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HOW DO ENERGY PRICES AND UNCERTAINTY AFFECT CLIMATE INVESTMENT BY EUROPEAN FIRMS?

European Investment Bank

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How do energy prices and uncertainty affect climate investment by European firms?

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Abstract

Leveraging data from the European Investment Survey (EIBIS) spanning 2019-2022, encompassing the pandemic crisis and the 2022 energy price shocks, our study investigates how uncertainty influence firms' climate action investment decisions in Europe at a time of one of the largest energy shocks in recent history. Our results offer insights into firms' investment behaviors across various dimensions including country, sector, and firm size. We find that increasing energy prices drove European firms to invest in both energy efficiency and climate action investments to maintain competitiveness, albeit with a more pronounced effect on the former. By contrast, uncertainty deters firms from investing in climate action and reaching their potential, making them prioritize short-term challenges over long-term climate concerns. Additionally, we observe that firm characteristics, notably energy intensity, play a significant role in shaping investment decisions, with firms operating in energy-intensive sectors demonstrating a greater likelihood to invest in climate action regardless of uncertainty levels. Our results reveal the challenges and trade-offs that firms face when investing in climate action under uncertainty and high energy prices and emphasize the need for consistent and supportive policies to foster a green transition.

JEL Classification Numbers

D22, P28, Q5

Keywords

European Investment Bank Investment Survey, Uncertainty, Energy efficiency, Corporate investments, Energy costs, Climate Action.

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INTRODUCTION

The 2022 energy shock, triggered by the Russian invasion of Ukraine and by the aftermath of the COVID-19 pandemic, exposed the European Union's (EU) to substantial vulnerabilities in energy sourcing. The resulting increase in energy prices, coupled with rising levels of geopolitical uncertainty, had an impact on firm's incentives to invest in climate, ultimately affecting EU's ambitious goal of achieving climate neutrality by 2050. How did firms respond to rising uncertainty and high energy prices? Did firms act according to a long-term climate vision, or do they respond to short-term energy challenges? We answer these questions by relying on data from the European Investment Survey (EIBIS), a yearly survey from the European Investment Bank (EIB) on investment decisions and barriers to investments in Europe.

The economic literature shows that uncertainty has two effects on investment decisions. On the one hand, uncertainty makes firms wait for more information before investing, especially if they can adjust or reverse their decisions later (Dixit and Pindyck, 1994). Uncertainty also makes firms less responsive to demand and more cautious (Bloom et al., 2007). Many studies have confirmed the negative impact of uncertainty on investment dynamics, as firms' response to demand shock is smaller in the presence of uncertainty (Bloom et al., 2007; Kemfert et al., 2020). On the other hand, uncertainty can also have a positive effect on investment as it creates more opportunities for profitable projects and innovation (Dixit and Pindyck, 1994). The effect of uncertainty depends on how irreversible and profitable the investment is. The empirical evidence on the effect of uncertainty on green investment is mixed, with some studies finding a negative effect and others finding a positive or insignificant effect (Kemfert et al., 2020).

Similarly, energy price shocks can have both positive and negative effects on climate investment decisions depending on their type and duration. On the one hand, higher energy prices can increase firms' engagement in climate action, as they seek to improve their competitiveness and reduce their dependence on fossil fuels. Higher energy prices can also create incentives for innovation and deployment of clean energy technologies, as they increase the profitability and attractiveness of green investment. On the other hand, higher energy prices can also reduce firms' investment in climate action, especially in the short run, as they squeeze firms' cash flows and profitability, and induce them to switch to cheaper but more carbon-intensive fuels. Higher energy prices can also create uncertainty and volatility in energy markets, which can deter long-term investment in low-carbon projects. Moreover, higher energy prices can affect consumers' welfare and demand, which can have indirect effects on firms' investment decisions. Thus, the net effect of energy prices on green investment depends on various factors, such as the source and persistence of the price shocks, the availability and cost of alternative energy sources, the degree of substitution and complementarity between energy and capital, and the policy and regulatory environment.

Our study contributes to the literature by examining the dual role of uncertainty and energy prices on firms' investment in climate action in Europe. While previous studies have analyzed the effects of uncertainty or energy prices separately, there are limited studies that have considered their joint effects and interactions. This is important because uncertainty and high energy prices are often correlated at time of shocks and can have different impacts on different types of investment, such as conventional or green investment. In addition, to the best of our knowledge this is the first study that investigates the effects of these dual challenges on the adoption of short-run and long-run climate action strategies.

We use a unique and comprehensive data set from the European Investment Survey (EIBIS) for the years 2019-22, which covers the period of the pandemic crisis and the energy shock. This database allows us to capture the heterogeneity and dynamics of firms' investment behavior across countries, sectors, and size of firms, and to identify the effects of uncertainty and energy prices on investment in energy-efficiency and climate action. To

explore the heterogeneity of our results, we matched the EIBIS data with the sectorial energy intensity based on the total technical coefficient variable defined as the input required by energy sectors (oil, and electricity and gas) to produce one unit of output based on input-output tables (OECD, 2021).

