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REVIEW PAPER



Policy uncertainty and corporate investment: public versus private firms

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Abstract

Using a sample of comparably sized public listed and private firms from nine European countries, we show that public firms reduce their investments by about 50% more than private firms in response to an increase in policy-related uncertainty. We find suggestive evidence that this can be explained by public firms' management being typically subject to greater shareholder scrutiny than private firms' management. Furthermore, only public firms invest more efficiently when confronted with uncertainty. Thus, private firms may benefit from emulating the decision-making processes of public firms in uncertain times.

Keywords Uncertainty \cdot Investment \cdot Public versus private firms \cdot Shareholder scrutiny

JEL Classification $D80 \cdot D91 \cdot E22 \cdot E66 \cdot G38$

1 Introduction

Government agencies regularly alter and pass new regulations that companies must comply with. This leaves the entire business sector in a continual state of uncertainty as to if, when, and how new economic policy proposals will be signed into law. Uncertainty alone can lead to serious economic repercussions (Bloom 2009) by, among other things, depressing corporate investment activities (e.g., Kang et al. 2014; Baker et al. 2016). Real options theory attempts to explain such behavior by the desire of corporate managers to avoid costly mistakes. By postponing part of

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their investment projects, perhaps even indefinitely, managers try to wait until the uncertainty is removed and more informed decisions can be made (Bernanke 1983; McDonald and Siegel 1986; Ingersoll and Ross 1992; Dixit and Pindyck 1994).

In light of the sharp rise of policy-related uncertainty in Europe—heavily fueled by Britain's withdrawal from the European Union-we seek to advance this debate by investigating cross-sectional differences in the investment sensitivity of public and private European firms to Baker et al. (2016) Economic Policy Uncertainty (EPU) index. Despite private firms typically accounting for the largest share of a country's GDP (see Giannetti 2003), most of the empirical literature on uncertainty focuses exclusively on publicly listed firms (e.g., Gulen and Ion 2016; Kim and Kung 2017). However, private companies are fundamentally different from their public counterparts. They must comply with different legal requirements and operate under different ownership structures. Such fundamental differences can lead to diverging investment sensitivities to growth opportunities (Mortal and Reisel 2013; Asker et al. 2015; Gilje and Taillard 2016) and may thus also lead to contrasting investment decisions under uncertainty. Therefore, we are convinced that including private firms in our analysis and exploring possible differences between the two types of firms represents a more comprehensive and appropriate approach to gauge the actual impact of policy uncertainty on corporate investment.

The goal of this paper is threefold. First, we analyze whether EPU can depress investment decisions of private firms. Second, we examine whether there are significant differences in the investment sensitivity of public and private firms to EPU. Third, do public and private firms invest more efficiently in times of policy-related uncertainty?

Our firm-level analysis is based on a dataset containing financial information on a large set of public and private European firms from nine countries between 2009 and 2017. Firm-level information comes from the Amadeus Database by Bureau van Dijk.

To preview our results, we find a negative contemporaneous relation between private firms' fixed asset investment and uncertainty surrounding future economic policy decisions. This result withstands a range of sensitivity tests, including specifications aimed at eliminating potential endogeneity concerns and alternative sample selection criteria. It shows that the theoretical prediction of real options theory, which aims to capture the value of managers' temporal flexibility-independent of their work domain—seems to apply not only to public but also to private firms. Moreover, we demonstrate that the impact of EPU on investment is not felt equally by all firms. Public firms reduce their investments by about 50% more than private firms in response to an increase in policy-related uncertainty. We find suggestive evidence that this cross-sectional heterogeneity can be attributed to public firms' management being typically subject to greater scrutiny and myopic pressure from their shareholders than private firms' management (e.g., Asker et al. 2015; Gao et al. 2017). Specifically, we show that increases in shareholder power, transparency requirements, and liability standards are associated with fewer investments under uncertainty. This indicates that managers under higher shareholder scrutiny are likely to anticipate more severe negative consequences in the event of poor investment decisions, which fosters a larger degree of uncertainty averse decisions.

There are at least three possible explanations for why private European firms should face a lower baseline level of shareholder scrutiny in comparison to their public counterparts.

First, private firms are often managed by the major shareholder (founder) (see Asker et al. 2015), making it impossible to veto or fire the CEO. In contrast, CEOs of public firms act as mere agents of shareholders, leaving them principally vulnerable to being fired. In fact, Fisman et al. (2014) note that public shareholders are prone to call for the CEO's dismissal when short-term performance deteriorates, even if such events are entirely outside the CEO's control. Unsurprisingly, public firms display higher CEO turnover rates and have greater CEO and top management turnover-performance sensitivities than private firms (Lel et al. 2014; Gao et al. 2017).

Second, unlike private firms, public firms are obligated to hold an annual ordinary shareholders' meeting at which management is subject to open examination by their shareholders.

Third, while European law obliges private firms to report annual financial statements, public listed firms face even stricter disclosure requirements based on the Transparency Directive 2004/109/EC and country-specific stock exchange rules. The Transparency Directive, which was modified in 2013 by Directive 2013/50/EU, requires, among other things, the publication of half-yearly financial reports.¹ As a result, public firm managers should increasingly be aware of the ease and frequency with which shareholders can identify poor investment decisions.

In light of these differences, we expect public firm managers to cut their investments more acutely than private firm managers in times of uncertainty, as they should be even more concerned about having to account for their investment mistakes or getting laid off because of them.

As to whether public and private firms invest more efficiently in periods of uncertainty, our findings suggest that only public firms adapt to these changing circumstances. We find that in response to increases in policy-related uncertainty, public firms invest relatively more in high yielding projects. In comparison, the consolidated investments of private firms do not predict a significant increase in relative profitability when faced with uncertainty. Although insightful, these findings do not necessarily permit the conclusion that being publicly listed is the superior form of organization to adequately cope with spells of uncertainty. This is because private firms, unlike public ones, could (theoretically) always invest in the most efficient manner and therefore simply cannot invest even more efficiently in uncertain times.

From a time-series point of view, we observe that EPU negatively affects the investment activities of both public and private firms for an approximate duration of two years. After this period the negative impact begins to subside and will even turn positive for public firms. It is conceivable that this cross-sectional variation in recovery responses several years after the initial shock might be connected to the idiosyncratic increase in investment profitability rates in uncertain times. This could

¹ https://ec.europa.eu/info/business-economy-euro/company-reporting-and-auditing/company-reporting/ transparency-requirements-listed-companies_en.

encourage public firms to pursue new investments at a higher rate than before. As far as private firms are concerned, their inability to identify the projects that would justify immediate implementation the most potentially leads them to refrain from offsetting the initial investment decline in later periods.

Our paper contributes to the general literature on real options theory (e.g., Schwartz and Trigeorgis 2004; Grenadier and Malenko 2010). We show that the organizational form of a firm—public listed or private—is of critical importance in assessing the impact of policy-related uncertainty on corporate investment decisions. Having identified differences in the degree of shareholder scrutiny as a plausible explanation for this finding, this study contributes to the works of Baker et al. (2016), Gulen and Ion (2016), and Kim and Kung (2017) in demonstrating that the link between EPU and investment is not just a function of government dependencies or the degree of investment irreversibility. Thus, this study underscores the role of investor protection laws (La Porta et al. 1998, 2006; Djankov et al. 2008) in periods of uncertainty.

Assuming private firms do not always invest in the most efficient way possible, our results support the policy implication that if they were to adopt the decisionmaking processes of public companies in uncertain times, this could help them prioritize those projects that most warrant immediate implementation. Thus, when confronted with uncertainty, private firm decision-makers should be more transparent about their planned investments and actively seek and incorporate feedback from their peers.

The remainder of this paper is organized as follows. Section 2 outlines the data and sampling methods used in the study. Section 3 details our empirical results, starting with the analysis of the relationship between policy-related uncertainty and private firms' investments. This is followed by the examination of cross-sectional differences between the investment sensitivities of public and private firms to uncertainty and the channel that serves to explain their heterogeneous responses. Section 4 tests whether public and private firms invest more efficiently in periods of uncertainty. Section 5 analyzes the link between policy-related uncertainty and investment over time. Section 6 contains robustness tests. Section 7 concludes.

2 Data

Our dataset comprises firms from nine European countries covering the period 2009 to 2017. We obtain firm-level fundamentals from the Amadeus Database by Bureau van Dijk. Amadeus provides accounting data for a set of public and private European firms. These data are available because European law obligates private firms to disclose annual financial reports. Public firms face even stricter disclosure requirements.

The focus of this study is to analyze the effect of economic policy uncertainty on corporate investment. However, the Amadeus Database does not report any investment measure such as capital expenditures. For this reason, we follow Asker et al. (2015) and define *Investment* as the annual change in total fixed assets scaled by beginning-of-year total assets. To capture the impact of uncertainty related to future

economic policies, the firm-level data are complemented by Baker et al.'s (2016) EPU index.

2.1 Economic policy uncertainty

As of January 2020, the website www.policyuncertainty.com provides policy uncertainty measures for ten European countries based on the methodology of Baker et al. (2016). Separate monthly policy uncertainty indexes are created for France, Germany, Italy, Spain, and the United Kingdom by Baker et al. (2016). Additionally, the same index has been calculated for Greece by Fountas et al. (2018), for Ireland by Zalla (2017), for the Netherlands by Kroese et al. (2015), and for Sweden by Armelius et al. (2017). A policy uncertainty index is also available for Russia, but following Giannetti (2003) and Mortal and Reisel (2013), we exclude firms from Eastern European countries from our sample due to insufficient data availability in the Amadeus Database. Thus, our empirical analysis is limited to nine European countries.

To measure economic policy uncertainty, newspaper articles are: (1) counted that include keywords regarding: policy, economic, and uncertainty; and (2) set in proportion to the total count of articles publicized by the corresponding newspaper outlet in the same month. The list of keywords varies from country to country depending on the native language and regional peculiarities. The index draws on leading newspapers in individual countries, e.g. *Le Monde* in France or *Financial Times* in the U.K. To generate an index at the country-level, "[...] each monthly newspaper-level series [is standardized] to unit standard deviation [...] and [averaged] across the papers by month" (Baker et al. 2016, p. 1599) before being normalized to an average value of 100 prior to 2011.

