Norwegian School of Economics
Bergen, Fall, 2022

The Dynamics in Financial Markets During the Russia-Ukraine War

A quantitative analysis of stock prices in the oil and gas industry

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Master Thesis in Economics and Business Administration
Major: Financial Economics, and Business Analysis and Performance Management

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Abstract

This thesis analyses the impact of statements regarding Russian petroleum during the Russia-Ukraine war on stock prices of oil and gas companies in Europe. In addition, the paper analyses differences in this impact on tax haven companies versus companies not in tax havens. Shell is used as a reference point for oil and gas companies in parts of the analysis. The events are divided between statements regarding Shell and statements affecting all oil and gas companies. The statements are given each their predicted reaction. To detect effects of the events we have conducted an event study. The main results collected are: EU's decisions do impact the stock prices of oil and gas companies in Europe. The effect on Shell appears to be persistent throughout the analyzed event window, while the effect on all the other companies lessens as the shock of war settles. We do not find any evidence of a difference in abnormal returns between companies in tax havens and companies not in tax havens following the statements regarding the wider oil and gas market of the EU.

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1. Introduction

Europe has long been dependent on Russian oil and gas (Siddi, 2018). However, when Russia invaded Ukraine on February 24th, companies all over the world put sanctions on Russia due to their support of Ukraine (European Concil, 2022). The multinational oil and gas company Shell followed the principled act by withdrawing from all Russian oil and gas, and later sold retail and lubricants businesses in Russia (Shell, 2022a). As a response to the conflict, individual companies have announced statements regarding their own practices relating to Russia. Moreover, the European Union commission also assembled actions to support Ukraine's sovereignty. Such decisions come with both ethical considerations and economic repercussions, which naturally generates dynamics in the financial markets.

There have been conducted several studies on the effects of war on stock markets. Brune, Hens, Rieger & Wang (2011) find that the effect of a war breaking out is dependent on the predictability of the outbreak. Furthermore, Boungou and Yatié (2022) have studied the effects of the war in Ukraine on global stock markets. They find that there is a negatively significant relationship between the conflict in Ukraine and stock market indexes. The effect of the conflict on stock market indexes is however weakened three to four weeks after the outbreak of the war. Our study aims to further this research by focusing on a specific sector and how dependency on resources from a region can affect stock markets when this region is in conflict. We intend to do this by examining how events during the Russia-Ukraine war have affected stock prices within the European oil and gas sector. We are also conducting further examination of Shell individually. This is because Shell, as the biggest oil company in Europe, is representable as a prototypical company in the sector.

The chosen methodology for this thesis is event studies. This methodology helps us reveal the impact of events on stock prices. The events examined in this thesis are; the breakout of the war, announcements made by the EU in relation to Russian oil, and media statements made by Shell during the first months of the war. The events are classified as either positive, negative or neutral based on expected directions of the abnormal returns. Predictions for each event are dependent on expected future cash flow and future risk premium, as well as the efficient market hypothesis. The results from the event study of Shell are compared to the results of all other oil and gas companies in Europe. The comparison reveals whether Shell's reactions to statements made by Shell are company specific, or if the results can be explained by general fluctuations in the sector. The comparison also reveals if Shell reacts similar to other

companies in the sector following events announced by the EU. Furthermore, an event study is conducted for companies in tax havens, as well as two control groups for companies with lower secrecy scores. Our hypothesis is that companies located in tax havens will react differently to events than companies not located in tax havens. This is because high levels of secrecy allow companies to break sanctioned practices without being held accountable. We compare the results of each group to determine if our hypothesis is correct.

Our main findings are that the European oil and gas sector does get impacted by the EU statements regarding Russian oil during the Russia-Ukraine war. Companies in the sector react to both negative and positive events. Effects on all the companies combined appear to lessen as the shock of war settles, in coherence with Boungou and Yatié´s (2022) study. However, results show that the effect on Shell alone persists to the very last event in our study. We did not find proof that companies located in tax havens are more likely to refrain negative abnormal returns following our events.

2. Literature review

2.1 The effect of war on the stock market

When predicting how the Russia-Ukraine conflict will affect stock market prices in the oil sector it is imperative to consider how earlier conflicts and wars have affected the market. The first event in this paper is the outbreak of war in Ukraine on February 24th, 2022. In relation to predictions for this event, one must examine the effect an outbreak of war has on stock market prices. The Swiss Finance Institute finds that an increase in the probability of a war outbreak decreases stock market prices, indicators of a peaceful solution of conflicts leads to an increase in stock market prices, and the ultimate outbreak of a war tends to increase stock market prices (Brune, Hens, Rieger, & Wang, 2011). However, in instances where the outbreak of a war is not predictable, stock market prices tend to decrease once the war breaks out. This phenomenon is referred to as the war puzzle. The war puzzle can be explained by the investors mean-variance-preferences. Due to variance aversion, investors refrain from buying stocks when there is much uncertainty about what will happen. Therefore, the predicted effect of the outbreak of war will be affected by the markets ability to foresee the war.

Boungou and Yatié (2022) have conducted a study to examine the effects of the Russia-Ukraine war on the stock market. The study finds that there is a negatively significant relationship between the conflict and stock market indexes, using Wikipedia trends as a variable to track the development of the war. The negative impact of the conflict is significantly greater following the breakout of the war on February 24th than in the period leading up to the war. While Boungou and Yatié establish that the war has had a negative impact on the stock market as a whole, we are interested to see if the oil and gas sector is more affected then the rest of the market. The reactions we examine are tied to events that affect this sector specifically. Furthermore, Boungou and Yatié find that the negative effect of the war on the stock market weakens three to four weeks after the war breaks out. This indicates a recovery in global markets following the initial shock of the war. It will be interesting to see if this weakened effect applies to the later events in our own study as well.

In our study we wish to examine the effects of war on stock prices, specifically in the oil and gas sector. An interesting aspect of our research is that it demonstrates how reliance on important supplies from a region in conflict can disturb the stock market of a whole sector.

The study will further reveal whether the oil and gas sector is more affected then the general market by EU´s sanctions towards Russia during the conflict.

3. Background

3.1 Russia-Ukraine war

On the 24th of February this year, Russia unleashed the biggest attack since World War 2 on Ukraine (Zinets & Vasovic, 2022). The war came as a result of a conflict that has been ongoing for years. In 2014, protesters in Ukraine overthrew President Viktor Yanukovych, who had been friendly to Russia´s interests (Bigg, 2022). Since then, the Ukraine has been moving in a more pro-Western direction, for example by signing a trade agreement with the European Union in 2014. The president of Russia, Vladimir Putin, has abhorred the neighboring country growing closer to the US and its allies. In 2014, Putin annexed the Crimea Peninsula assumably as a reaction to these developments, as well as a belief that some Ukrainian territory should belong to Russia. The fighting later continued in the Donbas region of Ukraine. In 2014 and 2015, Russia and Ukraine signed ceasefire agreements known as the Minsk accords. However, there were disagreements connected to the interpretation of the accords and the conflict never fully stopped (Misumeci & Haltiwanger, 2022). In 2019, Ukraine´s new president, Volodymyr Zelensky, promised to restore the Donbas region to Ukraine.

In 2021-2022, Putin started seeking assurances from NATO that Ukraine will never join the military alliance. In November 2021, the U.S. raised an alarm with its European allies about a buildup of Russian forces near the border of Ukraine. NATO increased its defensive presence in eastern member-states as a response to this military mobilization. However, the military alliance also stated that it would not send troops into Ukraine in the event of a war (Bloomberg News, 2022). On February 21st, 2022, President Vladimir Putin signed a decree officially recognizing two self-proclaimed separatist republics in eastern Ukraine. This further escalated the tension between the countries. Eventually on February 24th, 2022, Russia began a large-scale military attack on Ukraine as Russian forces invaded the country and the war broke out (Rocco, et al., 2022). The fighting in Ukraine has continued to this day, with several other countries including the EU condemning Russia's actions and imposing sanctions on the nation (European Concil, 2022) (Borger, 2022).

3.2 Europe's dependency on Russian oil and gas

Oil has been an essential resource for Russia and has been exported to multiple European countries for almost five decades (Siddi, 2018). Europe has built a dependency on Russian oil that among several things stems from pipelines making exportation accessible between the countries. In addition, the oil crises that struck the Western world in 1973 also increased the relevance of Russian oil in Europe. In 2015, it was calculated that Russia was responsible for 29,1% of the crude oil imported to Europe.

Russia has also been the main provider for gas to Europe for a notable amount of time, and almost all Eastern and Central European countries are dependent on Russia for their natural gas consumption (Anderson, 2008). Today, Russia contributes with approximately 40% of the EU's import of natural gas (Mikulska, 2020). This equals nearly 1/3 of EU's demand, making remaining imports from other countries relatively small. Only Norway comes close to Russia covering 29-34% of EU´s import in recent years. Gazprom, the Russian state-controlled company with monopoly power over Russia's gas export, was also forecasted to deliver more gas to Europe in the future. This would be attainable for Gazprom as their pipelines have capacity for more delivery.

As Russia has had such an important role in EU's energy resources, there is no doubt that changes in the availability of these resources will affect the oil and gas sector in Europe. During the war, sanctions from the EU has led to European countries changing their policies on trading oil with Russia. Our paper aims to research how the stock prices of European oil and gas companies outside of Russia are affected by these changes.

3.3 Shell

Shell PLC is an international energy company with expertise in exploration, production, refining and marketing of oil and natural gas, and the manufacturing and marketing of chemicals (Shell, 2022b). The company is ranked as the number one company in Europe on CNN´s global 500 list (CNN, 2012), in addition to being the fifth largest publicly traded company globally (Kalam, 2021). This makes the company representable as a prototypical company in the oil sector, and we are therefore conducting further examination of Shell alone. An individual study of Shell enables us to identify potential company specific effects from the events.

Shell got involved with Russia in the early 1990s, when they joined the Sakhalin-2 project (Zhang Y. A., 2022). This project included development of natural gas reserves in Russia, as well as the first liquefied natural gas facility here. Because of the steep price of the project, Shell and the other partners were forced to sell a majority stake to Gazprom. Since then, the gains have exceeded the costs and Shell have continued operating in Russia. However, due to the outbreak of the war, Russia changed those calculations. Subsequently to the outbreak, Shell was quick to validate their standpoint and take action to divest from Russia. What actions were taken will be discussed in the next section.

3.4 Salient events and hypotheses

Financial markets are only expected to react to events that are economically relevant as well as unanticipated during the war (Choudhry, 2010). In accordance with standard theory, the anticipated effect of an event on stock prices in the oil market will rely on expected future cash flow and future risk premium. Each event must thereby be examined separately in order to predict the effect it will have on stock prices in the oil and gas sector.

For the collection of events, the intention is to select salient events surrounding the Ukrainian war that are thought to have a significant effect on Shell and other European oil and gas companies' stock price. The events we will be looking at are elected statements made about Russian petroleum during the war. There are some criteria for the statements to be valid for the study. First and foremost, Shell has to be the announcer of the statements regarding Shell, and EU has to be the announcer of statements regarding the wider oil and gas market of the EU. Additionally, the statements must be important enough to captivate both the media and shareholders. Furthermore, the statements must be announced during the Ukrainian war and be unanticipated to a certain extent. This relies on the efficient-market hypothesis (EMH), stating that the asset price has incorporated all available and relevant information. If the statements are anticipated, the fluctuations would not be a consequence of the market regulating to the new settings, as the event would already be factored into the stock price.

The statements we have chosen to include in this study occur in the early stages of the war, from February 2022 until May 2022. Shell's latest statement of response to the war was given in May, and therefore none of their statements are missing from the study. The European Commission, however, has released several statements and new sanctions against Russia after this period. The reason we only look at statements from the early stage of the war is that this

is assumed to be the period with the highest amount of uncertainty. Both the breakout of the war and the way other countries will react is uncharted territory at this stage. Thus, this period is most likely to include unpredictable events that are expected to affect the stock market. After a while the general perception of the world towards the war is established. New sanctions should then come less surprisingly for investors, and thereby not affect stock prices as much. Furthermore, as the stock prices adapt to future expected risk and uncertainty, the expected reaction to events later in the war is further reduced (Choudhry, 2010).

The events are split into three sections based on expectations for abnormal returns following each event. The different classifications are as following: positive, negative and neutral. The predicted reaction of each event in Table 1 is based on theory and previous literature regarding how the market will react to events given their implications and circumstances surrounding the event. An event that leads stockholders to expect higher cash flow and lower risk in the future will increase the price of a stock, while events that lead to an expectation of lower cash flow and higher risk in the future will decrease the price of a stock.

Table 1: Timeline of events

Timeline of Events

Date	Event	Predicted Reaction
All European Companies		
24-02-2022	The war breaks out	Negative
08-03-2022	The EU commission suggests to phase out Russian oil from Europe	Negative
04-05-2022	The EU announces that they will initiate a boycott of Russian oil	Negative
18-05-2022	EU presents the REPowerEU Plan	Neutral
Shell		
28-02-2022	Announcement of intent to exit equity partnership held with Gazprom entities	Negative
04-03-2022	Response on the purchase of Russian crude oil	Positive
08-03-2022	Announcement of intent to withdraw from Russian oil and gas	Negative
12-05-2022	Annoncement of sale of retail and lubricants business in Russia	Neutral

Notes: All the selected salient events have been predicted as either negative, positive or neutral. The predictions are related to expected abnormal returns under each event.

