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Cum-Ex Transactions in European Countries

Theoretical issues and emperical evidence

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Abstract

The purpose of this thesis is to shed light on cum-ex transactions in European countries. Cum-ex trading is an aggressive scheme where the aim is to receive multiple dividend withholding tax reimbursements for the same share. This scheme, along with a related strategy known as cum-cum trading, has, according the to the journalists in the widely publicised CumEx-Files, defrauded European states of 55 billion euros. The journalists, and the media in general, do, however, provide few specific details on whether European countries are mainly affected by cum-ex or cum-cum specifically. In this thesis we therefore look at the extent of cum-ex trading across 18 EU and EFTA countries.

As the literature on the subject is very limited, and primarily centred around the cum-ex scandal in Germany, we contribute with some, to the best of our knowledge, new theoretical aspects on whether cum-ex would work in other countries. Most importantly, we argue that cum-ex trading is far less likely to be a problem in countries with a specific type of dividend administration. The system, which we refer to as a record date system, reduces the likelihood of situations where the wrong investors receives the dividend from the company, something which is a necessary condition for the cum-ex structure.

In our empirical study, we take advantage of the fact that comprehensive cum-ex trading would result in a distinct trading pattern with very high trading volumes on specific days close to dividend distributions. With this in mind, we examine whether having a record date system affects the trading volumes on these days. We also study abnormal volumes in the 18 countries separately. When examining the specific countries, we use Germany and the United Kingdom as a basis for comparison. This is because we know for certain that cum-ex has been a substantial problem in Germany prior to 2012, while in the UK cum-ex is not possible.

In contradiction to our theory, the results from our analysis do not indicate that cum-ex trading has been a larger problem in countries without a record date system. Furthermore, based on our analysis, we cannot state, with any degree of certainty, that cum-ex trading actually has been a substantial problem in any other European countries than Germany. However, the trading pattern in Sweden is worryingly similar to the one in the German cum-ex period. Moreover, other countries like the Netherlands, Italy and, especially, Spain also show very high volumes close to dividend distributions, which, at the very least, indicate a considerable amount of tax-motivated trading.

Acknowledgements

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Contents

1. Introduction

1.1 Background

Tax avoidance and fraud related to taxation of dividends is a topic which, compared to the extent of the problem, probably has received disproportionately little attention in Europe over the last couple of decades. The subject has occasionally been brought up in some European countries in connection with specific national cases, but they have rarely been widely publicised, and any European wide scrutiny and debate has so far been lacking. Or at least, this was in any case the situation until the publishing of the CumEx-Files in the fall of 2018. In the CumEx-Files, a collaboration of journalists from all over Europe claimed investors were using specially designed transactions to drain public funds in several European countries. According to the authors, different schemes, ranging from those located in a legal grey area to outright tax fraud, have led to billions of euros in losses for the European taxpayers.

The schemes are broadly categorised into cum-ex and cum-cum variants, where the cum-ex variants by far are the most aggressive. The aim of cum-ex transactions is to receive multiple tax reimbursements for the same withholding tax, and thereby defraud the state (Buettner, Holzmann, Kreidl, & Scholz, 2018). This was made possible through advanced trading strategies, consisting of multiple share transactions around dividend distributions, which exploited flaws in the administration of dividend withholding taxes (Buettner et al., 2018). As the perpetrators of cum-ex trades are getting refunds for taxes they have not paid, these trades are clearly illegal. For cum-cum trades on the other hand, the idea is to take advantage of differences in the effective dividend taxation between investors. This is achieved by a temporary shift in ownership of shares around the time of dividend distributions (Buettner et al., 2018). Whether cum-cum trades are illegal is more disputed.

As a consequence of these schemes, countries such as Germany, France, Italy and Denmark have, according to the journalists, paid out billions of Euros in illegitimate refunds (CumEx-Files, 2018). Overall the journalists estimate that an amount of 55 billion Euros has been swindled across European countries. The estimate has also been claimed to be conservative (Flood, 2018), and whether it is anywhere near in justifying the actual magnitude of the problem is uncertain.

