The Impact of Climate Policies on Financial Markets: Evidence from the EU Carbon Border Adjustment Mechanism

Mengjie Shi* Yupu Zhang‡ Christoph Meinerding¶

This version: September 9, 2025

Abstract

The introduction of the EU Carbon Border Adjustment Mechanism (CBAM) has triggered statistically significant negative stock market responses for firms within the EU. Comparing EU customers that have non-EU suppliers in CBAM-affected industries with their non-treated peers in the control group, we find an extra cumulative abnormal return of up to -1.3 percentage points over our main five-day event window around December 13, 2022. Furthermore, we document substantial anticipatory market responses reflecting updated beliefs about broader climate policy developments going forward, like the phasing-out of EU ETS free allowances. This paper is the first to provide empirical evidence of carbon border tax impacts on firm valuations through international supply chains. Our findings contribute to the understanding of climate policy transmission through international trade networks and inform the debate on stranded assets resulting from environmental regulations.

Keywords: Carbon border adjustment mechanism, carbon pricing, supply chain, event study, cumulative abnormal returns, trade

JEL: G12; G14; G15; Q58

*Goethe University Frankfurt and Deutsche Bundesbank. Email: mengjie.shi@bundesbank.de

‡University of Edinburgh Business School. Email: yupu.zhang@ed.ac.uk

¶Deutsche Bundesbank. E-mail: christoph.meinerding@bundesbank.de.

We thank colleagues and seminar participants at the University of Edinburgh, the Deutsche Bundesbank, and Goethe University Frankfurt, DGF 2024 (Aachen), the Conference on Net Zero, Nature and Supply Chain Vulnerabilities (London), SAEe 2024 (Palma de Mallorca), the AFA 2025 Poster Session (San Francisco) and GRASFI 2025 (Paris) for valuable comments. Special thanks go to Refet Gurkaynak, Emanuel Moench, Tobias Berg, Claudio Baccianti, Janet Gao, Jurian Hendrikse, Ole Wilms, Christian Schlag, Luca Taschini, Ben Sila, Frank Venmans, Chendi Zhang and Michael Pahle. The views expressed in this paper represent the authors' personal opinion and do not necessarily reflect the views of the Deutsche Bundesbank or the Eurosystem.

1 Introduction and Motivation

Climate policy has gained significant momentum in many countries in recent years. Among the wide range of policy measures, carbon pricing schemes stand out because they are deeply rooted in foundational theories of economics, including Pigouvian taxation and Coasean property rights. The theoretical optimality conditions are operationalized through a carbon tax or a market-based cap-and-trade framework, where marginal abatement costs are equalized across heterogeneous firms. In practice, though, these schemes come with loopholes: for one, they are not harmonized, let alone implemented globally. For another, it is usually the domestic producers who have to pay for emissions, not the consumers. Firms can thus evade the pressure from carbon pricing by engaging in carbon leakage, i.e. by shifting their production to countries with no or less stringent emissions pricing in place.

Against this backdrop, in 2023 the EU decided to introduce a new flagship climate policy instrument: the EU Carbon Border Adjustment Mechanism (CBAM). The CBAM is the world's first carbon border tax. In a nutshell, it requires the importers of certain goods to pay an import tax proportional to the carbon footprint of these goods. The CBAM complements the already existing EU Emissions Trading System (EU ETS). Ideally, it levels the playing field for production inside and outside the EU in terms of carbon pricing, discouraging carbon leakage.[1]

Importantly, though, the CBAM does not only represent a novel climate policy instrument. Broadening the perspective, it can be viewed as a paradigm shift, blending carbon regulation with trade policy. The latter has become salient on its own recently: the CBAM is introduced during a time of elevated geoeconomic tension, induced by the disruptions in US trade policy. In fact, these developments have put the interplay of climate policy and geoeconomic fragmentation at the forefront of the policy agenda, as evidenced, among others, by a recent ECB report.[2] The authors argue that uncoordinated climate transition policies can increase geoeconomic fragmentation. Vice versa, increased geoeconomic fragmentation may also hinder the pace and scope of the

[1]For instance, the CBAM tax rate is calibrated such that the tax roughly equals the hypothetical amount that would have to be paid for EU ETS certificates, had the goods been produced within the EU.

[2]See Weber, Afota, Boeckelmann, Gaye, Dieppe, Faubert, Grieco, Roux, Meunier, Munteanu, Nobletz, Norring, Reininger, Skackauskaite, Suarez-Varela, Svartzman, Valadier, Vlajie, Wilbert, Zaghini, Attinasi, and Brueggemann (2025).

low carbon transition. The report actually prominently highlights the role of the CBAM as an example for internationally uncoordinated climate policy elevating geoeconomic risks. On the other hand, the report acknowledges that the CBAM likely prevents carbon leakage.

Because of its recency, to the best of our knowledge, there is no systematic empirical evidence examining the impact of the CBAM yet. This paper analyzes the stock price response of firms involved in international trade to the introduction of the CBAM. To this end, we conduct a causal event study around the main legislative event on December 13, 2022. On this day, at 1:00 a.m. in the morning, the EU published a press release announcing the breakthrough in the so-called Trilogue negotiations between the European Commission, the European Parliament and the Council of the European Union.[3] For our main analysis, we merge seven datasets, most importantly FactSet Revere data on customer-supplier relationships, Compustat and Worldscope data on returns and firm characteristics, and a linking table from CN goods classifiers to SIC industry codes.[4] Equipped with this merged final sample, we document a set of novel empirical findings.

First and foremost, the cumulative abnormal returns (CARs) of EU customer firms with CBAM-treated suppliers are on average 1.3 percentage points lower than the CARs of their peers in our control group, when measured over a five-day event window. This basic treatment effect is strongly significant and robust to a series of robustness checks, for instance changing the specification of treatment and control groups, allowing the customer-supplier relationships to end before the event date, and using the Fama-French 3-factor or 5-factor model instead of the CAPM to compute abnormal returns. It is also sustained over a longer time window which includes a related policy announcement concerning a reform of the EU ETS one week later.

Albeit small at first glance, this treatment effect is remarkable for several reasons. First of all, multiplying the average treatment effect with the total market capitalization of all treated firms in our sample suggests losses above 1 billion EUR over the event window. This estimate is roughly in the ballpark of EU estimates of the expected CBAM revenues.[5] Depending on the

[3] In Section 2, we provide an in-depth discussion why this agreement constitutes the main exogenous event around which we conduct our event study. But we also run a series of robustness checks for other important dates related to the CBAM.

[4] We thank Pierce and Schott (2012a) for making this linking table publicly available.

[5] To put this into perspective, according to a press release in 2023, the European Commission expects CBAM

trading partner country, the imports of CBAM-treated goods account for up to 10% of total imports.[6] Second, the documented treatment effect applies to customer firms *within the EU*, suggesting a spillover of the effects of climate policies along the supply chain. Third, as will become clear below, the treatment effect measured here should rather be regarded as a lower bound for the (unknown) total effect of the CBAM.

Fourth, our clean event study identification ensures that the measured effect is causal. This causality is a contribution because the CBAM is part of a large package of EU climate policy measures, the so-called Fit-for-55 package. These policies were all negotiated in parallel, making it hard to single out an event date which clearly relates to one individual policy only. The clean identification, however, also comes at a cost. Because the Fit-for-55 package covers so many policy instruments, we can only analyze the short-term financial market response to the CBAM announcement. We cannot evaluate movements in lower frequency firm level data like profit statements, investments, or supply chain relationships due to endogeneity conflicts stemming from the interference with other policies.

Fifth, our findings complement the developing empirical literature about the effect of carbon pricing on the financial performance of firms. Dechezlepretre, Nachtigall, and Venmans (2023) and Colmer, Martin, Muuls, and Wagner (2023) document that the EU ETS – while it triggered substantial carbon emission reductions – did not have notable negative side effects on output, profitability or employment of regulated firms during Phase 1 and 2 (2005-2012), a period with low emission prices and a very generous allocation of free allowances. These authors argue that the EU ETS may have induced productivity-increasing investments which offset the regulatory costs. However, the situation has changed. Studying the intensive margin, Bolton, Lam, and Muuls (2023) find significant negative stock price responses to changes in carbon allowance prices during Phase 3 of the EU ETS. Our paper refers to Phase 4 which, for the first time, involves

revenues of roughly 1.5 billion EUR per year, as of 2028. Assuming that EU importers have to bear half of it (an uneducated guess concerning their bargaining power) implies annual costs of about 0.75 billion EUR. Extrapolating over 23 years (the EU aims to be carbon-neutral by 2050) and discounting generously with an equity premium of 6 percentage points results in an expected total loss of market value above 5 billion EUR. Note that this EU estimate refers to the entire universe of firms in the EU, whereas the sample used in our paper covers only publicly traded firms.

[6] This estimate is based on statistics published by Eurostat on behalf of the European Commission's DG Trade. Highly exposed countries include, for instance, South Korea and China.

a cross-border instrument to mitigate carbon leakage, and emphasizes the extensive margin of climate policy. Using a clean event study identification, our paper documents economically and statistically significant negative effects from the introduction of the CBAM, a companion policy tool to the EU ETS, when viewed through the lens of equity market investors. Summing up, carbon pricing, after all, does seem to bite and to be detrimental to the financial performance of regulated firms, both at the intensive and the extensive margin, when the pricing regime is strict enough and loopholes are closed.

We also document significant market responses which go beyond this direct impact of the CBAM. Specifically, we find anticipatory effects related to market participants updating their beliefs regarding broader climate policy developments. Our empirical strategy exploits the temporal separation between the announcement of the CBAM agreement and subsequent announcements of EU ETS reforms, particularly concerning the allocation of free emission allowances. These free allowances are supposed to sustain the global competitiveness of firms in specific sectors whose competitors abroad do not face the burden of carbon pricing. When the CBAM becomes effective, this support will no longer be needed and will be phased out. However, while these policy instruments were negotiated concurrently, the official press release on our event day only refers to the CBAM. Still, we posit that this announcement served as a credible signal regarding the imminent phase-out of free allowances – a policy change that was in fact agreed on one week later. Furthermore, the CBAM press release included the EU's explicit commitment to expand its scope to encompass all goods currently under EU ETS jurisdiction until 2030. This goes far beyond the initial subset of affected goods where we identify our primary treatment effect.

To systematically analyze these anticipatory effects, we construct various treatment group specifications. For our baseline analysis, a customer firm needs to have suppliers that satisfy two requirements in order to be counted as treated by the CBAM: (i) supplier location outside EU jurisdiction (the "location treatment") and (ii) product coverage under CBAM regulations (the "industry treatment"). For the beliefs updating hypotheses, we analyze these two requirements in isolation. Our empirical analysis reveals that both of them independently generate economically significant effects, each one being associated with approximately -1 percentage point average cumulative abnormal returns.

The industry treatment effect highlights market participants' revised expectations regarding the free allowance allocation mechanism. It captures the anticipated increase in the financial burden on EU-based producers. Similarly, the location treatment effect provides compelling evidence of market participants' forward-looking assessment of the CBAM's scope expansion. Despite the initial specification of CBAM-affected goods, the press release explicitly articulates the intention to encompass all EU ETS-covered goods by 2030. The significant market reaction we document suggests high credibility of this policy commitment among investors. Overall, our findings suggest substantial market repricing of climate policy risk, even for firms not directly affected by the initial CBAM implementation. The stock returns align with theoretical predictions regarding rational expectations formation in response to credible policy commitments.

A set of further analyses complements and supports our key takeaways. In our baseline case, we analyze the returns of EU customer firms because they are more relevant for policymakers within the EU. But of course it is natural to also study the cumulative abnormal returns of supplier firms located outside the EU around December 13, 2022. Because the data for suppliers is arguably much noisier, we find mostly insignificant treatment effects, but in magnitude the effects are comparable to those for customer firms within the EU. This suggests that the financial burden arising from the CBAM is shared among customers and suppliers, at least when viewed through the lens of equity investors. Given the limitations of our current dataset, there is however scope for further research on this question.

We also conduct similar event studies around other important legislative dates related to the CBAM. This is complicated by the fact that the CBAM is part of a larger set of EU climate policies subsumed under the so-called "Fit for 55 package", so that there are often news about several climate policies released on the same day. Still, our partial treatments (location treatment and industry treatment) are informative on these dates because none of the other, perhaps conflicting policies are targeting cross-border trade. We find cumulative abnormal returns of up to -2 percentage points around some of these dates. Overall, these results generally support the intuition described above that the introduction of the CBAM and the associated climate policy reforms do affect the financial performance of newly regulated firms negatively.

We close the paper with a series of robustness checks concerning the length of the event window, the exact composition of our treatment and control group, customer-supplier relationships ending prior to the event date, or the asset pricing models used to compute abnormal returns. Our key results turn out to be very robust to such choices.

Related Literature Given the lack of empirical examples, the research on the financial impact of *global* carbon pricing schemes is still in its infancy. Since the CBAM legislation has been adopted only recently, our paper is – to the best of our knowledge – the first to study the financial market response to carbon border taxes. There is also – to the best of our knowledge – no study that analyzes the effects of carbon pricing along the supply chain empirically. Quantitatively, our paper documents that the potential losses of suppliers and customers caused by the CBAM regulation can be substantial. This stands in contrast to parts of the literature cited above which document only negligible negative effects of the EU ETS or other carbon pricing schemes on the performance of regulated firms during early phases of the EU ETS. A comprehensive survey of this early literature is provided by Martin, Muûls, and Wagner (2016).[7]

Still, our paper can be connected to a few strands of literature more generally. Firstly, our paper contributes to the broader discussion about the effectiveness and the design of climate policies. As previously noted by Blanchard, Gollier, and Tirole (2023), various existing climate policy instruments, including carbon markets, carbon taxes, and green subsidies, often appear incoherent and should be considered jointly in specific contexts.[8] Among them, carbon pricing is a pivotal solution to restore economic and environmental efficiency and should be part of the optimal mix of climate policies. Nevertheless, international climate agreements come with

[7]Besides the papers cited above, see, e.g., Martin, de Preux, and Wagner (2014), Jaraite-Kaukauske and di Maria (2016), Marin, Marino, and Pellegrin (2018), Loeschel, Lutz, and Managi (2019), Teixido, Verde, and Nicolli (2019), Klemetsen, Rosendahl, and Jakobsen (2020), Trinks and Hille (2024) for the responses of various quantities like employment, investment or profitability at the firm level. The responses of stock prices to changes in emission allowance prices during Phases 1 and 2 of the EU ETS have been studied, among others, by Oberndorfer (2009), Veith, Werner, and Zimmermann (2009), Mo, Zhu, and Fan (2012), Bushnell, Chong, and Mansur (2013), Scholtens and van der Goot (2014), Oestreich and Tsiakas (2015), Huiming Zhu and Yu (2018) Millischer, Evdokimova, and Fernandez (2023).