The main findings of our study are as follows. First, we find that firms in Europe were engaging in climate action to maintain their competitiveness at times of high energy price. We show that higher energy prices have a positive and similar effect on firms' investment in climate action and in energy efficiency. Evidence from the 2022 wave of EIBIS showed that the energy price shock was particularly strong for EU firms, as 70% of them experienced an increase in energy cost greater than 25%, compared to 30% of firms in the US. As a result, energy efficiency was the first short term measure implemented by firms to contain energy costs overall. The energy shock had a somehow less pronounced effect in terms of accelerating firms' investment in climate action, a measure which includes different forms of climate change mitigation and adaptation investment.

Second, we find that the uncertainty remains a fundamental challenge to firms' investment decisions, hindering them from reaching their potential in climate action. We show that growing uncertainty has a negative effect on firms' investment decisions, especially in climate action compared to energy efficiency investments. This indicates that firms facing more uncertainty focus on short-term challenges, like the energy shock, rather than long-term ones, like the climate emergency. Third, we find that firms' characteristics and in particular the importance of energy input in the production function, as reflected by their energy intensity, play a key role in the willingness of firms to invest in climate action. We show that firms that operate in high energy-intensive sectors, are more likely to invest in climate action than their counterparts regardless of the level of uncertainty perceived.

This paper is organized as follows. Section 2 provides a literature review on the role of uncertainty and energy prices in investment decisions, with a focus on climate action. Section 3 describes the data and Section 4 the methodology used in the empirical analysis. Sections 5 and 6 present the main results and discuss their implications. Section 7 concludes and offers some policy recommendations.

LITERATURE REVIEW

Uncertainty is a key concept in economics (Galbraith, 1977), but it has no single definition in the literature (Al-Thaqeb et al. 2019). It can arise from various sources, such as geopolitical events, industry-specific shocks, firm-specific news, or policy changes. One type of uncertainty is economic uncertainty, which refers to unexpected changes that affect the economic ecosystem and the performance of corporations. These changes can be related to fiscal, regulatory, or monetary policies, or any other government policies. Economic uncertainty can cause market volatility and unpredictability (Abel, 1983). Another type of uncertainty is policy uncertainty, which is the economic risk associated with unclear future government policies and regulatory frameworks. Policy uncertainty can discourage spending and investment by businesses and individuals, as they face market uncertainty. Baker et al. (2016) argue that policy uncertainty increased after the 2008 global financial crisis and delayed the recovery from the recession. Uncertainty can have both short-term and long-term impacts, depending on the nature and duration of the factors that cause it. For example, factors such as regulatory policies can affect uncertainty in the short and long terms, while variations in energy prices can have only a short-term effect. Therefore, the time horizon is a key factor in understanding the impact of uncertainty. The most challenging task for researchers is to find ways to measure it, especially in relation to economic policies. Several proxies or indicators have been developed to monitor uncertainty and capture its trends and fluctuations. Most of the researchers used news-based index of uncertainty (Al-Thaqeb et al. 2019 present a list of these studies), which motivated Baker et al. (2016) to develop a proxy index for economic policy uncertainty that is widely used in recent studies to investigate the effect of uncertainty on corporations. By contrast, we rely on EIBIS in which firms report their

own subjective expectations of uncertainty about the future. This allows us to avoid measurement problems often encountered in the literature, as indicated by Fuss and Vermeulen (2004). Overall, the existing literature shows that when uncertainty is high, borrowing money becomes more expensive and firms act more cautiously. They spend less on new projects (Gulen and Ion, 2015), may cancel or delay projects to avoid future risks depending on the size of the firm (Kang, Lee, & Ratti, 2014), industry, and country (Boutchkova et al., 2012) and development level i.e., in emerging markets credit constraints become more pronounced (Carriere-Swallow & Cespedes, 2013). These negative effects could be mitigated when firms depend on internal financing (Wang, Chen, and Huang 2014). However, these behaviors vary depending on the situation (Gupta et al., 2018; Hassan et al., 2018; Istiak & Alam, 2019).