Although the problem, and especially its magnitude, did not receive a lot of attention prior to the discoveries in the CumEx-Files, the issue had in fact been raised earlier. In Germany, the hardest hit country, the Federal Minister of Finance received information by the Federal Association of German Banks as early as 2002, that cum-ex trades were conducted in the market. Five years later, in 2007, cum-ex was even mentioned in specialist tax literature. The same year, the laws in Germany were revised based on a proposal from the Association of Banks. However, this did not effectively stop the trades as the new rules did not apply to certain foreign institutions. The tax authorities even stated in 2009 that cum-ex trading was still possible under certain conditions. Not before 2012, presumably over a decade after the authorities became aware of these trades, did implementation of new regulations, finally, close the loophole. (Spengel, 2016)

However, Germany´s experience with cum-ex trades did not lead them to warn other countries (Spengel & Schick, 2018). This seems to have been a recurring issue in Europe. In a European Parliament hearing regarding the cum-ex scandal, Gerhard Schick, a co-rapporteur of the former Bundestag Committee of Inquiry into the cum-ex scandal, claimed that Switzerland had stopped cum-ex trades in 2008 (Spengel & Schick, 2018). Schick also mentioned that in 2005, Dutch newspapers had reported on a court decision in the Netherlands where cum-ex trades were involved. This, evidently, recurring lack of communication between European tax authorities may have allowed the scheme to sustain for far longer than it should have, and even made it possible for the perpetrators to move the scheme across borders once they were effectively prevented in some countries (CumEx-Files, 2018).

One of the countries that suffered the most from this was Denmark. The Danish Tax Authorities received a tip in 2015 that cum-ex trades were being performed in their country (NTB, 2016). After an investigation into the matter, the Tax Authorities discovered that cum-ex trades were being perpetrated by an organised network of foreign companies and investments banks. Supposedly, it had led to payments of an amount equivalent to 2,2 billion Euros, of which shareholders only were entitled to about 400 million (NTB, 2016).

Allegedly, it was first in the aftermath of the Danish case that The Norwegian tax authorities became aware of cum-ex trades (Skatteetaten, 2016). According to NRK, the Norwegian Broadcasting Corporation, the Norwegian awareness did not come as a result of communication between the tax authorities in the two Scandinavian countries, but rather through a Danish documentary on the subject (NRK, 2018). The Norwegian Tax Authorities

responded by investigating whether cum-ex trades had been perpetrated in Norway. The investigation led to a discovery of a single case of illegitimate refunding of an amount equivalent to about 60.000 Euros in 2013, and ten attempts that were successfully stopped in 2015, which combined equalled an amount equivalent to 36 million Euros (Skatteetaten, 2016).

From the examples above, it is obvious that the rules, practices and collaboration of the tax authorities in Europe have been far from adequate in combatting complex tax schemes such as cum-ex and cum-cum trading. An important question is therefore whether these weaknesses are still allowing foreign investors and banks to carry out these trades, draining state funds and causing increasing pressure on European taxpayers.

1.2 Purpose of the research

Aside from information regarding Germany and Denmark, the CumEx-Files provides few specific details on the other, supposedly, affected countries. Amongst other things, it is often unclear whether the journalists are referring to cum-cum or cum-ex when claiming a country has been affected. As a result, it is unsure whether the estimates for loss of tax revenue are based on cum-ex, cum-cum or both combined. In our view, this lack of distinction is problematic. Firstly, because one is clearly illegal and the other is more questionable, and secondly, because, in our opinion, the measures necessary to combat the two are different. Whether a country's problem is with one or the other is therefore not insignificant.

To avoid contributing to this confusion, we will in this thesis clarify the differences between the two schemes. However, our main goal, and primary focus of the research, is to analyse theoretical aspects of cum-ex specifically and examine whether European countries have been affected by this scheme. The reason we focus on cum-ex is because we find it incredible that these clearly illegal and preventable trades have been successfully performed in Denmark more than ten years after German authorities were made aware of them. We therefore find it interesting to examine whether evidence suggests that cum-ex trades have been carried out in other European countries as well. Considering the recurring lack of communication between European countries, we do not even see it as unthinkable that these trades are being conducted today.

Because cum-ex trading involves a set of specific transactions around dividend distributions, comprehensive cum-ex trading would result in a distinct trading pattern. The intention is therefore to examine whether such a trading pattern is observable in various European countries. More specifically, we will look at trading patterns and trading volumes around dividend distributions in 18 EU and EFTA countries for the years 2009 to 2018.

Our method of examining trading patterns close to dividend distributions is based on the one used in "Withholding-tax non-compliance: The case of cum-ex stock-market transactions" by Buettner, Holzmann, Kreidl and Scholz (2018). In this paper, the authors analyse whether the administrative change in Germany in 2012 seems to have stopped cum-ex trading. They take advantage of the fact that cum-ex transactions, in their data, would have to be conducted on the two days before a dividend stops trading with dividend entitlement, and compare trading volume on these two days before and after the change. In line with their expectations, they find a significant decline in the volume for taxable dividends between the two periods, while there was no significant effect on tax-exempt dividends. Their results therefore indicate that cum-ex trading had been a major problem in Germany, and that the administrative change in 2012 was, in fact, effective.