[8]There is an extant literature on each of these instruments. See, e.g., Calel and Dechezleprêtre (2016), Cui, Wang, Zhang, and Zheng (2021), Van den Bremer and Van der Ploeg (2021) for carbon markets; Elliott, Foster, Kortum, Munson, Cervantes, and Weisbach (2010), Marron and Toder (2014) for carbon taxes; Allcott, Knittel, and Taubinsky (2015), De Groote and Verboven (2019)) for subsidies.

coordination failure due to free-riding problems, creating obstacles to forging effective global climate policies. Nordhaus (2015) therefore suggested the idea of a climate club, which is an agreement among countries to undertake harmonized climate actions. If the participation in such a club is incentivized properly, this coordination device may solve free-rider problems. Our paper studies the potential consequences of the most recent climate policy innovation, the EU CBAM. First and foremost, the CBAM is designed to address carbon leakage directly, but it can also be regarded as such an incentive for third countries to form a climate club with the EU, as emphasized by Beaufils, Wanner, and Wenz (2024). Farrokhi and Lashkaripour (2024) study and compare theoretical properties, effectiveness and efficiency of these two trade policy instruments in great detail.[9] In a recent paper, Clausing, Colmer, Hsiao, and Wolfram (2025) assess the welfare implications of CBAM policies with simulations from a quantitative equilibrium model of global trade, calibrated to worldwide aluminum and steel production and trade data. On the one hand, these authors document obvious consequences like a reduction of carbon leakage, incentives for stricter climate policy abroad, or increased global competitiveness of domestic producers. On the other hand, they find that the CBAM increases aggregate welfare in the EU: the increase in the market power of firms in the EU outweighs the welfare losses of consumers. Importantly, these findings complement rather than contradict our results, since our paper focuses on downstream EU customer firms, not on aggregate (average) effects. Specifically, we examine the financial market reaction to the announcement of such a policy. There is also a large empirical literature that tries to find evidence in favor of carbon leakage, but the results are overall inconclusive so far.[10]

A substantial body of literature, mainly in macroeconomics, studies the optimal design of climate policies in open economy models. Examples are Larch and Wanner (2017), Weisbach, Kortum, Wang, and Yao (2023), Ernst, Hinterlang, Mahle, and Stähler (2023), Böhringer, Fischer, Rosendahl, and Rutherford (2022), Fischer and Fox (2012), Al Khourdajie and Finus (2020),

[9]In fact, the preamble of the official CBAM regulation contains a paragraph that explicitly calls for the development of further cooperation with third countries to establish a climate club "in order to promote the implementation of ambitious climate policies in all countries and pave the way for a global carbon pricing framework".

[10]See, e.g., Naegele and Zaklan (2019), Dechezlepretre, Gennaioli, Martin, Muuls, and Stoerk (2022), Fowlie and Reguant (2022), Colmer, Martin, Muuls, and Wagner (2023), Bolton, Lam, and Muuls (2023).

Böhringer, Carbone, and Rutherford (2016), Salib (2024). A survey of this literature is provided by Fontagne and Schubert (2023). However, except for Fowlie, Petersen, and Reguant (2021), no prior studies have analyzed the economic impact of such a policy in empirical real-world settings.

Furthermore, our paper also contributes to the literature on environmental policy and international trade. Early works have explored the impact of trade on a country's environment. For example, Antweiler, Copeland, and Taylor (2001) argue that this impact can be categorized into three components: scale, technique, and composition, and finds that international trade can induce technological change, therefore creating net benefits for the environment.[11] Other papers focus on how environmental regulation can affect trade flows. Separating industrialized and developing countries, Ederington, Levinson, and Minier (2005) finds the pollution abatement cost on imports from developing countries to be high. In this respect, the concept of carbon leakage explained above has received attention (Fowlie, Reguant, and Ryan (2016), Shapiro and Walker (2018)).

Our paper also contributes to the literature about the effect of tariffs and trade policy on stock returns, which has become salient following the recent US trade policy turmoil. Based on estimates of the pass-through of the 2018 tariff increases to goods prices and quantities, Fajgelbaum, Goldberg, Kennedy, and Khandelwal (2020), Flaaen, Hortacsu, and Tintelnot (2020), Cavallo, Gopinath, Neiman, and Tang (2021) and Amiti, Redding, and Weinstein (2019) estimate aggregate welfare losses of several billion US dollar per month. Consequently, Amiti, Gomez, Kong, and Weinstein (2024) find that the tariffs reduced the market value of US equity by about 4 trillion USD. For the "Liberation Day" tariff announcements in April 2025, estimates of market value losses of US or global equity vary between 6 and 11 percent of total market capitalization (see, e.g., Demir, Kaczmarek, Rouatbi, and Zaremba (2025) or Cocozza and Gallo (2025)). Importantly, the gains and losses are cross-sectionally unevenly distributed between importing firms and domestic producers or across different households.

Lastly, our paper sits within the context of literature analyzing the effects of public policies

[11]Similarly, Frankel and Rose (2005) find that trade tends to reduce three measures of air pollution using exogenous geographic determinants of trade as instrumental variable.

and regulations on asset prices. Cohen, Diether, and Malloy (2013) show that the historical voting record of legislators has explanatory power for (seemingly) abnormal post-legislation drifts in the prices of stocks that are affected by certain policies. Other papers delve into the implications of monetary policy (Nakamura and Steinsson (2018)) and fiscal policy (Gómez-Cram and Olbert (2023)) for equity prices using high-frequency data. The most relevant paper is by Meng (2017), who investigates the stock market reaction to climate policy and adopts Regression Continuity Design (RDD) to evaluate the marginal abatement cost. Extending this line of research, our paper analyzes the stock market's reaction to a new cross-border climate policy by incorporating supply chain information.

The rest of the paper is structured as follows. In Section 2, we elaborate on the legislative background of the CBAM. Data and methodology are presented in Section 3. Sections 4 and 5 discuss our results, and Section 6 provides a set of robustness checks. Section 7 concludes and discusses policy implications.

2 Background information on the legislative process and theoretical predictions

The event study that we perform has two major requirements. First, we need to single out the dates on which relevant news about the EU CBAM were released. Second, we need to develop testable hypotheses based on the news that were released and on the general theory about carbon border adjustments. The former is addressed in the first subsection below, the latter in the subsection thereafter.

2.1 Timeline of political events

Table 1 summarizes the timeline of the CBAM legislation process. In the following, we will discuss these events briefly. As will become clear below, the most important and suitable date for our event study is December 13, 2022. We will therefore conduct our event studies mainly around this date.

On December 11, 2019, a few months after the European Parliament election, the newly

Table 1: **Timeline of events related to the CBAM**

Dec 11, 2019	Ursula v.d.Leyen announces EU Green Deal in a speech
Jul 14, 2021	European Commission adopts proposals for **“Fit for 55 package”** including proposal for the CBAM
Sep 13, 2021	Committee referral announced in European Parliament
Mar 15, 2022	European Council adopts its position on the CBAM
May 23, 2022	Draft report of the Committee on the Environment, Public Health and Food Safety of the European Parliament
June 22, 2022	European Parliament adopts its position on the CBAM
July 11, 2022	Beginning of Trilogue meetings (Commission, Parliament, Council)
Dec 13, 2022	**Informal provisional agreement about CBAM reached**
Feb 09, 2023	Parliamentary Committee approves official text of the Trilogue agreement concerning CBAM (and other parts of “Fit for 55”)
Apr 18, 2023	CBAM (and other parts of “Fit for 55”) formally adopted by the European Parliament
Apr 25, 2023	CBAM (and other parts of “Fit for 55”) formally adopted by the European Council
May 10, 2023	Final act officially signed
May 16, 2023	Publication in the Official Journal of the EU
Oct 01, 2023	CBAM goes into effect (transitional period, reporting obligations only)
Jun 18, 2025	European Parliament and European Council reach agreement to simplify the CBAM and to postpone the first CBAM payments from Jan 2026 to Feb 2027
Feb 01, 2027	Importers have to surrender CBAM certificates for imports of listed goods (certificates can be purchased throughout the year, official declaration for a given year is due by May of the next year)
Jan 01, 2030	Intention that CBAM will apply to all goods covered by EU ETS (proposal still to be worked out by EU legislative bodies)

appointed president of the European Commission, Ursula von der Leyen, gave a widely recognized speech to the new parliament, in which she laid out her plans for the so-called EU Green Deal. The CBAM was one of many climate policy initiatives that she proposed in this speech.

From a legal perspective, the EU CBAM was implemented by means of an EU regulation, i.e. a "binding legislative act which must be applied in its entirety across the EU"[12]. As such, the CBAM regulation had to pass the EU's so-called "ordinary legislative procedure", which involves the European Commission, the European Parliament, and the Council of the European Union with different roles. The Commission usually initializes the legislative process, but it is the Parliament and the Council that have to adopt the act eventually (so-called Codecision Procedure). A proposal can go back and forth between Parliament and Council in several rounds, until both pass the act. In order to speed up the joint decision-making, the EU has established an informal meeting format between Commission, Parliament and Council, the so-called Trilogue, which was also applied to the CBAM.

This ordinary legislative procedure is visible in the timeline of events in Table 1. The legislative process was initiated through the adoption of a proposal by the Commission on July 14, 2021. This proposal was then passed on to the Parliament where the Committee on the Environment, Public Health and Food Safety was in charge of it. After both the Parliament and the Council had formulated their opinions on the CBAM proposal, the series of Trilogue meetings started on July 11, 2022, and resulted in an informal agreement on December 13, 2022. More precisely, the press release about the agreement was published at 1:00 am in the morning of December 13, 2022. After this breakthrough in the negotiations, it then took a few weeks to clarify further details. The final version of the CBAM regulation was approved by the responsible Parliamentary Committee on February 09, 2023. Both the European Parliament and the European Council adopted this final version of the CBAM regulation officially in April 2023.

We conduct our event study mainly around one date – December 13, 2022 – when the breakthrough in the Trilogue negotiations was reached. There are two major reasons for this choice. First of all, many of the candidate dates listed in Table 1 are confounded by multiple legislative events happening on the same day. The CBAM regulation is part of a broad legislative

[12] See `https://european-union.europa.eu/institutions-law-budget/law/types-legislation_en`

agenda that is publicly referred to as the "Fit for 55 package". This package concretizes the ideas laid out in the inaugural EU Green Deal speech from December 11, 2019. It includes, for instance, changes to the EU ETS (like an extension to further sectors and a stronger reduction of the emissions cap), a new emissions trading system for the road transport and building sector, the phasing-out of fossil fuel cars by 2035, and most importantly, the phasing-out of the free allowance system for a number of sectors. This free allowance system was established at the beginning of the EU ETS in order to shield certain sectors which are heavily exposed to global competition with countries which do not have a carbon pricing scheme in place. In order to level the playing field internationally, firms in these sectors were granted free allowances generously. This system of free allowances will now come to an end together with the introduction of the CBAM.

All these policies were negotiated very much in parallel with the CBAM. For instance, the first detailed proposal of the "Fit for 55 package" – including the first proposal for the CBAM – was adopted and publicly announced by the European Commission on July 14, 2021. Moreover, in its plenary meetings on April 18, 2023, the European Parliament voted on both the CBAM and the reform of the EU ETS. From the list of events in Table 1, December 13, 2022, is the only major event that is not contaminated with other EU climate policy decisions happening on the same day. The Trilogue negotiations for the CBAM were closely connected to, but formally independent from the negotiations of the EU ETS reform. In fact, the Trilogue agreement concerning the phasing-out of free allowances was reached one week later, on Sunday, Dec 18, 2022.

Second, the information that was released on December 13, 2022, can be considered as both novel and important for financial investors. To see this, one has to dig a little deeper into the details of the CBAM negotiations. The legislation proposal of the EU Commission on July 14, 2021, was already very advanced. For instance, it contained an initial list of goods (with CN codes) that the CBAM should cover. The proposal was also very detailed about how the carbon border tax should be implemented via trading of CBAM certificates, and also outlined penalties for misbehavior. Roughly speaking, for every import into the EU, importing firms located inside the EU need to surrender CBAM certificates, which can be purchased (and traded) at any time at a price equal to the average EU ETS price in the respective week. This general idea of the CBAM was not changed during the entire negotiation process. Clearly, a large part of the regulation is devoted to rules how to measure, declare and audit the amount of emissions for which CBAM certificates need to be surrendered. The initial proposal also contained the intention that the CBAM should be extended to all goods covered by the EU ETS until 2036. To sum up, the overall structure and outline was very clear already from this initial proposal.

Still, many details of the CBAM were changed or clarified during the following negotiations. Overall, the final CBAM regulation can be regarded as stricter than the initial proposal because the Parliament was pushing for more ambition during the negotiations. The initial list of CBAM-affected goods was extended towards hydrogen, certain indirect (i.e., Scope 2) emissions, certain precursors and downstream products like screws and bolts and similar products of iron and steel. The penalties for misbehavior were strengthened. Moreover, many details concerning the alignment of the CBAM with the EU ETS (for instance as regards the allocation of free allowances) had to be settled, also with an eye on the compatibility of the CBAM with WTO rules. Importantly, this alignment also implies that the CBAM should be extended towards a larger number of goods in the near future. The gradual phasing-in of the CBAM was decided to be much faster than initially proposed by the Commission. The CBAM is now supposed to be extended to all goods covered by the EU ETS until 2030. Finally, the institutional design was adjusted, with certain parts of the governance being centralized at the EU level. The tax will be collected by the national authorities of the EU member states, but the declarations of purchased allowances will have to be filed to an EU-wide CBAM registry administered by the EU Commission, presumably facilitating a proper enforcement of the CBAM.

Naturally, these adjustments represent a compromise between the positions of the Parliament and the Council that was reached during several rounds of negotiations. For instance, in its positioning on June 22, 2022, the Parliament pushed for the extension of the list of CBAM-affected goods and the stricter timeline. On the other hand, the semi-central governance structure rather reflects the position of the Council adopted on March 23, 2022. The compromise between these positions was published in a three-page press release on December 13, 2022, sketching the

Trilogue agreement as outlined above.[13] We therefore view this date as the one containing the largest amount of news for financial markets that can be related specifically to the CBAM. The complete and final version of the legislative text was released alongside the final decision of the Parliamentary Committee on the Environment, Public Health and Food Safety on February 09, 2023. This version was then officially adopted by the European Parliament and the Council of the European Union in April 2023. But the key features of this final legislation were publicly known since December 13, 2022.

Finally, we wish to remark that, in 2025, the EU pushed forward a reform of the CBAM. Besides introducing further exemptions for small companies, the European Parliament and the European Council have decided to postpone the phasing-in of the CBAM by one year, in order to reduce the administrative burden for firms. The first carbon border tax payments will now be due in February 2027 instead of January 2026. Importantly, this postponement does not affect the results in our paper because it came up two years after our main event on December 13, 2022.

2.2 Developing hypotheses

From the political developments and the design specifications of the CBAM, we can deduce our main testable hypothesis. We conjecture to see a negative abnormal stock return of firms that are subject to the CBAM regulation as opposed to non-regulated firms. Following the canonical framework of Campbell and Shiller (1988), we posit that carbon pricing affects firm valuations through two primary theoretical channels: cash flows and discount rates.

