corporate investment. Rev. Financ. Stud. 29 (3), 523–564, http://dx.doi.org/10.1093/rfs/hhv050.
Gupta, K., Krishnamurti, C., 2018. Do macroeconomic conditions and oil prices influence corporate risk-taking? J. Corp. Financ. 53, 65–86, http://dx.doi.org/10.1016/j.jcorpfin.2018.10.003.
Hillary, G., Hui, K.W., 2009. Does religion matter in corporate decision making in America? J. Financ. Econ. 93 (3), 455–473, http://dx.doi.org/10.1016/j.jfineco.2008.10.001.
Hofstede, G., 2001. Culture's Consequences: Comparing Values, Behaviors, Institutions and Organizations Across Nations. Sage publications.
Irvine, P.J., Pontiff, J., 2008. Idiosyncratic return volatility, cash flows, and product market competition. Rev. Financ. Stud. 22 (3), 1149–1177, http://dx.doi.org/10.1093/rfs/hhn039.
Jensen, M., 1986. Agency cost of free cash flow, corporate finance, and takeovers. Am. Econ. Rev. 76 (2), 323–329 https://www.jstor.org/stable/1818789.
John, K., Litov, L., Yeung, B., 2008. Corporate governance and risk-taking. J. Finance 63 (4), 1679–1728, http://dx.doi.org/10.1111/j.1540-6261.2008.01372.x.
Julio, B., Yook, Y., 2012. Political uncertainty and corporate investment cycles. J. Finance 67 (1), 45–83, http://dx.doi.org/10.1111/j.1540-6261.2011.01707.x.
Kang, W., Ratti, R.A., 2013. Oil shocks, policy uncertainty and stock market return. J. Int. Financ. Mark. Inst. Money 26, 305–318, http://dx.doi.org/10.1016/j.intfin.2013.07.001.
Kang, W., Lee, K., Ratti, R.A., 2014. Economic policy uncertainty and firm-level investment. J. Macroecon. 39, 42–53, http://dx.doi.org/10.1016/j.jmacro.2013.10.006.
Kaplan, S.N., Zingales, L., 1997. Do investment-cash flow sensitivities provide useful measures of financing constraints? Q. J. Econ. 112 (1), 169–215, http://dx.doi.org/10.1162/003355397555163.
Kim, O.S., 2019. Does political uncertainty increase external financing costs? Measuring the electoral premium in syndicated lending. J. Financ. Quant. Anal. 54 (5), 2141–2178, http://dx.doi.org/10.1017/S0022109018001382.
Koirala, S., Marshall, A., Neupane, S., Thapa, C., 2018. Corporate governance reform and risk-taking: evidence from a quasi-natural experiment in an emerging market. J. Corp. Financ., http://dx.doi.org/10.1016/j.jcorpfin.2018.08.007.
Konishi, M., Yasuda, Y., 2004. Factors affecting bank risk taking: evidence from Japan. J. Bank. Financ. 28 (1), 215–232, http://dx.doi.org/10.1016/S0378-4266(02)00405-3.
Lamont, O., Polk, C., Saaá-Requejo, J., 2001. Financial constraints and stock returns. Rev. Financ. Stud. 14 (2), 529–554, http://dx.doi.org/10.1093/rfs/14.2.529.
Lerner, A.P., 1934. Economic theory and socialist economy. Rev. Econ. Stud. 2 (1), 51, http://dx.doi.org/10.2307/2967550.
Li, K., Griffin, D., Yue, H., Zhao, L., 2013. How does culture influence corporate risk-taking? J. Corp. Financ. 23, 1–22, http://dx.doi.org/10.1016/j.jcorpfin.2013.07.008.
Li, X., Luo, J., Chan, K.C., 2018. Political uncertainty and the cost of equity capital. Financ. Res. Lett. 26, 215–222, http://dx.doi.org/10.1016/j.frl.2018.01.009.
Liu, L., Zhang, T., 2015. Economic policy uncertainty and stock market volatility. Financ. Res. Lett. 15, 99–105, http://dx.doi.org/10.1016/j.frl.2015.08.009.
Liu, J., Zhong, R., 2017. Political uncertainty and a firm's credit risk: evidence from the international CDS market. J. Financ. Stab. 30, 53–66, http://dx.doi.org/10.1016/j.jfs.2017.03.006.
Nguyen, P., 2011. Corporate governance and risk-taking: evidence from Japanese firms. Pacific-Basin Financ. J. 19 (3), 278–297, http://dx.doi.org/10.1016/j.pacfin.2010.12.002.
Nguyen, Q., Kim, T., Papanastassiou, M., 2018. Policy uncertainty, derivative use and firm-level FDI. J. Int. Bus. Stud. 49, 96–126, http://dx.doi.org/10.1057/s41267-017-0090-z.
Pástor, L., Veronesi, P., 2012. Uncertainty about government policy and stock prices. J. Finance 67 (4), 1219–1264, http://dx.doi.org/10.1111/j.1540-6261.2012.01746.x.
Pástor, L., Veronesi, P., 2013. Political uncertainty and risk premia. J. Financ. Econ. 110 (3), 520–545, http://dx.doi.org/10.1016/j.jfineco.2013.08.007.
Phan, H.V., Nguyen, N.H., Nguyen, H.T., Hegde, S., 2019. Policy uncertainty and firm cash holdings. J. Bus. Res. 95, 71–82, http://dx.doi.org/10.1016/j.jbusres.2018.10.001.
Raith, M., 2003. Competition, risk and managerial incentives. Am. Econ. Rev. 93 (4), 1425–1436, http://dx.doi.org/10.1257/000282803769206395.
Tian, G.Y., Twite, G., 2011. Corporate governance, external market discipline and firm productivity. J. Corp. Financ. 17 (3), 403–417, http://dx.doi.org/10.1016/j.jcorpfin.
Tran, Q.T., 2019. Economic policy uncertainty and corporate risk-taking: international evidence. J. Multinatl. Financ. Manag. 52–53, 1–11, http://dx.doi.org/10.1016/j.mulfin.2019.100605.2010.12.004.
Valta, P., 2012. Competition and the cost of debt. J. Financ. Econ. 105 (3), 661–682, http://dx.doi.org/10.1016/j.jfineco.2012.04.004.
Xu, Y., Malkiel, B.G., 2003. Investigating the behavior of idiosyncratic volatility. J. Bus. 76 (4), 613–645, http://dx.doi.org/10.1086/377033.