Figure 1 shows the monthly time-series of the economic policy uncertainty index for the U.K. As expected, Fig. 1 illustrates that the highest values are achieved around the Brexit referendum. This observation supports the assumption that the index is a reliable indicator of economic policy-related uncertainty. Regardless of this meaningful observation, Baker et al. (2016) also conduct several formal tests to ensure that their measure adequately captures the uncertainty pertaining to future economic policies. Besides, Fig. 1 shows that the time-series does not only indicate rare events—such as elections or referendums—but also exhibits substantial fluctuations over the entire sample period.

2.2 Control variables

On firm-level, we control for growth opportunities, cash flow, and size in all regressions. The investment literature typically uses Tobin's q or sales growth as a measure of growth opportunities. Tobin's q is commonly defined as the ratio between the market value of the company and the book value of its assets. However, the market values of private firms cannot be determined as they are not listed on a stock exchange. Therefore, similar to Mortal and Reisel (2013) and Gilje and Taillard (2016), we utilize sales growth as an alternative measure of growth opportunities



Fig. 1 Economic Policy Uncertainty in the U.K

because it can be calculated for both types of firms. Sales growth is calculated as the change in the firm's turnover scaled by the turnover of the previous year.

Cash flow is reported in the Amadeus Database for all firms. For our analysis, the cash flow variable is scaled by beginning-of-year total assets. We measure the size of a company by the natural logarithm of its total assets. To account for the macroe-conomic environment in a country, we include the annual GDP growth and inflation rate as provided by the World Bank as additional control variables.

Although we rely on the classic corporate finance literature to select firm-level control variables (e.g., Mortal and Reisel 2013; Foucault and Fresard 2014), we recognize that our list of controls is not exhaustive. For example, prior empirical studies find that a firm's payout policy influences its investment behavior (Almeida et al. 2016; Wang et al. 2021) while being significantly correlated with Baker et al.'s (2016) EPU index (Smietanka et al. 2018; Pirgaip and Dinçergök 2019; Attig et al. 2021; Anolick et al. 2021). Unfortunately, information about private companies' payout policies is not available. As a consequence, we must be conservative in the causal interpretation of our results.

2.3 Sample construction

Our sample covers the period 2009–2017. We classify firms into public listed and private firms. The Amadeus Database includes an identifier that indicates the listing status of every company. However, this identifier only provides information on the

contemporaneous listing status and does not contain historical information. Therefore, we supplement this variable by extracting information on initial public offering (IPO) and delisting dates from the Osiris dataset by Bureau van Dijk. This allows us to elicit the annual listing and delisting status of every company in our sample. Consequently, a firm-year is indicated as 'listed' if the firm is quoted on a stock exchange in a given year and was reported to be unlisted prior to its IPO. Likewise, a firm-year is classified as 'unlisted' if the firm is not quoted on a stock exchange in a given year and was reported to be listed prior to its delisting. In line with Mortal and Reisel (2013), we classify private firms by their legal form as indicated in the dataset and exclude from our sample cooperatives, foreign companies, foundations, government enterprises, sole proprietorships, and unlimited partnerships.

In a manner similar to Baker et al. (2003) and McLean and Zhao (2014), we omit firm-years with total assets less than 10 million euros to reduce undue effects of small businesses. In addition, we exclude financial and (regulsated) utility firms from our sample—that is, firms with a one-digit SIC code of six and a two-digit SIC code of 49. All firm-level variables are winsorized at the 1% and 99% level in order to mitigate the impact of outliers.

In a last step, we drop all firm-year observations with missing data for *Investment, Sales growth, Cash flow*, or *Size*. These filters result in 291,415 private firmyear observations. The number of private firm-year observations is substantially larger than the number of public listed firm-year observations. They only amount to 4.5% of the private firm-year observations. Table 1 shows that the full sample covers 56,802 unique private firms and only 2,301 unique public listed firms.

There are large differences between the public listed and private firm samples, especially with regard to their total assets. The average public firm has about 22 times more assets than the average private firm. To improve the comparability of these samples, we follow (Gilje and Taillard 2016) and try to find for every public company the private company that is most similar in terms of total assets in the same industry, country, and year. In those cases where there is no suitable match in the same industry and country with an overall similar asset amount for a public firm in the year of entering the sample, we attempt to find a match in the following year. Matched private and public listed firms stay in the sample for the entire duration of the public firm's existence. In the event that a matched private firm stops existing, we try to identify a new match for the public firm during the exact same year, thus ensuring that the public firm will continue to belong to the matched sample. Similar to Asker et al. (2015) and Gilje and Taillard (2016), our matching procedure is based on replacements, allowing us to take within-firm effects into account in our analyses. To the degree that large private firms behave more like public firms, this matching procedure has the potential to bias the estimates towards detecting no differences between them.

The determined matched sample includes 18,912 firm-year observations. It comprises 2238 unique private firms and 1786 unique public listed firms. The difference in total assets reduces dramatically. In the full sample, the average public listed firm has about 22 times more assets than the average private firm. In the matched sample, the average public firm has only 1.6 times more assets than the average private firm.

	Full sample			Matched sample		
	Public	Private	Difference	Public	Private	Difference
Total asset						
Mean	2898.701	129.257	2769.444	770.740	480.307	290.433
SD	17,046.884	1235.407		8090.304	5265.316	
Investment						
Mean	0.035	0.018	0.017	0.039	0.017	0.023
SD	0.151	0.116		0.160	0.120	
Sales growth						
Mean	0.164	0.140	0.024	0.193	0.110	0.083
SD	0.775	0.674		0.834	0.637	
Cash flow						
Mean	0.066	0.084	-0.018	0.069	0.085	- 0.016
SD	0.121	0.108		0.127	0.113	
Size						
Mean	18.957	17.479	1.478	18.617	17.897	0.720
SD	1.659	1.076		1.434	1.361	
No. of obs.	13,128	291,415		9456	9456	
No. of firms	2301	56,802		1786	2238	

Table 1 Descriptive statistics

Note: This table contains summary statistics for the full and matched samples of public listed and private firms between 2009 to 2017. A description of the construction of the samples and details on the matching procedure are given in Sect. 2. Samples are divided into calendar years; financial years ending between 1 January and 31 May are counted towards ending in the preceding calendar year. The table presents means and standard deviations of the main firm-level variables used in our analysis as well as pairwise differences in means. All firm-level data are obtained from the Amadeus Database by Bureau van Dijk. *Total asset* is expressed in millions of euros. *Investment* is the annual change in total fixed assets scaled by beginning-of-year total assets, *Sales growth* is the change in the firm's turnover scaled by the turnover of the previous year, *Cash flow* is reported in the Amadeus Database and it is scaled by beginning-of-year total assets, and *Size* is the natural logarithm of total assets. All firm-level variables are winsorized at the 1% and 99% level to reduce the impact of outliers

For our matching procedure, we apply a caliper of 0.05 on the maximum total asset difference and use three-digit SIC industries. In Table 11 in the Appendix, we show that our results are robust to using other calipers (± 0.04), two-digit SIC, or four-digit NAICS industries.

Table 2 presents country-specific summary statistics for our main macroeconomic variables. As expected—due to the Brexit referendum—the country with the highest average EPU index in our sampling period is the U.K. The Netherlands and Sweden have the lowest mean EPU scores and are therefore the countries least affected by economic policy uncertainty in our sample. The mean values of *GDP growth* and *Inflation* are relatively similar across all nine European countries. The average *GDP growth* ranges between 0.184% and 2.696%. There are only two outliers: Ireland (6.657%) and Greece (-2.942%). Both countries were heavily affected by the euro crisis in the late 2000s, but starting in 2012 the Irish economy began to recover

France EPU

Table 2 Descriptive statistics by country

Mean	SD
253.344	45.882
1.306	0.722
0.814	0.330
168.627	33.495
2.130	1.292
1.496	0.426
149.986	39.246
- 2.942	3.982

GDP growth	1.306	0.722
Inflation	0.814	0.330
Germany		
EPU	168.627	33.495
GDP growth	2.130	1.292
Inflation	1.496	0.426
Greece		
EPU	149.986	39.246
GDP growth	- 2.942	3.982
Inflation	- 0.384	1.163
Ireland		
EPU	143.945	24.411
GDP growth	6.657	8.019
Inflation	0.676	3.204
Italy		
EPU	124.488	25.607
GDP growth	0.184	1.625
Inflation	0.987	0.403
Netherland		
EPU	100.355	30.482
GDP growth	1.434	1.357
Inflation	0.800	0.472
Spain		
EPU	128.349	24.758
GDP growth	0.695	2.471
Inflation	0.307	0.434
Sweden		
EPU	101.071	6.436
GDP growth	2.696	1.933
Inflation	1.505	0.498
United Kingdom		
EPU	298.994	135.716
GDP growth	2.029	0.472
Inflation	1.666	0.546

Note: This table presents summary statistics for the macroeconomic variables used in the main part of our analysis. Economic Policy Uncertainty (EPU) is the yearly average of a country's news-based policy uncertainty index, as developed by Baker et al. (2016). GDP growth and Inflation are retrieved from the World Bank's World Development Indicators. GDP growth is the annual percentage change in GDP and Inflation is the annual GDP deflator

significantly. The average *Inflation* varies from 0.307% in Spain to 1.666% in the U.K. Only Greece has a slightly negative average *Inflation* of -0.384%.