An interesting aspect that may have facilitated the cum-ex scheme in Germany, but which is not discussed by Buettner et al. (2018), was the lack of what we refer to as a "record date system". The purpose of a record date system is to ensure that an investor who buys a share with dividend entitlement, is registered as the owner before the actual distribution, and thereby receives the dividend from the company. As this was not necessarily the case with the system in Germany, the wrong investors would, on a regular basis, receive dividends. It was therefore necessary with a dividend clearing process which corrected this. This dividend clearing process is, as we will get to, an essential part of the cum-ex structure, and is primarily an issue in countries without a record date system.

Today, all EU and EFTA countries have a record date system, but some countries have implemented the system in more recent years. We therefore also want to examine whether not having had a record date system seems to have facilitated cum-ex trading.

The two main questions we wish to answer in this thesis are therefore:

1. Does transaction data suggest that cum-ex trading primarily has been a problem in countries which, at the time, did not have a record date system?

2. Do the trading patterns and trading volumes around dividend distributions in European countries indicate substantial cum-ex trading?

1.3 Structure of the thesis

The rest of the thesis is structured as follows. First, in chapter 2, we present the theoretical basis for our analysis. This includes some aspects that are important in order to understand cum-ex as well as specific issues related to cum-ex transactions. In chapter 3, we first describe, in more detail, the rationale behind our research questions. Then we present the data and the method we use for answering these questions. We also discuss the appropriateness of this method. In chapter 4, we first present the results from our comparison of countries with and without a record date system, and then the results from the country-specific analysis. In this chapter, we also discuss the validity of, and potential explanations for, our results. Based on these results, we then present our conclusions in chapter 5. Finally, chapter 6, presents our suggestions for further research on the topic.

2. Theoretical framework

In this chapter, we present the theoretical basis for our analysis. We begin with describing how dividends, on a general basis, are taxed in Europe. An essential part of this taxation, and the cum-ex scheme, is withholding taxes, which we discuss in detail. We will then briefly address two topics that are of significant importance for understanding the cum-ex scheme. First, we touch on the topic of share settlement. Second, we introduce dividend entitlement, and briefly explain how dividend administration is related to two important dates.

After having introduced the necessary background knowledge, we turn to tax-motivated trading by describing, in short, the mechanisms and purpose behind cum-cum trading, before moving on to the topic of this paper, cum-ex trading. In order to explain the specific details of cum-ex transactions, we will thoroughly present the cum-ex scandal in Germany. After this, we delve into the details of the record date system and why the lack of this system may be an important determinant for the possibility to conduct cum-ex transactions. We then present the known details from cum-ex in other countries. Lastly, as our theory is that cum-ex trading leads to higher trading volumes around dividends, we review the current literature on other reasons for abnormal trading around dividend distributions.

2.1 Taxation of dividends

Taxation of dividends can be achieved either through income taxes or withholding taxes. In general, when companies distribute dividends to natural persons, the dividend payment is normally subject to an income tax. Similarly, for legal persons, the dividend income can be included in the tax base and thereby be subject to corporate taxation. In practice, however, inter-corporate dividends are in many cases tax exempt. (Schreiber, 2013)

This form of income taxation is however limited to shareholders that are resident in the country. It is therefore only the country of the recipient that can tax dividends in this way. For non-resident natural and legal persons, who cannot be taxed directly by the source country of the dividend, another option is to levy a withholding tax on the source of the income, that is, the dividend paying company (Schreiber, 2013). So, instead of taxing the shareholders directly, the companies are charged with withholding the tax from the dividend before paying out the net amount to the shareholders. Alternatively, specialised financial organizations such as depositary banks (Buettner et al. 2018) or account operators in a central securities

depositary[1] (The Royal Norwegian Ministry of Finance, 2015) can handle this process on behalf of the company. Either way, the shareholders are still the statutory tax bearers.

2.1.1 Withholding taxes as an anti-tax avoidance measure

Another benefit of using withholding taxes, instead of an income tax on the recipient, is that this form of taxation can be a key instrument for tax compliance (Buettner et al., 2018). According to Buettner et al. (2018), withholding taxes conduces tax compliance through creating a discrepancy between the statutory tax bearer and the party paying the tax. As the party paying the tax does not directly benefit from avoiding to pay, there is no direct incentive to do so.