3.4.1 Events regarding the wider oil and gas market of the EU

The breakout of the war is the evident outset for the following events in this thesis. Such an incursion made by Russia creates major uncertainty in the market and can also impact the economic growth in outsider nations (D'Souza, 2022). Prior to discussing the effect of this event on stocks in the oil and gas sector, it must be considered whether the event is predictable

as the predictability of the war will affect the market's reaction (Brune, Hens, Rieger, & Wang, 2011).

Before the breakout of war in February 2022, Russian forces had been positioned near Ukraine for a while. On January 7th, 2022, the New York Times reported a build-up of Russian forces near the Ukrainian border, as well as Western officials being concerned that a military operation could start soon (Schwirtz & Reinhard, 2022). These kind of news reports could be used to argue that the breakout of war was a predictable event. However, as mentioned, the conflict between Russia and Ukraine has been ongoing for years, with some smaller aggressions from the Russian side. The ongoing nature of the conflict and the several turns of escalation and de-escalation has led to the threat of war being normalized. Furthermore, in the speech made by Putin on February 24th to announce Russia´s "special military operation" in Ukraine, he articulated aims far beyond those of Russia´s prior assaults (Fisher, 2022). We would therefore argue that an attack of this scale was surprising and will base further expectations on this assumption.

The market as a whole is expected to experience decreasing stock prices after the breakout of the war in accordance with the war puzzle. The oil and gas sector is expected to be affected more than the general market due to Russia's role in this industry. Because Europe relies on Russian oil and gas, a conflict involving this region will create higher levels of uncertainty and future risk for this sector. Therefore, we expect negative abnormal returns for the oil and gas sector.

On March 8th, The European Commission proposes the REPowerEU Plan (European Commission, 2022). This is a joint plan for Europe to become independent from Russian oil and gas within the next few years. By the end of the year 2022, the EU wants to restore the gas storage in the EU by at least 90% and reduce the demand for Russian gas by two thirds. This is because Russia's high income from fossil fuels is helping the country sustain its war against Ukraine. Furthermore, the plan includes a focus on quickly substituting fossil fuels by accelerating Europe's clean energy transition (European Comission, 2022). The acceleration of movement away from fossil fuels will negatively affect companies in all parts of the oil supply chain and decrease expected future cash flow. Overall, the sudden change that follows the REPowerEU Plan causes disturbance in the oil and gas companies' financials, as many lose one of their main oil import sources and might be struggling to find alternative options. Hence, the plan is predicted to have a negative effect on abnormal returns.

On May 4th, the EU further proposes a boycott of all Russian oil in Europe (Rauhala, Ariès, & Halper, 2022). Even though the intent of the plan is to penalize Russia, it also induces consequences for the countries that are still dependent on Russian oil. It is natural to assume that companies in these countries will be affected by the sanction as uncertainty levels rises in the industry and new solutions for supply have to be found quickly. Even though the EU already proposed the REPowerEU plan with intent to reduce demand of Russian oil, the proposal of a ban imposes more of a rapid and severe consequence for the oil and gas companies. Thus, this event is predicted to have a negative effect on oil and gas stocks.

Lastly, the EU presents the finished REPowerEU plan on May 18th. Since the plan´s general contents have previously been proposed to the public, we expect the market to already have incorporated the event into the price, and therefore have a neutral response to the event. The effect of this plan is therefore expected to only be reflected on March 8th when it was proposed. If this assumption is correct, it violates the criteria we have set for events to not be anticipated. However, looking more closely into the event will reveal if we are correct in assuming the effect of the REPowerEU plan is already incorporated in the stock price.

3.4.2 Events regarding Shell

Shell reacts early in the light of the invasion. On February 28th, the oil company announces its intent to exit equity partnerships held with Gazprom and related entities (Shell, 2022c). In the end of 2021, Shell reportingly had $3 billion worth of noncurrent assets through the Gazprom ventures (Imbert, 2022). Such a departure will inherently make an impairment on the book value of Shell's financial assets, and the stock price is therefore expected to react negatively.

In the evening of March 4th, Shell publishes a statement after their purchase of Russian crude oil became viral. Shell had reportedly bought 100,000 metric tons of Russian crude oil at a heavy discount earlier that day (Clinch, 2022). Despite the purchase not breaching any Western laws, it received heavy criticism as other companies were already shunning Russia due to the invasion. In the statement, Shell states that they are further wanting to end their activities involving Russian oil (Shell, 2022d). However, they also state that until they find an optimal alternative, they will continue purchasing Russian crude oil to ensure their customers are backed. Because Shell lays a stable plan that priorities and secures its customers, shareholders do not need to worry about reduced turnover or loss of clients. Hence, Shell is reducing uncertainty for shareholders. The stock is therefore predicted to generate positive

abnormal returns following this event. The next day (March 5th), Shell publishes a more exhaustive version of the statement. Considering the statements were posted late Friday night and Saturday, the effects are expected to appear the next trading day, March 7th. Therefore, these two events are pooled together in the analysis.

As mentioned, the EU presents their REPowerEU plan to phase out Russian oil on March 8th. Shell is then quick to validate their position and announces its intent to withdraw from Russian oil and gas the same day. They report immediate actions including stop of spot purchases and shutting down service stations concerning Russian crude oil (Shell, 2022e). Since Shell just a couple days earlier announced that they could not make significant changes overnight, this sudden contradiction could create uncertainty for the shareholders. The conversion from Shell seems to be implemented in order to satisfy EU's sanctions, hence shifting their main priority. It is therefore predicted that this event will have a negative effect on the stock price.

On May 12th, Shell further distances itself from Russia by signing an agreement to sell retail and lubricant businesses in Russia to Lukoil (Shell, 2022f). The deal afflicts 411 retail stations and is expected to be done by the end of the year. Shell states that their primary concern about the acquisition is the wellbeing of their employees and that they will remain employed by the new owner. The price of the deal remains undisclosed. However, earlier in the month Shell published their First Quarter Report for 2022, which unveiled some details of the sale (Shell, 2022g). The sale reportingly caused a $3.9 billion post-tax charge related to integrated gas, upstream, marketing and other. Despite the big deficit, Shell still managed to deliver strong results in volatile times. Because the impairments were already admitted in the first quarter report, it is reasonable to anticipate that the reactions of the sale have already been factored into the stock price. Hence, the statement made by Shell on May 12th is predicted to have a neutral response.

3.4.3 Tax Havens

In order to examine movements in stock market prices in tax havens we must first define some common traits of tax havens. Tax havens, also called secrecy jurisdictions, do not have a broadly accepted definition. The Tax Jurisdiction Network characterizes laws and other measures that can be used to evade or avoid the tax laws or regulations of other jurisdictions as a central feature of tax havens (Weyzig & Booijink). They further establish that the main element of tax havens attractiveness is their secrecy. Hines & Rice (1994) also establish

legislation that supports banking and business secrecy as one of four attributes that define tax havens. In his paper on Secrecy Jurisdictions, Guttrom Schjelderup (2015) points out that secrecy takes many forms in tax havens. He states that one of the most common forms of secrecy is lack of transparency in the operation of legislative, legal, or administrative provisions. This form of secrecy combined with asymmetrical information regarding who is responsible for companies in tax havens, makes it hard to hold anyone accountable for illegal or questionable activities within these jurisdictions.

It has been established that tax havens have a high degree of secrecy which allows companies in these locations to operate without interference from government or transparency regarding their transactions (Schelderup, 2015). The secrecy in these regions facilitate for lower costs for companies wanting to go against the guidelines provided by the EU in relation to the war. We would argue that because of these elements, companies located in tax havens are more likely to ignore sanctions set in place by the EU, and thereby less likely to experience fluctuations in stock price as a result of negative events. We therefore propose the following hypothesis:

H_0: Companies based in tax havens will react equivalently to companies based in locations with low secrecy scores following negative events

H_1: Companies based in tax havens will react differently to negative events than companies based in locations with low secrecy scores.

4. Data selection

The analysis in this thesis will be completed using secondary data. We have collected data from three different sources to use in our study; Orbis, Yahoo Finance and Tax Justice Network. The three different datasets have all been merged in order to complete the event study. The finished dataset contains stock information for 144 European companies in the oil and gas sector.

4.1 Company and Stock Data

Extracted company data from Orbis was sorted by region. Eastern Europe, Western Europe and the European Union were included in the selection. Furthermore, the selection was sorted by only extracting industry-codes (NACE) related to the oil and gas industry. The extracted data contained information about 36 447 European oil and gas companies and needed some further sorting. Companies that were listed as branches were excluded from the dataset. Companies from Russia were also excluded because some of the EU events, such as the boycott of Russian oil, have direct impact on these businesses. It is likely that Russian companies will not react the same way as the rest of the sector to these events. As we are interested in seeing a general trend for the whole European sector, the reactions of Russian companies are not relevant. Lastly, companies without a ticker were also excluded from the data.

The Orbis data with 314 remaining companies was then merged by tickers with daily stock data from Yahoo Finance in the period 01.01.2021-31.08.2022. Several Orbis-tickers did not match tickers in Yahoo Finance, and these were therefore found manually from Yahoo Finance. Data of the S&P500-index was also downloaded from Yahoo Finance and merged with the rest of the data by date. The merged datasets gave us some interesting insights of the remaining companies, revealing low to non-existing trading volume for several companies. Because of these low traded companies, we decided to further sort the data by trade volume. Companies with a mean trade volume below 1 000 were removed from the dataset. This was done in order to reduce the occurrence of smaller companies with no trading smoothing our results. In addition, infrequent trading can imply that the capital market is inefficient, which would reduce the validity of the stock price reaction.

As shown in Table 2 the minimum observation of average trade volume in the finished dataset is 1091. There is a lot of variation in the mean trade volume variable with a standard error of 4 279 946. Shell has a mean trade volume of 5 148 879 in this period, making the company above average in trade. This is consistent with it being among the largest oil and gas companies in Europe. Sorting by mean volumes further limited the dataset to 144 companies. The finished dataset contains mostly companies that are in business of support activities for petroleum and natural gas extraction, or extraction of crude petroleum. These are shown in Table 7 in the appendix. An overview of all companies included in the dataset can be found in Table 10 in the appendix.

Table 2. Descriptive statistics

	Mean	Median	Standard Error	Min	Max
Mean Trade Volume	2133501	328926	4279946	1091	25825203
Secrecy Scores	51.028	47.2	5.567	44.625	70.05

Notes: Secrecy Scores are collected from the Tax Justice Network. Mean trade volumes are calculated for each company by the sum of trade volumes each day divided by number of trading days in the dataset.

4.2 Tax Haven data

The Tax Justice network defines their financial secrecy index as “a ranking of jurisdictions most complicit in helping individuals to hide their finances from the rule of law” (Tax Justice Network, 2022). This index is an indicator of how high the level of secrecy in a jurisdiction is. In this study secrecy scores will be used as a proxy for tax haven likeness. As shown in Table 2 the maximum secrecy score in our data is 70.05, while the minimum is 44.625. Furthermore, the mean value is 51.028. These numbers confirm that a secrecy score of 60 is above average and can be used as a limit for tax havens. Tax havens will hereby be defined as countries with a score above 60.

Information on secrecy scores was downloaded from the tax justice network. This data was merged with existing data through country ISO codes. Secrecy Index scores will be used to examine differences in market reactions for companies that have headquarters in tax havens and companies based in countries with lower secrecy scores. The data contains companies from 24 different countries. The Secrecy scores for these countries and the number of companies in each country can be found in

Table 3. Table 3 also shows that the data contains companies located in four different tax havens. These are Cyprus, North Macedonia, the Netherlands and Switzerland. The lowest secrecy score of 44.625 can be found in Sweden.

Table 3: Countries in the data and their respective secrecy scores

Country	Secrecy Score	N
Sweden	44.625	8
Poland	46.05	1
United Kingdom	47.175	64
Ireland	47.2	4
France	47.875	4
Denmark	48.95	2
Czechia	50	1
Lithuania	50.95	1
Finland	51.8	2
Belgium	52.525	2
Greece	52.825	2
Norway	53.3	23
Austria	54.625	2
Italy	54.85	8
Spain	56.575	2
Germany	56.7	5
Portugal	56.875	1
Ukraine	58.875	1
Romania	59.375	5
Cyprus	61.525	1
North Macedonia	61.95	1
Netherlands	64.625	3
Switzerland	70.05	1

Notes: N shows the number of companies that have their headquarters in each country.

By studying the data, it becomes apparent that most companies are, as expected, not located in tax havens. There are in fact only six companies located within the four tax havens. Furthermore, there are eight Swedish companies in the data that can be used as a control group for tax haven companies. The companies based in Sweden and the companies based in tax havens are listed in Table 9 in the appendix.

5. Methodology

5.1 Event studies

To analyze the impact of announcements regarding Russian oil during the war, an event study methodology following the market model is utilized. We look at daily abnormal returns in order to detect effects of events specific to the oil and gas sector. The first part of the event study is conducted for two event windows, each containing multiple events. Shell and the rest of the oil and gas sector are studied separately. In the second part of the event study, we examine tax havens. This part only includes events from the EU. The EU events are not as close together, and the event study is therefore conducted with separate event windows for each event. Because stock prices are only available on business days, weekends are not included in the event windows.

To generate the returns for the market index and all the companies, we calculate the log of the adjusted price divided by the lag of the adjusted price for the individual companies ($R_i = \log\left(\frac{adjusted}{lag(adjusted)}\right)$), and the log of the closing price divided by the lag of the closing price for the market index ($R_M = \log\left(\frac{closing}{lag(closing)}\right)$). The S&P500 index is used as a representation of the market, as it includes a wide market breadth of the large-cap companies. Thus, it gives us an indication of the overall economic health. The reasoning for using the adjusted price for companies instead of the closing price is that it factors in corporate actions such as stock splits, dividends, and rights offering (Ganti, 2020).