3 The relationship between policy uncertainty and public and private firms' investment decisions

We begin our empirical analysis by estimating whether private firms' fixed asset investments are sensitive to changes in economic policy uncertainty. The existing empirical literature finds a negative link between policy-related uncertainty and the investment decisions of public firms (e.g. Kang et al. 2014; Gulen and Ion 2016; Baker et al. 2016). However, because private firms differ fundamentally from their public counterparts in terms of their legal requirements or ownership structures, we cannot draw reliable conclusions about private firms' investment sensitivity to EPU based purely on public firm results. Mortal and Reisel (2013), Asker et al. (2015), and Gilje and Taillard (2016), for example, show that public and private firms adjust their investments very differently to changing economic circumstances; the same may thus also apply in times of economic policy uncertainty. Therefore, we run the following regression model for our sample of only private European firms:

$$Investment_{i,t} = \alpha_i + \alpha_t + \beta_1 \log(EPU_{j,t}) + \beta_2 SG_{i,t} + \beta_3 CF_{i,t} + \beta_4 Size_{i,t} + \beta_5 GDP growth_{i,t} + \beta_6 Inflation_{i,t} + \epsilon_{i,t}$$
(1)

where *i* indexes firms, *t* indexes years, and *j* denotes countries. The dependent variable, *Investment*, is the annual change in total fixed assets scaled by beginning-ofyear total assets. The variables α_i and α_t are firm and year fixed effects, respectively. Our independent variable of interest is log(EPU). It is the natural logarithm of Baker et al. (2016) economic policy uncertainty measure. *SG* stands for sales growth and it captures the change in the firm's turnover scaled by the turnover of the previous year. *CF* is cash flow, which is scaled by beginning-of-year total assets. Firm *Size* is captured by the natural logarithm of total assets. *GDP growth* is the annual percentage change in GDP and *Inflation* is measured by the annual GDP deflator. In all regressions reported, standard errors are double clustered at the firm- and year-level.

In line with previous literature, regression 1 in Table 3 shows that the variable of interest (EPU) has a negative relationship with public firm-level investment. Similarly, regression 2 reveals that an increase in policy-related uncertainty is associated with a significant decrease in private firms' investment decisions. This demonstrates that the theoretical prediction of real options theory applies not only to public but also to private firms. Specifically, the coefficient on the natural logarithm of EPU is -0.031 (*t*-statistic = -3.052) and *Investment* in our private firm sample has a mean value of 0.018. This implies that, ceteris paribus, a 10% increase in the level of policy uncertainty is associated with a contemporaneous decline in private firm *Investment* equivalent to $0.031/(10 \times 0.018) = 17.222\%$ of the sample mean. Hence, this finding is both statistically significant as well as economically relevant. With regard to the additional control variables, which remain qualitatively similar in

	Dependent variable: Investment					
	Private firm sample	Public firm sample	Full sample		Matched sample	
	(1)	(2)	(3)	(4)	(5)	(6)
Log(EPU)	- 0.031***	- 0.051***	- 0.032***	- 0.031***	- 0.051***	- 0.033***
	(- 3.052)	(- 3.209)	(- 3.126)	(- 3.027)	(-4.020)	(-2.666)
$Log(EPU) \times Public$				-0.018**		- 0.034***
listed				(- 2.024)		(-4.595)
Public listed				0.100**		0.281***
				(2.102)		(4.449)
Sales growth	0.014***	0.034***	0.016***	0.016***	0.026***	0.026***
	(18.591)	(8.139)	(19.393)	(19.403)	(9.110)	(9.027)
Cash flow	0.135***	0.312***	0.144***	0.144***	0.200***	0.200***
	(21.636)	(8.954)	(22.819)	(22.830)	(9.695)	(9.672)
Size	0.084***	0.111***	0.086***	0.086***	0.104***	0.105***
	(7.698)	(6.487)	(7.701)	(7.694)	(6.754)	(6.845)
GDP growth	0.000	0.001	0.000	0.000	- 0.001	- 0.001
	(0.095)	(0.940)	(0.098)	(0.125)	(-0.663)	(-0.689)
Inflation	-0.002	- 0.004	- 0.002	-0.002	0.000	0.000
	(-0.905)	(- 1.596)	(-0.959)	(-0.975)	(0.051)	(0.084)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R ²	0.076	0.15	0.079	0.079	0.113	0.115
Observations	291,415	13,128	304,543	304,543	18,912	18,912

Table 3 Baseline investment reg	gressions
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Note: This table reports firm-level regression estimates of Eq. (1). The dependent variable is *Investment*. The independent variables of interest are Log(EPU) and *Public listed*. Log(EPU) is the natural logarithm of a country's economic policy uncertainty index. *Public listed* is an indicator variable that takes the value of 1 for each year the firm is identified as being listed on a stock exchange and 0 otherwise. See Tables 1 and 2 for further variable definitions. Regressions 1 and 2 show the results for the two samples of private or public firms, respectively. Regressions 3 and 4 include results for the full sample of private and public firms. Regressions 5 and 6 show results for the matched sample. All regressions include year dummies as well as firm fixed effects. Standard errors are clustered on both firm and year. Robust *t*-statistics are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively

all specifications, their relations with *Investment* do not exhibit salient discrepancy to the extant empirical finance literature.

In regression 3, we estimate the same equation for our full sample of public listed and private firms, consisting of 304,543 firm-year observations. The coefficient on log(EPU) loads negatively at the 1% significance level. It indicates that, on average, a rise in EPU is associated with a reduction in public and private firms' investment.

To investigate potential cross-sectional differences in investment sensitivities between public listed and private firms, we introduce an additional interaction term to Eq. (1). It interacts the natural logarithm of EPU with an indicator variable which is equal to unity if the firm is listed on a stock exchange, and zero if it is a private firm. The results are reported in regression 4. They show that the relationship between policy uncertainty and corporate investment is a function of the organizational form of the firm. The negative and significant interaction term of -0.018 (*t*-statistic = -2.024) demonstrates that investments of public listed firms are more sensitive to economic policy uncertainty than investments of private firms. To quantify the total impact of EPU on public firm investment, we need to aggregate the coefficients on log(EPU) and on the log(EPU)-Public listed interaction term. The log(EPU) coefficient in this regression is -0.031. Thus, a 10% increase in EPU is associated with a decrease in public firm *Investment* of about $(-0.031 - 0.018 \times 1)/10 = -0.005$. *Investment* in our full sample has a mean value of 0.019,² so this represents a reduction equivalent to 26.316% of the sample mean. As for private firms, *Investment* only declines by 16.316% relative to the sample mean, which corresponds to approximately three fifth of the decrease of public firms.

Regressions 5 and 6 in Table 3 are based on our matched sample. Their results are comparable to those observed in the full sample. Focusing on the non-uniformity in the cross-section, regression 6 provides additional evidence that the relationship between EPU and corporate investment is a function of the type of firm—that is, being public listed or private. The coefficient on the interaction term is -0.034 (*t*-statistic = -4.595). *Investment* in our matched sample has a mean of 0.028. These results imply that when EPU assumes a level 10% higher as what is used to be, public firm *Investment* is 23.929% lower (relative to the sample mean) than before the increase. This compares to a reduction in *Investment* by 11.786% of the sample mean if the firm were not listed on a stock exchange. Hence, public firms cut their investments by about 50% more than private firms in response to an increase in policy-related uncertainty.

In the following subsection, we provide empirical evidence that this cross-sectional variation is likely to be related to public firms' management being typically subject to greater shareholder scrutiny than private firms' management.

3.1 Shareholder scrutiny

Real options theory predicts that when confronted with uncertainty, managers tend to respond by reducing their contemporaneous investment activity in anticipation that they would otherwise make costly investment mistakes (e.g., Bernanke 1983; Dixit and Pindyck 1994). We argue that this wait-and-see behavior should intuitively be reinforced when managers are aware that they are under a higher level of scrutiny and will face more severe consequences if such mistakes were indeed to occur.

Prior literature suggests that the management of public companies typically faces greater shareholder scrutiny and myopic pressure than the management of private companies (e.g., Asker et al. 2015; Gao et al. 2017). Consequently, this should help explain the heterogeneous investment-EPU sensitivities observed in Table 3.

² This figure is the weighted average of the mean *Investment* values of public and private companies: $(13,128 \times 0.035 + 291,415 \times 0.018)/(13,128 + 291,415) = 0.019$.

We submit that there are at least three reasons why public European firms should be exposed to higher levels of scrutiny from their shareholders compared to their private counterparts.

First, most private firms are managed by the owner (major shareholder) (see Asker et al. 2015). This frequently makes it impossible to veto their decisions, let alone fire them. In contrast, the CEOs of public firms are merely agents of their shareholders, which theoretically puts them in constant danger of being dismissed. For instance, Fisman et al. (2014) find that public shareholders are quick to demand the CEO's removal when short-term performance deteriorates, even when such events are completely outside the CEO's control. Not surprisingly, public firms display higher CEO turnover rates and exhibit greater CEO and top management turnover-performance sensitivities than private firms (Lel et al. 2014; Gao et al. 2017).

Second, listed firms are required by law to hold an annual ordinary shareholders' meeting at which management is in principle subject to open scrutiny by their shareholders. Conversely, private firms are not legally compelled to hold such a meeting and thus do not have to publicly answer to their shareholders.

Lastly, while European law obliges private firms to report annual financial statements, public listed firms face even stricter disclosure requirements. According to the Transparency Directive 2004/109/EC—amended by Directive 2013/50/EU in 2013—public firms are required to publish half-yearly financial reports. Accordingly, public firm managers should be increasingly conscious of the ease and frequency with which shareholders can pinpoint poor investment decisions.

Given these differences in ownership structures and legal requirements, we expect managers of public firms to become even more apprehensive about making investments amidst the uncertainty, as they should be even more concerned than their private firm counterparts about having to account for their investment mistakes or getting laid off because of them.