Withholding taxes are also capable of reducing international tax planning (Johansson, Skeie, & Sorbe, 2016). Johansson et al. points out that a withholding tax on interest will reduce the incentive for internal debt shifting, while a withholding tax on royalties reduces the incentive to locate patents, trademarks, and other intangible assets in low-tax jurisdictions. Both are common methods for international tax avoidance, where the aim is to shift profits from high-tax countries to low-tax countries (Schreiber, 2013). Subjecting interest payments and payments related to intangible assets to withholding taxes, would however ensure that the profits are effectively taxed in the high-tax country. This removes the incentive to shift the profits in the first place. Similarly, a withholding tax on dividends should reduce the incentives for investors and multinational companies to structure their ownership so as to receive the dividends in countries with beneficial tax treatment of dividends. In other words, withholding taxes are considered to be an important anti-tax avoidance tool.

On the other hand, as most withholding tax systems are accompanied by an opportunity for some taxpayers to get a tax refund, a risk of fraudulent refund claims arises (Buettner et al., 2018). Not only does the state risk losing tax revenue by paying out illegitimate refunds of withheld taxes, it may even end up refunding taxes that have not been withheld in the first place. This is exactly the purpose of cum-ex trades, where the aim is to receive several refund payments for the same tax.

[1] A CSD is an organization which holds financial instruments, allowing for electronic transfer of ownership of these through updating electronic records, instead of physical exchanges of certificates.

2.1.2 Withholding tax refunds and relief at source

Refunding of withholding taxes are necessary when too much tax has been withheld. This can happen when different rules or rates are applied for different shareholders, and for one reason or the other, tax has been wrongfully withheld or a too high tax rate has been used. One such reason for differential treatment is that countries may only apply a withholding tax on dividends distributed to foreign shareholders (PWC, 2019). Another reason is that some types of investors may be exempt from paying the tax. This is often applicable for certain inter-corporate dividends. One such case is within the EEA, where the Parent Subsidiary Directive stipulates that a withholding tax may not be levied on inter-corporate dividends if the recipient holds at least 10% of the shares in the dividend paying company (Schreiber, 2013). Additionally, most countries have several bilateral tax treaties which reduces the tax rate imposed, or altogether eliminates the withholding tax, on dividends paid to other countries (Schreiber, 2013). Different rates can therefore apply to different foreign shareholders depending on their country of residences' tax treaties.

Because of these differences, countries must have a system for ensuring that the correct tax rate is applied for each shareholder. One solution is to allow for what is called relief at source. Relief at source allows the entity withholding the tax to deviate from the standard rate and withhold tax at a lower rate, or to avoid withholding any tax at all (Internal Market and Services Directorate-General [IMSDG], 2010). Usually, allowing for relief at source is though dependent on some type of evidence for why the shareholder is entitled to a lower rate (IMSDG, 2010). There are however cases where relief at source is not feasible. This can happen because the shareholder is not able to, or chooses not to, provide the necessary evidence in due time. For domestic investors, this can be remedied by allowing the taxpayer a tax credit (Schreiber, 2013). For foreigners however, there is no payable tax to deduct the tax credit from, and followingly, there has to be a possibility to have the tax refunded (IMSDG, 2010).

2.1.3 Dividend withholding tax rates in Europe

Today, most OECD countries apply withholding taxes on dividends distributed from domestic companies to foreign shareholders (Johansson et al., 2016). In addition, many countries also apply withholding taxes on distributions to domestic shareholders (PWC, 2019). Out of the 18 EU and EFTA countries we examine, only the United Kingdom does not apply a withholding

tax at all (PWC, 2019). As the aim of cum-ex trading is to receive illegitimate refunds of withholding taxes, the United Kingdom is therefore the only country where we know for certain that cum-ex is not possible. The standard withholding tax rates for the various countries are summarised in Table 1.