The expected cash flow channel operates through direct impacts on firms' future operational costs and revenues, with the magnitude being determined by, for instance, import intensity, cost pass-through capabilities, and market structure. There is a rich literature which provides estimates of the pass-through of the 2018 tariff increases to goods prices and quantities. Recent examples evaluating the impact of the US trade policy turmoil in 2018 are the papers of Fajgelbaum, Goldberg, Kennedy, and Khandelwal (2020), Flaaen, Hortacsu, and Tintelnot (2020), Cavallo, Gopinath, Neiman, and Tang (2021) and Amiti, Redding, and Weinstein (2019). From

[13] See `https://ec.europa.eu/commission/presscorner/detail/en/ip_22_7719`

this literature, we can hypothesize that the CBAM reduces the expected cash flows of firms which import the specified goods.

The discount rate channel emerges through exposure to systematic risks like carbon price volatility, regulatory uncertainty, or international trade frictions, potentially affecting firms' cost of capital. Depending on the financial situation of a firm and on its import share, the CBAM may increase the exposure of its cash flows to such risk factors substantially, which could result in higher cost of capital (i.e. discount rates) to the extent that this additional cash flow risk is systematic and not diversifiable. Policy uncertainty may also increase discount rates through an increase in aggregate market prices of risk. In fact, such discount rate effects have been documented in the broader literature on trade policy and stock returns. For example, Amiti, Gomez, Kong, and Weinstein (2024) provide strong evidence in favor of a "flight to safety" on US tariff announcement days in 2018. Nominal and real bond yields dropped, while empirical proxies for equity risk premia derived from option markets went up. Taken together, both cash flow and discount rate channels imply a decrease in regulated firms' stock prices upon announcement of the CBAM, relative to the stock prices of unregulated firms.

A recent paper aligns with our main hypothesis. The CBAM changes the relative competitiveness of EU and non-EU producers; in particular, it creates a reallocation effect, as noted by Clausing, Colmer, Hsiao, and Wolfram (2025). High-emission producers outside the EU avoid CBAM costs by diverting sales away from Europe. This diversion reduces product supply within the EU and raises prices, thereby lowering consumer surplus. EU producers do not fully profit from these price increases because they remain subject to existing EU carbon regulations. The model of Clausing, Colmer, Hsiao, and Wolfram (2025) does not explicitly allow for supply chains and different layers of the production process, implying that EU customer firms in our empirical data are best represented by EU consumers in their model. Supporting our hypothesis, EU consumers in the calibrated model are, on net, made worse off by the CBAM due to the reallocation of non-EU suppliers. Although the CBAM strengthens EU producers' relative competitiveness and yields gains from limiting foreign entry, these gains do not fully offset consumer losses.

A few design features need to be taken into account more specifically, though. First of all, we will test the hypothesis on firms located within the EU. It is the importing firm (within the EU) which has to report the emissions of its imports and purchase the CBAM certificates, not the producer (located outside the EU). To what extent the importer can pass on the additional costs to the producers, depends on the relative bargaining power of the two. But it is reasonable to assume that importers will have to bear at least a significant share.

Second, the CBAM puts a price on carbon emissions that were previously unpriced, i.e., it operates at the extensive margin, not the intensive margin. Third, the CBAM covers only a few goods categories, for which carbon emissions are important and relatively easy to measure and report, but not all imports. When constructing our treatment and control group, we will thus separate firms using two criteria: (i) whether they have suppliers outside the EU (ii) and which goods they import.

One can construct (seeming) counterarguments against our main hypothesis. For instance, as noted above, the CBAM changes the relative competitiveness of domestic and foreign producers. If the CBAM makes foreign imports less appealing, thereby making domestic products more competitive, customers may switch their suppliers to domestic ones. However, while this channel may reduce the magnitude of the results, it cannot fully offset the expected cash flow and discount rate effects above. First, switching suppliers is costly, for instance in terms of search costs. Second, it is unreasonable to assume that a firm would be overall financially better off with a new domestic supplier than in the situation without CBAM and with the incumbent foreign supplier. If this was the case, the incumbent customer-supplier relationship would have been suboptimal to begin with. Third, the costs already borne by EU-domiciled upstream producers due to the pre-existing EU ETS are not reduced by the CBAM regulation. If anything, these upstream producers are expected to be negatively affected by the phasing-out of free allowances in the future. To sum up, the possibility to switch suppliers cannot fully offset our results at least in the short run.

Finally, the policy process described above gives rise to two additional testable hypotheses. These hypotheses relate to market participants' updating beliefs regarding two further climate policy reforms down the road: (1) the phasing out of free allowances and (2) the extension of the CBAM to more goods.

Concerning (1), The CBAM is part of the larger “Fit-for-55” package, which includes, among others, a phasing-out of the system of free allowances within the EU ETS. These free allowances exist mainly in order to sustain the global competitiveness of firms in certain sectors, given that their competitors abroad do not face the burden of carbon pricing. When the CBAM becomes effective, this support will no longer be needed. In fact, WTO rules also require the phasing-in of the CBAM and the phasing-out of free allowances to be aligned. The decision to end the system of free allowances was publicly announced one week after the CBAM decision, but it is closely connected by construction. Therefore market participants likely interpreted the CBAM announcement as a strong signal that also the free allowances would come to an end soon. If markets are informationally efficient, firms that profit from the free allowance system should then see a decrease of their stock price through similar expected cash flow and discount rate effects as for the CBAM. In the rest of the paper, we will refer to this as the “free allowances treatment”. It operates at the intensive margin. Note that for the EU ETS, it is the producers within the EU which have to purchase the emission certificates, not the customers. For this reason, we will conduct our empirical tests regarding the free allowance treatment for both customer and supplier firms in the EU.

Concerning (2), a similar signaling effect may exist with respect to goods that are not subject to the EU CBAM initially. The press release on Dec 13, 2022, announced the commitment to include all goods covered by the EU ETS by 2030. If markets are efficient, most firms which import ETS-regulated goods into the European Union should see a decrease in their stock price upon announcement of the CBAM decision. Market participants should update their beliefs, which will have repercussions on stock prices through expected cash flows and discount rates again. We will refer to this as the “CBAM extension treatment”.

3 Data and Methodology

3.1 Data

We merge seven datasets for our analysis. The central datasource for our study is the FactSet Revere Supply Chain Relationships Database. This is one of the prime databases for research about business relations between companies worldwide, providing information on suppliers, customers, competitors, or strategic partners.[14] The information is systematically collected from primary public sources such as SEC 10-K annual filings, investor presentations, or press releases and classified according to normalized relationship types. Importantly and distinguishing it from other data providers, FactSet augments this primary data by reverse-linking it with data from the reportings of counterparties, to get a more complete picture of the global firm network and a very large global coverage. The data is at daily frequency and the time series start between 2003 and 2014, depending on the country. We start from the 729,223 global customer-supplier relationships that are active in the time period between January 01, 2021 and February 23, 2024. We then restrict the sample to relationships which are active around the event date (i.e. with start date before and end date after December 13,2022), which results in 321,268 active relationships. These active relationships involve 70,827 customer firms and 28,910 supplier firms globally.

Most data on firm characteristics such as firms' location, industry, stock price (including the adjustment factor accounting for dividend payments) is taken from Compustat North America and Global. As many small supplier firms are not publicly listed, we complement the data with location data from FactSet and suppliers' primary 4-digit SIC as well as 8 other non-primary SICs from Worldscope. For our study, it is paramount to consider all available SIC codes because a firm which produces diverse goods in different industries can be affected by the CBAM even if its core products are not subject to it. The firm-level data is matched via FactSet IDs as well as ISIN and SEDOL numbers. After merging with suppliers' location and industry information, we are down to 65,038 global customers and 20,154 global suppliers.

[14]It has been used recently, for instance, by Pankratz and Schiller (2023) and Ersahin, Giannetti, and Huang (2024).

The EU CBAM legislation specifies only goods categories to be subject to the border tax, not entire industries. To divide customers and suppliers into treatment and control group, we therefore need to link our industry information with goods categories. The list of affected goods is taken from the Official Journal of the European Union (L 130, published on May 16, 2023). The provisional agreement between the European Parliament, the European Commission and the European Council that was reached on December 13, 2022, states that the CBAM will initially apply to imports of cement, iron and steel, aluminium, fertilisers, electricity and hydrogen, whose production is very carbon intensive and presumably at the most significant risk of carbon leakage. The goods are listed with their official CN codes. We use the linking table provided by Pierce and Schott (2012b)[15] in order to match the CBAM-affected goods (CN or HS codes) to industries (SIC codes). We use 6-digit CN or HS codes for the matching. Out of the 1,036 SIC codes in our sample, 474 appear in the linking table. As a result, our sample is reduced to 15,471 customers and 5,178 suppliers globally. Since our analysis focuses on customers located within the EU and suppliers inside or outside the EU, our final data sample contains 1,142 publicly listed EU customers and their suppliers.

We calculate cumulative abnormal returns (CARs) of European customers using the daily European asset pricing factors provided by Ken French[16], which represents the conventional way to control for confounding factors in cross-sectional asset pricing. We are interested in the stock price response to our event which goes above and beyond the variation caused by a firm's exposure to the standard systematic risk factors (market return, size, value, profitability and investment), which have been shown to be major drivers of the cross-section of equity returns. To compute the CARs of global suppliers, we proxy the market excess returns through the difference between returns of country-level MSCI equity indices and 1-month sovereign zero-coupon rates. This data is downloaded from Thomson Reuters Eikon.

[15] The linking table is available on the webpage of Peter Schott: `https://sompks4.github.io/sub_data.html`.

[16] See `https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html`.

3.2 Methodology

We study the stock market responses to the introduction of the CBAM via event studies. To do so, we first calculate the daily abnormal log return $AR_{i,t}$ relative to the CAPM.[17] Market betas are based on 180 days prior to the event window. The cumulative abnormal return, $CAR_{i,t-2,t+2}$, for each customer is defined as the sum over all $AR_{i,t}$ over the five-day event window. We then compare the average CARs of various groups of firms.

There are a lot of possible ways to split the sample into treatment and control groups. We will later present results from a series of robustness checks for the choices that we make in this regard. In our baseline analysis, we study only the CARs of European customer firms because they are more relevant for policymakers within the EU. We will later, in Section 4.2, also discuss results for supplier firms, but because of sampling issues these results need to be taken with a grain of salt.

Our baseline exercise for EU customer firms is specified as follows. A customer firm that is supposed to be treated by the CBAM must have at least one supplier which satisfies two requirements: (i) the supplier is located outside the EU and (ii) it supplies goods that fall under the CBAM-affected goods categories.

In order to operationalize requirement (i), we construct the variable *loc_treat_ratio*, defined as the number of non-EU suppliers divided by the total number of suppliers for each customer:

$$loc\_treat\_ratio_i = \frac{\#\ \textit{non-EU suppliers of firm } i}{\#\ \textit{suppliers of firm } i}.$$

For requirement (ii), we need to make additional assumptions on the link between industries and goods. We define an industry as CBAM-affected if at least one type of goods produced by this industry (according to the industry-goods linking table) falls under the CBAM. Furthermore, we define a supplier as CBAM-affected if it belongs to at least one affected industry (according to its primary and non-primary SIC codes). We then construct the variable *ind_treat_ratio*, defined as the number of suppliers in CBAM-affected industries divided by the total number of

[17] We consider the Fama French 3-factor and 5-factor models in robustness checks further below.

suppliers for each customer:

$$ind\_treat\_ratio_i = \frac{\#suppliers\ of\ firm\ i\ in\ CBAM\text{-}affected\ industries}{\#\ suppliers\ of\ firm\ i}.$$

We categorize firms into treatment and control groups based on these two treatment variables. The control group in the following consists of all customer firms for which both $loc\_treat\_ratio_i$ and $ind\_treat\_ratio_i$ are equal to zero, i.e., firms which have no suppliers outside the EU and no suppliers in treated industries. Because the number of firms in the control group is rather small, we will also show results for a broader control group comprising firms for which both $loc\_treat\_ratio_i$ and $ind\_treat\_ratio_i$ are below the cross-sectional median. We will label this group as "generalized control group". The treatment group contains all firms for which both $loc\_treat\_ratio_i$ and $ind\_treat\_ratio_i$ are above the cross-sectional median.

Ideally, we would like to extend the control group to also include firms for which only one of the two requirements is satisfied, but not both. At first glance, these firms should also be unaffected by the CBAM. However, as the discussion in Section 2.2 has shown, they may be subject to ancipatory treatment effects regarding broader climate policy changes. We therefore handle these firms separately. To address the beliefs updating hypotheses, we will construct several other treatment groups using combinations of the variables $loc\_treat\_ratio_i$ and $ind\_treat\_ratio_i$, which we introduce as we go along. Finally, we will present a series of robustness checks where we vary the composition of treatment and control groups further.

Table 2 reports a few summary statistics for our treatment and control groups. The firms in the treatment group all have international supply chains by construction. Not surprisingly, they are larger and more profitable than the firms in the control group. Following standard practice in asset pricing, we control for these differences in robustness checks (see Section 6.4) where we construct cumulative abnormal returns relative to the Fama-French three-factor or five-factor model. All our results are robust. The stocks of firms in the treatment group are also more liquidly traded. But the stocks in the control group are far away from being illiquid, as indicated by the bid-ask spread, for instance. In particular, our key treatment effects reported below are orders of magnitude larger than the bid-ask spread. For completeness, Table A.1 in Appendix A shows the sectoral composition of our treatment and control groups. Importantly, our sample

Table 2: **Stock and Firm Characteristics**

	(1) **Control group**	(2) **Generalized control group**	(3) **Treatment group**
	$loc\_treat\_ratio_i = 0$ & $ind\_treat\_ratio_i = 0$	$loc\_treat\_ratio_i <$ median & $ind\_treat\_ratio_i <$ median	$loc\_treat\_ratio_i >$ median & $ind\_treat\_ratio_i >$ median
ln(MktCap)	17.8934	18.3503	19.7996
Inverse Price	0.4287	0.6527	0.3017
Amihud Ratio	1.1233	1.0063	0.0771
Bid-ask Spread (%)	0.0274	0.0287	0.0274
ln(Assets)	20.6224	21.2722	22.6977
Debt/Assets	0.2959	0.2811	0.2705
PP&E/Assets	0.3103	0.2584	0.2268
EBIT/Assets	-0.0226	0.0051	0.0573
Capex/Assets	0.0567	0.0421	0.0394
# Observations	117	354	209

Table 2 reports the mean of stock and firm characteristics for (generalized) control and treatment group. To avoid forward-looking bias, we use the balance sheet and financial data as of the end of 2021.

of EU customer firms covers a broad and representative range of manufacturing sectors. It thus includes various sectors for which the introduction of the CBAM can be expected to have a meaningful effect.