In order to (indirectly) test this hypothesis, we rely on cross-country differences in public firms' minority shareholder rights (Djankov et al. 2008; La Porta et al. 1998), disclosure requirements, and liability standards (La Porta et al. 2006). If there is any truth to our argument, we would expect publicly traded firms from countries with stronger shareholder rights and higher disclosure and liability standards to reduce their investments more acutely to an increase in EPU. As public and private firms are confronted with similar differences in legal requirements as the countries in our sample, the underlying intuition of such public firm results should principally be transferable to the public versus private firm domain as well. We test this prediction with the following regression model:

$$Investment_{i,t} = \alpha_i + \alpha_t + \beta_1 \log(EPU_{j,t}) + \beta_2 \log(EPU_{j,t}) \times Inv. Protection_j + \beta_3 SG_{i,t} + \beta_4 CF_{i,t} + \beta_5 Size_{i,t} + \beta_6 GDP growth_{j,t} + \beta_7 Inflation_{j,t} + \epsilon_{i,t}$$
(2)

where *Inv. Protection* stands for four mean-centered investor protection measures: *Anti-Self, Anti-Dir, Disclosure*, and *Liability*. We define each of these country-level

	Dependent variable: Investment				
	Anti-self	Anti-dir	Disclosure	Liability	
	(1)	(2)	(3)	(4)	
Log(EPU)	- 0.028***	- 0.036***	- 0.035***	- 0.034**	
	(-2.971)	(- 3.396)	(- 3.431)	(- 2.207)	
$Log(EPU) \times Inv.$ protection	- 0.115***	- 0.020***	- 0.186***	- 0.109***	
	(- 5.789)	(-4.942)	(-6.173)	(- 3.633)	
Sales growth	0.033***	0.033***	0.033***	0.034***	
	(7.947)	(7.979)	(7.883)	(8.051)	
Cash flow	0.309***	0.310***	0.309***	0.311***	
	(8.958)	(8.957)	(8.932)	(8.977)	
Size	0.112***	0.112***	0.113***	0.111***	
	(6.689)	(6.642)	(6.759)	(6.485)	
GDP growth	- 0.000	0.000	-0.000	0.001	
	(- 0.255)	(0.171)	(- 0.206)	(0.547)	
Inflation	- 0.003	- 0.003	- 0.003**	- 0.003	
	(- 1.587)	(- 1.641)	(- 1.967)	(- 1.086)	
Firm fixed effects	Yes	Yes	Yes	Yes	
Year dummies	Yes	Yes	Yes	Yes	
Adjusted R ²	0.154	0.153	0.153	0.151	
Observations	13,128	13,128	13,128	13,128	

Table 4 Investment regression with investor protection variables

Note: This table reports firm-level regression estimates of Eq. (2) for the full sample of only publicly listed firms. The dependent variable is *Investment*. The independent variables of interest are Log(EPU) and *Inv. Protection.* Log(EPU) is the natural logarithm of a country's economic policy uncertainty index. *Inv. Protection* is a mean-centered placeholder variable that either stands for a measure of antiself-dealing, anti-director rights index, disclosure requirements, or liability standards. Detailed variable definitions are provided in the Appendix. See Table 1 for firm-level variable definitions. All regressions include year dummies as well as firm fixed effects. Standard errors are clustered on both firm and year. Robust *t*-statistics are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively

legal variables in detail in the Appendix. According to our hypothesis, we expect β_2 to be negative and statistically significant.

The estimation results of Eq. (2) are reported in Table 4. In regressions 1 and 2, we alternatively use two minority shareholder rights indexes (*Anti-Self* and *Anti-Dir*) to directly quantify shareholders' theoretical control over the decision-making processes within a listed firm. Intuitively, the greater the control of (minority) shareholders over corporate decision-making processes, the lower the ability of CEOs and top management to act independently and they should therefore be more cautious of their own shareholders. The negative and significant coefficients on the interaction term indicate that the better the shareholder protection in a country, the greater the investment reduction of public firms to policy-related uncertainty. Specifically, in

regression 1, the coefficient on the interaction term between the natural logarithm of EPU and the mean-centered *Anti-Self* variable is -0.115 (*t*-statistic = -5.789). *Investment* in our public firm sample has a mean of 0.035. Thus, a 10% increase in EPU is associated with a decline in *Investment* equivalent to 8.000% of the sample mean for a public firm that resides in a country with an average level of shareholder protection (e.g., Italy). This compares to a reduction in *Investment* by 19.500% relative to the sample mean if the firm were located in the U.K., the country with the highest level of *Anti-Self* of 0.35 in our sample. This is nearly two and a half times as strong a reaction as that of an average Italian firm.

Regressions 3 and 4 interact our measures of disclosure requirements (*Disclosure*) and liability standards (*Liability*) with the natural logarithm of EPU, respectively. While stricter disclosure requirements increase the company's transparency towards its shareholders, stronger liability standards allow investors to place managers under greater (legal) scrutiny if they provide misleading information. In both regressions, the coefficients on the interaction term load negatively at the 1% level. They indicate that the stronger the disclosure and liability standards, the greater the reduction in public firms' investment in times of heightened economic policy uncertainty.

These results suggest that different levels of shareholder scrutiny—induced by varying minority shareholder rights and disclosure and liability standards—can explain cross-countries differences in public firms' investment sensitivities to EPU. Since public and private European firms differ to a similar extent with regard to the legal requirements they need to adhere to, these findings provide some (indirect) explanation for the non-uniform reaction between the two types of companies as well.

4 Policy uncertainty and future operating performance

This section explores whether public and private firms invest more efficiently when exposed to increasing policy-related uncertainty. Theoretically, return on investment should be comparatively high when EPU is high as both public and private firms significantly reduce their investments due to their increasing fear of making costly mistakes (see Table 3). Consequently, both firms should primarily invest in their most valuable projects, i.e. those projects that justify immediate implementation rather than postponement. This line of reasoning is related to McLean and Zhao's (2014) findings. They demonstrate that when firms' financing costs are high, some of their projects will have to be abandoned. The ensuing consolidation of investments is then carried out in such a manner that the firms primarily realize their most profitable projects. Therefore, we run the following regression for both public and private firms:

AverageROA_{*i*,*t* to *t*+2} =
$$\alpha_i + \alpha_t + \beta_1$$
 Investment_{*i*,*t*}
+ β_2 Investment_{*i*,*t*} × log(EPU_{*j*,*t*}) + β_3 log(EPU_{*j*,*t*}) + $\mathbf{X}'_{i,t} + \epsilon_{i,t}$
(3)

Table 5Investment, EPU, andEx post efficiency		Dependent variable: Average ROA		
Ex post enterency		Public firms	Private firms	
		(1)	(2)	
	Investment	- 0.244**	- 0.051	
		(- 2.329)	(-0.577)	
	$Log(EPU) \times Investment$	0.050***	0.007	
		(2.593)	(0.397)	
	Log(EPU)	0.016**	0.004	
		(2.179)	(0.576)	
	Control variables	Yes	Yes	
	Firm fixed effects	Yes	Yes	
	Year dummies	Yes	Yes	
	Adjusted R ²	0.200	0.243	
	Observations	6431	6361	

Note: This table reports firm-level regression estimates of Eq. (3). The dependent variable is the Average ROA over a 3-year period (t, t + 1, and t + 2). The independent variables of interest are *Invest*ment and Log(EPU). Investment is defined as the annual change in total fixed assets scaled by beginning-of-year total assets. Log(EPU) is the natural logarithm of a country's economic policy uncertainty index. The set of control variables includes Sales growth, Cash flow, Size, GDP growth, and Inflation. See Tables 1 and 2 for definitions of these variables. Regressions 1 and 2 present results for the public listed and private firms of the matched sample, respectively. All regressions include year dummies as well as firm fixed effects. Standard errors are clustered on both firm and year. Robust t-statistics are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively

The dependent variable is the average annual return-on-assets (ROA) measured over a 3-year period including the year in which the investment is undertaken. Annual ROA is captured by the variable used in the Amadeus Database for the return on total assets. It is defined as profit before taxation scaled by total assets. \mathbf{X}' denotes our typical set of control variables. According to our hypothesis, we expect the interaction term between investment and the natural logarithm of EPU to be positive and significant for both types of firms.

Table 5 presents the results of the operating performance regressions. We divide our matched sample into public and private firms. For expositional clarity, we only present the coefficients of interest (β_1 to β_3). Regression 1 examines public firms. The coefficient on the interaction term between investment and the natural logarithm of EPU is 0.050 (*t*-statistic = 2.593). It shows that the greater the threat of policy-related uncertainty, the more efficiently public firms invest. In detail, a one unit increase in *Investment* portends a 0.011 rise in public firms' *ROA* whenever they experience the average level of uncertainty of 163.240 in our sample. If EPU were to reach its maximum of 542.766 in our sample, public firms' average ROA

would increase by 0.071, which is more than six times as much as before. This result demonstrates that public firms invest relatively more in their most valuable projects when they have to deal with mounting economic policy uncertainty. Or, put differently, the quality of realized investments improves as uncertainty increases.

In regression 2—in contrast to public firms—the coefficient on the *Investment*-log(EPU) interaction term is insignificant. This estimate implies that a greater level of policy uncertainty is not associated with an increase in private firms' investment profitability.

In summary, the estimates show that when faced with uncertainty, only public firms invest in a more profitable manner than in tranquil periods. Since both types of firms significantly reduce their investments in uncertain times, this suggests that public firms are more capable of identifying their most valuable projects—that is, those projects that warrant immediate execution rather than deferral.³

We suspect that these cross-sectional differences are again related to the fact that managers of public firms have to be more concerned about potential costly investment mistakes and the associated consequences than their private firm counterparts. This is because if they decided to pursue uncertain investments and they later prove to be underperforming, they would be more likely to lose their jobs than private firm decision-makers (Lel et al. 2014; Gao et al. 2017). Embracing the decision-making processes of public firms in uncertain times could therefore aid private firms in detecting those investment opportunities that most justify immediate implementation.

Consequently, in the face of uncertainty, private company decision-makers should increasingly incorporate feedback from their peers into their investment strategy. Having to present and justify investment ideas to others may not put their jobs at risk, but at least their reputation. This should increase the propensity to invest in projects with the highest degree of certainty for a given rate of expected profitability, i.e. easy-to-justify investments. This idea is related to the literature that finds that when investors have to engage and explain their investment decisions to human brokers instead of anonymously trading online (Barber and Odean 2001, 2002; Konana and Balasubramanian 2005) or when they have to justify their decisions to other members of an investment club (Barber et al. 2003), they tend to prefer investing in projects with lower levels of uncertainty. Konana and Balasubramanian (2005) find that online investors are partially afraid of their interactions with traditional brokers as they do not want to be judged by them of lacking in knowledge about the economics of the stock market.