Further, we regress the market returns from 2021 and use the Predict Method for Linear Model Fits to produce predicted returns for 2022. The method obtains the predicted values by evaluating the regression function within the data frame of returns for 2022. Thus, the year 2021 is used as a counterfactual to 2022.

In order to find the abnormal returns for each stock on each day, the market model is utilized.

$$R_{it} = \alpha_i + \mathrm{b}_i(R_{mt}) + \epsilon_{it} \quad (1)$$

R_{it} is the return on company i on day t, α_i is the intercept, b_i is the beta for company i, R_{mt} is the return on the market on day t, and ϵ_{it} is the error term on company i on day t. The benefit of using this model is that by removing the portion of returns that are related to

variation in the market, the variances of abnormal returns are reduced (Mackinlay, 1997). Reducing the variance can lead to a better ability to detect the effects of events. The abnormal returns are thereafter found as the residuals left between the developed predicted returns and the actual returns for each company i for every day t in the event windows.

5.1.1 European oil and gas companies

When the abnormal returns are computed, we continue to look into the actual events for our event study. The analysis is divided in two periods to first capture the prompt reactions to the war outbreak, and next the reaction to actions taken after the immediate shock has settled. Because there are multiple events within each event window, we want to look at the distinct movement on specific dates rather than trends lasting over a period of time. This prevents certain data points being ignored and can also help provide a clearer explanation of the patterns in the data, compared to other methods such as using CAR.

For the first period we select abnormal returns two days prior to the war as a baseline for upcoming events. This is done by selecting the abnormal return on February 22nd from each individual company and subtracting it from the abnormal returns for the days in the event window. Thus, the abnormal return value of the baseline day can be expressed as $AR_{i0} = \tau_i$. The reaction of the first event in the event window is therefore defined as $e_{i1} = AR_{i1} - \tau_i$, the reaction of the second event is defined as $e_{i2} = AR_{i2} - \tau_i$, and so on. For this part of the thesis, we are looking at multiple events within the given time period for all the companies combined. This gives us a general estimation equation for each event window:

$$y_t = \alpha_0 + D_i\beta_1 + D_i\beta_2 + D_i\beta_3 + D_i\beta_4 + u \quad (2)$$

The D is a binary variable which takes on number 1 when the event is taken into account, and 0 if the event is left out. The standard errors are clustered by company and are robust to heteroskedasticity. By selecting two days before the events as a baseline, we are also able to observe any abnormal return the day before the outbreak. This allows us to detect effects that might have occurred before the event as a result of leaked information (Mackinlay, 1997). Especially important events that may have a significant effect on the company's stock price are prone to insider trading (Sebastian, 2022). In that case, we observe abnormal fluctuation in the stock price the day before the actual event as well. For the second period we select three business days before the first event as a baseline for the event window. Hence, the date selected is April 29th. The reason for selecting three days earlier instead of two is due to the Early May

Bank Holiday in the U.K whereby all the banks are closed on May 2nd (National Today, 2022). This caused missing data from the 64 U.K based companies which would be insufficient for further analysis.

The lengths of the event windows vary with how many events are happening consecutive in a time period. The regression is formed as $Return = event_1 + \cdots + event_i$, with the event window as the sample period.

5.1.2 Shell

To further examine Shell on its own, we create a subset of the data only containing this company. The same event windows and baseline days are applied to this study. This allows us to compare the results from Shell and all the other oil and gas companies. The other oil and gas companies are used as a control group for Shell's statements. This can detect if Shell is reacting to its own statement or if the fluctuation is mutual for the rest of the oil sector.

5.1.3 Tax havens

To examine the differences in effects between companies in tax havens and companies with a low secrecy score, three subsets are created. The first subset is companies located in tax havens, hence companies with a secrecy score > 60. The second subset is companies located in Sweden. These companies are used as a control group because Sweden has the lowest secrecy score in the dataset and contains approximately the same number of companies as the first subset. All companies in the subset of Sweden have a secrecy score of 44.625. The last subset includes all companies that have a secrecy score < 60, meaning the subset is made up of data on all companies that are not located in tax havens. The subset for tax havens is our treatment group, while the two other subsets are control groups.

When conducting event studies for tax haven research, we only look at events tied to the EU. This due to the fact that events tied to Shell will not affect all other companies in the sector. The following method of event studies is applied to all three subsets separately.

In order to check for significant changes in abnormal returns an event window of 11 days is used. The event window for each event is set as the event day +/- 5 days, as the market is expected to react fast to news of changes regarding Russian oil. This allows us to examine the context around the event day to reveal if there is a bigger difference in abnormal returns

between the treatment group and the control groups following an event. Comparing the surrounding days to the event day increases the robustness of our conclusions.

In this part of the analysis, 20 days before each event is used as a reference point in our regressions. The reason 20 days before is used, is because we expect the abnormal returns on these dates to be representative of a normal day outside of events. None of the dates used as reference points are included in event windows for other events and they are all distant from days in which we expect to see fluctuations. **Error! Reference source not found.** displays d ates for each reference point.

Lastly a regression with the following estimation equation is run for each event window on each subgroup:

$$y_t = \alpha_0 + D_i\beta_{-5} + D_i\beta_{-4} + \cdots + D_i\beta_4 + D_i\beta_5 + u \quad (3)$$

The D is a binary variable which takes on number 1 when the day in question is taken into account, and 0 if the event is left out. This is done for each day in the event windows. The standard errors are clustered by company and are robust to heteroskedasticity.

6. Results

In this section the results from the event study for Shell, other oil and gas companies, and tax havens are presented. The results will be interpreted visually and discussed in light of predicted reactions.

6.1 Event study

6.1.1 European oil and gas companies in the first time window

Figure 1 displays the abnormal returns from the first event window in the event study, using values from February 22nd as a baseline. Based on this we have generated results to discuss if the hypotheses are to be rejected or not. When looking into all European oil and gas companies in the first event window, only two of the events are expected to affect these companies; when the war breaks out (February 24th) and when EU suggests phasing out Russian oil (March 8th). However, the analysis of the two other dates can be used as a control group in order to observe if Shell's reaction is unique.

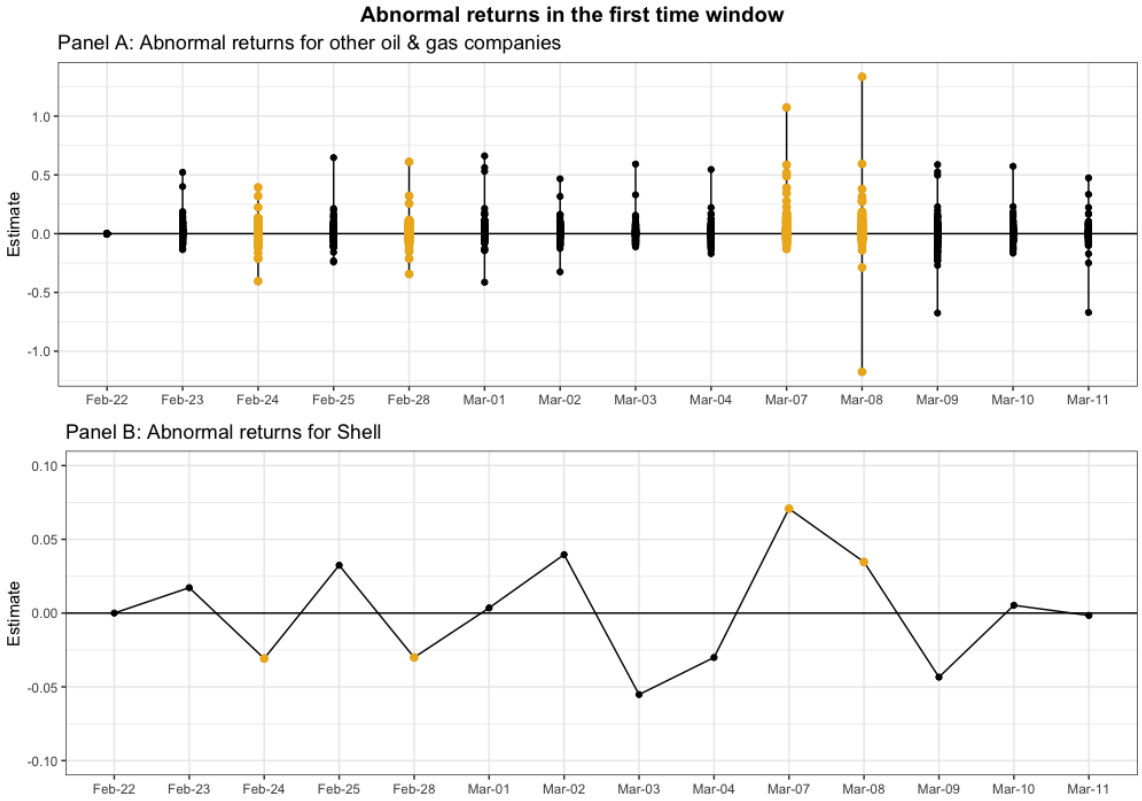
As expected, investors react to Russia invading Ukraine on February 24th, which generates negative abnormal returns. The result is significant on a 5 percent level. This means the stock price of the companies within the oil and gas sector decreases more than the general market as consequence of the conflict outbreak. The outbreak of war lowers the abnormal returns significantly by 1,4 percent ($\hat{e}_1 = -0{,}0140$) for companies in the oil sector. The fact that we receive significant negative results indicate that the oil and gas sector in Europe is more vulnerable to war than the general market, and that investors anticipate that the oil and gas companies will perform worse than other sectors due to the war. Considering the war puzzle, the result also strengthens the assumption that the event was unpredicted, and the information had not been factored into the stock price yet (Brune, Hens, Rieger, & Wang, 2011).

On February 28th, Shell announces that they intend to exit equity partnership with Gazprom. We observe that the event does not generate a significant reaction in either positive or negative direction for the other oil and gas companies. This is expected, as the statement this day only applies to Shell. The size of the effect is the smallest effect in the event window ($\hat{e}_1 = 0{,}0028$), which indicates a neutral response to the event. Hence, the companies in the oil and gas sector are not affected by this statement.

Moreover, the event on March 7th also only applies to Shell. On this day, Shell responds to their purchase of Russian crude oil. Despite only expecting an effect for Shell, shareholders of the other oil and gas companies also react on this event day, generating a strong positive statistically significant result on a 1 percent level. The effect is more than double the size the effect from the war outbreak. The result is surprising as other companies should not be affected by Shell's statement. A potential explanation for the significance is other economic factors that are beneficial to the oil and gas industry, making them perform better than the general market on the event day.

Lastly, March 8th is expected to generate negative abnormal returns. On this day, the EU announces a suggestion to phase out Russian oil from Europe. Contrary to our expectation, the result is significantly positive on a 10 percent level. This effect is also twice the size the war outbreak effect. A possible explanation is that our predicted reaction of this event is based on incorrect assumptions. The investors could be positive to the suggestion of phasing out Russian oil, which would explain why we receive a positive coefficient for the reaction of all oil companies. The regression results are presented in Table 4.

Figure 1: Abnormal returns for Shell and the other oil & gas companies in the first event window



Notes: Panel A shows abnormal returns for 144 oil and gas companies in Europe. Panel B shows abnormal returns for Shell only. Abnormal returns on February 22nd are used as a baseline date for both. Event days are marked in yellow. Date description:

February 24th: The war breaks out
February 28th: Shell announces intent to exit equity partnership held with Gazprom entities
March 4th: Shell response to purchase of Russian crude oil
March 8th: The EU commission suggests phasing out Russian oil from Europe

Table 4: Regression results of the effect of the events in the first event window on the stock prices of Shell and the other oil and gas companies

Date	Event Window	Predicted reaction	Estimate	Std.Error	p-value
Shell					
Feb-24	Breakout of war	Negative	-0.0276	0.0326	0.4198
Feb-28	Announcement of intent to exit equity partnership with Gazprom	Negative	-0.0268	0.0326	0.4315
Mar-07	Response on purchase of Russian crude oil	Positive	0.0740	0.0326	0.0493
Mar-08	Announcement of intent to withdraw from Russian oil and gas	Negative	0.0379	0.0326	0.2754
All companies					
Feb-24	Breakout of war	Negative	-0.0140	0.0056	0.0129
Feb-28	Shell announces intent to exit equity partnership with Gazprom	Neutral	0.0028	0.0044	0.5236
Mar-07	Shell respond to purchase of Russian crude oil	Neutral	0.0392	0.0107	0.0003
Mar-08	EU suggests to phase out Russian oil from Europe	Negative	0.0282	0.0151	0.0625

Notes: It can be noted that the standard error for Shell is the same for all events. Because we are only looking into one individual company within the same time frame for all events, we have the same amount of information for each event in the regression. This means we test each event against the same control group of non-event days. Thus, the standard error is the same for all events.

6.1.2 Shell in the first event window

Similar to the rest of the oil sector, Shell's investors also react to the event on February 24th, and generate a negative abnormal return. This is consistent with our predicted reaction for the event. As we observe in Table 4, the effect of the event on Shell is even larger than the effect we observed for the oil sector. Relative to the sector, Shell's decrease in stock price due to the war outbreak is almost twice as large ($\hat{e}_1 = -0{,}0276$). It is clear that Shell's investors anticipate the company to perform worse due to the war.