4 Results

4.1 Total treatment effect for customers inside the EU

This section presents the results from our baseline exercise. Table 3 reports the average cumulative abnormal returns of the treatment group and the two control groups around the event date (December 13, 2022). The stars indicating statistical significance are derived from two-sided t-tests of the null hypothesis that the respective mean equals zero. Table 3 also reports the differences of the average CARs between the groups, together with the p-value from a one-sided t-test of the null hypothesis that these differences in mean are positive or zero.[18] Complement-

[18]We rely on one-sided t-tests following the discussion about testable hypotheses outlined in Section 2. Eventually, we seek to analyze whether the introduction of the CBAM had a negative effect on stock returns of regulated

ing Table 3, Figure 1 depicts the evolution of the cumulative abnormal returns over the event window. To ensure comparability, we benchmark each day's return against the first day of the event window.

Table 3: **Total treatment effect**

	(1) **Control group** $loc\_treat\_ratio_i = 0$ & $ind\_treat\_ratio_i = 0$	(2) **Generalized control group** $loc\_treat\_ratio_i <$ median & $ind\_treat\_ratio_i <$ median	(3) **Treatment group** $loc\_treat\_ratio_i >$ median & $ind\_treat\_ratio_i >$ median	(4) **Difference (3) − (1)**	(5) **Difference (3) − (2)**
Mean CAR	0.0035	0.0000	-0.0097***	-0.0131***	-0.0096**
SE	(0.0036)	(0.0030)	(0.0030)		
p-value				(0.0036)	(0.0164)
# Obs	117	354	209		

Table 3 reports the average CARs for the treatment group and the two control groups of EU customer firms for the 5-day event window around December 13, 2022. The treatment group comprises customers with above median *loc_treat_ratio* and above median *ind_treat_ratio*. The control group comprises firms with $loc\_treat\_ratio = 0$ and $ind\_treat\_ratio = 0$. The generalized control group comprises firms where both ratios are below the median. The variable *loc_treat_ratio* is defined as the number of non-EU suppliers divided by the total number of suppliers for each customer. The variable *ind_treat_ratio* is defined as the number of suppliers in CBAM-affected industries divided by the total number of suppliers for each customer. Robust standard errors or p-values are reported in parentheses. CARs are calculated relative to CAPM expected returns. In the first three columns, stars indicating statistical significance (*** p<0.01, ** p<0.05, * p<0.1) refer to two-sided t-tests of the null hypothesis of the mean being equal to zero. In the last two columns, they refer to a one-sided t-test of the null hypothesis of the mean difference being positive or zero.

The treatment group exhibits a strongly negative return, which is both statistically significant and economically large (-1 percentage point on average). The net treatment effect of -1.3 percentage points is also strongly significant. When we use the generalized control group as a comparison, the treatment effect becomes slightly smaller, but remains significant.

Supporting our causal interpretation, Figure 1 reveals that the bulk of this negative return is in fact realized during a narrow two-day window around the event date. To be precise, all returns in our analysis are obtained from closing prices. The press release about the breakthrough in the negotiations was published at 1:00 a.m. in the morning on Tuesday, December 13, 2022. The final round of negotiations itself took place over the course of Monday, December 12, 2022.

firms.

Acknowledging the possibility of information leakage during such political bargaining, it seems natural that stock prices already started reacting at some point between market close on Friday, December 09, 2023, and market close on Monday, December 12, 2023.

Figure 1: **Total treatment effect**

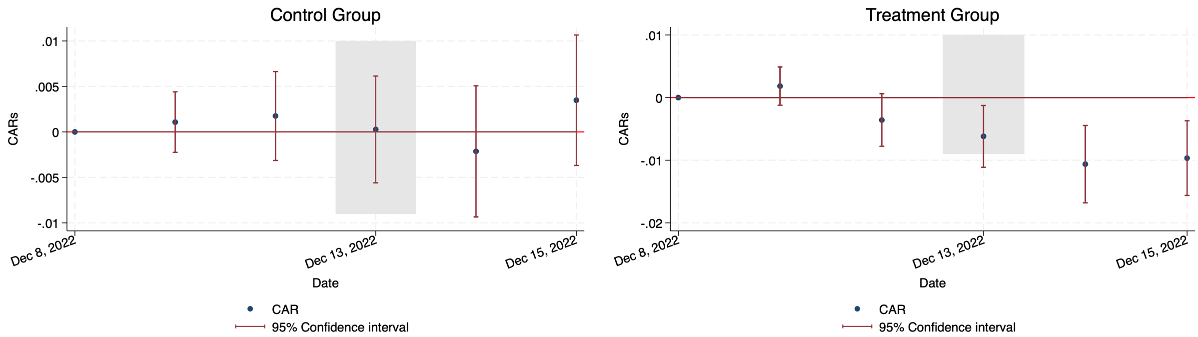

Figure 1 depicts the average CARs for the same groups as in Table 3 over the 5-day event window around December 13, 2022. To ensure comparability, we benchmark each day's return against the first day of the event window. CARs are calculated relative to CAPM expected returns. The vertical lines on each day indicate 95% confidence intervals based on robust standard errors.

Altogether, we view this as clear evidence that the introduction of the CBAM affects the market valuation of EU customers with treated suppliers negatively. Albeit quantitatively small at first glance, the size of the treatment effect is remarkable. Importantly, it can be considered a lower bound for the total effect of the CBAM on the stock prices of treated firms. This is because our event date is only one in a long sequence of dates where news about the CBAM was released, and most of these news indicated that the CBAM could become stricter than previously expected. As outlined in Section 2, a lot of these news releases unfortunately fall together with news about other parts of the "Fit for 55 package", so that they are not suitable for clean identification in an event study. Presumably, the total effect of the CBAM on stock prices is thus much larger than documented in the table.

Finally, we have also looked into various subsamples, for instance along the lines of a sectoral decomposition. Since our sample size is relatively small, we do not find statistically significant treatment effects in such subsamples. Therefore we do not report any numbers in our paper.

However, the point estimates for sectoral subsamples are mostly in line with the economic rationale concerning the policy announcement on December 13, 2022. For instance, we observe a (statistically insignificant) treatment effect of -3 percentage points for the cement industry, potentially caused by the surprising negotiation outcome that the CBAM will also cover Scope 2 emissions from cement production. Similarly, we observe no treatment effect at all for the food manufacturing industry, confirming the intuition that the announcement did not contain any news regarding the inclusion of agricultural upstream products like fertilizers into the CBAM. More details are available upon request.

4.2 Cumulative abnormal returns of suppliers

In our baseline specification above, we analyze the stock returns of customer firms inside the EU only. Obviously, supplier firms both inside and outside the EU are affected by the CBAM regulation as well. Unfortunately, we have only limited data available to derive robust results for the cumulative abnormal returns of suppliers. There are several reasons for this. First, many supplier firms in our customer-supplier relationship data are small and not publicly listed. Second, we are dealing with a very heterogeneous international sample of firms, which complicates the computation of cumulative abnormal returns relative to the CAPM. We use MSCI country-level equity indices as proxies for the market factor, acknowledging that there remains a lot of noise in the abnormal returns. Third, the international sample of firms which have customer-supplier relationships reported in our data is rather small and cannot be regarded as representative for the worldwide set of publicly listed firms. In particular the cumulative abnormal returns of what we label as control group have to be taken with a grain of salt.

Despite the caveats concerning data quality indicated above, we essentially follow the same event study procedure as in the previous section. In the final dataset, we have identified 1,598 publicly listed suppliers which are located outside the EU. We construct the variable $EU\_customer\_ratio$, defined as the number of EU customers divided by the total number of customers for each supplier:

$$EU\_customer\_ratio_j = \frac{\#\ EU\ customers\ of\ supplier\ j}{\#\ customers\ of\ supplier\ j}.$$

Table 4: **Cumulative abnormal returns of non EU suppliers**

	(1) **Control group** $EU\_customer\_ratio_j > 0$ & $ind\_cbam_j = 0$	(2) **Treatment group** $EU\_customer\_ratio_j > 0$ & $ind\_cbam_j > 0$	(3) **Difference (2) − (1)**
Mean CAR	-0.0567***	-0.0802***	-0.0235
SE	(0.0117)	(0.0150)	
p-value			(0.2859)
# Obs	662	53	

Table 4 reports the average CARs for groups of supplier firms outside the EU for the five-day event window around December 13, 2022, as well as differences between them. CARs are calculated relative to CAPM expected returns. The composition of the different groups is explained in Section 4.2. Robust standard errors or p-values are reported in parentheses. For the CAR of each group, stars indicating statistical significance (*** p<0.01, ** p<0.05, * p<0.1) refer to two-sided t-tests of the null hypothesis of the mean being equal to zero. For the CAR differences, they refer to one-sided t-tests of the null hypothesis of the mean difference being positive or zero.

As in the baseline specification, we define an industry as CBAM-affected if at least one type of goods produced by this industry (according to the industry-goods linking table) falls under the CBAM. The dummy variable ind_cbam_j equals 1 if supplier j belongs to at least one affected industry (according to its primary and non-primary SIC codes) and 0 otherwise.

The most suitable control group for this exercise comprises supplier firms outside the EU which have customers within the EU, but in different industries that are not subject to the CBAM. The group labeled as "control group" in the following thus refers to firms which have $EU\_customer\_ratio > 0$, but $ind\_cbam = 0$. The "treatment group" comprises all firms which have EU customers and belong to CBAM-affected industries ($EU\_customer\_ratio > 0$, and $ind\_cbam = 1$).[19]

The results for the cumulative abnormal returns of supplier firms outside the EU are presented in Table 4.[20] In line with the results for customer firms, the treatment group has the most negative cumulative abnormal return. The difference between the treatment and the con-

[19] The median of *EU_customer_ratio* equals zero, rendering a median split like in the previous section infeasible. In a robustness check also reported below, we split the sample into control and treatment groups along the 70% of the cross-sectional distribution of the *EU_customer_ratio*, i.e. we compare firms below the 70% quantile and firms above the 70% quantile.

[20] The complete results of non EU suppliers are documented in Table B.2 in Appendix B.

trol group amounts to -2 percentage points and is thus even larger than the treatment effect that we have measured for customer firms in Section 4.1. Unfortunately, because of the large noise in the data, the difference is statistically insignificant. But, as we show in robustness checks in Section 6.5 later on, there are also slightly different specifications of treatment and control groups in which the negative treatment effects for suppliers become significant. Moreover, because of the data limitations outlined above, the control group has a large negative and significant CAR as well, reflecting the fact that our control group is not representative for the worldwide universe of publicly listed firms. Still, altogether, we view these results as roughly confirming the results for customers presented in the previous section, but take them with a grain of salt.

4.3 Further event dates

For completeness, we report cumulative abnormal returns for EU customer firms for a set of further events outlined in Section 2. These events are unfortunately characterized by news about several different EU climate policies being announced jointly on one day, making causal identification impossible at first glance. But we can still gain some insights from the following results. Specifically, none of the other policy measures of the "Fit for 55 package" that were negotiated in parallel with the CBAM, like a reform of the EU ETS, are directly related to international trade. We can thus still meaningfully compare different treatment groups with each other. It is rather the firms in the control group that are affected by several policy measures at the same time. For this reason, we try not to overinterpret any numbers for the control group in the following.

The event study is designed exactly as in the baseline specification. We study three additional dates. On July 14, 2021, the EU Commission presented the initial proposal for the CBAM, along with proposals for several other climate policy measures subsumed under the "Fit for 55 package". Around this date, we have 278,145 active customer-supplier relations, and we end up with 1,140 EU customers after merging with the various other databases. On February 09, 2023, the Parliamentary Committee of the Environment, Health, and Food Safety adopted the final Trilogue agreement. There we have 332,037 active customer-supplier relations and end up with 1,130 EU customers. On April 18, 2023, the EU Parliament finally adopted the CBAM regulation. For this event, we have 568,926 active customer-supplier relations and 1,120 EU customers.[21]

Table 5: **Average CARs on other event dates**

Event date		(1) **Control group** $loc\_treat\_ratio_i = 0$ & $ind\_treat\_ratio_i = 0$	(2) **Treatment group** $loc\_treat\_ratio_i >$ median & $ind\_treat\_ratio_i >$ median	(3) **Difference (2) − (1)**
July 14, 2021	Mean	0.0024	-0.0116	-0.0140
	SE	(0.0050)	(0.0091)	
	p-value			(0.1047)
	# Obs	151	191	
Dec 13, 2022	Mean	0.0035	-0.0097***	-0.0131***
	SE	(0.0036)	(0.0030)	
	p-value			(0.0036)
	# Obs	117	209	
Feb 9, 2023	Mean	0.0011	-0.0035	-0.0046
	SE	(0.0040)	(0.0043)	
	p-value			(0.2429)
	# Obs	112	216	
April 18, 2023	Mean	0.0007	-0.0175	-0.0182
	SE	(0.0049)	(0.0186)	
	p-value			(0.2620)
	# Obs	118	247	

Table 5 reports the average CARs for each group of EU customer firms for five-day event windows around a few other event dates. CARs are calculated relative to CAPM expected returns. The control and treatment groups are defined in the same way as in Tables 3. Robust standard errors or p-values are reported in parentheses. In the first two columns, stars indicating statistical significance (*** p<0.01, ** p<0.05, * p<0.1) refer to two-sided t-tests of the null hypothesis of the mean being equal to zero. In the third column, they refer to one-sided t-tests of the null hypothesis of the mean difference being positive or zero.

Table 5 presents the results for all three dates. For the sake of readability, we report only the numbers for the total treatment, the complete set of results can be found in Table B.3 in Appendix B. Several observations can be made. First of all, there is no treatment effect at all

[21] As discussed in Section 2, the list of goods that are subject to the CBAM varies across the event dates. For instance, the initial list that comes with the proposal on July 14, 2021, comprises fewer goods than the final CBAM regulation on April 18, 2023. We therefore use different lists of goods, exactly as published on the respective event dates, throughout this section.

on February 09, 2023. We view this as evidence that all relevant news related to the Trilogue agreement have been priced in since the press release on December 13, 2022. The publication of the full text of the regulation two months later does not trigger any stock price reaction.

Second, both the release of the first proposal by the EU Commission on July 14, 2021, and the final decision by the EU Parliament on April 18, 2023, trigger large (but insignificant) stock price reactions. We avoid to interpret the numbers for the control group because of the simultaneity of several policy announcements. But this concern of non-separability does not apply to the location treatment in isolation. In fact, the complete set of results in the appendix suggests that the partial treatments (both location and industry) also give rise to large negative (but insignificant) stock returns of up to -0.8 percentage points around July 14, 2021. For April 18, 2023, the respective treatment effects are even larger (up to -2.4 percentage points).