We conclude this section with a small caveat regarding the interpretation of our results. On first sight, it might be tempting to deduce that public firms operate more profitably than private ones in uncertain times. While this might be the case, our results do not necessarily imply that. This is because private firms might have higher initial profitability rates that simply do not change during periods of uncertainty,

³ This inference is based on the (lenient) assumption that private firms do not invest in the most efficient way at all times, i.e. have ex ante potential for improvement.

but are still greater than the increased profitability rates of public firms in uncertain times.

5 The dynamic relationship between policy uncertainty and investment decisions

This section examines the evolving relation over time between policy uncertainty and fixed asset investment for both public and private firms. The most commonly used method for studying such dynamic relationships is the estimation of vector autoregressions (VARs) with the subsequent computation of impulse response functions (IRFs). IRFs would allow us to assess and visualize the endogenous investment reaction to an initial EPU shock across subsequent points in time. Consequently, we start by estimating VARs based on our standard set of variables: *log(EPU)*, *Cash flow, Sales growth, Size, GDP growth, Inflation,* and *Investment*. The VARs are run on annual data from 2009 to 2017, using a lag structure of one. To calculate the IRFs, we apply a Cholesky decomposition using the same variable order outlined above.⁴

Both IRFs are displayed in Fig. 2. As shown in the top panel, we observe that a one unit shock to EPU has a negative and statistically significant impact on public firms' fixed asset investment for an approximate duration of two years, reaching its trough 1 year after the shock. This finding is in accordance with real options theory. As (policy-related) uncertainty increases, the urge of firm managers to inform themselves (about government commitments) becomes more valuable than investing immediately in uncertain projects. Thus, the option value of an investment delay exceeds the value of immediate investment. This causes companies to postpone part of their investments. However, when focusing on later periods, we discover a rebound effect that starts towards the end of the third year and lasts almost until the end of the fourth year after the initial shock. This observation is in line with the notion that although uncertainty may trigger investment delays, once it is cleared up, the levels of investment will rise to meet pent-up demand. These results are similar to those of Gulen and Ion (2016), who find that in times of policy-related uncertainty spells, public U.S. firms experience an initial decline in investment for about two and a half years, which is attenuated by a rebound effect in later periods.

The bottom panel of Fig. 2 indicates that, comparable to public firms, a one unit shock to EPU has a negative and significant impact on private firms' fixed asset investment for about two years. Again, the IRF reaches its trough 1 year after the shock. However, contrary to public firms, we fail to detect a statistically significant rebound in investments at any time in the future. Thus, consistent with real options theory, both public and private firms postpone part of their investments, whereas private firms delay them indefinitely.

⁴ Our results remain qualitatively similar when we position the EPU index as the last variable in the ordering, or when we include election year dummies.



Fig. 2 Effect of a policy uncertainty shock on corporate investment

It is possible that this cross-sectional variation in recovery responses several years after the initial shock might be connected to the idiosyncratic increase in investment profitability rates in uncertain times. This could encourage public firms to pursue new investments at a higher rate than before. As far as private firms are concerned, their inability to identify the projects that would justify immediate implementation the most potentially leads them to refrain from offsetting the initial decline in later periods. Consequently, no significant rebound in their investments can be observed.

6 Robustness

6.1 Omitted variable bias

In this subsection, we adopt multiple specifications to assess the robustness of our baseline finding of a negative relation between EPU and private firms' investment decisions. One potential point of concern with our analysis thus far is that the EPU index may track some macroeconomic information pertaining to investment opportunities, despite the efforts of Baker et al. (2016) to ensure that it does not merely reflect macroeconomic conditions. Several authors point out that economic uncertainty is counter-cyclical (e.g., Bloom 2009; Baker et al. 2016). As policy-makers often feel the urge to implement policy changes to combat prevailing poor economic conditions, it appears reasonable to assume that EPU is also counter-cyclical and thus negatively correlates with investment opportunities. Consequently, if our current control variables in the form of *GDP growth* and *Inflation* do not fully reflect firms' overall investment chances, our estimates might suffer from a potential omitted variable bias.

In order to alleviate such concerns, we estimate Eq. (1) for our full sample of 291,415 private firm-years with the addition of two country-level economic indicators that are likely to impact corporate investment decisions. These controls consist of annual GDP per capita (*GDP per capita*) and annual exports plus imports scaled by GDP (*Trade*).

The results are reported in Table 6. Regression 1 shows that despite the inclusion of *GDP per capita* and *Trade*, the magnitude and significance of the EPU coefficient remain virtually unchanged. Specifically, the coefficient on log(EPU) is -0.030 (*t*-statistic = -2.737). Thus, a 10% increase in EPU stands in association to reduce private firms' *Investment* by about 16.667% of the sample mean. Compared to the initial decline of 17.222% reported in regression 1 in Table 3, this provides us with substantiated evidence that our results are not compromised by omitted investment opportunity measures. Similarly, in regression 2, we use the first principal component from a different set of control variables developed to capture investment opportunities. This set of variables follows (Greenland et al. 2019) and comprises the forecasted real GDP growth (*Predicted RGDP growth*), the Composite Leading Indicator (*CLI*), the Business Confidence Indicator (*BCI*), and the Consumer Confidence Indicator (*CCI*). All variables are obtained from the OECD database.

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	Dependent vari	Dependent variable: Investment				
	(1)	(2)	(3)	(4)		
Log(EPU)	- 0.030***	- 0.031***	- 0.029***	- 0.029***		
	(- 2.737)	(- 2.991)	(-3.128)	(-2.859)		
GDP growth	0.000	0.000	0.000	0.000		
	(0.336)	(0.005)	(0.239)	(0.425)		
Inflation	- 0.002	- 0.001	- 0.002	- 0.002		
	(- 0.829)	(- 0.778)	(-0.888)	(-0.765)		
GDP per capita	- 0.000**			- 0.000*		
	(- 1.993)			(- 1.663)		
Trade	0.000			0.000		
	(0.620)			(0.152)		
Economic condition, first PC		0.000		0.000		
		(0.345)		(0.176)		
Return volatility			- 0.520	- 0.468		
			(- 1.494)	(- 1.512)		
CS std. dev. of sales growth			- 0.040***	- 0.038***		
			(-2.749)	(-2.655)		
Firm-level control variables	Yes	Yes	Yes	Yes		
Firm fixed effects	Yes	Yes	Yes	Yes		
Year dummies	Yes	Yes	Yes	Yes		
Adjusted R ²	0.076	0.076	0.077	0.077		
Observations	291,415	291,415	291,415	291,415		

 Table 6
 Full private firm sample: further macroeconomic control variables

Note: This table reports firm-level regression estimates of Eq. (1) for our full private firm sample with additional macroeconomic control variables. The dependent variable is *Investment*. The independent variable of interest is *Log(EPU)*. It is the natural logarithm of a country's economic policy uncertainty index. *GDP per capita* is expressed in constant 2011 international dollars. *Trade* is exports plus imports scaled by annual GDP. *GDP per capita* and *Trade* are retrieved from the World Bank's World Development Indicators. *Economic condition, first PC* is the first principle competent of four different OECD measures for economic prospects. Theses OECD measures are described in detail in the Appendix. *Return volatility* is the time-series volatility of realized monthly returns on the main stock exchange in each country of the previous year and *CS std. dev. of sales growth* is the cross-sectional standard deviation of sales growth of all firms in our sample in each country of the previous year. The set of firm-level control variables includes *Sales growth, Cash flow*, and *Size*. See Tables 1 and 2 for definitions of the other variables. All regressions include year dummies as well as firm fixed effects. Standard errors are clustered on both firm and year. Robust *t*-statistics are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively

Nevertheless, despite the inclusion of the *Economic condition, first PC* variable, the coefficient on *log(EPU)* remains negative and significant.⁵

⁵ In Tables 12 and 13 in the Appendix, private firm *Investment* is regressed on each variable used to construct the *Economic condition*, *first PC* measure. Again, we find that the inclusion of these variables does not substantially alter the size or significance of our primary covariate.

A second potential concern to which the previous literature has already alerted is that the EPU index may simply reflect macroeconomic uncertainty, which is not necessarily tied to future policy decisions (see Gulen and Ion 2016; Greenland et al. 2019). Since events such as recessions, wars, and financial crises do not only increase policy-related uncertainty but also contribute to intensifying overall macroeconomic uncertainty, firms facing policy uncertainty may also experience uncertainty about other elements of their operations (e.g., supply chain issues).

To address this matter, we include two alternative measures of macroeconomic uncertainty. First, we use one of the most frequently applied proxies of general macroeconomic uncertainty as perceived by the stock market (e.g., Bloom 2009; Taglioni and Zavacka 2013). We therefore calculate the time-series volatility of realized monthly returns on the respective main stock exchange in each of our nine European countries (Return volatility). The monthly return data are from the Thomson Reuters Eikon database. Second, in line with Bloom (2009) we also utilize the crosssectional standard deviation of sales growth for all firms in each country included in our sample (CS std. dev. of sales growth) to measure macroeconomic uncertainty. Regression 3 in Table 6 shows that while the coefficients on *Return volatility* and CS std. dev. of sales growth have a negative relationship with private firm investment, only CS std. dev. of sales growth is statistically distinguishable from zero. Crucially, these controls have little impact on our point estimate of interest, which remains qualitatively unaffected. Lastly, regression 4 demonstrates that economic policy uncertainty affects private firm investment in a way that is consistent with our model, even when investment opportunities and general macroeconomic uncertainty are included in a single specification.

While the estimates of Table 6 are based on our full sample of 291,415 private firm-years, Table 7 presents estimates based on the private firm observations used in our matched sample. Regarding the primary covariate, the results show no salient discrepancies from the previous table. Hence, Tables 6 and 7 are in line with our baseline finding. The negative relationship between economic policy uncertainty and investment decisions of private firms does not systematically depend on the omission of investment opportunity and macroeconomic uncertainty measures.