Following the next event, on February 28th, we observe a negative abnormal return for Shell. This is coherent with our negative expectations of the event, as the equity partnership exit will make an impairment on the book value of Shell's financial assets. The effect size of the event on Shell is nearly as big as the effect size the day of the war outbreak. This indicates that the announcement is important and has a big impact on investors' expectations of the future cash flow. We trust that the effect we observe for Shell is due to the event, as the result for the rest of the sector is neutral. Our claim that the event causes negative reactions among shareholders therefore seems to hold.

On March 7th, when Shell responds to their purchase of Russian crude oil, we expect the stock price to increase. As we observe in Table 4, the predicted results are correct. The abnormal return is positive statistically significant on a 5 percent level, and the event has the largest effect on Shell out of all the events in this event window ($\hat{e}_1 = 0{,}0740$). The absolute value of the effect is indeed more than twice as large as the effect from the war outbreak. Isolated, the published response seems to have a big impact on shareholders. However, all the other oil and gas companies also have significant positive abnormal returns on this day. Therefore, we cannot say for certain that this event has an effect on Shells returns without a neutral baseline from the rest of the sector. The large effect can also imply that Shell has reacted both to their own statement as well as the same factors that caused the increase in the rest of the oil and gas sector. Hence, we cannot state that the positive abnormal return for Shell is solely due to their own statement.

Lastly, the event on March 8th generates an abnormal return in the positive direction. This is opposite of our negative predicted reaction to this event. The absolute value of the effect here is also bigger than the effect from the breakout of the war. Shell announces their intent to withdraw from Russian oil and gas and the EU commission suggests to phase out Russian oil

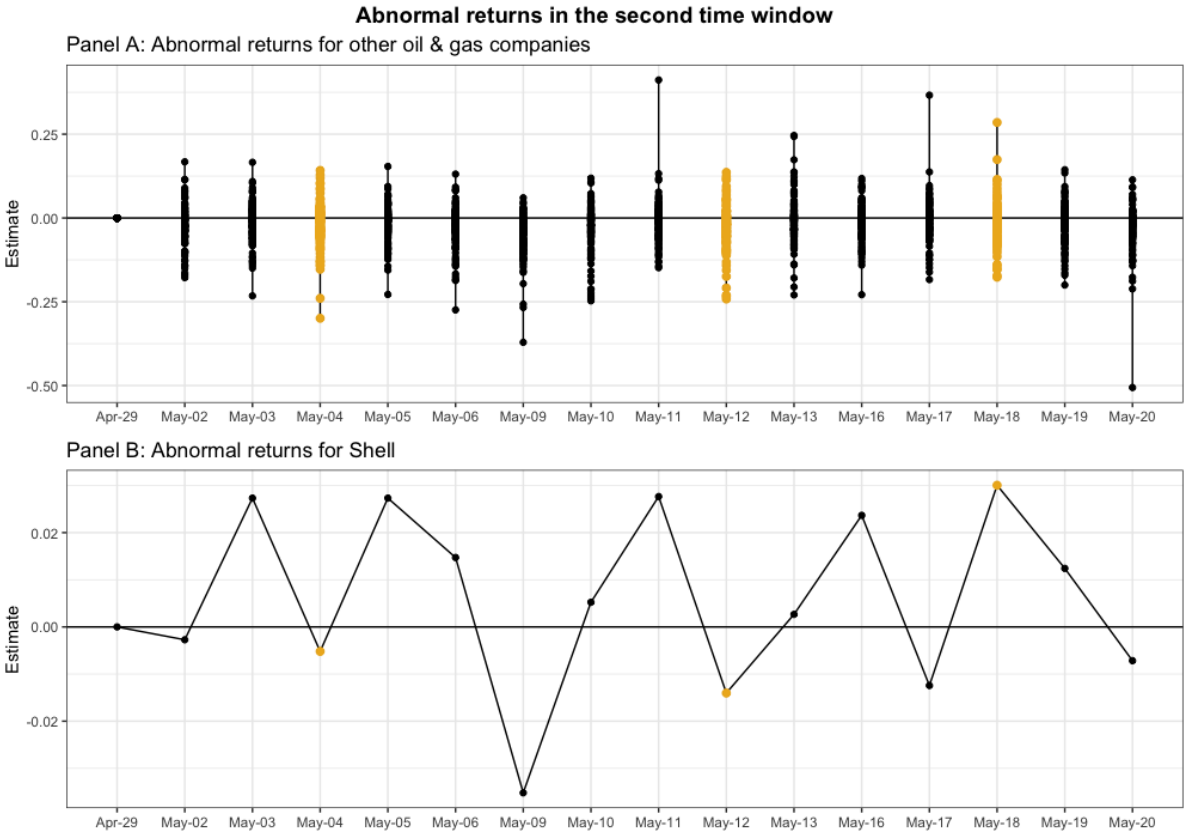
from Europe on the same day. Despite having two statements on the same day predicted to affect the stock negatively, the event generates positive abnormal returns for Shell. It can therefore be substantial to look at the stock price increase on this day in light of the event the day before. The positive event on March 7th could potentially have both an immediate response and a slower response on the stock price. A strong significant positive effect from the event on March 7th could therefore bleed onto the next trading day and dominate the negatively predicted event occurring on March 8th for Shell. On the other hand, the other companies in the oil sector also have significantly positive abnormal returns on this day. Similar to the day before, other factors causing the stock prices in the oil and gas industry to increase could also be the reason for Shell's stock price to increase on this day.

Summed up, the results show that the majority of the fluctuating movements for Shell are as predicted. The events on the 24th and 28th of February both receive negative abnormal returns, and the sizes of the effects are nearly the same. When Shell responded to the purchase on Russian crude oil (March 7th) we expected a positive abnormal return. The regression result for this date has a bigger absolute value than the two previous events, in the predicted direction. On the other hand, other factors in the oil sector seem to have an impact on the effect. Further, the last event day (March 8th) also delivered positive abnormal returns, although we expected this to be negative. Hence, this was the only event in the first event window that reacted contrary to our expectations.

6.1.3 European oil and gas companies in the second time window

For the next event window, we detect more fluctuation for both Shell and other oil and gas companies. Figure 2 displays a greater spread in the observations for this period. Further, there are generally less significant results for the events in this event window, as shown in Table 5. It will therefore later be discussed if the effect of war has been reduced at this point and the risk of war has already been incorporated into the stock price.

Figure 2: Abnormal returns for Shell and the other oil & gas companies in the second time window



Notes: Panel A shows abnormal returns for 144 oil and gas companies. Panel B shows abnormal returns for Shell only. Abnormal returns on April 29th are used as a baseline for both. Event days are marked in yellow. Date description:

May 4th: The EU announces they will initiate a boycott of Russian oil
May 12th: Shell announces intent to sell retail and lubricant businesses in Russia
May 18th: EU represents the REPowerEU plan

Table 5: Regression results of the effect of the events on the stock prices of Shell and the other oil and gas companies

Date	Event Window	Predicted reaction	Estimate	Std.Error	p-value
Shell					
May-04	The EU announces they will initiate a boycott of Russian oil	Negative	-0.0116	0.0193	0.5579
May-12	Announcement of sale of retail and lubricant businesses in Russia	Neutral	-0.0205	0.0193	0.3094
May-18	EU represents the REPowerEU plan	Neutral	0.0236	0.0193	0.2437
All companies					
May-04	The EU announces they will initiate a boycott of Russian oil	Negative	0.0009	0.0037	0.8134
May-12	Shell announces intent to sell retail and lubricant businesses in Russia	Neutral	-0.0082	0.0038	0.0314
May-18	EU represents the REPowerEU plan	Neutral	0.0108	0.0041	0.0088

The first event in the second event window is on May 4th when the EU announces they will initiate a boycott of Russian crude oil. This leads to heightened uncertainty levels as new solutions have to be found quickly, and the stock price is expected to fall. From the regression results in Table 5 we observe that the effect of the event on the European oil and gas companies is small and positive ($\hat{e}_1 = 0{,}0009$). It is also the most insignificant estimate out of all events in the study. The result indicates a neutral response to the event, hence, the oil and gas sector is not affected by EU's statement.

On May 12th, Shell announces a statement about selling all retail and lubricant businesses in Russia. This event is not expected to affect other companies in the oil and gas sector. As we observe in Table 5, the event generates abnormal returns in the negative direction for the oil and gas companies. However, the coefficient is small, thus the event does not cause immoderate fluctuations. Because the other companies should not be affected by the event, it can be argued that the small negative effect is likely due to other economic factors surrounding the oil industry as this time.

Lastly, we expect all the companies to have a neutral reaction to the EU representing the REPowerEU plan on May 18th. This is because content of the REPowerEU Plan became public before the presentation of the plan, and it is therefore expected that the market has already incorporated this information into the stock price. Despite this, investors react to something on this day, generating positive statistical significance on a 1 percent level for the European oil and gas companies. It was earlier discussed in the first event window that the prediction of the event on March 8th is wrongly classified. This was the day the outline of the plan was presented. The fact that the event on the May 18th is also significantly positive adds to the suspicion that the events should have been predicted to be positive. The investors could be positive to the suggestions in the REPowerEU plan. This would explain why we receive a positive coefficient for the reaction of the oil companies for both events tied to the plan.

Overall, the results for the second event window are not consistent with our hypothesis. The results are generally weaker in this event window. This suggests that the effects of the statements are stronger for the oil sector in the beginning of the war, and then weakened when the immediate shock of the war has settled. This is consistent with Boungou and Yatié´s (2022) findings for global stock markets, where effects of the war are reduced after three to four weeks. However, the results imply that the last event should have been predicted to be positive.

In that case, the oil sector is still affected by announcements made by the EU in the second event window.

6.1.4 Shell in the second time window

For May 4th we expect Shell to react negatively to the EU´s statement about initiating a boycott of Russian oil as this will increase uncertainty levels in the industry. Consistent with our prediction, the investors react to the event and generate a negative abnormal return on this day. This indicates that Shell as an individual company still reacts to the EU statements, despite the other companies combined not generating the predicted abnormal return. The fact that Shell has a negative return may suggest that some of the other oil and gas companies also react to the event, but not enough of them to cause an effect in the predicted direction. This potentially explains why the event did not cause a significant effect in any direction for the other companies in oil and gas sector, whilst we see an effect in the negative direction for Shell. Hence, the EU initiation of banning Russian oil seems to affect Shell.

The second event in this time window, May 12th, is predicted to be a neutral event. Even though Shell announces the sale of retail and lubricant businesses on this day, the impairment of the sale has already been admitted in the first quarter report (Shell, 2022g). It was therefore predicted that the stock price had already adjusted to the information. In Table 5, we detect that the size of the effect of the event is even bigger than the previous event (May 4th). This result implies that the impairment was not yet as familiar to the public as expected, and the information was therefore not factored into the stock price. However, the other oil and gas companies also generate negative abnormal returns on this day, and we can therefore not conclude that Shell's statement is the reason for the negative effect on the stock price.

Lastly, the event on May 18th was expected to be a neutral event as the outline of the REPowerEU plan had already been proposed to the public. If the event had not been factored into the stock price yet, the event should have a negative effect on Shell's stock price. As we discussed for the oil and gas sector, the expected reaction may be wrong, and should have been predicted to be positive for this event. The argument is also consistent with Shell, as they receive a positive abnormal return for this event day. Hence, the result adds to the proof that the last event should have been predicted to be positive, as we observe a positive effect from the event.

Summed up for Shell, the company still seems to react to statements made by the EU. The announcement made by Shell is uncertain as the oil and gas industry in general is affected negatively on this day.

6.1.5 Tax havens

In this section we examine the results of negatively predicted events announced by the EU for tax haven companies versus companies with lower secrecy scores. We also include a neutral event in the analysis for robustness check. For negative events we expect to see a larger reaction in companies with low secrecy scores than companies in tax havens. The results for February 24th, March 8th and May 4th are therefore expected to differ between tax haven companies and the control groups. On May 18th we expect no difference in results as this is classified as a neutral event. Further, we look at differences between estimates for control groups and estimates for tax havens on all days in the event window. This is to determine if the differences increase in coherence with our expectations for the events.

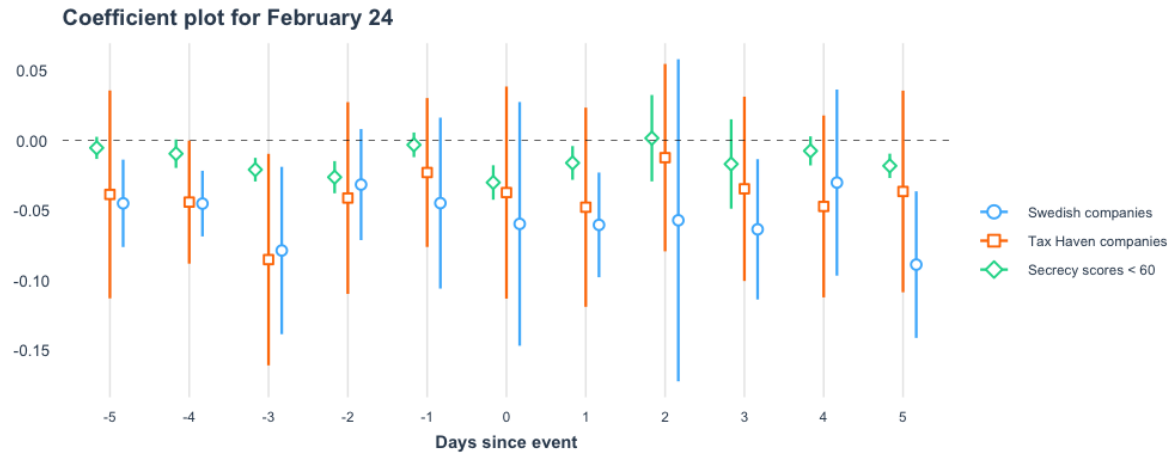
Table 6: Regression results of the effect of EU events on stock prices of companies in regions with different levels of secrecy.