Taken together, these numbers give a very rough indication of the economic significance of the CBAM for financial markets. Of course, adding up the treatment effects around all the different dates is statistically infeasible. For one, they are derived from very different samples. For another, we cannot control for other, potentially positive or zero news reaching the market in between the events. Still, from our reading of the sequence of legislative documents published by the EU decision-making bodies over the course of two years, there was not much contrarian positive or zero news along the negotiation process of the CBAM which could have reversed the negative treatment effects that we find. Specifically, the opinions of both the European Parliament and the Council of the European Union can be regarded as stricter than the initial proposal by the EU Commission, and so was the final outcome of the Trilogue. The (hypothetical, back-of-the-envelope) combined treatment effect for EU customers across the three major event dates (July 14, 2023, December 13, 2022, and April 18, 2023) amounts to more than 4 percentage points. On top, the analysis of supplier firms in Section 4.2 suggests that the treatment effects for suppliers outside the EU could be (at least) about equally large. Against the background of economic debates about "stranded assets" resulting from the tightening of climate policies, these numbers are remarkable.

5 Updating beliefs about climate policy changes

The timeline of the policy process discussed in Section 2 has revealed that the agreement about the CBAM on December 13, 2022, was only part of a larger package of legislations that were negotiated in parallel. Thus, market participants may have perceived the CBAM agreement as a signal that the negotiations about the other parts of this package would soon come to a successful end as well. The most important companion legislation is the phasing-out of free allowances under the EU ETS, on which the different parties in fact reached an agreement a few days later. Moreover, as another surprise, the press release about the CBAM on December 13, 2022, states the explicit goal of the EU to extend the CBAM to all goods covered by the EU ETS until 2030.

If markets are informationally efficient, the updating of beliefs about climate policy reforms should change market prices immediately, as soon as the signal becomes public. Our setup of treatment and control groups allows us to test this hypothesis. Specifically, we study a set of treatment groups that can be seen as intermediate cases between the CBAM treatment and control groups analyzed above. Remember that a customer firm that is supposed to be treated by the CBAM must have at least one supplier which satisfies two requirements: (i) the supplier is located outside the EU and (ii) it supplies goods that fall under the CBAM-affected goods categories. In the following, we construct groups of firms that satisfy only one of the two requirements.

For instance, firms which purchase CBAM-affected goods, but from producers inside the EU, are likely affected by the phasing-out of free allowances. The key reason for the existence of free allowances under the EU ETS has been the missing carbon price for the respective goods outside the EU. The free allowances are granted to supplier firms within the EU so that their products remain competitive internationally. But the positive effects from free allowances are likely to spill over to customer firms. Without the CBAM and without free allowances, firms importing from outside the EU would have a comparative advantage relative to their peers who source input goods from within the EU. Both the free allowances and the CBAM reduce this comparative advantage. In order to level the playing field (and to comply with WTO rules), the free allowances for these respective goods must be phased out in parallel with the introduction of the CBAM.

The CBAM announcement on Dec 13, 2022, may also induce a beliefs update about a potential broadening of the CBAM to cover further goods categories. Specifically, the CBAM announcement came with the commitment that the EU will examine such a broadening until 2030. Firms which import non-CBAM-affected goods from producers outside the EU are most likely affected by this extension.

Tables 6-8 report the CARs for the respective treatment groups and some more differences across groups. Figures 2 and 3 present the respective returns of these groups over the full event window.[22]

5.1 Phasing out of free allowances

We address the issue of the phasing-out of free allowances under the EU ETS with two exercises. For the first exercise, Table 6 presents results from a treatment based on suppliers' industries using the merged dataset and the methodology introduced in Section 3. We compare the control group from Table 3 with a group that comprises firms with above median *ind_treat_ratio*, but below median *loc_treat_ratio*. Stated differently, the EU customer firms in this group have many suppliers in CBAM-treated industries, but mostly from within the EU. This group comprises firms whose suppliers are likely to be affected by a reduction in free allowances under the EU ETS. The treatment effect is negative, significant, and economically large, exceeding -1 percentage point. Moreover, from Figure 2, we again take away that the bulk of this treatment effect is realized in a very narrow time window around the event. On the other hand, the treatment effect in Table 6 is somewhat smaller than the treatment effects in our baseline analysis of the CBAM effect in Table 3.[23]

[22]For the sake of readability, we do not report the CAR differences between all possible combinations of groups in the tables and figures here. The complete set of results is reported in Table B.1 in Appendix B.

[23]We wish to point out that – in principle – an analysis of the anticipation effects for EU ETS reforms should rather focus on supplier firms within the EU. This is because the suppliers are the firms who currently receive the free allowances and who will have to pay for the EU ETS certificates in the future. Unfortunately, within our merged dataset, we do not have enough observations of publicly traded supplier firms for this type of analysis. Therefore we stick to the customer firms in this sample. If the additional burden from having to purchase EU ETS certificates spills over, there should also be an effect on asset prices for these firms, and in fact our results confirm this hypothesis.

Table 6: **Free allowances treatment effect I**

	(1)	(2)	(3)
	Control group	**Industry treatment, location control group**	**Difference**
	$loc\_treat\_ratio_i = 0$ & $ind\_treat\_ratio_i = 0$	$loc\_treat\_ratio_i <$ median & $ind\_treat\_ratio_i >$ median	
Mean	0.0035	-0.0069***	-0.0104*
SE	(0.0036)	(0.0025)	
p-value			(0.0088)
# Obs	117	217	

Table 6 reports the average CARs for further groups of EU customer firms for the five-day event window around December 13, 2022. The treatment group comprises customers with below median *loc_treat_ratio* and above median *ind_treat_ratio*. The CAR of the control group has been reported in Table 3. Robust standard errors or p-values are reported in parentheses. CARs are calculated relative to CAPM expected returns. In the first two columns, stars indicating statistical significance (*** p<0.01, ** p<0.05, * p<0.1) refer to two-sided t-tests of the null hypothesis of the mean being equal to zero. For the differences in the last column, the stars refer to a one-sided t-test of the null hypothesis of the mean difference being positive or zero.

Figure 2: **Free allowances treatment effect I**

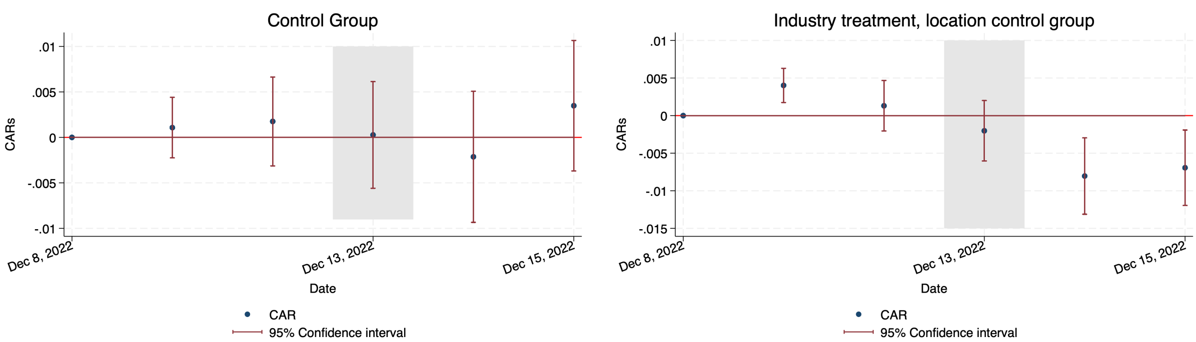

Figure 2 depicts the average CARs for the control group and the industry treatment, location control group over the 5-day event window around December 13, 2022. The groups are the same as those in Table 6. CARs are calculated relative to CAPM expected returns. The vertical lines on each day indicate 95% confidence intervals based on robust standard errors.

Our second exercise is based on a broader sample of European firms than the other exercises above, it targets the free allowances more directly. The sample comprises all publicly traded firms in the EU, which we split into two subsamples based on the firms' industries. Firms in industries which receive free allowances are sorted into the treatment group, all others firms are sorted into the control group. We do not use any supply chain data in this second exercise. Table 7 reports the cumulative abnormal returns of the two groups. The difference of -0.22 percentage points is negative and significant, indicating that our main event – the announcement of the CBAM agreement – had a detrimental effect on firms receiving free allowances.

We implement this second exercise in order to fully capture the design of the EU ETS free allowance policy. Free allowances have been allocated to European firms for many years, long before any considerations of a carbon border adjustment mechanism. The political reasoning behind the free allowances is to support the global competitiveness of EU firms subject to the EU ETS. The mechanism how free allowances are allocated is somewhat involved, with two issues worth being highlighted. First, the industry of a firm plays the most important role. The EU has defined a list of industries which are at risk of carbon leakage, and firms in these industries receive at least three times as many free allowances as all other firms. Our treatment group definition relies on the NACE codes of these industries. Second, firms' actual supply chains are irrelevant for the allocation of free allowances.

To interpret all results correctly, we need to dig into the political negotiation process once again. From the very beginning, it was stated clearly that the CBAM and the phasing-out of free allowances will be tightly linked. Therefore, the announcement of the Trilogue agreement concerning the CBAM on Dec 13, 2022, must have been perceived as a signal that a Trilogue agreement concerning the phasing-out of free allowances was to follow soon. Market participants should update their beliefs accordingly. At the same time, the details about the phasing-out of free allowances were still to be finalized (which was done one week later). Moreover, the two political measures work very differently. The CBAM is based on firms' supply chains and the goods which they import, the free allowances are mainly allocated based on the industries to which firms belong, so that an alignment of these two policy measures is not straightforward.

Table 7: **Free allowances treatment effect II**

	(1)	(2)	(3)
	No Free Allowances	**Free allowances**	**Difference**
Mean	0.0031***	0.0008	-0.0022**
SE	(0.0003)	(0.0012)	
p-value			(0.0013)
# Obs	3906	272	

Table 7 reports the average CARs for two groups of EU publicly traded firms for the five-day event window around December 13, 2022. The treatment group comprises firms in industries which are officially at risk of carbon leakage (according to a list with NACE codes published by the EU Commission) and thus receive the bulk of all free allowances. The control group comprises all other European publicly traded firms. Robust standard errors or p-values are reported in parentheses. CARs are calculated relative to CAPM expected returns. In the first two columns, stars indicating statistical significance (*** p<0.01, ** p<0.05, * p<0.1) refer to two-sided t-tests of the null hypothesis of the mean being equal to zero. For the differences in the last column, the stars refer to a one-sided t-test of the null hypothesis of the mean difference being positive or zero.

Our results confirm this view. First, from Table 7, we infer that the beliefs update is broad. It affects all firms which currently receive free allowances, irrespective of whether their industry is also captured by the CBAM or not. That is, market participants revise the probability of a phasing-out of free allowances upwards broadly across all firms. This reflects the pronounced uncertainty as to which firms will be confronted with a phasing-out eventually. Second, from Table 6 we take away that EU firms with suppliers in CBAM-treated industries from within the EU suffered even more strongly. This suggests that, while the beliefs update is broad, market participants also anticipate cross-sectional differences, with some firms being affected more strongly than others and this distinction running along the lines of the CBAM treatment.

Lastly, we have also run our event study around December 18, 2022, the day when the Trilogue agreement concerning the free allowances was reached. We do not find any significant stock price reactions there. While insignificant results should always be interpreted with care, we still view the absence of any market response as an indication that the new information was largely priced in already one week earlier.

5.2 Extension of the CBAM

Table 8 addresses the issue of a possible extension of the CBAM to all goods that are currently regulated by the EU ETS. It presents results from two additional treatments based on suppliers' location inside versus outside the EU, using the sample introduced in Section 3. For Panel A, we simply perform a median split based on the variable *loc_treat_ratio*. I.e., we compare EU customer firms with many suppliers outside the EU with EU customers which have only few suppliers outside the EU, irrespective of the industry of these suppliers. Interestingly, we observe a negative and significant treatment effect of about -0.5 percentage points, i.e. about half as large as the total treatment effect shown in the Section 4.1.

The official CBAM regulation contains the commitment that, by 2030, all goods that are subject to the EU ETS should also be subject to the CBAM. Even though the official CBAM regulation concentrates on a few selected goods initially, investors may thus anticipate many more goods (or industries, respectively) to be subject to the CBAM in the future, as long as the suppliers are located outside the EU. If markets are informationally efficient, this updating of beliefs should affect prices immediately, and this is what our results document.

In Panel B, we view the CBAM extension treatment effect from another angle, supporting these explanations. Specifically, we compare the control group, which was already presented in Table 3, with another dedicated group. This group comprises firms with above median *loc_treat_ratio*, but below median *ind_treat_ratio*.[24] Stated differently, the EU customer firms in this group have many suppliers outside the EU, but mostly in industries that are currently not subject to the CBAM, however, may be affected in the future. This group is a subgroup of the location treatment group in Panel A. The treatment effect is again negative, significant, and economically large, exceeding -1 percentage point. Figure 3 also indicates that the bulk of this treatment effect is indeed realized in a very narrow time window around the event. Altogether, we view these results as evidence that the announcement that the CBAM is likely going to be expanded by 2030 has significant effects on the stock prices of firms which may arguably be affected by this additional policy reform in the future.

[24]In contrast to the control group, we do not impose the stricter condition $loc\_treat\_ratio_i = 0$ here because this would reduce the number of firms in the treatment group considerably. The same holds true for Table 6 above.

Table 8: **CBAM extension treatment effect**

Panel A: Only location information

	(1)	(2)	(3)
	Location control group	**Location treatment group**	**Difference**
	$loc\_treat\_ratio_i$ < median	$loc\_treat\_ratio_i$ > median	
Mean CAR	-0.0027	-0.0081***	-0.0054*
SE	(0.0021)	(0.0031)	
p-value			(0.0724)
# Obs	571	571	

Panel B: Location and industry information

	(1)	(2)	(3)
	Control group	**Location treatment, industry control group**	**Difference**
	$loc\_treat\_ratio_i = 0$ & $ind\_treat\_ratio_i = 0$	$loc\_treat\_ratio_i$ > median & $ind\_treat\_ratio_i$ < median	
Mean CAR	0.0035	-0.0072	-0.0106*
SE	(0.0036)	(0.0045)	
p-value			(0.0982)
# Obs	117	362	

Table 8 reports the average CARs for further groups of EU customer firms for the five-day event window around December 13, 2022. The location treatment group and location control group in Panel A result from a median split of our entire sample for the variable *loc_treat_ratio*. The treatment group in Panel B comprises customers with below median *ind_treat_ratio* and above median *loc_treat_ratio*. It is a subgroup of the location treatment group in Panel A. The CAR of the control group in Panel B has been reported in Table 3. Robust standard errors or p-values are reported in parentheses. CARs are calculated relative to CAPM expected returns. In the first two columns, stars indicating statistical significance (*** p<0.01, ** p<0.05, * p<0.1) refer to two-sided t-tests of the null hypothesis of the mean being equal to zero. For the differences in the last column, the stars refer to a one-sided t-test of the null hypothesis of the mean difference being positive or zero.