6.2 Instrumental variable analysis

The existing literature on corporate investment has long acknowledged the difficult task to discriminate between uncertainty and bad investment opportunities. Another important objective is to ensure that EPU reflects only uncertainty related to future economic policies and does not capture the uncertainty surrounding future macroeconomic developments in general. As demonstrated above, we deal with this challenge by controlling for these interfering factors using various measures of investment opportunities and overall macroeconomic uncertainty. However, the effectiveness of this strategy hinges critically on the precision and appropriateness of the measures employed. We thus use an instrumental variable (IV) approach

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	Dependent var	Dependent variable: Investment				
	(1)	(2)	(3)	(4)		
Log(EPU)	- 0.032***	- 0.033***	- 0.029***	- 0.028***		
	(- 3.341)	(- 3.594)	(-3.106)	(-2.996)		
GDP growth	0.001	0.002*	0.002**	0.001		
	(1.114)	(1.793)	(2.287)	(1.103)		
Inflation	- 0.003	-0.002	- 0.002	- 0.003		
	(- 1.281)	(- 0.866)	(-0.979)	(- 1.270)		
GDP per capita	0.000			0.000*		
	(1.206)			(1.702)		
Trade	0.001*			0.001		
	(1.691)			(0.910)		
Economic condition, first PC		-0.000		0.001		
		(-0.250)		(0.575)		
Return volatility			- 0.738	- 0.779		
			(- 1.286)	(- 1.439)		
CS std. dev. of sales growth			- 0.080***	- 0.081***		
			(- 5.172)	(-4.966)		
Firm-level control variables	Yes	Yes	Yes	Yes		
Firm fixed effects	Yes	Yes	Yes	Yes		
Year dummies	Yes	Yes	Yes	Yes		
Adjusted R ²	0.061	0.061	0.063	0.063		
Observations	9456	9456	9456	9456		

 Table 7
 Matched private firm sample: further macroeconomic control variables

Note: This table reports firm-level regression estimates of Eq. (1) for our matched private firm sample with additional macroeconomic control variables. The dependent variable is *Investment*. The independent variable of interest is *Log(EPU)*. It is the natural logarithm of a country's economic policy uncertainty index. *GDP per capita* is expressed in constant 2011 international dollars. *Trade* is exports plus imports scaled by annual GDP. *GDP per capita* and *Trade* are retrieved from the World Bank's World Development Indicators. *Economic condition, first PC* is the first principle competent of four different OECD measures for economic prospects. Theses OECD measures are described in detail in the Appendix. *Return volatility* is the time-series volatility in monthly returns on the main stock exchange in each country of the previous year and *CS std. dev. of sales growth* is the cross-sectional standard deviation of sales growth of all firms in our sample in each country of the previous year. The set of firm-level control variables. All regressions include year dummies as well as firm fixed effects. Standard errors are clustered on both firm and year. Robust *t*-statistics are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively

to mitigate the risk that the measures may not completely eliminate potential endogeneity problems present in our previous analysis.

We propose one such variable, namely the relative strength of right-wing parties in government (*Gov. right*). It is based on the "gov_right2" index taken from the Comparative Political Data Set 1960-2017 (CPDS).⁶ It measures the percentage of parliamentary seats held by right-wing parties in government. Intuitively, this index ranges from 0 to 100, taking a value of 0 if no right-wing party is represented in parliament and 100 if all parliamentary seats are held by right-wing parties.

We expect to find a positive link between *Gov. right* and policy-related uncertainty. The rationale for this positive relationship is straightforward: In recent decades, the rising popularity of right-wing populist parties has become a central issue in the European political environment (Trumm 2018). In some countries, they were already part of the government or strongly associated with it, such as the Lega Nord (LN) in Italy or the Partij voor de Vrijheid (PVV) in the Netherlands. With their anti-establishment and pro-national stance, these parties have created much instability in the political system and in the business world (de Sousa et al. 2020). Even if these parties are not directly part of the government, they influence the positions of the established parties (Muis and Immerzeel 2017). The established parties feel they have to adapt some of the positions of the right-wing populist parties in order to win back their voters. For example, one of the greatest successes of European rightwing populist parties was in 2015, when UKIP forced the ruling Tories to hold the Brexit referendum in 2016, leading to dramatic economic policy uncertainty across the European continent (Bale 2018).

Thus, we expect that a higher percentage of right-wing parties in government increases the impact of populism on the political system, which should lead to greater policy-related uncertainty. Therefore, our measure should meet the relevance condition as an instrument. In contrast, it is not apparent how the composition of the government affects business investments, except through its influence on economic policy uncertainty. Correspondingly, we are certain that our proposed instrumental variable should also meet the exclusion restriction.

In Table 8, we re-run our baseline regression for the full and matched sample of private firms using the index as outlined above as an instrument for economic policy uncertainty. The results of the first-stage regression show that the *Gov. right* variable is a significant and strong determinant of the natural logarithm of EPU. In particular, the coefficient on log(1 + Gov. right) is 0.111 (*t*-statistic = 3.765) for the full private firm sample. The F-statistic is 14.18, indicating that we are not suffering from a weak instrument problem. The results imply that a doubling of the relative power position of right-wings parties in government is associated with a 11.1% increase in policy-related uncertainty.

The second-stage regression estimates show that EPU, indeed, has an exogenous impact on investments of private firms that is not attributable to other distorting factors. The impact of EPU is still negative and significant. Therefore, we are confident that our previously presented results are not significantly compromised by endogeneity issues, but are in fact linked to the exogenous impact of the uncertainty surrounding future economic policy decisions.

⁶ Armingeon, Klaus, Virginia Wenger, Fiona Wiedemeier, Christian Isler, Laura Knöpfel, David Weisstanner and Sarah Engler (2019). Comparative Political Data Set 1960–2017. Institute of Political Science, University of Zürich.

	Dependent variable:					
	Investment	Log(EPU)	Investment	Log(EPU)		
	Full private firm sample		Matched private firm sample			
	(1)	(2)	(3)	(4)		
Log(EPU)	- 0.035**		- 0.039*			
	(- 2.280)		(- 1.779)			
Log(1 + Gov. right)		0.111***		0.080***		
		(3.765)		(3.265)		
Sales growth	0.014***	- 0.006***	0.008**	- 0.003		
	(17.511)	(-2.748)	(2.045)	(- 0.934)		
Cash flow	0.134***	- 0.054**	0.112***	- 0.016		
	(22.809)	(- 2.373)	(5.278)	(- 0.601)		
Size	0.085***	- 0.019	0.085***	- 0.017		
	(7.748)	(- 1.286)	(7.747)	(- 1.502)		
GDP growth	-0.000	- 0.068***	0.002	- 0.049**		
	(-0.087)	(- 2.879)	(1.047)	(- 2.054)		
Inflation	- 0.001	0.183***	- 0.001	0.152***		
	(-0.709)	(3.450)	(-0.331)	(2.737)		
Firm fixed effects	Yes	Yes	Yes	Yes		
Year dummies	Yes	Yes	Yes	Yes		
Adjusted R ²	0.076	0.745	0.061	0.761		
Observations	291,415	291,415	9,456	9,456		

Table 8 Instrumental variables analysis

In Regression 1, this table replicates our results from Table 1 for the full and matched private firm samples using a two-stage least squares approach with Log(1 + Gov. right) as an instrument for Log(EPU). Log(EPU) is the natural logarithm of a country's economic policy uncertainty index. The *Gov. right* variable quantifies the relative dominance of right-wing parties in government based on their seat share in parliament. It is obtained from the Comparative Political Data Set 1960–2017 (CPDS). See Tables 1 and 2 for definitions of the other variables. Regression 2 reports the results of the first-stage regression. All regressions include year dummies as well as firm-fixed effects. Standard errors are clustered on both firm and year. Robust *t*-statistics are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively

6.3 Alternative matching procedure

Thus far, our matching procedure is comparable to that of Mortal and Reisel (2013), Asker et al. (2015), and Gilje and Taillard (2016). Specifically, based on a caliper of 0.05, each public firm is matched with a private firm that is most similar in terms of total assets in the same industry, country, and year. While this drastically reduces the difference in average firm size between these two types of firms, it unfortunately leads to an increase in heterogeneity in sales growth (see Table 1).

To mitigate the possibility that our results are in any way distorted by this circumstance, we create a new matched sample using an alternative matching procedure. It uses nearest neighbor matching in each year based on *Sales growth*,

	Dependent variable: Investment		
	(1)	(2)	
Log(EPU)	- 0.055***	- 0.045***	
	(-4.177)	(- 3.247)	
$Log(EPU) \times Public listed$		- 0.016*	
		(- 1.718)	
Public listed		0.129**	
		(2.180)	
Sales growth	0.029***	0.029***	
	(9.836)	(9.849)	
Cash flow	0.307***	0.307***	
	(11.104)	(11.106)	
Size	0.110***	0.110***	
	(6.839)	(6.889)	
GDP growth	- 0.002	-0.002	
	(- 1.448)	(- 1.478)	
Inflation	0.001	0.001	
	(0.219)	(0.248)	
Firm fixed effects	Yes	Yes	
Year dummies	Yes	Yes	
Adjusted R ²	0.136	0.137	
Observations	22,232	22,232	

This table reports firm-level regression estimates of Eq. (1) based on an alternatively matched sample (controls = *Sales growth, Cash flow*, and *Firm size*; exact match = year, industry, and country; nearest neighbor matching). The dependent variable is *Investment*. The independent variables of interest are Log(EPU) and *Public listed*. Log(EPU) is the natural logarithm of a country's economic policy uncertainty index. *Public listed* is an indicator variable that takes the value of 1 for each year the firm is identified as being listed on a stock exchange and 0 otherwise. See Tables 1 and 2 for further variable definitions and see Table 14 in the Appendix for descriptive statistics of the match sample. All regressions include year dummies as well as firm fixed effects. Standard errors are clustered on both firm and year. Robust *t*-statistics are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively

Cash flow, and *Size* in the same industry and country. Table 14 in the Appendix shows that in this newly created sample, the differences between public and private firms with respect to all three variables are smaller compared to our unmatched sample.

Regression 1 in Table 9 reports estimation results of Eq. (1). The coefficient on log(EPU) is -0.055 (*t*-statistic = -4.177), indicating that an increase in economic policy uncertainty continues to be significantly associated with depressing the investment behavior of public and private European firms. Compared with the

sample

 Table 9
 Investment regressions

 based on alternatively matched

coefficient on log(EPU) in regression 5 in Table 3 of -0.051, this result suggests that the effect of EPU is almost independent of the matching procedure applied.