Timeline of Events and regression results

			Tax Haven Companies		Swedish Companies		Companies With Secrecy Score < 60	
Date	Event	Predicted Reaction	Estimate	p-value	Estimate	p-value	Estimate	p-value
24-02-2022	The war breaks out	Negative	-0.0375	0.3269	-0.0599	0.1757	-0.0303	0.0000
08-03-2022	The EU commission suggests to phase out Russian oil from Europe	Negative	-0.1595	0.4744	0.0228	0.0671	0.0297	0.0128
04-05-2022	The EU announces that they will initiate a boycott of Russian oil	Negative	0.0036	0.8565	-0.0105	0.6455	-0.0024	0.5963
18-05-2022	EU presents the REPowerEU Plan	Neutral	0.0147	0.3768	0.0129	0.5095	0.0175	0.0005

Notes: The subgroups of the oil and gas sector are divided by secrecy scores where tax haven companies > 60, Swedish companies = 47.625, and all other companies < 60.

Figure 3: Coefficient plot for February 24th

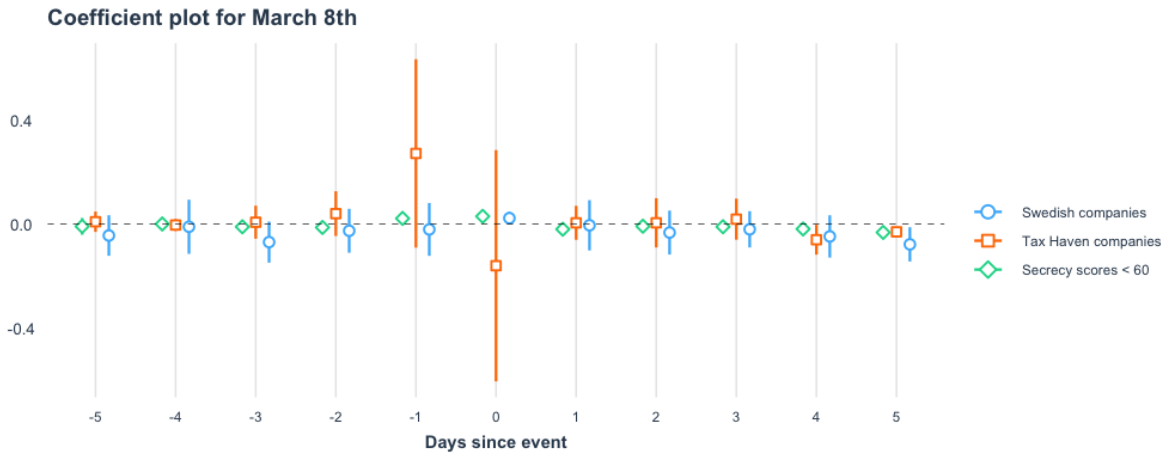


Notes: Figure 3 displays the value of coefficients, as well as the 95% confidence interval for all subgroups in the event window for the 24th of February. The full regression results and differences are shown in Table 12.

On February 24th, as the war breaks out, all the subgroups have negative coefficients. The coefficient for Swedish companies is the most negative, as expected for companies with low secrecy score. However, the result for tax havens is slightly more negative than the rest of the sector. This indicates that companies in tax havens do not stand out from the rest of the oil and gas sector in terms of how their stock price reacts to negative events.

The difference in estimates between tax havens and the control groups is expected to increase around the event day, indicating different reactions for the subgroups. Furthermore, the difference here is expected to be negative. Abnormal returns for the control groups should be lower than for tax haven companies following a negative event if our hypothesis is correct. The difference between Swedish companies and tax haven companies increases and turns negative from 0.0096 to -0.0219 the day before our event. This difference stays relatively high in the remaining days of the event window. Hence, there is a difference in reaction between tax haven companies and Swedish companies in the direction we expected. For companies with a secrecy score below 60, the difference stays positive throughout the event window, indicating that these companies respond less negatively to the event than tax haven companies. This is not in line with our expectations and indicates that tax haven companies do not react less to the breakout of war than the rest of the sector.

Figure 4: Coefficient plot for March 8th

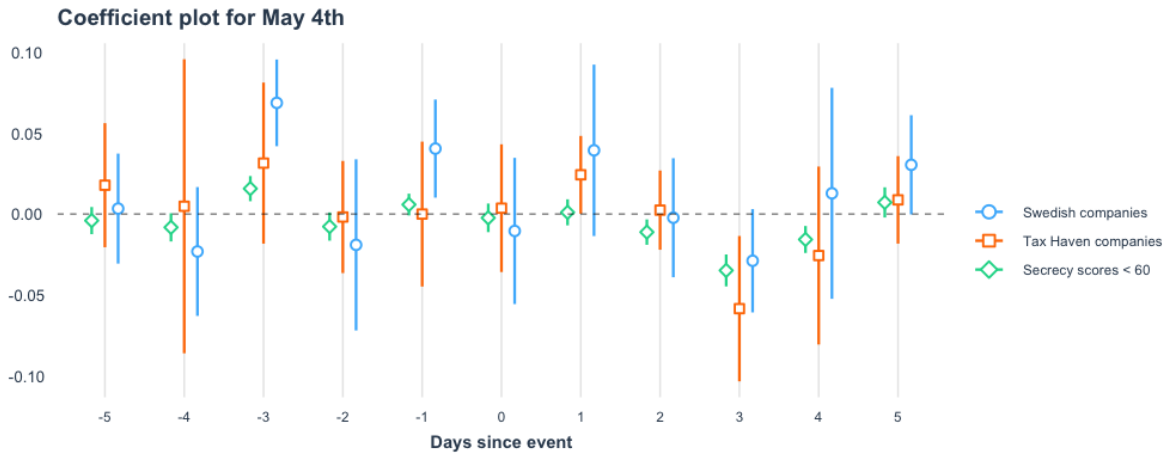


Notes: Figure 4 displays the value of coefficients, as well as the 95% confidence interval for all subgroups in the event window for the 8th of March. The full regression results and differences are shown in Table 13.

The second negatively predicted event in our study occurs on March 8th when the EU commission suggests to phase out Russian oil from Europe. This event does not show a negative reaction in our earlier analysis and give indications of being a positive event. On the event day we observe slightly positive coefficients for both of our control groups. Tax haven companies, however, have a negative coefficient. As the positive reactions for both Swedish companies and companies with a tax score below 60 are significant, we can confidently claim that tax havens behave differently than the rest of the sector on the event day.

The difference in abnormal returns between tax haven companies and both control groups are positive on the event day. Assuming that this is a positive event, the differences are in the expected direction. Positive differences for a positive event are an indication of tax haven companies reacting less than the rest of the sector. However, both differences are bigger on the day before the event than on the event day. This development is the opposite of our hypothesis of events leading to higher differences in abnormal returns.

Figure 5: Coefficient plot for May 4th



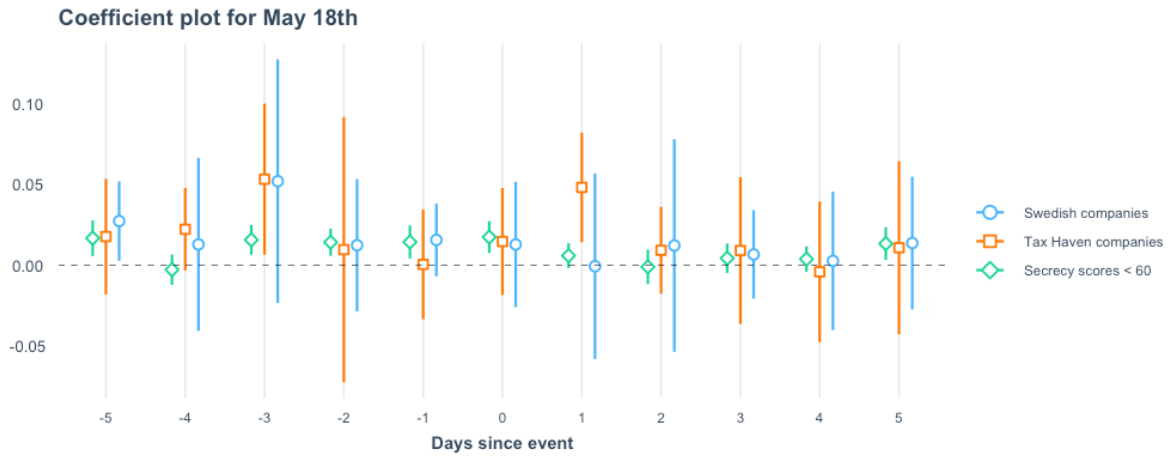
Notes: This figure displays the value of coefficients, as well as the 95% confidence interval for all subgroups in the event window for the 4th of May. The full regression results and differences are shown in Table 14.

The announcement of a boycott on Russian oil on May 4th showed no significant reaction from the oil and gas sector in the previous analysis. This analysis does not receive any significant results either. The control groups have negative coefficients on the event day, while tax haven companies have a positive coefficient on this day. However, all sizes of effects on the event day are small, hence, they do not show strong reactions to the event.

The differences in abnormal returns show that there is not a bigger gap following the event than prior to the event between tax havens and control groups. Therefore, we cannot conclude that the event has led to a difference in reactions between tax haven companies and the control groups.

Robustness check

Figure 6: Coefficient plot for May 18th



Notes: Figure 6 displays the value of coefficients, as well as the 95% confidence interval for all subgroups in the event window for the 18th of May. The full regression results and differences are shown in Table 15.

On the 18th of May the EU presents the REPowerEU plan. The sector shows a positive reaction to this news in earlier analysis. All subgroups also have positive coefficients on this event day. The lack of difference in abnormal returns on this day is as expected for a neutral event. However, the reaction of the sector in previous analysis indicates that this should be a positive event. As for the days surrounding the event, the differences following the event are not larger than for the rest of the event window. This indicates that tax haven companies do not react differently than the rest of the sector to positive events.

In conclusion, there is not substantial evidence to state that there is a difference in reactions between tax haven companies and the control groups following our events. Therefore, based on these results, we cannot reject the null hypothesis stating: *Companies based in tax havens will react equivalently to companies based in locations with low secrecy scores following negative events.*

7. Discussion

In this part of the paper, we will be discussing other factors that influence the stock price fluctuations of oil and gas companies. Further, we will look at limitations regarding our methodology.

7.1 Oil price

Hamilton (1983) has shown that the macroeconomy is negatively affected by increased oil prices. When the oil price rises, it reduces the GDP, which furthermore reduces the earnings of firms incorporating oil in their production. Thus, the increased price of oil will lower the earnings of the average company on the market, and consequently stock prices will fall. Given that the market reacts so coherently to changes in oil prices, our inclusion of the S&P500-index and the market model will adjust our results so that effects of oil prices are included in our model.

As for oil and gas companies, intuition would indicate that these companies are more sensitive to changes in oil price than the rest of the market. However, it is common for oil producing companies to develop a hedging program (Sembos & Medova, 2001). In this way oil companies are able to protect themselves from loss connected to fall in oil prices, as well as reduce the impact of higher oil prices on stock prices (Scott & Rathburn, 2022). Because of this, oil price has not been incorporated into our methodology, and we are confident that the reactions of the events can be examined without taking into account oil price movements.

7.2 Liquidity of the market

Multiple of our events create a supply shock in the oil industry by reducing the availability of Russian oil. Zhang and Wong (2022) find that oil supply shocks positively impact liquidity in stock markets for both oil-related stocks as well as oil-users. Furthermore, due to the presence of algorithms that take advantage of arbitrage opportunities across stock markets, the market is efficient and liquid. Sklavos, Dam and Scholtens (2013) find that energy stocks that are heavily traded react to changes in turnover after one day, while it takes two days for energy stocks that are traded less. As Shell has a high mean trade volume compared to the rest of the companies in the data, it is reasonable to conclude that reactions will be fast for this company.

The study further finds that all groups and stocks examined in the energy sector exhibit a high degree of liquidity clustering. To conclude, changes in stock prices following our events should occur rapidly and we should be able to see reactions on the event day.

7.3 Litimations

One limitation to the methodology in this paper stems from the chaotic nature of conflicts and the surrounding environment. It is natural for stock prices in different sectors to react as the war escalates and de-escalates, as well as when other countries bring forward sanctions against Russia. This could lead to noise in the data, which results in uncertain estimates. There are however two aspects to our methodology that should reduce the risk of uncertain estimates. Firstly, the use of the market model hinder results from being affected by unrelated events that concern the whole market. Furthermore, given that we have data on many companies over several events, we are more confident in the identification of general patterns in our results.

7.3.1 Methodolody for Shell and other oil & gas companies

For our analysis of Shell and all companies in the sector, there are a lot of events in a short time window. When conducting an event study, one usually sets the event window to show reactions through regressions both in the days prior to an event and in the days following. This is done to pick up possible premature reactions that can be related to predictability, leaked information or insider trading. A lag in reactions to events can also be picked up by examining the whole event window. By looking at the surrounding days, one can be more certain that the reaction one sees on the event day stems from the event and not for example from an event three days prior with lag in its reaction. However, in our analysis of Shell and all companies in the sector, there are several events in a short time window. Therefore, there is a risk that the results are tainted by events effecting abnormal returns on other event days. This has already been addressed in the discussion regarding March 7th and March 8th for Shell, which include two events next to each other with no trading days in between. However, given that we look at many companies over several events, we are able to identify general patterns in our results. This makes us more confident in our conclusions.