Figure 3: **CBAM extension treatment effects**

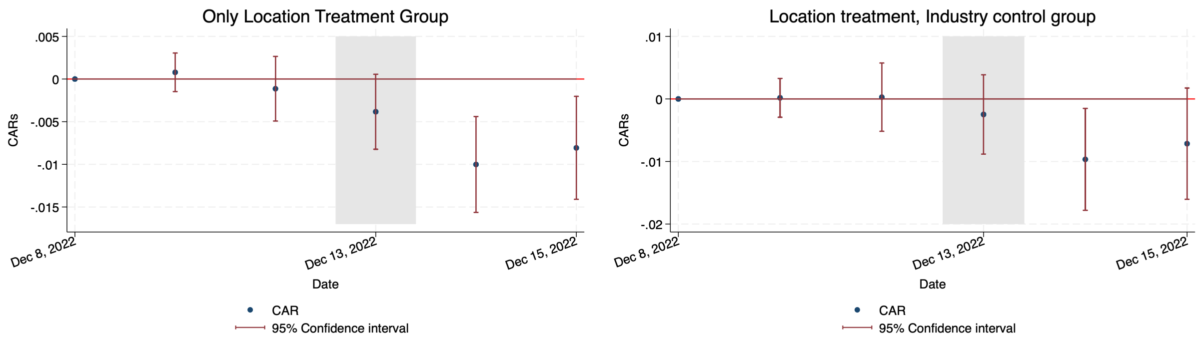

Figure 3 depicts the average CARs for different treatment groups over the 5-day event window around December 13, 2022. The treatment groups are the same as those in Table 8. CARs are calculated relative to CAPM expected returns. The vertical lines on each day indicate 95% confidence intervals based on robust standard errors.

As a final exercise, Table B.4 in the Appendix reports the treatment effect when we bunch all three treatment groups (double treatment, location treatment and industry treatment) together into one "universal treatment group". This group combines all firms which are supposedly affected by the CBAM regulation, either directly through the carbon border payments or indirectly through a phasing-out of free allowances or through the expectation of being subject to the CBAM in the future. The universal treatment effect amounts to -1.12 percentage points and is strongly statistically significant.

6 Robustness

We close the paper with a series of robustness checks concerning choices that we made for our baseline specification. For the sake of readability, we only report a small selection of the cumulative abnormal returns in the main text. The complete set of results can be found in Tables B.5 to B.8 in Appendix B.

6.1 Longer event window

Table 9 reports cumulative abnormal returns around December 13, 2022, when we extend the event window to 10 days, ranging from December 08 to December 20. Figure 4 displays the returns graphically. First of all, this robustness check confirms that the parallel trends assumption, which underlies any diff-in-diff event study, holds. Second, over this longer event window, the cumulative abnormal return of the treatment group is much more negative than in the baseline exercise, exceeding -2.7 percentage points. However, the control group also exhibits a strongly negative (but insignificant) return. As a result, the treatment effect is insignificant and smaller than in the baseline setting. Notably, when we compare the treatment group to the generalized control group as defined in Table 3 (results not shown here for brevity), the treatment effect turns out to be significant again and exceeds -1 percentage point.

Table 9: **10 day event window**

	(1) **Control group** $loc\_treat\_ratio_i = 0$ & $ind\_treat\_ratio_i = 0$	(2) **Treatment group** $loc\_treat\_ratio_i >$ median & $ind\_treat\_ratio_i >$ median	(3) **Difference (2) − (1)**
Mean	-0.0215	-0.0271***	-0.0056
SE	(0.0118)	(0.0054)	
p-value			(0.3119)
# Obs	117	209	

Table 9 reports the average CARs for each group of EU customer firms for the 10-day event window around December 13, 2022. The composition of the different treatment groups is the same as in Tables3. Robust standard errors or p-values are reported in parentheses. In the first two columns, stars indicating statistical significance (*** p<0.01, ** p<0.05, * p<0.1) refer to two-sided t-tests of the null hypothesis of the mean being equal to zero. In the third column, they refer to one-sided t-tests of the null hypothesis of the mean difference being positive or zero.

Importantly, the extended 10 trading days event window includes Sunday, December 18, 2022, the day when the Trilogue agreement about the phasing out of free allowances under the EU ETS was officially announced. The figure shows that this conflicting climate policy event did not induce another major shift in stock prices for any of the treatment groups. The primary

Figure 4: **Robustness check: longer event window**

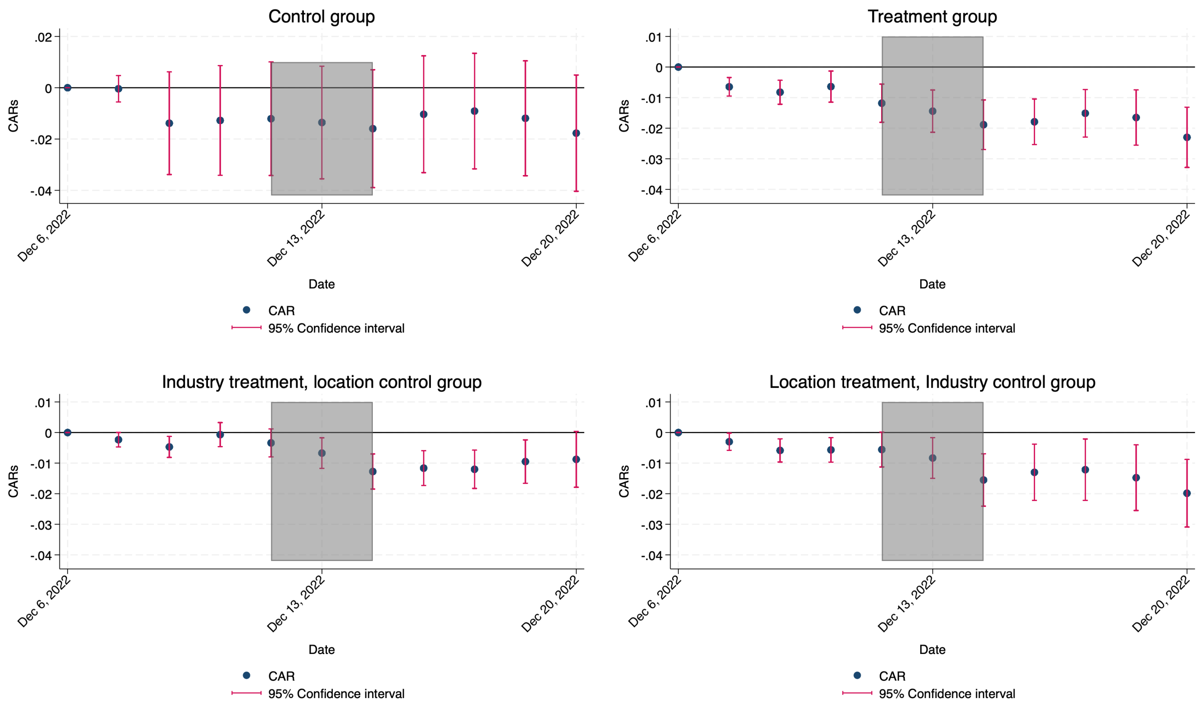

Figure 4 depicts the average CARs for each group of EU customer firms for the 10-day event window around December 13, 2022. The treatment groups are the same as those in Sections 4.1 and 5. CARs are calculated relative to CAPM expected returns. The vertical lines on each day indicate 95% confidence intervals based on robust standard errors.

source for the blurred results over the longer time window is the large standard error for the control group, not the potential response to the follow-up announcement. We interpret this as corroborating evidence that the announcement of December 18, 2022, was already anticipated. The news were already priced in by market participants after our main event date, December 13, 2022.

Taken together, we view the strong negative abnormal return of the treatment group as evidence that our findings are, with a grain of salt, robust to extending the event window. But the additional news that arrive on financial markets during this longer event window make it harder to identify a clear treatment effect.

6.2 Alternative specifications of treatment and control groups

Table 10 reports cumulative abnormal returns around December 13, 2022, when we slightly change the specification of treatment and control groups. Instead of median splits for the two treatment variables $loc\_treat\_ratio_i$ and $ind\_treat\_ratio_i$, we now split the sample at the 70% quantile or at the 30% quantile of the respective cross-sectional distributions.

The average cumulative abnormal returns of the different groups are hardly affected by these choices. We mainly see changes in the p-values for the CAR differences for some of the partial treatments (not reported here for brevity). Qualitatively, our results are very robust.

6.3 Customer-supplier relationships ending prior to the event date

One may be concerned that the information about the start and end date of a customer-supplier relationship which firms disclose in official declarations and which is then incorporated into the FactSet Supply Chain database is not equal to the true beginning or end of the relations among these firms. FactSet mainly relies on official SEC 10-K annual filings. But customer-supplier relationships may, e.g., be paused and resumed later on, or it may take some time to negotiate contracts and build up a new relationship. Such processes are not fully captured in the SEC 10-K repository, which takes into account only realized and reported sales of goods from one firm to another.

Table 10: **Alternative specifications of treatment and control groups**

		(1) **Control group** $loc\_treat\_ratio_i = 0$ & $ind\_treat\_ratio_i = 0$	(2) **Treatment group** $loc\_treat\_ratio_i >$ x% quantile & $ind\_treat\_ratio_i >$ x% quantile	(3) **Difference (2) − (1)**
70% quantile split	Mean	0.0035	-0.0055	-0.0090*
	SE	(0.0036)	(0.0061)	
	p-value			(0.0899)
	# Obs	117	80	
30% quantile split	Mean	0.0035	-0.0084**	-0.0119***
	SE	(0.0036)	(0.0023)	
	p-value			(0.0035)
	# Obs	117	306	

Table 10 reports the average CARs for each group of EU customer firms for the five-day event window around December 13, 2022. The composition of groups is similar as in Tables 3, but the different treatment groups are based on 70% or 30% quantile splits, respectively. Robust standard errors or p-values are reported in parentheses. In the first two columns, stars indicating statistical significance (*** p<0.01, ** p<0.05, * p<0.1) refer to two-sided t-tests of the null hypothesis of the mean being equal to zero. In the third column, they refer to one-sided t-tests of the null hypothesis of the mean difference being positive or zero.

Table 11: **Relationships ending prior to event date**

		(1) **Control group** $loc\_treat\_ratio_i = 0$ & $ind\_treat\_ratio_i = 0$	(2) **Treatment group** $loc\_treat\_ratio_i >$ median & $ind\_treat\_ratio_i >$ median	(3) **Difference (2) − (1)**
1 month	Mean	0.0034	-0.0099***	-0.0133***
	SE	(0.0036)	(0.0030)	
	p-value			(0.0031)
	# Obs	118	213	
2 months	Mean	0.0039	-0.0097***	-0.0135***
	SE	(0.0035)	(0.0021)	
	p-value			(0.0025)
	# Obs	117	220	
3 months	Mean	0.0053	-0.0091***	-0.0144***
	SE	(0.0035)	(0.0029)	
	p-value			(0.0012)
	# Obs	119	221	

Table 11 reports the average CARs for each group of EU customer firms for the five-day event window around December 13, 2022. The composition of groups is similar as in Tables 3, but we allow the customer-supplier relationships to end 1, 2, 3 months before the event date. Robust standard errors or p-values are reported in parentheses. In the first two columns, stars indicating statistical significance (*** p<0.01, ** p<0.05, * p<0.1) refer to two-sided t-tests of the null hypothesis of the mean being equal to zero. In the third column, they refer to one-sided t-tests of the null hypothesis of the mean difference being positive or zero.

We therefore run robustness checks where we also include customer-supplier relationships that have officially been terminated 1, 2, or 3 months prior to our main event date. This increases our sample size only very slightly to 1,148, 1,157, or 1,167 EU customer firms, respectively. Table 11 reports the cumulative abnormal returns. They are practically identical to those in the baseline specification.

6.4 Fama-French three-factor and five-factor model

The one-factor Capital Asset Pricing Model is arguably a very rough model when it comes to computing abnormal returns for a cross-section of stocks. For robustness, we estimate our baseline specification using the Fama-French three-factor or five-factor model instead. For our sample of EU customer firms, we use the European Fama-French factors that are available on Kenneth French's webpage, although these factors also contain information from stocks traded in some non-EU countries like the UK.

Table 12: **Average CARs with respect to FF3 and FF5 factors**

		(1) **Control group** $loc\_treat\_ratio_i = 0$ & $ind\_treat\_ratio_i = 0$	(2) **Treatment group** $loc\_treat\_ratio_i >$ median & $ind\_treat\_ratio_i >$ median	(3) **Difference (2) − (1)**
FF3	Mean	-0.0002	-0.0109***	-0.0108**
	SE	(0.0035)	(0.0037)	
	p-value			(0.0277)
	# Obs	117	209	
FF5	Mean	-0.0006	-0.0119***	-0.0113**
	SE	(0.0036)	(0.0033)	
	p-value			(0.0151)
	# Obs	117	209	

Table 12 reports the average CARs with respect to the Fama-French three-factor and five-factor models for each group of EU customer firms for the five-day event window around December 13, 2022. The composition of the different treatment groups is the same as in Tables3. Robust standard errors or p-values are reported in parentheses. In the first two columns, stars indicating statistical significance (*** p<0.01, ** p<0.05, * p<0.1) refer to two-sided t-tests of the null hypothesis of the mean being equal to zero. In the third column, they refer to one-sided t-tests of the null hypothesis of the mean difference being positive or zero.

The results are presented in Table 12. Qualitatively, our results remain unchanged. In fact, the average cumulative abnormal return of the treatment group is now slightly more negative, the CAR of the control group is now virtually zero, and the total net treatment effect is about the same size as in baseline specification.

6.5 70% split for supplier firms

Finally, we present results from a robustness check regarding the analysis of the returns of supplier firms in Section 4.2. There, we sorted firms with $EU\_customer\_ratio_j = 0$ into the control or industry treatment group and firms with $EU\_customer\_ratio_j > 0$ into the treatment or location treatment group.

Table 13: **Cumulative abnormal returns of non EU suppliers (70% split)**

	(1) **Control group** $EU\_customer\_ratio_j$ >70% quantile & $ind\_cbam_j = 0$	(2) **Treatment group** $EU\_customer\_ratio_j$ > 70% quantile & $ind\_cbam_j > 0$	(3) **Difference (2) − (1)**
Mean CAR	-0.0559***	-0.0968***	-0.0409
SE	(0.0171)	(0.0183)	
p-value			(0.2455)
# Obs	439	37	

Table 13 reports the average CARs for groups of supplier firms outside the EU for the five-day event window around December 13, 2022. CARs are calculated relative to CAPM expected returns. The different groups are composed as explained in Section 4.2, with the exception that the split between treatment and control groups is done at the 70% quantile of the *EU_customer_ratio*. Robust standard errors or p-values are reported in parentheses. In the first two columns, stars indicating statistical significance (*** p<0.01, ** p<0.05, * p<0.1) refer to two-sided t-tests of the null hypothesis of the mean being equal to zero. In the last column, they refer to one-sided t-tests of the null hypothesis of the mean difference being positive or zero.