Regarding the role of energy prices in investment look, there is extensive literature but most of them focus on the overall economy or the financial markets, not on individual firms. Only a few studies have examined this relationship at the firm level. For example, Uri (1980) found that energy prices significantly influence the investment decisions of energy-intensive industries in the US, such as chemicals and paper, with a lag of one to two years. Lee and Ni (2002) showed that oil price shocks reduce both the demand and supply of various industries in the US, but not consistently across different sectors. They also found no link between the output response and the energy intensity of industries. Jimenez-Rodriguez (2008) analyzed how oil price shocks affect the output of different manufacturing industries in six industrialized countries. He found that the effects vary across countries and industries, depending on their structure and composition. Kilian (2008) found no significant effect of energy prices on non-residential investment in the US using a bivariate VAR model with quarterly data from 1970 to 2006. Fukunaga et al. (2009) decomposed oil price changes into supply and demand shocks and estimated their effects on industry-level production and prices in the US and Japan using identified VAR models with monthly data from 1973 to 2008. They found that the effects depend on the oil intensity and export orientation of each industry and country. Henriques and Sadorsky (2011) analyzed the impact of oil price volatility on strategic investments in the US using a linear dynamic investment model with several econometric methods. They used a large panel of firms from 1990 to 2007 and found a U-shaped relationship between oil price volatility and firm investment, consistent with the strategic growth options theory. Ratti et al. (2011), who estimated a dynamic model of investment to investigate the effect of relative energy price variation on firm-level investment in 15 European countries. They used data from 25 industries from 1991 to 2006 and found that higher relative energy prices reduce firm investment, especially for manufacturing firms and smaller firms. Therefore, the previous studies agree that energy price increase affects the investment decisions of firms. Nevertheless, little is known about the role of energy prices in green investment decisions. Kalantzis and Revoltella (2019) using firm-level information to explore this relationship showed that higher energy prices act as an economic incentive for green investment decisions compared to conventional ones.

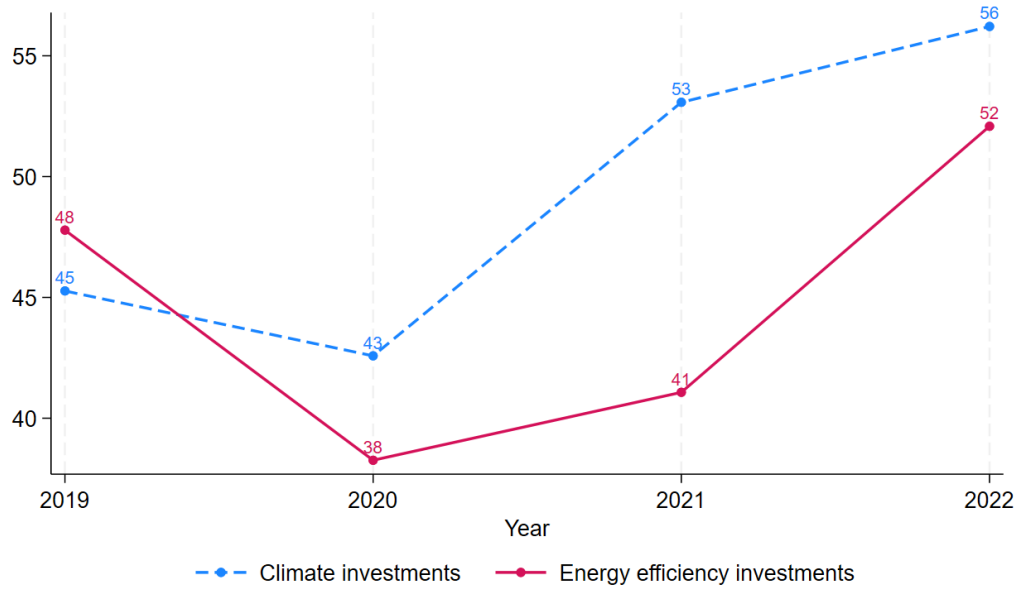
Our study fills a gap in the literature by being the first to examine the dual role of uncertainty and energy prices on firms' investment in climate action in Europe at micro (firm) level. Previous studies have only looked at the effects of uncertainty or energy prices separately, ignoring their correlation and interactions and have focused on investment generally without identifying their impact on green investments. This is crucial because uncertainty and energy prices can affect conventional and green investment differently. It is, therefore, important to understand how the pandemic crisis and the war in Ukraine, two major sources of uncertainty and energy price shocks in Europe, affect investment in climate actions in general and those in energy efficiency measures which could be considered the best means to cope with the increasing energy costs.

DATA

We draw our analysis from the EIB Investment Survey (EIBIS), a panel dataset that contains survey evidence on firms' investment activities carried out by the EIB on a set of approximately 12,000 firms from 27 EU member states. EIBIS was launched in 2016 and it is designed to measure firms' investment expectations and report on barriers or constraints to investments. The survey has a specific focus on relevant investment areas, such as the reduction of carbon emissions, digitalization and global value chains. EIBIS' sampling framework is based on firms included in Orbis, a Bureau van Dijk's database on firms' financials, which the survey is linked to. The sampling is stratified and ensures representativeness within firm size groups: Micro enterprises (0-9 employees), Small enterprises 10-49, Medium enterprises 50-250 and Mid-caps 250-3000 employees. Moreover, the sample also ensures country representativeness also across countries within the EU and across the following four different sectors: manufacturing, services, construction, and infrastructure.