7.3.2 Methodology for tax havens

In our research on whether companies located in tax havens react less than other companies to negative events, our subsets contain different amounts of companies. The data contains stock information on 6 companies in tax havens, 8 Swedish companies, and 138 companies that are not located in tax havens. P-values are typically lower for a higher number of observations due to the standard errors being lower. This is because it is easier to pick up trends in the data with more observations and thereby a more accurate regression line. Therefore, the fact that one can see more significant results for all companies not located in tax havens is tied to the amount of data in this subset, making it less comparable to the other subgroups. If we had data on more companies in tax havens, we might have seen more clearly trends that point to a reaction from the events. However, since the data has different sample sizes, we have focused our analysis on effect sizes and the directions of the effects. This allows us to compare the general direction of abnormal returns following an event and see trends that become more reliable as results.

7.3.3 External statements

It is plausible to assume that Shell and the other oil and gas companies have been affected by other statements not included in the analysis. For example, on March 8th we looked at the EU announcing a suggestion to phase out Russian oil from Europe, and Shell announcing their intent to withdraw from Russian oil and gas. On this day, there are also other important authorities announcing their actions towards the war. Both the U.K government and The White House announce that they will ban all imports of Russian oil (Mayes, 2022). Because a majority of our analysed companies are located in the U.K, the measure taken by the U.K government most likely has an impact on abnormal returns for the sector. Therefore, we cannot be certain that the effects we observe on March 8th are solely due to our analysed event.

8. Conclusion

The intention of this thesis was to evaluate if salient events during the Russia-Ukraine war impacted the stock prices of oil and gas companies in Europe. Our selected events were appointed predicted reactions based on whether the events were expected to have a positive, negative or neutral effect on the stock price. In order to evaluate the effects of the events, we conducted a common event study methodology on 144 companies in the oil and gas sector in Europe. The multinational oil and gas company Shell was also examined isolated in order to identify company specific effects. In addition, we examined if companies located in tax havens were less sensitive to the negative statements than companies not located in tax havens.

Based on our analysis we found that European oil and gas companies were affected negatively by the war outbreak on February 24th. The event had a statistically significant effect in the negative direction on the companies in the oil sector, as expected. Further, the two following events in the first event window regarding Shell generated positive abnormal returns for the oil and gas companies. This was opposite of our predictions for these events. The effect sizes of March 7th and 8th were also twice the size the effect of the war outbreak. The result suggested that the predicted reaction of EU's statement on March 8th was based on incorrect assumptions, and the event should have been classified as positive.

The data further showed that a majority of the fluctuating movements of Shell were as predicted in the first event window. Similar to the rest of the oil sector, the investors of Shell reacted to the breakout of the war and caused negative effects in the abnormal return. The following two announcements made by Shell in the first event window also gave the expected results. These results isolated suggested that Shell's statements did affect the stock price in the predicted direction. However, the remaining oil and gas companies also had significant positive abnormal returns when Shell responded to the purchase of Russian crude oil on March 7th. This event should not have had an effect on any other companies than Shell, and we could therefore not claim that Shell's statement was solely the reason for Shell's fluctuation in the stock price on this event day. Similar to the rest of the oil and gas sector, the results of Shell imply that the last event should have been predicted to be positive.

In the second event window the results for events regarding the wider oil and gas industry in Europe did not agree with our predictions. On the other hand, the positive response to the finished REPowerEU plan further strengthened the supposition that the event should have

been predicted to be positive. If this is the case, the oil and gas sector is still affected by announcements made by the EU in the second event window. The size of the effects has however decreased.

Further, the shareholders of Shell appeared to react to new announcements in the second event window. It is uncertain if the reaction to their own statement was caused by other factors in the oil sector, as the rest of the oil and gas companies also moved in a negative direction on this event day. Moreover, Shell's investors reacted to the REPowerEU plan and generated positive abnormal returns. If this event is positive as discussed earlier, the results of Shell prove that they reacted to the EU's statements in the second event window as well.

Looking at these four analyses combined, results suggest that the oil and gas industry did get impacted by the EU statements regarding Russian oil during the Russia-Ukraine war. The sector reacted to both negative and positive events. The effects on all the companies combined however appear to lessen as the shock settles. This is consistent with the findings of Boungou and Yatié (2022), who found that effects of the Russia-Ukraine war lessened after three to four weeks. However, results show that the effect on Shell alone persists to the very last event in our study.

This thesis has shown that dependency on resources from a specific region can lead to strong fluctuations in stock markets when this region is in conflict. Previous studies have shown the effects of war on global stock markets. Among these, Boungou and Yatié (2022) found that there is a negative correlation between the Russia-Ukraine war and stock market indexes. Our study further found that the oil and gas sector reacts more strongly than the rest of the market to our events regarding the war. In conclusion, Europe's dependency on Russian oil and gas has made stocks in the oil and gas sector vulnerable in the face of the conflict and the following sanctions.

This thesis also examined if companies located in tax havens reacted less to negative events than companies not located in tax havens. Our study found no tangible proof that companies located in tax havens are more likely to refrain negative abnormal returns following our events.

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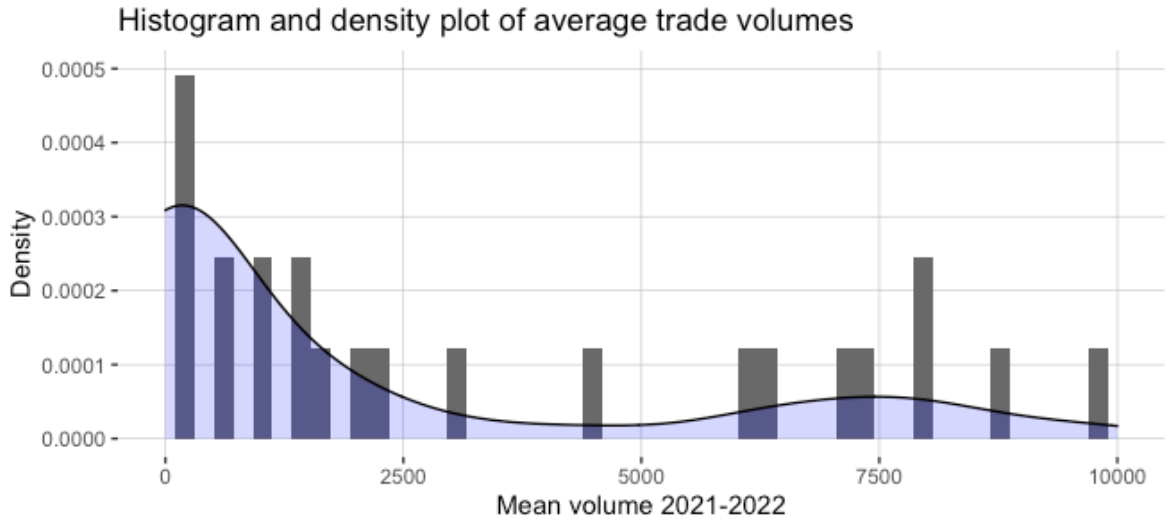
Appendix

Description of data

Figure 7: Histogram and density plot of average trade volumes before sorting



Notes: Companies with a mean trade volume below 1000 were excluded from the data to avoid smoothing of the data by companies that are not traded every day and thus do not have return values.

Table 7: Industry codes, industry descriptions and sample numbers

NACE-codes	Industry Decription	N
061	Extraction of crude petroleum	44
062	Extraction of natural gas	7
091	Support activities for petroleum and natural gas extraction	64
192	Manufacture of refined petroleum products	14
352	Manufacture of gas; distribution of gaseous fuels through mains	16

Notes: N represents the number of companies in the data belonging to each NACE-code.

Table 8: Descriptive statistics for Shell

Ticker	SHEL
Company Name	SHELL PLC
NACE-code	0610
MeanVolume	5148879
Country	United Kingdom

Table 9: Companies with low secrecy scores and companies in tax havens

Company Name	Country	Secrecy Score
Low Secrecy Score		
BIOFRIGAS SWEDEN AB	Sweden	44.625
CROWN ENERGY AB	Sweden	44.625
GUIDELINE GEO AB	Sweden	44.625
MAHA ENERGY AB	Sweden	44.625
MISEN ENERGY AB	Sweden	44.625
RAYSEARCH LABORATORIES AB	Sweden	44.625
COLABITOIL FORSALJNING GROUP AB	Sweden	44.625
TETHYS OIL AB	Sweden	44.625
Tax Haven Companies		
SEABIRD EXPLORATION PLC	Cyprus	61.525
OKTA AD	North Macedonia	61.95
CORE LABORATORIES N V	Netherlands	64.625
SEQUA PETROLEUM NV	Netherlands	64.625
SBM OFFSHORE N.V.	Netherlands	64.625
TRANSOCEAN LTD	Switzerland	70.05

Table 10: Overview over companies in the dataset

Overview over companies in the dataset

Company Name	Ticker	Orbis Ticker	MeanVolume	NACE-code	Ìndustry desciption	Country ISO	Country	Secrecy Score
TETHYS OIL AB	TETY.ST	TETY	190964.496	0610	Extraction of crude petroleum	SE	Sweden	44.625
CROWN ENERGY AB	CWE.F	CRWN.MTF	2049.059	0910	Support activities for petroleum and natural gas extraction	SE	Sweden	44.625
GUIDELINE GEO AB	GGEO.ST	GGEO	12145.845	0910	Support activities for petroleum and natural gas extraction	SE	Sweden	44.625
RAYSEARCH LABORATORIES AB	RAY-B.ST	RAY.B	56481.544	0910	Support activities for petroleum and natural gas extraction	SE	Sweden	44.625
MISEN ENERGY AB	MISE.ST	MISE	170901.764	0910	Support activities for petroleum and natural gas extraction	SE	Sweden	44.625
MAHA ENERGY AB	MAHA-A.ST	MAHA A	782598.943	0910	Support activities for petroleum and natural gas extraction	SE	Sweden	44.625
COLABITOIL FORSALJNING GROUP AB	SMAR	SMAR	1399021.292	0910	Support activities for petroleum and natural gas extraction	SE	Sweden	44.625
BIOFRIGAS SWEDEN AB	BIOF	BIOF	328925.598	3521	Manufacture of gas	SE	Sweden	44.625
GALVO SA	GAL	GAL	16777.273	1920	Manufacture of refined petroleum products	PL	Poland	46.05
HARBOUR ENERGY PLC	PMOIF	HBR	11104.880	0610	Extraction of crude petroleum	GB	United Kingdom	47.175

Company Name	Ticker	Orbis Ticker	MeanVolume	NACE-code	Ìndustry desciption	Country ISO	Country	Secrecy Score
EMMERSON PLC	EML	EML	13887.560	0610	Extraction of crude petroleum	GB	United Kingdom	47.175
DIVERSIFIED ENERGY COMPANY PLC	DECPF	DGOC	23502.153	0610	Extraction of crude petroleum	GB	United Kingdom	47.175
ADM ENERGY PLC	ADME	ADME	37879.904	0610	Extraction of crude petroleum	GB	United Kingdom	47.175
LEED RESOURCES PLC	LDP	LDP	57379.187	0610	Extraction of crude petroleum	GB	United Kingdom	47.175
ELAND OIL & GAS LIMITED	ELA	ELA	62303.589	0610	Extraction of crude petroleum	GB	United Kingdom	47.175
PREMIER OIL GROUP LIMITED	PMO	PMO	76344.737	0610	Extraction of crude petroleum	GB	United Kingdom	47.175
SERICA ENERGY PLC	SQZ	SQZ	186528.230	0610	Extraction of crude petroleum	GB	United Kingdom	47.175
IMPAX ASSET MANAGEMENT GROUP PLC	IPX.L	IPX	231460.103	0610	Extraction of crude petroleum	GB	United Kingdom	47.175
ABBOT GROUP LIMITED	ABG	ABG	232830.622	0610	Extraction of crude petroleum	GB	United Kingdom	47.175
ENERGEAN PLC	ENOG.L	ENOG	308067.586	0610	Extraction of crude petroleum	GB	United Kingdom	47.175
ENWELL ENERGY PLC	RPT	RPT	458238.038	0610	Extraction of crude petroleum	GB	United Kingdom	47.175
I3 ENERGY PLC	ITE.TO	I3E	712331.470	0610	Extraction of crude petroleum	GB	United Kingdom	47.175
SDX ENERGY PLC	SDX.L	SDX	737656.935	0610	Extraction of crude petroleum	GB	United Kingdom	47.175
PRESIDENT ENERGY PLC	PPC	PPC	748987.081	0610	Extraction of crude petroleum	GB	United Kingdom	47.175
ASCENT RESOURCES PLC	AST.L	AST	842642.579	0610	Extraction of crude petroleum	GB	United Kingdom	47.175
NOSTRUM OIL & GAS PLC	NOG	NOG	1089675.598	0610	Extraction of crude petroleum	GB	United Kingdom	47.175
JADESTONE ENERGY PLC	JSE.L	JSE	1191341.386	0610	Extraction of crude petroleum	GB	United Kingdom	47.175