To examine whether the two types of firms continue to differ significantly in their investment responses to policy uncertainty, a $log(EPU) \times Public listed$ interaction term is introduced in regression 2. Similar to our baseline results, the coefficient on the interaction term is negative and statistically significant. It implies that public firms reduce their investments more than private firms to an increase in EPU. Therefore, we are confident that our baseline results are not simply attributable to the adoption of the matching approach of Mortal and Reisel (2013), Asker et al. (2015), and Gilje and Taillard (2016).

7 Conclusion

This paper studies whether Baker et al.'s (2016) economic policy uncertainty index can depress investment decisions of private firms and whether their reaction differs significantly from that of public ones. Our analyses are conducted in a large sample of public and private firms from nine European countries between 2009 and 2017.

The results show that private firms invest significantly less in times of uncertainty. This finding is robust in different specifications aimed at eliminating potential endogeneity concerns. Further, we observe that public firms reduce their investments by about 50% more than private firms in response to an increase in uncertainty. We attribute these results to the greater inclination of public firm management to avoid scrutiny by their shareholders, which fosters a larger degree of uncertainty averse decisions. When examining how the relationship between policy uncertainty and investment varies at different points in time, we find that unlike private firms, public firms experience a rebound effect in their investment levels. This variation in recovery responses might be connected to our observation that only public firms invest more efficiently when confronted with increases in policy-related uncertainty. This could encourage public firms to pursue investments at a higher rate than before whereas private firms refrain from offsetting their initial decline in later periods.

In terms of policy implications, our results suggest that if private companies do not always invest in the most efficient manner, they may benefit from adopting the decision-making processes of public companies in uncertain times, as this could help them identify the projects that justify immediate implementation the most. Therefore, when faced with uncertainty, private company decision-makers should proactively gather and consider feedback from their peers on future investments.

We see an avenue for future research to explore other channels that could help further explain the different investment responses of public and private firms to uncertainty. For example, Michaely and Roberts (2012) argue that public firms face greater public scrutiny than private firms because analysts only track and monitor listed companies.

Appendix for "Policy uncertainty and corporate investment: public versus private firms"

Description of variables

Variable	Туре	Description
I. Country-level legal variable	les	
Anti-self	Cross-section	This variable stands for the anti- self-dealing index constructed by Djankov et al. (2008) and measures the strength of minority shareholder protection against self-dealing. It includes both the ex ante strength of law that hinders self-dealing and the ex post enforcement of this law, once a self-dealing transaction occurred
Anti-dir	Cross-section	The anti-director rights index is con- structed by La Porta et al. (1998). It measures the extent to which minority shareholders are pro- tected in business decision-making processes. The index is constructed by adding up indicator variables for six sub-categories. A sub-category receives a value of one when: "(1) the country allows shareholders to mail their proxy vote to the firm, (2) shareholders are not required to deposit their shares prior to the general shareholders' meeting, (3) cumulative voting or proportional representation of minorities in the board of directors is allowed, (4) an oppressed minorities mechanism is in place, (5) the minimum percent- age of share capital that entitles a share-holder to call for an extraor- dinary shareholders' meeting is less than or equal to 10 percent (the sample median), or (6) shareholders' have pre-emptive rights that can be waived only by a shareholders' vote" (La Porta et al. 1998, p. 1123)

Variable	Туре	Description
Disclosure	Cross-section	The index of disclosure, as established by La Porta et al. (2006), measures the disclosure requirements of public firms in a given country. It is the arithmetic mean of six sub- categories, all of which are designed as indicator variables with being equal to one if certain requirements are meet and zero otherwise. The sub-categories measure whether a country requires a firm to deliver a prospectus to its investors when new securities are issued and whether this prospectus needs to include information on the directors' and officers' compensations, share- holder structure, insider ownership, irregular contracts, and any business dealings between the issuer and its officers and directors
Liability	Cross-section	The public firm liability standard index is created by La Porta et al. (2006) and is equal to the arithmetic mean of three sub-categories. The categories measure the liability standards of the issuing firm, the distributors, and the accountants in case that losses occur to the investor due to misleading information in the prospectus
II. Macroeconomic control var	iables	
Predicted RGDP growth	Cross-section and annual time-series	This variable resembles the forecasted real GDP growth from the OECD database. The OECD's forecast relies on expert- and model-based evaluations of the economic envi- ronment in specific countries and the world economy
CLI	Cross-section and annual time-series	This index stands for the Composite Leading Indicator and is devel- oped by the OECD. It consists of multiple components, which reflect the business cycle. Components considered differ between countries according to the availability of data. For instance, the CLI for the United States includes, among several other things, the number of new homes started, the number of weekly hours worked in manufacturing, and stock prices (NYSE composite)

Variable	Туре	Description
BCI	Cross-section and annual time-series	This index stands for the Business Confidence Indicator. It is based on the OECD's Business Tendency Surveys and measures managers' expectations on the economic devel- opment by calculating the average score on questions about future trends in production, finished goods inventory, and order backlogs
CCI	Cross-section and annual time-series	This index stands for the Consumer Confidence Indicator. It is based on the OECD's Consumer Opinion Surveys and measures how consum- ers assess the economic develop- ment. The index averages the scores on questions that compare the economic situation of the recent past with expectations on the immediate future
Economic condition, first PC	Cross-section and annual time-series	This variable represents the first principle component of the four above-mentioned macroeconomic control variables

Additional tables

See Tables 10, 11, 12, 13 and 14

Sample	Public	Public firms		Private firms			Public-private firms	
	Mean	SD	No. of obs.	Mean	SD	No. of obs.	Diff. in means	
SIC3 & cal. = 0.05	771	8090	9456	480	5265	9456	290	
SIC3 & cal. = 0.01	980	13,395	8206	538	5686	8206	442	
SIC3 & cal. = 0.09	897	8792	9768	468	5186	9768	429	
SIC2 & cal. = 0.05	846	8468	10,149	549	5359	10,149	296	
NAICS4 & cal. = 0.05	796	9357	9275	459	5271	9275	337	

Table 10 Means and standard deviations: total assets

Note: This table presents means and standard deviations of firms' total assets (in millions of euros) for the basic matched sample and for various variations of our initial matching specification. A description of the construction of the sample and details on the basic matching procedure are given in Sect. 2. In rows 1, 2, and 3, the matched samples are based on three-digit SIC industry sectors. The matched sample in row 4 is based on two-digit SIC industry sectors and in row 5 on four-digit NAICS industry sectors. For comparing purposes, row 1 is a repetition of our basic matched sample that is based on a caliper of 0.05. Row 2 applies a caliper of 0.01 and row 3 a caliper of 0.09. Rows 4 and 5 use a caliper of 0.05. The final column presents pairwise differences in means of firms' total assets

	Dependent var	Dependent variable: Investment						
	SIC3 & cal.=0.05	SIC3 & cal.=0.01	SIC3 & cal.=0.09	SIC2 & cal.=0.05	NAICS4 & cal.=0.05			
	(1)	(2)	(3)	(4)	(5)			
Log(EPU)	- 0.033***	- 0.033*	- 0.027*	- 0.038**	- 0.042**			
	(- 2.666)	(- 1.837)	(- 1.902)	(-2.319)	(- 2.256)			
$Log(EPU) \times Public$	- 0.034***	- 0.029***	- 0.037***	- 0.030***	- 0.021**			
listed	(-4.595)	(- 3.520)	(-4.886)	(-2.979)	(- 1.977)			
Public listed	0.281***	0.005	0.238***	0.200***	0.174**			
	(4.449)	(0.039)	(3.922)	(3.124)	(2.392)			
Sales growth	0.026***	0.031***	0.027***	0.026***	0.027***			
	(9.027)	(9.406)	(7.851)	(7.009)	(7.183)			
Cash flow	0.200***	0.219***	0.226***	0.231***	0.185***			
	(9.672)	(7.646)	(10.865)	(10.612)	(6.703)			
Size	0.105***	0.105***	0.106***	0.099***	0.111***			
	(6.845)	(7.397)	(7.082)	(6.337)	(6.362)			
GDP growth	- 0.001	- 0.002	- 0.001	- 0.000	- 0.000			
	(- 0.689)	(- 1.103)	(- 1.048)	(-0.142)	(-0.142)			
Inflation	0.000	0.001	- 0.000	- 0.001	- 0.002			
	(0.084)	(0.332)	(- 0.203)	(-0.421)	(- 0.820)			
Firm fixed effects	Yes	Yes	Yes	Yes	Yes			
Year dummies	Yes	Yes	Yes	Yes	Yes			
Adjusted R ²	0.115	0.13	0.123	0.117	0.125			
Observations	18,912	16,412	19,536	20,298	18,550			

Table 11 Investment regressions with different matching approaches

Note: This table reports firm-level regression estimates that capture cross-sectional differences between public and private firms for the basic matched sample and for various variations of our initial matching specification. The dependent variable is *Investment*. The independent variables of interest are Log(EPU) and *Public listed*. Log(EPU) is the natural logarithm of a country's economic policy uncertainty index. *Public listed* is an indicator variable that takes the value of 1 for each year the firm is identified as being listed on a stock exchange and 0 otherwise. See Tables 1 and 2 for variable definitions and Table 11 for the composition of the samples. All regressions include year dummies as well as firm fixed effects. Standard errors are clustered on both firm and year. Robust *t*-statistics are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively

	Dependent variable: Investment						
	(1)	(2)	(3)	(4)	(5)	(6)	
Log(EPU)	- 0.031***	- 0.031***	- 0.031***	- 0.031***	- 0.031***	- 0.031***	
	(-2.991)	(- 3.052)	(- 3.052)	(- 3.052)	(- 2.991)	(- 2.991)	
Predicted RGDP	0.000				0.000		
growth	(0.345)				(0.345)		
CLI		0.149***			0.029		
		(6.332)			(1.411)		
BCI			- 0.031***		- 0.016		
			(- 6.332)		(- 0.855)		
CCI				- 0.020***	- 0.006		
				(- 6.332)	(- 0.457)		
Economic condition,						0.000	
first PC						(0.345)	
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	
Adjusted R ²	0.076	0.076	0.076	0.076	0.076	0.076	
Observations	291,415	291,415	291,415	291,415	291,415	291,415	