Austria	25%(*)	Greece	10%(*)	Poland	19%(*)
Belgium	30%(*)	Ireland	20 %	Portugal	25%(*)
Denmark	27%(*)	Italy	26 %	Spain	19%(*)
Finland	20 %	Luxembourg	15%(*)	Sweden	30 %
France	30 %	Netherlands	15%(*)	Switzerland	35%(*)
Germany	25%(*)	Norway	25 %	United Kingdom	-

Table 1 - The standard withholding tax rate applied to foreign shareholders in selected EU and EFTA countries (indicates that the same rate is also applied to distributions to domestic shareholders). Source: (PWC, 2019)*

2.2 Settlement period

Cum-ex trading takes advantage of the fact that share trades are normally not settled immediately, that is to say, transferring of the ownership of the shares does not occur on the trade date, but rather on a later date which is called the settlement date. The period between the trade date and the settlement date, usually referred to as the settlement period, is typically a couple of trading days (Clearstream, 2014). If a trade is settled two days after the trade, the settlement cycle is described as a T+2 cycle. Similarly, if a trades settles after three days it is a T+3 cycle and so on.

The settlement period is normally standardised across all the regulated markets in a country (Oslo Børs, 2014). This entails that the majority of trades in a country are carried out with the same settlement period. There has though, until recently, been a lack of standardisation on an international level. However, following a trend towards shorter settlement cycles, where for instance the EU implemented T+2 as the Union wide standard settlement cycle in 2014 (Clearstream, 2014), and both the US (U.S Securities and Exchange Commission, 2017) and Canada (Clearstream, 2017b) changed from T+3 to T+2 in 2017, most western countries are now using T+2 settlement. As we will see, the European harmonization of settlement cycles is an interesting policy change that may have influenced the window of opportunity for cum-ex trades.

2.3 Ex-date and record date

An important date regarding dividend distributions is the ex-date. This is the first date on which a share is no longer trading with entitlement to the announced dividend. From this date, the share is said to be trading "ex-dividend", that is, without dividend. In other words, if an investor wishes to buy a share with dividend, referred to as "cum-dividend", he has to buy the share prior to the ex-date. The last trading day prior to the ex-date is usually referred to as the cum-date.

Another date of importance is the record date. The record date is the date on which the dividend paying company looks at its shareholder register in order to determine whom to pay the dividends to (Oslo Børs, 2017). Because the shareholder register is updated based on settlement of transactions, only transactions which have settled before or on this date will be taken into account for the distribution. The entitlement to the dividend is, on the other hand, dependent on the time of the transaction. Because trades are usually settled a couple of days after the transaction, a time gap between the dividend entitlement and the registration of the shareholders of record, can lead to complications. Specifically, it could lead to situations where investors who were entitled to the dividend would not be the shareholders of record. As we will see, creating a situation where the wrong investor receives the dividend from the company, is a crucial part of the cum-ex scheme.

2.4 Cum-cum

As mentioned earlier, cum-ex and cum-cum schemes are often mixed up and portrayed wrongly by media sources. As a consequence, the scope of the cum-ex scandal is frequently exaggerated as cum-cum trading is included in the valuation of tax losses from cum-ex trades (Spengel, 2016). For this reason, and in an attempt to clarify the difference, we here briefly present the mechanisms behind cum-cum trading.

Cum-cum trading is an arbitrage method where the aim is to exploit differences in the effective tax burden between investors (Buettner et al. 2018). In a cum-cum transaction, a shareholder temporarily transfers cum-dividend shares to another investor. The temporary holder, benefits from being able to receive the dividend at a lower tax rate, or from not being taxed at all. The tax savings is split between the participants (Spengel, 2016). According to Spengel (2016), the

parties involved would avoid financial risk by conducting the transfer through share lending or through different types of repurchase agreements.

Because cum-cum transactions, unlike cum-ex transactions, are not directly linked to the refund possibility associated with a withholding tax, cum-cum can, in theory, also be used in connection with income taxes. In practice, however, we believe that cum-cum trading in the shares of European companies is predominantly a problem related to withholding taxes.[2] The fact that, in our experience, cum-cum trading is always mentioned in relation to withholding taxes, supports this assumption.

2.5 Cum-ex transactions

Cum-ex trading, unlike cum-cum trading, is not about avoiding tax, but rather to receive multiple refunds for a withholding tax which was only paid once (Spengel, 2016). Because the very limited literature on cum-ex is solely based on the German cum-ex scandal, we will base our description of cum-ex on the method used there. However, if cum-ex has been a problem in other countries, it is likely that the same scheme, or, at least, schemes with similar characteristics, have been used. We therefore choose to thoroughly describe the mechanisms behind cum-ex trading in Germany, and the flaws in the German withholding tax system that made the scheme possible.

The scheme which was used in Germany consisted of a specific set of complex trades within a small window of opportunity close to dividend distributions. The trades were designed to take advantage of how dividends and withholding taxes were administered (Buettner et al., 2018). In order to understand how the scheme was set up, it is useful to first look at how ordinary trades close to dividend distributions were handled in Germany at the time.