Although the survey dates to 2016, we restrict the analysis to the survey responses collected in years between 2019 and 2022, when firms were asked questions about their investment to tackle climate change risks and specifically to improve energy efficiency. This leaves a sample of 42,856 respondents over the four-year time frame in Europe. Our main two outcome variables are energy efficiency and climate investments. While energy efficiency investments relate to investments reducing the amount of energy used for existing production processes, climate investments refer instead to broader types of green investments that focus on addressing the physical or transition risks of climate change and related regulatory policies by implementing adaptation and mitigation measures, including energy efficiency investments. In this sense, energy efficiency investments can be interpreted as actions to address primarily short-term challenges, such as higher energy costs, while climate investments refer to action capturing firms' longer-term investment plans for making their businesses more climate resilient and less susceptible to energy transition risks.

Figure 1 – Share of EU firms investing in climate and energy efficiency

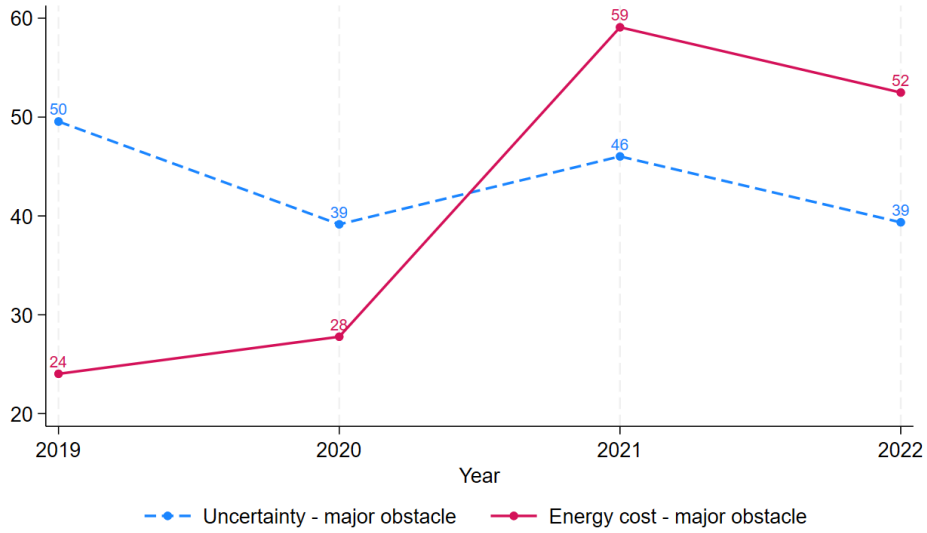


Source: EIBIS

Notes: Question for energy efficiency: "What proportion of the total investment in the last financial year was primarily for measures to improve energy efficiency in your organisation?". Question for climate investments: "have you invested in the last financial year to tackle the impacts of weather events or to reduce carbon emissions". Energy efficiency investments are defined as the share of firms that reported investing more than 0% of their budget in energy efficiency improvements during the last financial year.

We report EIBIS summary statistics on firms' investment decision in energy efficiency and climate investments in **Erreur ! Source du renvoi introuvable.**. The data shows that the share of EU firms investing in energy efficiency and climate fluctuated from 2019 to 2022, with a general upward trend. The COVID-19 pandemic had a negative impact on both types of investments in 2020, as the share of firms investing in energy efficiency dropped from 48% in 2019 to 38% in 2020, and the share of firms investing in climate fell from 45% in 2019 to 43% in 2020. However, they recovered and increased in the following years, driven by the recovery of the economy, the increased awareness of the environmental and economic benefits of climate action measures, and the availability of incentives and subsidies for green projects. The share of firms investing in energy efficiency rose to 41% in 2021 and 52% in 2022, while the share of firms investing in climate climbed to 53% in 2021 and 56% in 2022.

Figure 2 – Share of EU firms citing uncertainty and energy costs a major obstacle



Source: EIBIS

Notes: Questions for the obstacles: "Thinking about your investment activities, to what extent is uncertainty or energy costs a major obstacle?"