In fact, more than 50% of our sample have $EU\_customer\_ratio_j = 0$. For robustness, Table 13 presents results when we split the sample along the 70% quantile of $EU\_customer\_ratio_j$.[25] Compared to Table 4, we find that the treatment effects are much larger in size. Interestingly, the difference between treatment group (fourth column) and the "industry treatment, location control" group (second column) is now strongly significant. This difference proxies for the in-

[25]The full set of results is documented in Table B.2 in Appendix B

cremental effect of the location treatment: we compare supplier firms in treated industries that have many versus only few customers within the EU. Overall, the results thus support the key takeaways from Section 4.2 that the financial performance of supplier firms is affected by the CBAM regulation as well and that the magnitude of the effect is comparable, if not larger than for EU customer firms.

7 Conclusion

In order to address the carbon leakage problem and to sustain the international competitiveness of European firms, the EU decided to complement the EU Emissions Trading System (ETS) with a companion policy instrument – the EU Carbon Border Adjustment Mechanism (CBAM) – in 2023. The CBAM is the world's first carbon border tax and, ideally, levels the playing field for production inside and outside the EU in terms of carbon pricing.

This paper analyzes the stock price response of firms involved in international trade to the introduction of the CBAM in a causal event study around important legislative events. Quantitatively, our paper documents that the stock price responses of both suppliers and customers caused by the CBAM regulation are substantial, at the minimum -1 percent on average per event, depending on the exact specification of treatment and control group. Besides, we also document substantial anticipatory market responses reflecting updated beliefs about broader climate policy developments going forward, like the phasing-out of free allowances under the EU ETS or a broadening of the CBAM to further goods categories. Importantly, these treatment effects are causal. Moreover, given the peculiarities of the empirical setup, the estimates presented in this paper should rather be regarded as a lower bound for the (unknown) total effect.

Our paper has several implications for policymakers. For instance, on a broader level, we provide evidence that EU climate policy which targets supplier firms outside the EU has spillover effects for customer firms located inside the EU. These spillover effects are also economically significant on aggregate, given that the EU accounts for 14% of the world's trade in goods. Moreover, our findings for the CBAM complements recent literature which documents that the EU ETS has had no measurable negative impact on the economic performance of regulated firms inside the EU during its first two phases.

Substitution elasticities within industries and product market competition might play an important role for these spillover effects. How the costs from the CBAM are shared ultimately depends on the relative market power of customers and suppliers. This market power, in turn, is determined by many factors, including the scarcity of the respective goods, the opportunity costs for replacing an existing customer-supplier relationship, as well as further regulations and policies, like changes in the EU ETS that are implemented in parallel with the CBAM. Given the limitations of our current dataset, we leave these issues open for future research.

Our paper also informs the broader debate about "stranded assets" and risk premia resulting from the tightening of climate policies. Our empirical design does not allow us to disentangle whether the negative abnormal stock returns arise from a change in firms' expected cash flows or a change in their discount rates. One can make a case for both hypotheses. On the one hand, there is a rich literature documenting that an import tax reduces the expected earnings of treated firms and thus their expected cash flows. On the other hand, it can also increase the systematic risk to which certain suppliers or customers are exposed. If equity investors assess this systematic risk correctly, the cost of capital (a.k.a. discount rates) will increase, triggering negative announcement returns, just as we document them in our data.

Last, but not least, our findings also speak to the current debate about the economic consequences from the disruptions in US trade policy in 2025. As the academic literature has shown for many similar instances in the past, import taxes have the potential to hurt both importing and exporting firms, and the same is true for the EU CBAM.

Looking ahead, it seems plausible that other countries will follow the EU example – as it was also the case with the EU ETS back in 2005 – and also introduce carbon border taxes. Alternatively, but partly also as a response to the CBAM, a number of countries have joined the new climate club, which was founded by the G7 in 2022. In one or the other way, the EU CBAM has helped pave the way towards a globally harmonized carbon pricing system. In this regard, our results inform the respective political debates with quantitative evidence about the impact of climate policies on financial market expectations.

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A Sectoral composition

Table A.1: **Sectoral Composition**

			(1) **Control group** $loc\_treat\_ratio_i = 0$ & $ind\_treat\_ratio_i = 0$	(2) **Generalized control group** $loc\_treat\_ratio_i <$ median & $ind\_treat\_ratio_i <$ median	(3) **Treatment group** $loc\_treat\_ratio_i >$ median & $ind\_treat\_ratio_i >$ median
Mining		Total	4	11	15
	10	Metal	0	1	10
	12	Bituminous Coal and Lignite Mining	0	2	0
	13	Oil and Gas Extraction	4	7	4
	14	Mining and Quarrying of Nonmetallic Minerals, except Fuels	0	1	1
Manufacturing		Total	113	343	194
	20	Food and Kindred Products	6	20	7
	21	Tobacco Products	0	0	0
	22	Textile Mill Products	0	6	3
	23	Apparel and other Finished Products Made from Fabrics and Similar Materials	3	16	4
	24	Lumber and Wood Products, except Furniture	0	3	6
	25	Furniture and Fixtures	0	0	1
	26	Paper and Allied Products	2	9	4
	27	Printing, Publishing and Allied Industries	0	0	0
	28	Chemicals and Allied Products	26	52	31
	29	Petroleum Refining and Related Industries	0	1	1
	30	Rubber and Miscellaneous Plastics Products	1	3	6
	31	Leather and Leather Products	0	0	0
	32	Stone, Clay, Glass, and Concrete Products	4	9	8
	33	Primary Metal Industries	1	1	30
	34	Fabricated Metal Products, except Machinery and Transportation Equipment	2	10	22
	35	Industrial and Commercial Machinery and Computer Equipment	43	114	29
	36	Electronic and other Electrical Equipment and Components, except Computer Equipment	12	61	32
	37	Transportation Equipment	6	21	7
	38	Measuring, Analyzing, and Controlling Instruments; Photographic, Medical and Optical Goods; Watches and Clocks	6	12	3
	39	Miscellaneous Manufacturing Industries	1	5	0
Total			117	354	209

Table A.1 reports the number of EU customer firms in our treatment and control groups by sector (2-digit SIC codes).

B Complete results

Table B.1: **CARs and CAR differences for the baseline exercise**

	Panel A: Average CARs for each group								
	(1) **Control**	(2) **Generalized Control**	(3) **Industry Treatment Location Control**	(4) **Location Treatment Industry Control**	(5) **Treatment**	(6) **Industry Control**	(7) **Industry Treatment**	(8) **Location Control**	(9) **Location Treatment**
	$loc\_treat\_ratio_i = 0$ & $ind\_treat\_ratio_i = 0$	$loc\_treat\_ratio_i <$ median & $ind\_treat\_ratio_i <$ median	$loc\_treat\_ratio_i <$ median & $ind\_treat\_ratio_i >$ median	$loc\_treat\_ratio_i >$ median & $ind\_treat\_ratio_i <$ median	$loc\_treat\_ratio_i >$ median & $ind\_treat\_ratio_i >$ median	$ind\_treat\_ratio_i <$ median	$ind\_treat\_ratio_i >$ median	$loc\_treat\_ratio_i <$ median	$loc\_treat\_ratio_i >$ median
Mean	0.0035	0.0000	-0.0069***	-0.0072	-0.0097***	-0.0036	-0.0083***	-0.0027	-0.0081***
SE	(0.0036)	(0.0030)	(0.0025)	(0.0045)	(0.0030)	(0.0027)	(0.0020)	(0.0021)	(0.0031)
# Obs	117	354	217	362	209	716	426	571	571

	Panel B: Differences between groups							
	(5)-(3)	(3)-(1)	(5)-(4)	(4)-(1)	(5)-(1)	(5)-(2)	(7)-(6)	(9)-(8)
Mean	-0.0027	-0.0104***	-0.0025	-0.0106*	-0.0131***	-0.0096**	-0.0046	-0.0054*
p-value	(0.2444)	(0.0088)	(0.3469)	(0.0982)	(0.0036)	(0.0164)	(0.1133)	(0.0724)

Panel A in Table B.1 reports the average CARs for each group of EU customer firms for the five-day event window around December 13, 2022. Panel B reports differences between them. CARs are calculated relative to CAPM expected returns. The composition of the different treatment groups is the same as in Table 3, 8 and 6. Robust standard errors or p-values are reported in parentheses. In Panel A, stars indicating statistical significance (*** p<0.01, ** p<0.05, * p<0.1) refer to two-sided t-tests of the null hypothesis of the mean being equal to zero. In Panel B, they refer to one-sided t-tests of the null hypothesis of the mean difference being positive or zero, respectively.

Table B.2: **CARs and CAR differences for non EU suppliers**

Panel A: Average CARs for each group

		(1) **Control**	(2) **Industry Treatment Location Control**	(3) **Location Treatment Industry Control**	(4) **Treatment**	(5) **Industry Control**	(6) **Industry Treatment**	(7) **Location Control**	(8) **Location Treatment**
		$EU\_customer\_ratio_j = 0$ & $ind\_cbam_j = 0$	$EU\_customer\_ratio_j = 0$ & $ind\_cbam_j = 1$	$EU\_customer\_ratio_j = 1$ & $ind\_cbam_j = 0$	$EU\_customer\_ratio_j = 1$ & $ind\_cbam_j = 1$	$ind\_cbam_j = 0$	$ind\_cbam_j = 0$	$EU\_customer\_ratio_j = 0$	$EU\_customer\_ratio_j = 1$
Zero split	Mean	-0.0602***	-0.0553***	-0.0567***	-0.0802***	-0.0586***	-0.0685***	-0.0599***	-0.0584***
	SE	(0.0204)	(0.0160)	(0.0117)	(0.0150)	(0.0125)	(0.0110)	(0.0194)	(0.0109)
	# Obs	836	47	662	53	1498	100	883	715
		Control	**Industry Treatment Location Control**	**Location Treatment Industry Control**	**Treatment**	**Industry Control**	**Industry Treatment**	**Location Control**	**Location Treatment**
		$EU\_customer\_ratio_j < 70\%$ qtle & $ind\_cbam_j = 0$	$EU\_customer\_ratio_j < 70\%$ qtle & $ind\_cbam_j = 1$	$EU\_customer\_ratio_j > 70\%$ qtle & $ind\_cbam_j = 0$	$EU\_customer\_ratio_j > 70\%$ qtle & $ind\_cbam_j = 1$	$ind\_cbam_j = 0$	$ind\_cbam_j = 0$	$EU\_customer\_ratio_j < 70\%$ qtle	$EU\_customer\_ratio_j > 70\%$ qtle
70 % quantile split	Mean	-0.0597***	-0.0518***	-0.0559***	-0.0968***	-0.0586***	-0.0685***	-0.0593***	-0.0591***
	SE	(0.0162)	(0.0133)	(0.0171)	(0.0183)	(0.0125)	(0.0110)	(0.0153)	(0.0159)
	# Obs	1059	63	439	37	1498	100	1122	476

Panel B: Differences between groups

		(2)-(1)	(4)-(3)	(3)-(1)	(4)-(2)	(4)-(1)	(6)-(5)	(8)-(7)
Zero split	Mean	0.0049	-0.0235	0.0035	-0.0249	-0.0200	-0.0098	0.0015
	p-value	(0.4773)	(0.2859)	(0.4451)	(0.1291)	(0.4027)	(0.4196)	(0.4751)
70% quantile split	Mean	0.0079	-0.0409	0.0038	-0.0450**	-0.0371	-0.0098	0.0002
	p-value	(0.4527)	(0.2455)	(0.4447)	(0.0234)	(0.3348)	(0.4196)	(0.4968)

Panel A in Table B.2 reports the average CARs for each group of non EU supplier firms for the five-day event window around December 13, 2022. Panel B reports differences between them. CARs are calculated relative to CAPM expected returns. The composition of the different treatment groups is the same as in Table 4 and 13. Robust standard errors or p-values are reported in parentheses. In Panel A, stars indicating statistical significance (*** p<0.01, ** p<0.05, * p<0.1) refer to two-sided t-tests of the null hypothesis of the mean being equal to zero. In Panel B, they refer to one-sided t-tests of the null hypothesis of the mean difference being positive or zero.

Table B.3: **CARs and CAR differences on the other event dates**

Panel A: Average CARs for each group										
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Event Dates		**Control**	**Generalized Control**	**Industry Treatment Location Control**	**Location Treatment Industry Control**	**Treatment**	**Industry Control**	**Industry Treatment**	**Location Control**	**Location Treatment**
		$loc\_treat\_ratio_i = 0$ & $ind\_treat\_ratio_i = 0$	$loc\_treat\_ratio_i <$ median & $ind\_treat\_ratio_i <$ median	$loc\_treat\_ratio_i <$ median & $ind\_treat\_ratio_i >$ median	$loc\_treat\_ratio_i >$ median & $ind\_treat\_ratio_i <$ median	$loc\_treat\_ratio_i >$ median & $ind\_treat\_ratio_i >$ median	$ind\_treat\_ratio_i <$ median	$ind\_treat\_ratio_i >$ median	$loc\_treat\_ratio_i <$ median	$loc\_treat\_ratio_i >$ median
July 14, 2021	Mean	0.0024	-0.0042	-0.0035	-0.0036	-0.0116	-0.0039	-0.0078	-0.0040	-0.0063*
	SE	(0.0050)	(0.0050)	(0.0030)	(0.0028)	(0.0091)	(0.0029)	(0.0050)	(0.0036)	(0.0036)
	# Obs	151	401	169	379	191	780	360	570	570
Feb 9, 2023	Mean	0.0011	0.0006	0.0008	-0.0019	-0.0035	-0.0006	-0.0014	0.0007	-0.0025
	SE	(0.0040)	(0.0032)	(0.0035)	(0.0041)	(0.0043)	(0.0026)	(0.0028)	(0.0024)	(0.0030)
	# Obs	112	343	212	359	216	702	428	555	575
April 18, 2023	Mean	0.0007	0.0018	0.0065	-0.0144	-0.0175	-0.0061	-0.0065	0.0034	-0.0156
	SE	(0.0049)	(0.0044)	(0.0042)	(0.0133)	(0.0186)	(0.0068)	(0.0103)	(0.0032)	(0.0109)
	# Obs	118	395	208	370	247	765	455	603	617

Panel B: Differences between groups									
		(5)-(3)	(3)-(1)	(5)-(4)	(4)-(1)	(5)-(1)	(5)-(2)	(7)-(6)	(9)-(8)
July 14, 2021	Mean	-0.0082	-0.0061	-0.0080	-0.0059	-0.0140	-0.0074	-0.0039	-0.0023
	p-value	(0.2099)	(0.1315)	(0.1457)	(0.1510)	(0.1047)	(0.2207)	(0.2410)	0.3243
Feb 9, 2023	Mean	-0.0043	-0.0003	-0.0016	-0.0029	-0.0046	-0.0042	-0.0007	-0.0032
	p-value	(0.2177)	(0.4823)	(0.3961)	(0.3503)	(0.2429)	(0.2148)	(0.4274)	(0.2036)
April 18, 2023	Mean	-0.0240	0.0058	-0.0031	-0.0151	-0.0182	-0.0193	-0.0005	-0.0190**
	p-value	(0.1223)	(0.1941)	(0.4439)	(0.2620)	(0.2509)	(0.1098)	(0.4834)	(0.0484)

Panel A in Table B.1 reports the average CARs for each group of EU customer firms for the five-day event window around the other event dates. Panel B reports differences between them. CARs are calculated relative to CAPM expected returns. The composition of the different treatment groups is the same as in Table 5. Robust standard errors or p-values are reported in parentheses. In Panel A, stars indicating statistical significance (*** p<0.01, ** p<0.05, * p<0.1) refer to two-sided t-tests of the null hypothesis of the mean being equal to zero. In Panel B, they refer to one-sided t-tests of the null hypothesis of the mean difference being positive or zero.