Table 12 Full private firm sample: controlling for economic conditions

Note: This table reports firm-level regression estimates of Eq. (1) for our full private firm sample with additional economic condition controls, as described in the Appendix. The dependent variable is *Investment*. The independent variable of interest is *Log(EPU)*. It is the natural logarithm of a country's economic policy uncertainty index. The set of control variables includes *Sales growth*, *Cash flow*, *Size*, *GDP growth*, and *Inflation*. See Tables 1 and 2 for definitions of these variables. All regressions include year dummies as well as firm fixed effects. Standard errors are clustered on both firm and year. Robust *t*-statistics are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively

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	Dependent variable: Investment							
	(1)	(2)	(3)	(4)	(5)	(6)		
Log(EPU)	- 0.033***	- 0.033***	- 0.033***	- 0.033***	- 0.033***	- 0.033***		
	(- 3.594)	(- 3.556)	(- 3.556)	(- 3.556)	(- 3.594)	(- 3.594)		
Predicted RGDP	-0.000				-0.000			
growth	(- 0.250)				(- 0.250)			
CLI		0.106***			0.006			
		(4.108)			(0.303)			
BCI			- 0.022***		0.009			
			(- 4.108)		(0.498)			
CCI				- 0.014***	- 0.019			
				(- 4.108)	(- 1.600)			
Economic condition,						-0.000		
first PC						(- 0.250)		
Control variables	Yes	Yes	Yes	Yes	Yes	Yes		
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes		
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes		
Adjusted R ²	0.061	0.061	0.061	0.061	0.061	0.061		
Observations	9,456	9,456	9,456	9,456	9,456	9,456		

 Table 13
 Matched private firm sample: controlling for economic conditions

This table reports firm-level regression estimates of Eq. (1) for our matched private firm sample with additional economic condition controls, as described in the Appendix. The dependent variable is *Investment*. The independent variable of interest is *Log(EPU)*. It is the natural logarithm of a country's economic policy uncertainty index. The set of control variables includes *Sales growth*, *Cash flow*, *Size*, *GDP growth*, and *Inflation*. See Tables 1 and 2 for definitions of these variables. All regressions include year dummies as well as firm fixed effects. Standard errors are clustered on both firm and year. Robust *t*-statistics are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively

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		Full sam	Full sample			Matched sample		
		Public	Private	Difference	Public	Private	Difference	
Investment	Mean	0.035	0.018	0.017	0.039	0.024	0.015	
	SD	0.151	0.116		0.156	0.136		
Sales growth	Mean	0.164	0.140	0.024	0.174	0.196	- 0.023	
	SD	0.775	0.674		0.776	0.897		
Cash flow	Mean	0.066	0.084	- 0.018	0.073	0.078	-0.005	
	SD	0.121	0.108		0.121	0.114		
Size	Mean	18.957	17.479	1.478	19.077	18.574	0.503	
	SD	1.659	1.076		1.659	1.496		
No. of observations		13,128	291,415		11,116	11,116		
No. of firms		2,301	56,802		2,016	5,626		

Table 14 Descriptive statistics for alternatively matched sample

Note: This table contains summary statistics for our full sample and alternatively matched sample that is used in Table 9. A description of the construction of the new sample and details on the matching procedure are given in Sect. 6. Samples are divided into calendar years; financial years ending between 1 January and 31 May are counted towards ending in the preceding calendar year. The table presents means and standard deviations of the main firm-level variables used in our analysis as well as pairwise differences in means. All firm-level data are obtained from the Amadeus Database by Bureau van Dijk. See Tables 1 and 2 for further variable definitions

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Declarations

Conflict of interest None of the authors have any conflict of interest to declare.

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References

- Almeida H, Fos V, Kronlund M (2016) The real effects of share repurchases. J Financ Econ 119(1):168-185
- Anolick N, Batten JA, Kinateder H, Wagner N (2021) Time for gift giving: abnormal share repurchase returns and uncertainty. J Corp Finance 66:101787
- Armelius H, Hull I, Köhler HS (2017) The timing of uncertainty shocks in a small open economy. Econ Lett 155:31–34
- Asker J, Farre-Mensa J, Ljungqvist A (2015) Corporate investment and stock market listing: A puzzle? Rev Financ Stud 28(2):342–390
- Attig N, El Ghoul S, Guedhami O, Zheng X (2021) Dividends and economic policy uncertainty: international evidence. J Corp Finance 66:101785
- Baker M, Stein JC, Wurgler J (2003) When does the market matter? Stock prices and the investment of equity-dependent firms. Q J Econ 118(3):969–1005
- Baker SR, Bloom N, Davis SJ (2016) Measuring economic policy uncertainty. Q J Econ 131(4):1593–1636
- Bale T (2018) Who leads and who follows? The symbiotic relationship between UKIP and the conservatives-and populism and euroscepticism. Politics 38(3):263–277
- Barber BM, Odean T (2001) The internet and the investor. J Econ Perspect 15(1):41-54
- Barber BM, Odean T (2002) Online investors: Do the slow die first? Rev Financ Stud 15(2):455-488
- Barber BM, Heath C, Odean T (2003) Good reasons sell: reason-based choice among group and individual investors in the stock market. Manag Sci 49(12):1636–1652
- Bernanke BS (1983) Irreversibility, uncertainty, and cyclical investment. Q J Econ 98(1):85-106
- Bloom N (2009) The impact of uncertainty shocks. Econometrica 77(3):623-685
- de Sousa L, Fernandes D, Weiler F (2020) Is populism bad for business? Assessing the reputational effect of populist incumbents. Swiss Polit Sci Rev 27(1):1–20
- Dixit AK, Pindyck RS (1994) Investment under uncertainty. Princeton University Press, Princeton
- Djankov S, La Porta R, Lopez-de Silanes F, Shleifer A (2008) The law and economics of self-dealing. J Financ Econ 88(3):430–465
- Fisman RJ, Khurana R, Rhodes-Kropf M, Yim S (2014) Governance and CEO turnover: Do something or do the right thing? Manag Sci 60(2):319–337
- Foucault T, Fresard L (2014) Learning from peers' stock prices and corporate investment. J Financ Econ 111(3):554–577
- Fountas S, Karatasi P, Tzika P (2018) Economic policy uncertainty in Greece: measuring uncertainty for the Greek macroeconomy. South-East Eur J Econ 16(1):79–92
- Gao H, Harford J, Li K (2017) CEO turnover-performance sensitivity in private firms. J Financ Quant Anal 52(2):583–611
- Giannetti M (2003) Do better institutions mitigate agency problems? Evidence from corporate finance choices. J Financ Quant Anal 38(1):185–212
- Gilje EP, Taillard JP (2016) Do private firms invest differently than public firms? Taking cues from the natural gas industry. J Finance 71(4):1733–1778
- Greenland A, Ion M, Lopresti J (2019) Exports, investment and policy uncertainty. Can J Econ Rev Can d'écon 52(3):1248–1288
- Grenadier SR, Malenko A (2010) A Bayesian approach to real options: the case of distinguishing between temporary and permanent shocks. J Finance 65(5):1949–1986
- Gulen H, Ion M (2016) Policy uncertainty and corporate investment. Rev Financ Stud 29(3):523-564
- Ingersoll JE, Ross SA (1992) Waiting to invest: investment and uncertainty. J Bus 65(1):1-29
- Kang W, Lee K, Ratti RA (2014) Economic policy uncertainty and firm-level investment. J Macroecon 39:42–53
- Kim H, Kung H (2017) The asset redeployability channel: how uncertainty affects corporate investment. Rev Financ Stud 30(1):245–280
- Konana P, Balasubramanian S (2005) The social-economic-psychological model of technology adoption and usage: an application to online investing. Decis Support Syst 39(3):505–524

Kroese L, Kok S, Parlevliet J (2015) Beleidsonzekerheid in Nederland. Econ Stat Ber 100(4715):464-467

- La Porta R, Lopez-de Silanes F, Shleifer A, Vishny RW (1998) Law and finance. J Polit Econ 106(6):1113–1155
- La Porta R, Lopez-de Silanes F, Shleifer A (2006) What works in securities laws? J Finance 61(1):1-32

Lel U, Miller DP, Reisel N (2014) Differences in agency problems between public and private firms: evidence from top management turnover. Working paper

McDonald R, Siegel D (1986) The value of waiting to invest. Q J Econ 101(4):707-727

- McLean RD, Zhao M (2014) The business cycle, investor sentiment, and costly external finance. J Finance 69(3):1377–1409
- Michaely R, Roberts MR (2012) Corporate dividend policies: lessons from private firms. Rev Financ Stud 25(3):711–746
- Mortal S, Reisel N (2013) Capital allocation by public and private firms. J Financ Quant Anal 48(1):77–103
- Muis J, Immerzeel T (2017) Causes and consequences of the rise of populist radical right parties and movements in Europe. Curr Sociol 65(6):909–930
- Pirgaip B, Dincergök B (2019) Share repurchases under uncertainty: US evidence. Finance Res Lett 30:130–138
- Schwartz ES, Trigeorgis L (2004) Real options and investment under uncertainty: classical readings and recent contributions. MIT Press, Cambridge
- Smietanka P, Bloom N, Mizen P (2018) Business investment, cash holding and uncertainty since the Great Financial Crisis. Bank of England working paper
- Taglioni D, Zavacka V (2013) Innocent bystanders: how foreign uncertainty shocks harm exporters. ECB working paper series
- Trumm S (2018) The 'new' wave of populist right-wing parties in Central and Eastern Europe: explaining electoral support for the conservative people's party of Estonia. Representation 54(4):331–347
- Wang Z, Yin QE, Yu L (2021) Real effects of share repurchases legalization on corporate behaviors. J Financ Econ 140(1):197–219

Zalla R (2017) Economic policy uncertainty in Ireland. Atl Econ J 45(2):269-271

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