EIBIS also asks firms whether they perceive energy cost and uncertainty as obstacles to their investment activities. More specifically, the survey asks firms to report whether energy costs and uncertainty about the future constitute either major, minor, or not obstacles to firms' investment decisions. **Erreur ! Source du renvoi introuvable.Erreur ! Source du renvoi introuvable.** plots the evolution of energy costs and uncertainty as major obstacles over time. The share of firms reporting energy costs as a major obstacle to investments doubled from 28% in 2020 to 59% in 2021 to then stabilize at around 52% in 2022 reflecting changes in the energy market and the adoption of energy efficiency measures. Uncertainty decreased as an obstacle from 2019 to 2020 and from 2021 to 2022, reaching 39% in both years, reflecting the improvement of the economic outlook and the adaptation of firms to the new normal. However, uncertainty increased to 46% in 2021, reflecting the resurgence of the COVID-19 pandemic and the expectations for lower demand. Uncertainty measures from EIBIS capture uncertainty on general economic activities. We correlate this measure with a measure of twitter economic uncertainty (TEU) in Figure 5 in the appendix, which shows a positive relation between the two.

EMPIRICAL STRATEGY

To study the joint effects of high energy costs and uncertainty on investments in climate and energy-efficient technologies, we use the following logit specification:

$$logit(y_{icst}) = \alpha_s + \alpha_c + \alpha_t + \beta_0 ec_{isct} + \beta_1 unc_{isct} + \beta_2 (ec_{isct} \times unc_{isct}) + \beta_3 X_{isct} + \epsilon_{isct} \quad (1)$$

Where y_{icst} corresponds to the outcome variable of interest capturing firms' investments decisions. We define y_{icst} as either a dummy that equals one when firm *i* invests in energy efficiency and zero otherwise, or as a dummy that equals one if that firm invests to tackle climate change; α_s and α_c capture sector and country fixed effects, respectively.; ec_{icst} is a dummy that equals one if firm *i* reports high energy costs as a main obstacle to invest, while unc_{icst} is a dummy that equals one if firms report uncertainty as a main investment obstacle. The coefficient β_2 captures the combined effect of high energy costs and uncertainty on the outcome variable. Finally, X_{icst} is a vector of firm-level characteristics including turnover, total number of employees, total fixed assets and a dummy variable that identifies whether the firm is an SME.

RESULTS

Table 1 reports marginal effects from equation (1), where the outcome variables are investments to tackle climate change and investment in energy efficiency. For each outcome variable, the table reports marginal effects for three different model specifications. In the first specification we only include sector fixed effects, in the second we add country fixed effects and in the third we also control for year fixed effects. All three specifications include firm-level characteristics (turnover, number of employees and total fixed assets).

Results in Table 1 show a stronger positive impact of high energy prices on energy efficiency investment (columns 4-6) than on climate investment (columns 1-3). Intuitively transitory shocks such as high energy prices act as a trigger for short-run investments such as energy efficiency investments in existing production processes, while they have a smaller effect on longer-run investments that aim at tackling the risks from climate change and its related policies. As high energy prices are interacted with the dummy variable on uncertainty in equation (1), marginal effects depend on values of uncertainty as a major obstacle to investments. We report here the marginal effects of high energy prices computed in the absence and in the presence of uncertainty as an obstacle to investments. The first term represents marginal effects of high energy prices in the absence of uncertainty as an obstacle to investments. It shows that firms reporting energy costs as a major obstacle to investments are more likely to invest in energy efficiency than in climate. The second term reports instead marginal effects of high energy prices in the presence of uncertainty. Results show a positive although smaller impact than in the absence of uncertainty, suggesting a negative effect played by uncertainty on the likelihood to invest.

To understand if the difference between the two marginal effects is statistically significant, we estimate a pairwise comparison of the different predictive margins between firms reporting high energy prices and uncertainty as major obstacles to investments. We report the estimated results of these comparisons in **Erreur ! Source du renvoi introuvable.**. The first term predictive margins on green investments (columns 1-3) and energy efficiency investments (columns 4-6) between firms reporting high energy prices as an obstacle to investments

and firms not reporting energy prices as an obstacle. The positive and significant coefficient highlights that firms reporting high energy prices as a major barrier to investments are more likely to undertake green and energy efficiency investments. These results are robust across the three model specifications considered and magnitudes are broadly similar to the ones reported in Table 1.

The third term shows the difference in predictive margins between firms reporting uncertainty as an additional obstacle to investments to high energy prices and firms reporting high energy prices as an obstacle to investments only. This difference is approximately 3-5 p.p. for climate investments, while it is not statistically different from zero for energy efficiency investments. These results confirm that the presence of uncertainty as a major obstacle to investments dampens firms' incentives to invest in climate, while it does not discourage energy efficiency investments. These results are consistent with Bloom et. al. (2007) and with the notion of uncertainty acts as a drag to climate investments, dampening firms' incentives for long-run investments.