Company Name	Ticker	Orbis Ticker	MeanVolume	NACE-code	Ìndustry desciption	Country ISO	Country	Secrecy Score
ROCKHOPPER EXPLORATION PLC	RKH.L	RKH	1456204.490	0610	Extraction of crude petroleum	GB	United Kingdom	47.175
TOWER RESOURCES PLC	TRP	TRP	1839403.589	0610	Extraction of crude petroleum	GB	United Kingdom	47.175
BARON OIL PLC	BOIL	BOIL	1862894.737	0610	Extraction of crude petroleum	GB	United Kingdom	47.175
KATORO GOLD PLC	KAT.L	KAT	1986445.993	0610	Extraction of crude petroleum	GB	United Kingdom	47.175
CHALLENGER ENERGY GROUP PLC	CEG	CEG	2807163.226	0610	Extraction of crude petroleum	GB	United Kingdom	47.175
UNITED OIL & GAS PLC	UOG.L	UOG	3228520.184	0610	Extraction of crude petroleum	GB	United Kingdom	47.175
QUADRISE FUELS INTERNATIONAL PLC	QFI.L	QFI	4726092.321	0610	Extraction of crude petroleum	GB	United Kingdom	47.175
SHELL PLC	SHEL	SHEL	5148878.553	0610	Extraction of crude petroleum	GB	United Kingdom	47.175
SOUND ENERGY PLC	SOU.L	SOU	5851627.344	0610	Extraction of crude petroleum	GB	United Kingdom	47.175
ANGUS ENERGY PLC	ANGS.L	ANGS	18109616.385	0610	Extraction of crude petroleum	GB	United Kingdom	47.175
HURRICANE ENERGY PLC	HUR.L	HUR	20923096.888	0610	Extraction of crude petroleum	GB	United Kingdom	47.175
BG GROUP LIMITED	BG	BG	1333639.952	0620	Extraction of natural gas	GB	United Kingdom	47.175
DEEPMATTER GROUP PLC	DMTR.L	DMTR	4652931.620	0620	Extraction of natural gas	GB	United Kingdom	47.175
PANTHEON RESOURCES PLC	PANR.L	PANR	4842087.156	0620	Extraction of natural gas	GB	United Kingdom	47.175
CORO ENERGY PLC	CORO.L	CORO	10562684.285	0620	Extraction of natural gas	GB	United Kingdom	47.175
JOHN WOOD GROUP PLC	WDGJY	WG	1437.158	0910	Support activities for petroleum and natural gas extraction	GB	United Kingdom	47.175

Company Name	Ticker	Orbis Ticker	MeanVolume	NACE-code	Ìndustry desciption	Country ISO	Country	Secrecy Score
ENQUEST PLC	ENQUF	ENQ	7914.354	0910	Support activities for petroleum and natural gas extraction	GB	United Kingdom	47.175
PHAROS ENERGY PLC	SOCLF	SIA	8756.220	0910	Support activities for petroleum and natural gas extraction	GB	United Kingdom	47.175
EXILLON ENERGY PLC	EXI	EXI	34692.823	0910	Support activities for petroleum and natural gas extraction	GB	United Kingdom	47.175
UNION JACK OIL PLC	UJO.AQ	UJO	43741.938	0910	Support activities for petroleum and natural gas extraction	GB	United Kingdom	47.175
CADOGAN PETROLEUM PLC	CAD.L	CAD	66488.579	0910	Support activities for petroleum and natural gas extraction	GB	United Kingdom	47.175
AWILCO DRILLING PLC	AWDR.OL	AWDR	72463.067	0910	Support activities for petroleum and natural gas extraction	GB	United Kingdom	47.175
TRINITY EXPLORATION & PRODUCTION PLC	TRIN	TRIN	113449.000	0910	Support activities for petroleum and natural gas extraction	GB	United Kingdom	47.175
PETROFAC LIMITED	PFC	PFC	129149.761	0910	Support activities for petroleum and natural gas extraction	GB	United Kingdom	47.175

Company Name	Ticker	Orbis Ticker	MeanVolume	NACE-code	Ìndustry desciption	Country ISO	Country	Secrecy Score
JERSEY OIL AND GAS PLC	JOG.L	JOG	146322.483	0910	Support activities for petroleum and natural gas extraction	GB	United Kingdom	47.175
ASHTEAD TECHNOLOGY HOLDINGS PLC	AT.L	AT	155876.896	0910	Support activities for petroleum and natural gas extraction	GB	United Kingdom	47.175
BOWLEVEN PLC	BLVN.L	BLVN	195467.124	0910	Support activities for petroleum and natural gas extraction	GB	United Kingdom	47.175
GETECH GROUP PLC	GTC.L	GTC	251093.187	0910	Support activities for petroleum and natural gas extraction	GB	United Kingdom	47.175
EMPYREAN ENERGY PLC	EME	EME	273270.813	0910	Support activities for petroleum and natural gas extraction	GB	United Kingdom	47.175
GENEL ENERGY PLC	GENL.L	GENL	396712.404	0910	Support activities for petroleum and natural gas extraction	GB	United Kingdom	47.175
SERINUS ENERGY PLC	SENX.L	SENX	665847.952	0910	Support activities for petroleum and natural gas extraction	GB	United Kingdom	47.175
INDUS GAS LIMITED	INDI	INDI	1324014.115	0910	Support activities for petroleum and natural gas extraction	GB	United Kingdom	47.175

Company Name	Ticker	Orbis Ticker	MeanVolume	NACE-code	Ìndustry desciption	Country ISO	Country	Secrecy Score
EGDON RESOURCES PLC	EDR	EDR	1360604.720	0910	Support activities for petroleum and natural gas extraction	GB	United Kingdom	47.175
CASPIAN SUNRISE PLC	CASP.L	CASP	1533902.816	0910	Support activities for petroleum and natural gas extraction	GB	United Kingdom	47.175
SAVANNAH ENERGY PLC	SAVE.L	SAVP	2635022.105	0910	Support activities for petroleum and natural gas extraction	GB	United Kingdom	47.175
GTL TERMINALS LIMITED	PAN	PAN	3757197.795	0910	Support activities for petroleum and natural gas extraction	GB	United Kingdom	47.175
PETRO MATAD LIMITED	MATD.L	MATD	4014513.859	0910	Support activities for petroleum and natural gas extraction	GB	United Kingdom	47.175
SOLO OIL PLC	SOLO	SOLO	4354635.885	0910	Support activities for petroleum and natural gas extraction	GB	United Kingdom	47.175
EUROPA OIL & GAS (HOLDINGS) PLC	EOG	EOG	4435498.086	0910	Support activities for petroleum and natural gas extraction	GB	United Kingdom	47.175
NOSTRA TERRA OIL AND GAS COMPANY PLC	NTOG.L	NTOG	7081086.720	0910	Support activities for petroleum and natural gas extraction	GB	United Kingdom	47.175

Company Name	Ticker	Orbis Ticker	MeanVolume	NACE-code	Ìndustry desciption	Country ISO	Country	Secrecy Score
TECHNIPFMC PLC	FTI	FTI	8552953.366	0910	Support activities for petroleum and natural gas extraction	GB	United Kingdom	47.175
ECHO ENERGY PLC	ECHO.L	ECHO	13555065.555	0910	Support activities for petroleum and natural gas extraction	GB	United Kingdom	47.175
BP PLC	BP	BP	13478905.502	1920	Manufacture of refined petroleum products	GB	United Kingdom	47.175
CENTRICA PLC	CNA	CNA	172386.124	3522	Distribution of gaseous fuels through mains	GB	United Kingdom	47.175
HARLAND & WOLFF GROUP HOLDINGS PLC	INFA	INFA	678130.660	3522	Distribution of gaseous fuels through mains	GB	United Kingdom	47.175
NATIONAL GRID PLC	NG	NG	1209789.474	3522	Distribution of gaseous fuels through mains	GB	United Kingdom	47.175
SAN LEON ENERGY PLC	SLE.L	SLE	201882.254	0610	Extraction of crude petroleum	IE	Ireland	47.2
PETRONEFT RESOURCES PLC	P8ET.IR	P8ET	162675.851	0910	Support activities for petroleum and natural gas extraction	IE	Ireland	47.2
WEATHERFORD INTERNATIONAL PUBLIC LIMITED COMPANY	WFRD	WFRD	389694.498	0910	Support activities for petroleum and natural gas extraction	IE	Ireland	47.2

Company Name	Ticker	Orbis Ticker	MeanVolume	NACE-code	Ìndustry desciption	Country ISO	Country	Secrecy Score
AMINEX PLC	AEX.L	AEX	6641298.718	0910	Support activities for petroleum and natural gas extraction	IE	Ireland	47.2
TOTALENERGIES SE	TTE	TTE	2333481.340	0610	Extraction of crude petroleum	FR	France	47.875
ESSO SOCIETE ANONYME FRANCAISE	ES	ES	1548406.938	0910	Support activities for petroleum and natural gas extraction	FR	France	47.875
CGG	CGG.PA	CGG	12251697.988	0910	Support activities for petroleum and natural gas extraction	FR	France	47.875
ENGIE	ENGI.PA	ENGI	6045785.871	3522	Distribution of gaseous fuels through mains	FR	France	47.875
P/F ATLANTIC PETROLEUM	ATLA-DKK.CO	ATLA.DKK	47818.942	0610	Extraction of crude petroleum	DK	Denmark	48.95
EVERFUEL A/S	EFUEL.OL	EFUEL	75671.610	0620	Extraction of natural gas	DK	Denmark	48.95
BGS ENERGY PLUS JOINT STOCK COMPANY	BGS	BGS	1149389.234	3522	Distribution of gaseous fuels through mains	CZ	Czechia	50
AB AMBER GRID	AMG1L.VS	AMG1L	2160.467	3522	Distribution of gaseous fuels through mains	LT	Lithuania	50.95
VIAFIN SERVICE OYJ	VIAFIN.HE	VIAFIN	3125.940	0910	Support activities for petroleum and natural gas extraction	FI	Finland	51.8

Company Name	Ticker	Orbis Ticker	MeanVolume	NACE-code	Ìndustry desciption	Country ISO	Country	Secrecy Score
NESTE OYJ	NTOIY	NESTE	38950.718	1920	Manufacture of refined petroleum products	FI	Finland	51.8
TOTALENERGIES PETROCHEMICALS & REFINING	PET	PET	89985.470	1920	Manufacture of refined petroleum products	BE	Belgium	52.525
FLUXYS BELGIUM SA	FLUX	FLUX	135961.962	3522	Distribution of gaseous fuels through mains	BE	Belgium	52.525
HELLENIC PETROLEUM HOLDINGS SOCIETE ANONYME	ELPE.AT	ELPE	80605.112	0610	Extraction of crude petroleum	GR	Greece	52.825
MOTOR OIL (HELLAS) CORINTH REFINERIES S.A.	MOH	MOH	367104.306	1920	Manufacture of refined petroleum products	GR	Greece	52.825
AKER BP ASA	AKRBP.OL	AKERBP	1014249.627	0610	Extraction of crude petroleum	NO	Norway	53.3
INTEROIL EXPLORATION AND PRODUCTION ASA	IOX.OL	IOX	2826327.141	0610	Extraction of crude petroleum	NO	Norway	53.3
EQUINOR ASA	EQNR	EQNR	3233540.670	0610	Extraction of crude petroleum	NO	Norway	53.3
DNO ASA	DNO.OL	DNO	4332205.722	0610	Extraction of crude petroleum	NO	Norway	53.3
PETRONOR E&P ASA	PNOR.OL	PNOR	3913761.683	0620	Extraction of natural gas	NO	Norway	53.3
DEEPOCEAN AS	DEEP	DEEP	10629.426	0910	Support activities for petroleum and natural gas extraction	NO	Norway	53.3
GC RIEBER SHIPPING ASA	RISH.OL	RISH	19709.940	0910	Support activities for petroleum and natural gas extraction	NO	Norway	53.3

Company Name	Ticker	Orbis Ticker	MeanVolume	NACE-code	Ìndustry desciption	Country ISO	Country	Secrecy Score
ON & OFFSHORE HOLDING AS	ONOF	ONOF	20369.343	0910	Support activities for petroleum and natural gas extraction	NO	Norway	53.3
NORWEGIAN ENERGY COMPANY ASA	NOR.OL	NOR	35041.445	0910	Support activities for petroleum and natural gas extraction	NO	Norway	53.3
AKER ASA	AKER.OL	AKER	81042.423	0910	Support activities for petroleum and natural gas extraction	NO	Norway	53.3
NORTH ENERGY ASA	NORTH.OL	NORTH	188503.139	0910	Support activities for petroleum and natural gas extraction	NO	Norway	53.3
BONHEUR ASA	BON	BON	267657.191	0910	Support activities for petroleum and natural gas extraction	NO	Norway	53.3
PANORO ENERGY ASA	PEN	PEN	275954.785	0910	Support activities for petroleum and natural gas extraction	NO	Norway	53.3
AKASTOR ASA	AKA	AKA	329629.114	0910	Support activities for petroleum and natural gas extraction	NO	Norway	53.3
MAGNORA ASA	MGN.OL	MGN	349987.959	0910	Support activities for petroleum and natural gas extraction	NO	Norway	53.3