Table B.4: **Broad Treatment Group**

	Control group	**Generalized control group**	**Universal Treatment group**	**Beliefs Updating Treatment**	**Difference (3) − (1)**	**Difference (3) − (2)**	**Difference (4) − (1)**	**Difference (4) − (2)**
	$loc\_treat\_ratio_i = 0$ & $ind\_treat\_ratio_i = 0$	$loc\_treat\_ratio_i <$ median & $ind\_treat\_ratio_i <$ median	$loc\_treat\_ratio_i >$ median or $ind\_treat\_ratio_i >$ median	($loc\_treat\_ratio_i <$ median & $ind\_treat\_ratio_i >$ median) or ($loc\_treat\_ratio_i >$ median & $ind\_treat\_ratio_i <$ median)				
Mean	0.0035	0.0000	-0.0078***	-0.0071***	-0.0112**	-0.0077**	-0.0106*	-0.0070*
SE	(0.0036)	(0.0030)	(0.0023)	(0.0030)				
p-value					0.0354	0.0271	0.0615	0.0577
Obs	117	354	788	579				

Table B.4 reports the average CARs and their difference between different groups for the five-day event window around December 13, 2022. CARs are calculated relative to CAPM expected returns. Robust standard errors or p-values are reported in parentheses. For the columns with mean CARs, stars indicating statistical significance (*** p<0.01, ** p<0.05, * p<0.1) refer to two-sided t-tests of the null hypothesis of the mean being equal to zero. For the columns with differences, they refer to one-sided t-tests of the null hypothesis of the mean difference being positive or zero.

Table B.5: **CARs and CAR differences for ten-day event window**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A: Average CARs for each group									
	Control	**Generalized Control**	**Industry Treatment Location Control**	**Location Treatment Industry Control**	**Treatment**	**Industry Control**	**Industry Treatment**	**Location Control**	**Location Treatment**
	$loc\_treat\_ratio_i = 0$ & $ind\_treat\_ratio_i = 0$	$loc\_treat\_ratio_i <$ median & $ind\_treat\_ratio_i <$ median	$loc\_treat\_ratio_i <$ median & $ind\_treat\_ratio_i >$ median	$loc\_treat\_ratio_i >$ median & $ind\_treat\_ratio_i <$ median	$loc\_treat\_ratio_i >$ median & $ind\_treat\_ratio_i >$ median	$ind\_treat\_ratio_i <$ median	$ind\_treat\_ratio_i >$ median	$loc\_treat\_ratio_i <$ median	$loc\_treat\_ratio_i >$ median
Mean	-0.0215*	-0.0145***	-0.0091*	-0.0242***	-0.0271***	-0.0194***	-0.0179***	-0.0124***	-0.0252***
SE	(0.0118)	(0.0052)	(0.0048)	(0.0061)	(0.0054)	(0.0040)	(0.0036)	(0.0037)	(0.0043)
# Obs	117	354	217	362	209	716	426	571	571

Panel B: Differences between groups

	(5)-(3)	(3)-(1)	(5)-(4)	(4)-(1)	(5)-(1)	(5)-(2)	(7)-(6)	(9)-(8)
Mean	-0.0180***	0.0125	-0.0029	-0.0027	-0.0056	-0.0125*	0.0015	-0.0128**
p-value	(0.0065)	(0.1263)	(0.3725)	(0.4168)	(0.3119)	(0.0577)	(0.5989)	(0.0127)

Panel A in Table B.5 reports the average CARs for each group of EU customer firms for the ten-day event window around December 13, 2022. Panel B reports differences between them. CARs are calculated relative to CAPM expected returns. The composition of the different treatment groups is the same as in Table 9. Robust standard errors or p-values are reported in parentheses. In Panel A, stars indicating statistical significance (*** p<0.01, ** p<0.05, * p<0.1) refer to two-sided t-tests of the null hypothesis of the mean being equal to zero. In Panel B, they refer to one-sided t-tests of the null hypothesis of the mean difference being positive or negative, repectively.

Table B.6: **CARs and CAR differences using alternative specification of treatment and control**

		Panel A: Average CARs for each group								
		(1) **Control**	(2) **Generalized Control**	(3) **Industry Treatment Location Control**	(4) **Location Treatment Industry Control**	(5) **Treatment**	(6) **Industry Control**	(7) **Industry Treatment**	(8) **Location Control**	(9) **Location Treatment**
		$loc\_treat\_ratio_i = 0$ & $ind\_treat\_ratio_i = 0$	$loc_treat_ratio_i <$x% qtle & $ind\_treat\_ratio_i <$ x% qtle	$loc\_treat\_ratio_i <$ x% qtle & $ind\_treat\_ratio_i >$ x% qtle	$loc\_treat\_ratio_i >$ x% qtle & $ind\_treat\_ratio_i <$ x% qtle	$loc\_treat\_ratio_i >$ x% qtle & $ind\_treat\_ratio_i >$ x% qtle	$ind\_treat\_ratio_i <$ x% qtle	$ind\_treat\_ratio_i >$ x% qtle	$loc\_treat\_ratio_i <$ x% qtle	$loc\_treat\_ratio_i >$ x% qtle
70% quantile	Mean	0.0035	-0.0039	-0.0077***	-0.0062	-0.0055	-0.0046*	-0.0072***	-0.0051***	-0.0060
split	SE	(0.0036)	(0.0027)	(0.0022)	(0.0050)	(0.0061)	(0.0025)	(0.0022)	(0.0020)	(0.0041)
	# Obs	117	546	254	262	80	808	334	800	342
30% quantile	Mean	0.0035	0.0027	-0.0080**	-0.0066***	-0.0084***	-0.0036	-0.0083***	-0.0010	-0.0073***
split	SE	(0.0036)	(0.0039)	(0.0037)	(0.0036)	(0.0023)	(0.0027)	(0.0020)	(0.0028)	(0.0024)
	# Obs	117	228	120	488	306	716	426	348	794

		Panel B: Differences between groups							
		(5)-(3)	(3)-(1)	(5)-(4)	(4)-(1)	(5)-(1)	(5)-(2)	(7)-(6)	(9)-(8)
70% quantile	Mean	0.0023	-0.0112***	0.0007	-0.0097	-0.0090*	-0.0016	-0.0026	-0.0009
split	p-value	(0.3325)	(0.0032)	(0.4713)	(0.1097)	(0.0899)	(0.4148)	(0.2630)	(0.4101)
30% quantile	Mean	-0.0004	-0.0115**	-0.0018	-0.0101*	-0.0119***	-0.0111***	-0.0046	-0.0063*
split	p-value	(0.4619)	(0.0141)	(0.3539)	(0.0892)	(0.0035)	(0.0050)	(0.1133)	(0.0599)

Panel A in Table B.6 reports the average CARs for each group of EU customer firms for the five-day event window around the other event dates. Panel B reports differences between them. CARs are calculated relative to CAPM expected returns. The composition of the different treatment groups is the same as in Table 10. Robust standard errors or p-values are reported in parentheses. In Panel A, stars indicating statistical significance (*** p<0.01, ** p<0.05, * p<0.1) refer to two-sided t-tests of the null hypothesis of the mean being equal to zero. In Panel B, they refer to one-sided t-tests of the null hypothesis of the mean difference being positive or zero.

Table B.7: **CARs and CAR differences allowing for customer-supplier relationships ending before event dates**

Panel A: Average CARs for each group

		(1) **Control**	(2) **Generalized Control**	(3) **Industry Treatment Location Control**	(4) **Location Treatment Industry Control**	(5) **Treatment**	(6) **Industry Control**	(7) **Industry Treatment**	(8) **Location Control**	(9) **Location Treatment**
		$loc\_treat\_ratio_i = 0$ & $ind\_treat\_ratio_i = 0$	$loc\_treat\_ratio_i <$ median & $ind\_treat\_ratio_i <$ median	$loc\_treat\_ratio_i <$ median & $ind\_treat\_ratio_i >$ median	$loc\_treat\_ratio_i >$ median & $ind\_treat\_ratio_i <$ median	$loc\_treat\_ratio_i >$ median & $ind\_treat\_ratio_i >$ median	$ind\_treat\_ratio_i <$ median	$ind\_treat\_ratio_i >$ median	$loc\_treat\_ratio_i <$ median	$loc\_treat\_ratio_i >$ median
1 month	Mean	0.0034	-0.0002	-0.0069***	-0.0085*	-0.0099***	-0.0044	-0.0084***	-0.0027	-0.0091***
	SE	(0.0036)	(0.0029)	(0.0025)	(0.0047)	(0.0030)	(0.0028)	(0.0020)	0.0021	0.0031
	# Obs	118	358	216	361	213	719	429	574	574
2 month	Mean	0.0039	-0.0009	-0.0070***	-0.0075	-0.0097***	-0.0043	-0.0083***	-0.0032	-0.0083***
	SE	(0.0035)	(0.0029)	(0.0026)	(0.0046)	(0.0021)	0.0028	0.0019	0.0020	0.0031
	# Obs	117	348	214	375	220	723	434	562	595
3 month	Mean	0.0053	-0.0005	-0.0059	-0.0047	-0.0091***	-0.0027	-0.0076***	-0.0026	-0.0063*
	SE	(0.0035)	(0.0029)	(0.0029)	(0.0053)	(0.0029)	(0.0031)	(0.0021)	(0.0021)	(0.0035)
	# Obs	119	351	218	377	221	728	439	569	598

Panel B: Differences between groups

		(5)-(3)	(3)-(1)	(5)-(4)	(4)-(1)	(5)-(1)	(5)-(2)	(7)-(6)	(9)-(8)
1 month	Mean	-0.0030	-0.0103***	-0.0014	-0.0119*	-0.0133***	-0.0097**	-0.0041	-0.0063**
	p-value	(0.2233)	(0.0090)	(0.4144)	(0.0789)	(0.0031)	(0.0145)	(0.1487)	(0.0465)
2 month	Mean	-0.0027	-0.0108***	-0.0021	-0.0114*	-0.0135***	-0.0088*	-0.0040	-0.0051*
	p-value	(0.2458)	(0.0066)	(0.3699)	(0.0881)	(0.0025)	(0.0217)	(0.1503)	(0.0854)
3 month	Mean	-0.0032	-0.0112***	-0.0044	-0.0100	-0.0144***	-0.0087**	-0.0049	-0.0038
	p-value	(0.2192)	(0.0095)	(0.2715)	(0.1515)	(0.0012)	(0.0223)	(0.1271)	(0.1822)

Panel A in Table B.7 reports the average CARs for each group of EU customer firms for the five-day event window around the other event dates. Panel B reports differences between them. CARs are calculated relative to CAPM expected returns. The composition of the different treatment groups is the same as in Table 11. Robust standard errors or p-values are reported in parentheses. In Panel A, stars indicating statistical significance (*** p<0.01, ** p<0.05, * p<0.1) refer to two-sided t-tests of the null hypothesis of the mean being equal to zero. In Panel B, they refer to one-sided t-tests of the null hypothesis of the mean difference being positive or zero.

Table B.8: **CARs and CAR differences relative to Fama French 3 and 5 factors**

		Panel A: Average CARs for each group								
		(1) **Control**	(2) **Generalized Control**	(3) **Industry Treatment Location Control**	(4) **Location Treatment Industry Control**	(5) **Treatment**	(6) **Industry Control**	(7) **Industry Treatment**	(8) **Location Control**	(9) **Location Treatment**
		$loc\_treat\_ratio_i = 0$ & $ind\_treat\_ratio_i = 0$	$loc\_treat\_ratio_i <$ median & $ind\_treat\_ratio_i <$ median	$loc\_treat\_ratio_i <$ median & $ind\_treat\_ratio_i >$ median	$loc\_treat\_ratio_i >$ median & $ind\_treat\_ratio_i <$ median	$loc\_treat\_ratio_i >$ median & $ind\_treat\_ratio_i >$ median	$ind\_treat\_ratio_i <$ median	$ind\_treat\_ratio_i >$ median	$loc\_treat\_ratio_i <$ median	$loc\_treat\_ratio_i >$ median
FF3	Mean	-0.0002	-0.0033	-0.0092***	-0.0114***	-0.0109***	-0.0074***	-0.0101***	-0.0056***	-0.0112***
	SE	(0.0035)	(0.0029)	(0.0025)	(0.0045)	(0.0037)	(0.0027)	(0.0022)	(0.0020)	(0.0031)
	# Obs	117	354	217	362	209	716	426	571	571
FF5	Mean	-0.0006	-0.0041	-0.0094***	-0.0122***	-0.0119***	-0.0082***	-0.0106***	-0.0061***	-0.0121***
	SE	(0.0036)	(0.0028)	(0.0025)	(0.0045)	(0.0033)	(0.0027)	(0.0021)	(0.0020)	(0.0031)
		Panel B: Differences between groups								
		(5)-(3)	(3)-(1)	(5)-(4)	(4)-(1)	(5)-(1)	(5)-(2)	(7)-(6)	(9)-(8)	
FF3	Mean	-0.0017	-0.0090**	0.0005	-0.0113*	-0.0108**	-0.0076*	-0.0026	-0.0057*	
	p-value	(0.3467)	(0.0179)	(0.4711)	(0.0824)	(0.0277)	(0.0531)	(0.2477)	(0.0639)	
FF5	Mean	-0.0025	-0.0088**	0.0003	-0.0116*	-0.0113**	-0.0078**	-0.0025	-0.0060*	
	p-value	(0.2762)	(0.0212)	(0.4823)	(0.0773)	(0.0151)	(0.0403)	(0.2574)	(0.0518)	

Panel A in Table B.8 reports the average CARs for each group of EU customer firms for the five-day event window around the other event dates. Panel B reports differences between them. CARs are calculated relative to CAPM expected returns. The composition of the different treatment groups is the same as in Table 12. Robust standard errors or p-values are reported in parentheses. In Panel A, stars indicating statistical significance (*** p<0.01, ** p<0.05, * p<0.1) refer to two-sided t-tests of the null hypothesis of the mean being equal to zero. In Panel B, they refer to one-sided t-tests of the null hypothesis of the mean difference being positive or zero.