HETEROGENEITY

To enrich the empirical evidence highlighted in our baseline results, we explore how the role of uncertainty varies across sectors with different levels of energy intensity. We identify sectorial energy intensity on the total technical coefficient variable defined as the input required by energy sectors (oil, and electricity and gas) to produce one unit of output based on input-output tables (OECD, 2021). To ensure consistency with the EIBIS dataset, we aggregate the input-output tables - based on their NACE two-digit codes - into 14 sectors: Energy, Food and agriculture, Textile, Chemicals and pharmaceuticals, Electronics, Machinery, Raw materials, Trade, Construction, Transportation, tourism and arts, IT and telecommunications, Other services, and Water supply. This continuous variable is then normalized between 0 and 1, where 0 corresponds to sectors with low energy intensity and 1 to sectors with the highest energy intensity. **Erreur ! Source du renvoi introuvable.** reports the distribution of sectorial energy intensity, showing a distribution concentrated between 0 and 0.2. To test the role of energy intensity empirically, we extend the interaction term in the baseline model of equation (1) into a triple interaction:

$$logit(y_{icst}) = \alpha_s + \alpha_c + \alpha_t + \beta_0 ec_{isct} + \beta_1 unc_{isct} + \beta_2 (ec_{isct} \times unc_{isct} \times ei_s) + \\ + \beta_3 X_{isct} + \epsilon_{isct} \quad (2)$$

where ei_s denotes the level of energy intensity in sector *s*.

Erreur ! Source du renvoi introuvable. shows how climate investments decisions (marginal effects) vary depending on the energy intensity of the sectors and the presence of high energy prices and uncertainty. The blue line shows that when energy costs are considered as a major obstacle, firms in more energy-intensive sectors invest more in climate than firms in less energy-intensive sectors. However, when uncertainty is simultaneously considered as a major obstacle (magenta line), the effect of high energy prices becomes insignificant for all levels of energy intensity. These findings confirm the baseline results that uncertainty discourages climate investments in the presence of high energy prices, but the degree of discouragement depends on the energy intensity of the sector. For less energy intensive sectors, the difference between the two marginal effects on climate investments (with uncertainty and without uncertainty) is statistically significant, indicating that uncertainty has a stronger negative impact on climate investments. For more energy-intensive sectors, the difference is not statistically significant, meaning that uncertainty has a weaker negative impact or no impact at all on climate investments. These results suggest that for more energy-intensive sectors, climate action emerges as a necessity regardless of the level of uncertainty.

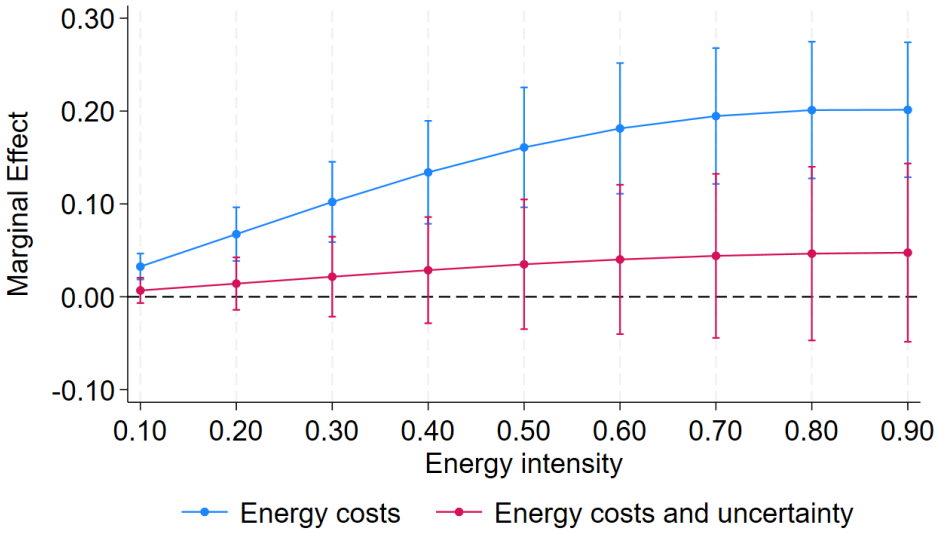


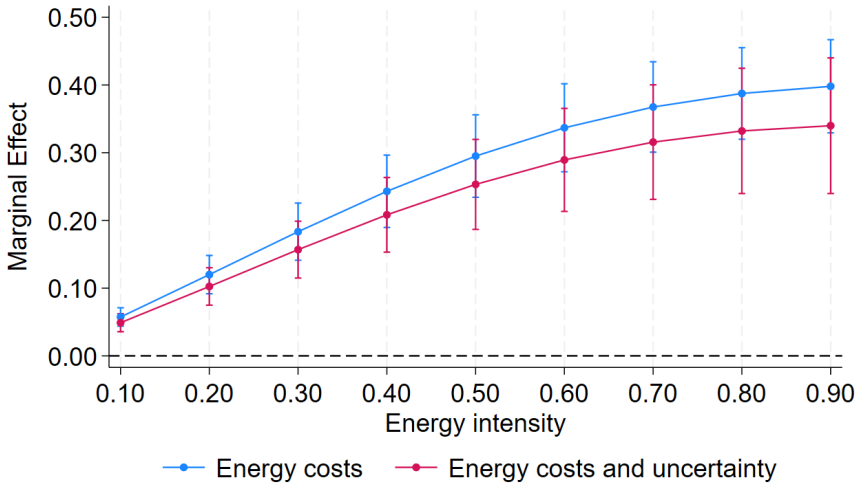
Figure 3 – Marginal effects of high energy costs and uncertainty on climate investments