Company Name	Ticker	Orbis Ticker	MeanVolume	NACE-code	Ìndustry desciption	Country ISO	Country	Secrecy Score
ELECTROMAGNETIC GEOSERVICES ASA	EMGS.OL	EMGS	519424.699	0910	Support activities for petroleum and natural gas extraction	NO	Norway	53.3
ABL GROUP ASA	AQUA	AQUA	947306.220	0910	Support activities for petroleum and natural gas extraction	NO	Norway	53.3
MAGSEIS FAIRFIELD ASA	MSEIS.OL	MSEIS	1245863.014	0910	Support activities for petroleum and natural gas extraction	NO	Norway	53.3
HUNTER GROUP ASA	HUNT.OL	HUNT	2186095.670	0910	Support activities for petroleum and natural gas extraction	NO	Norway	53.3
PGS ASA	PGS.OL	PGS	8706702.490	0910	Support activities for petroleum and natural gas extraction	NO	Norway	53.3
PROSAFE SE	PRS	PRS	33757.177	1920	Manufacture of refined petroleum products	NO	Norway	53.3
OKEA ASA	OKEA.OL	OKEA	252975.895	1920	Manufacture of refined petroleum products	NO	Norway	53.3
HORISONT ENERGI AS	HRGI.OL	HRGI	16203.509	3522	Distribution of gaseous fuels through mains	NO	Norway	53.3
OMV AKTIENGESELLSCHAFT	OMVKY	OMV	6238.278	0610	Extraction of crude petroleum	AT	Austria	54.625

Company Name	Ticker	Orbis Ticker	MeanVolume	NACE-code	Ìndustry desciption	Country ISO	Country	Secrecy Score
DEUTSCHE ROHSTOFF AG	DR0.DE	DR0	13990.736	0610	Extraction of crude petroleum	DE	Germany	56.7
FRIEDRICH VORWERK GROUP SE	VH2.DE	VH2	11198.191	0620	Extraction of natural gas	DE	Germany	56.7
FUCHS PETROLUB SE	FUPBY	FPE3	48533.493	1920	Manufacture of refined petroleum products	DE	Germany	56.7
ALEIA HOLDING AG	EBGK.HM	EBGK	1430.320	3522	Distribution of gaseous fuels through mains	DE	Germany	56.7
ENVITEC BIOGAS AG	ETG	ETG	146730.861	3522	Distribution of gaseous fuels through mains	DE	Germany	56.7
GALP ENERGIA SGPS S.A.	GLPEF	GALP	1090.670	0910	Support activities for petroleum and natural gas extraction	PT	Portugal	56.875
PUBLICHNE AKTSIONERNE TOVARISTVO PO GAZPOSTACHANNYU TA GAZYFIKATSIY DONETSKOBLGAZ	DOGZ	DOGZ	1455861.722	3522	Distribution of gaseous fuels through mains	UA	Ukraine	58.875
S.C. OMV PETROM S.A.	SNP	SNP	171516.268	0610	Extraction of crude petroleum	RO	Romania	59.375
OILFIELD EXPLORATION BUSINESS SOLUTIONS S.A.	VEGA	VEGA	4453.589	0910	Support activities for petroleum and natural gas extraction	RO	Romania	59.375
ROMPETROL WELL SERVICES S.A.	PTR	PTR	207044.852	0910	Support activities for petroleum and natural gas extraction	RO	Romania	59.375
OIL TERMINAL S.A.	OIL	OIL	78186.364	1920	Manufacture of refined petroleum products	RO	Romania	59.375

Company Name	Ticker	Orbis Ticker	MeanVolume	NACE-code	Ìndustry desciption	Country ISO	Country	Secrecy Score
ROMPETROL RAFINARE S.A.	RRC	RRC	5265535.885	1920	Manufacture of refined petroleum products	RO	Romania	59.375
SEABIRD EXPLORATION PLC	GEG.OL	SBX	346424.687	0910	Support activities for petroleum and natural gas extraction	CY	Cyprus	61.525
OKTA AD	OKTA	OKTA	2045943.301	1920	Manufacture of refined petroleum products	MK	North Macedonia	61.95
SEQUA PETROLEUM NV	MLSEQ.PA	MLSEQ	106541.745	0910	Support activities for petroleum and natural gas extraction	NL	Netherlands	64.625
CORE LABORATORIES N V	CLB	CLB	494173.923	0910	Support activities for petroleum and natural gas extraction	NL	Netherlands	64.625
SBM OFFSHORE N.V.	SBMO.AS	SBMO	577286.294	0910	Support activities for petroleum and natural gas extraction	NL	Netherlands	64.625
TRANSOCEAN LTD	RIG	RIGN	21441368.182	0910	Support activities for petroleum and natural gas extraction	CH	Switzerland	70.05

Methodology

Table 11: Dates used for tax haven regressions

Event Date	Date 20 business days prior to event
24-02-2022	26-01-2022
08-03-2022	07-02-2022
04-05-2022	06-04-2022
18-05-2022	20-04-2022

Notes: All dates in this table occur 20 business days prior to the accompanying event. The abnormal returns from these days are used as reference points in the tax haven event study.

Regressions from the Tax Haven analysis

Table 12: Robustness check February 24th

Regression February 24th

Event Window	Estimate	Std.Error	p-value	Difference Tax Havens
Tax haven companies				
Intercept	0.0456	0.0295	0.1272	0.0000
-5	-0.0388	0.0372	0.3009	0.0000
-4	-0.0443	0.0220	0.0486	0.0000
-3	-0.0855	0.0379	0.0276	0.0000
-2	-0.0414	0.0343	0.2323	0.0000
-1	-0.0232	0.0266	0.3883	0.0000
0	-0.0375	0.0379	0.3269	0.0000
1	-0.0480	0.0356	0.1833	0.0000
2	-0.0125	0.0335	0.7106	0.0000
3	-0.0348	0.0330	0.2953	0.0000
4	-0.0474	0.0326	0.1503	0.0000
5	-0.0367	0.0361	0.3129	0.0000
Swedish companies				
Intercept	0.0442	0.0158	0.0063	-0.0014
-5	-0.0452	0.0157	0.0051	-0.0064
-4	-0.0454	0.0118	0.0002	-0.0011
-3	-0.0790	0.0301	0.0104	0.0065
-2	-0.0318	0.0200	0.1157	0.0096
-1	-0.0450	0.0308	0.1469	-0.0219
0	-0.0599	0.0439	0.1757	-0.0224
1	-0.0606	0.0188	0.0018	-0.0126
2	-0.0573	0.0580	0.3255	-0.0448
3	-0.0638	0.0253	0.0134	-0.0290
4	-0.0304	0.0335	0.3674	0.0171
5	-0.0891	0.0264	0.0011	-0.0524
Companies with secrecy score below 60				
Intercept	0.0144	0.0034	0.0000	-0.0312
-5	-0.0055	0.0040	0.1726	0.0333
-4	-0.0097	0.0052	0.0629	0.0347
-3	-0.0211	0.0043	0.0000	0.0644
-2	-0.0265	0.0059	0.0000	0.0149
-1	-0.0033	0.0045	0.4602	0.0198
0	-0.0303	0.0063	0.0000	0.0072
1	-0.0163	0.0062	0.0084	0.0317
2	0.0014	0.0158	0.9275	0.0139
3	-0.0170	0.0163	0.2962	0.0178
4	-0.0077	0.0053	0.1489	0.0398
5	-0.0184	0.0045	0.0000	0.0184

Table 13: Robustness check March 8th

Regression February 24th

Event Window	Estimate	Std.Error	p-value	Difference Tax Havens
Tax haven companies				
Intercept	0.0017	0.0078	0.8253	0.0000
-5	0.0091	0.0195	0.6427	0.0000
-4	-0.0035	0.0115	0.7590	0.0000
-3	0.0072	0.0317	0.8214	0.0000
-2	0.0401	0.0428	0.3529	0.0000
-1	0.2707	0.1805	0.1389	0.0000
0	-0.1595	0.2215	0.4744	0.0000
1	0.0049	0.0326	0.8820	0.0000
2	0.0049	0.0472	0.9172	0.0000
3	0.0189	0.0394	0.6331	0.0000
4	-0.0599	0.0286	0.0407	0.0000
5	-0.0297	0.0096	0.0031	0.0000
Swedish companies				
Intercept	0.0241	0.0318	0.4496	0.0224
-5	-0.0437	0.0390	0.2655	-0.0528
-4	-0.0103	0.0521	0.8443	-0.0067
-3	-0.0690	0.0396	0.0852	-0.0762
-2	-0.0256	0.0423	0.5474	-0.0657
-1	-0.0204	0.0509	0.6899	-0.2911
0	0.0228	0.0123	0.0671	0.1822
1	-0.0046	0.0484	0.9246	-0.0095
2	-0.0325	0.0423	0.4454	-0.0374
3	-0.0200	0.0349	0.5687	-0.0389
4	-0.0472	0.0407	0.2495	0.0126
5	-0.0777	0.0330	0.0207	-0.0480
Companies with secrecy score below 60				
Intercept	0.0062	0.0037	0.0949	0.0044
-5	-0.0087	0.0164	0.5967	-0.0178
-4	0.0004	0.0062	0.9477	0.0040
-3	-0.0103	0.0050	0.0369	-0.0175
-2	-0.0128	0.0062	0.0393	-0.0529
-1	0.0217	0.0085	0.0106	-0.2490
0	0.0297	0.0119	0.0128	0.1892
1	-0.0196	0.0088	0.0254	-0.0244
2	-0.0081	0.0055	0.1418	-0.0131
3	-0.0101	0.0071	0.1540	-0.0290
4	-0.0187	0.0058	0.0013	0.0412
5	-0.0318	0.0052	0.0000	-0.0022

Table 14: Robustness check May 4th

Regression February 24th

Event Window	Estimate	Std.Error	p-value	Difference Tax Havens
Tax haven companies				
Intercept	-0.0017	0.0099	0.8679	0.0000
-5	0.0178	0.0192	0.3574	0.0000
-4	0.0048	0.0455	0.9167	0.0000
-3	0.0315	0.0249	0.2112	0.0000
-2	-0.0019	0.0173	0.9141	0.0000
-1	-0.0001	0.0224	0.9978	0.0000
0	0.0036	0.0198	0.8565	0.0000
1	0.0242	0.0120	0.0482	0.0000
2	0.0024	0.0123	0.8464	0.0000
3	-0.0586	0.0225	0.0115	0.0000
4	-0.0257	0.0275	0.3540	0.0000
5	0.0087	0.0135	0.5217	0.0000
Swedish companies				
Intercept	-0.0152	0.0101	0.1356	-0.0135
-5	0.0033	0.0171	0.8460	-0.0145
-4	-0.0232	0.0200	0.2500	-0.0280
-3	0.0688	0.0135	0.0000	0.0373
-2	-0.0191	0.0266	0.4747	-0.0172
-1	0.0405	0.0153	0.0096	0.0405
0	-0.0105	0.0227	0.6455	-0.0141
1	0.0394	0.0267	0.1434	0.0151
2	-0.0023	0.0185	0.9008	-0.0047
3	-0.0290	0.0161	0.0752	0.0296
4	0.0128	0.0328	0.6980	0.0385
5	0.0304	0.0154	0.0521	0.0217
Companies with secrecy score below 60				
Intercept	0.0049	0.0022	0.0240	0.0066
-5	-0.0041	0.0043	0.3401	-0.0219
-4	-0.0083	0.0045	0.0631	-0.0131
-3	0.0157	0.0040	0.0001	-0.0158
-2	-0.0078	0.0045	0.0808	-0.0059
-1	0.0058	0.0034	0.0905	0.0059
0	-0.0024	0.0045	0.5963	-0.0060
1	0.0010	0.0041	0.8046	-0.0232
2	-0.0112	0.0040	0.0052	-0.0136
3	-0.0349	0.0050	0.0000	0.0237
4	-0.0158	0.0043	0.0002	0.0099
5	0.0072	0.0048	0.1330	-0.0016

Table 15: Robustness check May 18th

Regression February 24th

Event Window	Estimate	Std.Error	p-value	Difference Tax Havens
Tax haven companies				
Intercept	0.0456	0.0295	0.1272	0.0000
-5	-0.0388	0.0372	0.3009	0.0000
-4	-0.0443	0.0220	0.0486	0.0000
-3	-0.0855	0.0379	0.0276	0.0000
-2	-0.0414	0.0343	0.2323	0.0000
-1	-0.0232	0.0266	0.3883	0.0000
0	-0.0375	0.0379	0.3269	0.0000
1	-0.0480	0.0356	0.1833	0.0000
2	-0.0125	0.0335	0.7106	0.0000
3	-0.0348	0.0330	0.2953	0.0000
4	-0.0474	0.0326	0.1503	0.0000
5	-0.0367	0.0361	0.3129	0.0000
Swedish companies				
Intercept	0.0442	0.0158	0.0063	-0.0014
-5	-0.0452	0.0157	0.0051	-0.0064
-4	-0.0454	0.0118	0.0002	-0.0011
-3	-0.0790	0.0301	0.0104	0.0065
-2	-0.0318	0.0200	0.1157	0.0096
-1	-0.0450	0.0308	0.1469	-0.0219
0	-0.0599	0.0439	0.1757	-0.0224
1	-0.0606	0.0188	0.0018	-0.0126
2	-0.0573	0.0580	0.3255	-0.0448
3	-0.0638	0.0253	0.0134	-0.0290
4	-0.0304	0.0335	0.3674	0.0171
5	-0.0891	0.0264	0.0011	-0.0524
Companies with secrecy score below 60				
Intercept	0.0144	0.0034	0.0000	-0.0312
-5	-0.0055	0.0040	0.1726	0.0333
-4	-0.0097	0.0052	0.0629	0.0347
-3	-0.0211	0.0043	0.0000	0.0644
-2	-0.0265	0.0059	0.0000	0.0149
-1	-0.0033	0.0045	0.4602	0.0198
0	-0.0303	0.0063	0.0000	0.0072
1	-0.0163	0.0062	0.0084	0.0317
2	0.0014	0.0158	0.9275	0.0139
3	-0.0170	0.0163	0.2962	0.0178
4	-0.0077	0.0053	0.1489	0.0398
5	-0.0184	0.0045	0.0000	0.0184