Notes: The graph shows marginal effects of high energy costs and the combined effects of high energy costs and uncertainty on climate investments. The impact of high energy costs on climate investments is higher for those sectors characterized by a higher energy intensity (the blue line is upward sloping). In addition, while the impact of high energy costs is significantly higher than the impact of the combined effect for low levels of energy intensity, the two effects are not statistically different for high levels of energy intensity.

Erreur ! Source du renvoi introuvable. shows how energy efficiency investments' decisions (marginal effects) vary depending on the energy intensity. Similar to climate investments, high energy prices increase firms' likelihood to invest in energy efficiency for more energy-intensive sectors, as these sectors have more incentives to reduce their energy costs. However, unlike climate investments, uncertainty does not have a significant negative impact on energy efficiency investments' decisions for any level of energy intensity. The marginal effects of energy cost being a major impediment to investments are positive and similar whether uncertainty is high or low.

Figure 4 – Marginal effects of high energy costs and uncertainty on energy efficiency investments

Notes: The graph shows marginal effects of high energy costs and the combined effects of high energy costs and uncertainty on energy



efficiency investments. The impact of high energy costs and the combined impact of high energy costs and uncertainty on energy efficiency investments are higher for those sectors characterized by a higher energy intensity (the blue and red lines are upward sloping). The impact of high energy costs is not statistically different from the combined impact of high energy costs combined with uncertainty.

CONCLUSIONS AND POLICY IMPLICATIONS

In this study, we investigated how uncertainty and energy prices affect firms' investment in climate action in Europe. We focused on two types of investment: energy efficiency, which can help mitigate the impacts of the 2022 energy shock, and climate adaptation and mitigation, which can help address the long-term climate risks. We used a unique and comprehensive data set from the European Investment Survey (EIBIS) for the years 2019-22, which covers 42,856 firms across countries, sectors, and sizes. This data set allowed us to analyse the impact of the pandemic crisis and the war in Ukraine, two major sources of uncertainty and energy price shocks in Europe, on firms' investment behavior.

Our study provides novel and relevant insights into the determinants and outcomes of firms' investment in climate action in Europe, in the context of uncertainty and energy price shocks, and can have implications for various stakeholders. For instance, increasing energy prices can be an effective instrument to stimulate firms' investment in climate action, as they create incentives for firms to reduce their energy costs and emissions. However, uncertainty can have negative effects on firms' investment decisions, especially in the long-run climate action strategies. Therefore, policies should aim to reduce uncertainty and increase transparency and predictability in the policy environment, as well as provide adequate support and incentives for firms to invest in climate action. Moreover, policies should consider the heterogeneity and dynamics of firms' investment behaviour across countries, sectors and sizes, and design policies that are tailored to the specific needs and characteristics of different types of firms.

In addition, investing in climate action can be a profitable and competitive strategy for firms in Europe, as it can improve their energy cost competitiveness. However, firms should also be aware of the challenges and risks associated with uncertainty and energy price shocks and adopt flexible and resilient strategies to cope with them. Moreover, firms should consider the role of their characteristics and climate awareness in shaping their investment decisions, and foster a long-term orientation, a high degree of innovation, a strong corporate social responsibility, and a high level of environmental concern within their organizations.

Future research could extend our analysis by using more granular data on firms' investment decisions, including the type, amount, and timing of investments, while also exploring the channels through which uncertainty and energy prices influence investment behavior—such as expectations, financing constraints, market conditions, and regulatory changes at a sector-specific or investment-related level. From a policy perspective, it would be valuable to examine the long-term effects of sustained high energy prices on firms' investment decisions, particularly whether firms that report energy prices as a major obstacle in consecutive years respond differently compared to those facing temporary shocks. Understanding these dynamics could provide crucial insights for designing policies that mitigate prolonged energy price pressures on investment and competitiveness.

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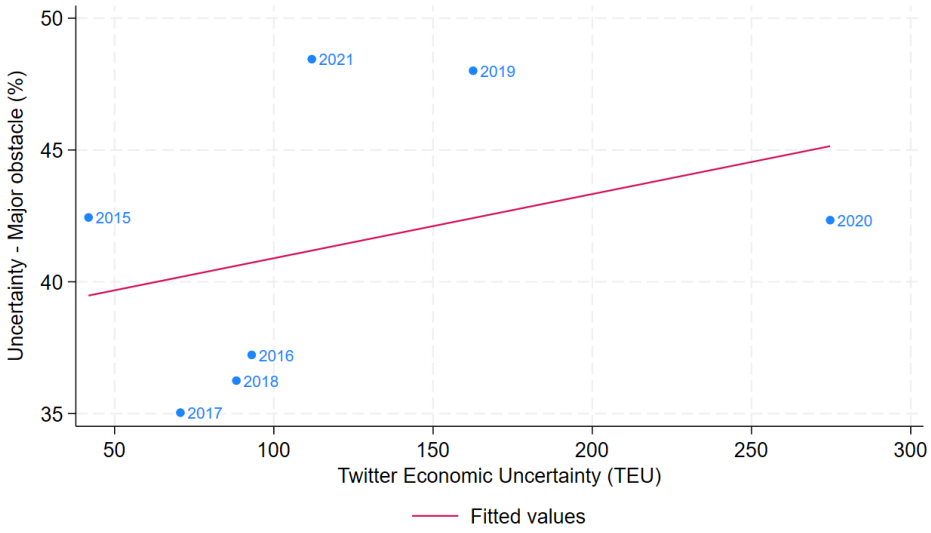
APPENDIX

Figures

Figure 5 – Uncertainty in EIBIS and Twitter Economic Uncertaitny



Notes: The graph shows a positive correlation between uncertainty measured in EIBIS and a measure of twitter economic uncertainty (TEU) between 2015 and 2021. While years between 2016 and 2018 have been characterized by low levels of TEU, 2019 and 2020 where years with larger uncertainty The graph suggests uncertainty measured in EIBIS represents indeed a good proxy of economic uncertainty.

Tables

Table 1 – Predictive margins of high energy prices

	(1) Invest in climate	(2) Invest in climate	(3) Invest in climate	(4) Invest in EE	(5) Invest in EE	(6) Invest in EE
Energy costs	0.060***	0.093***	0.052***	0.075***	0.088***	0.091***
	(0.005)	(0.005)	(0.006)	(0.005)	(0.005)	(0.006)
Uncertainty	-0.050***	-0.024***	-0.015***	-0.017***	-0.000	-0.000
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Energy costs × Uncertainty	-0.013	-0.023**	-0.022**	-0.013	-0.018*	-0.014
	(0.010)	(0.011)	(0.011)	(0.010)	(0.007)	(0.010)
Observations	42,856	42,856	42,856	42,856	42,856	42,856
R^2	0.04	0.09	0.10	0.06	0.07	0.08
Sector FE	Yes	No	Yes	Yes	No	Yes
Country FE	No	Yes	Yes	No	Yes	Yes

Year FE	No	No	Yes	No	No	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The table reports estimation results from equation (1). It includes predictive margins for the following dependent variables: climate investments (columns 1-3) and energy efficiency investments (columns 4 - 6). Columns (1) and (4) include sector fixed-effects, columns (2) and (5) include country fixed-effects, while columns (3) and (6) are the baseline regression and include country, sector and year fixed effects. The table also includes the number of observations. Standard errors, clustered at the firm level, are noted in parentheses: * p<0.10, ** p<0.05, *** p<0.01.

Table 2 – Point estimates – results from the Logit

	(1) Invest in climate	(2) Invest in climate	(3) Invest in climate	(4) Invest in EE	(5) Invest in EE	(6) Invest in EE
Energy costs	0.274***	0.43***	0.264***	0.352***	0.423***	0.429***
	(0.031)	(0.032)	(0.033)	(0.031)	(0.032.)	(0.033)
Uncertainty	-0.199***	-0.070**	-0.030	-0.056**	0.029	0.024
	(0.028)	(0.030)	(0.030)	(0.029)	(0.029)	(0.030)
Energy costs × Uncertainty	-0.041	-0.089**	-0.091**	-0.049	-0.079*	-0.063
	(0.044)	(0.045)	(0.045)	(0.044)	(0.045)	(0.045)
Observations	42,856	42,856	42,856	42,856	42,856	42,856
Sector FE	Yes	No	Yes	Yes	No	Yes
Country FE	No	Yes	Yes	No	Yes	Yes
Year FE	No	No	Yes	No	No	Yes

Notes: The table reports estimation results of equation (1). It includes logit point estimates for the following dependent variables: climate investments (columns 1-3) and energy efficiency investments (columns 4 - 6). Columns (1) and (4) include sector fixed-effects, columns (2) and (5) include country fixed-effects, while columns (3) and (6) are the baseline regression and include country, sector and year fixed effects. The table also includes the number of observations. Standard errors, clustered at the firm level, are noted in parentheses: * p<0.10, ** p<0.05, *** p<0.01.

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