2.5.1 German dividend clearing process

In the dividend administration system that Germany had prior to 2016, the companies would decide upon a payment date which would also serve as the ex-date (Clearstream, 2015b). Upon this date, the investors who had been in position of the shares by the end of the previous trading day would receive the dividend from the company (Clearstream, 2016a). The date prior to the

[2] Because cum-cum trading is not the focus of this thesis, we do not elaborate on this assumption here. However, because it is somewhat important for our analysis, we justify this assumption in some detail in section 8.1 of the appendix.

combined payment- and ex-date was therefore both the cum-date and the effective record date. In this setup, some cum-dividend transactions would settle after the effective record date. As a consequence, some investors who were entitled to the dividend would not be shareholders of record. In these cases, where the wrong investors received the dividend, it was necessary to ensure that the buyer received a compensation from the seller. In Germany, this was accomplished through a dividend clearing process (Buettner et al., 2018). To illustrate this process, we will look at a share transaction two days before the ex-date (Ex-2)[3].

Figure 1 illustrates the timing of the events, as well as the positioning of the record date and the ex-date in the previous German system. Figure 2 illustrates the transfer of the shares and the cash flows.

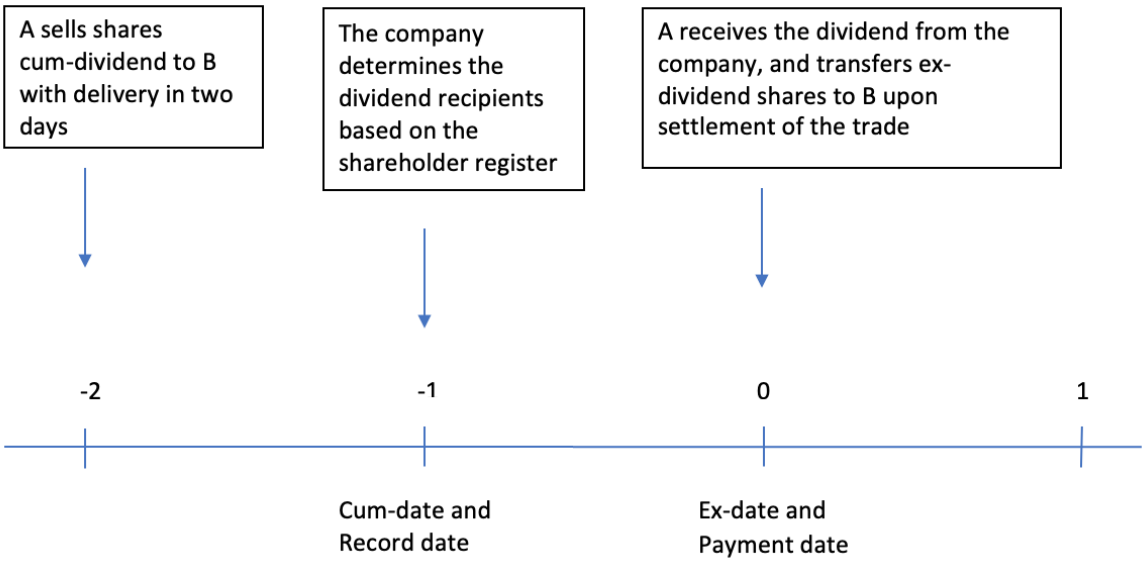


Figure 1 - Timing of dividend administration events for a share transaction on Ex-2 in a payment date system

With the German stock market having a T+2 settlement cycle, trades two days before the ex-date would settle on the ex-date. As the share was bought before the ex-date date though, the buyer and not the seller would be entitled to the dividend payment. However, due to the gap between the transaction and the settlement of the trade, it would appear to the dividend paying corporation as the seller of the shares was still the owner on the record date. The net dividend ($[1 - t_w] * D$) was therefore paid to the seller, while the remaining amount ($t_w * D$)

[3] The same process would be necessary with a share transaction one day before the ex-date (Ex-1), that is, on the cum-date.

was withheld by the company and later remitted to the tax authorities. To ensure that the buyer received the dividend, it was necessary that a dividend compensation equal to the net dividend was transferred from the seller to the buyer. Finally, the depositary bank of the buyer would issue a withholding tax certificate equivalent to $t_w * D$[4]. The buyer therefore ended up with the gross dividend D and ex-dividend shares (P_{ex}), while the seller ended up with the cum-dividend selling price (P_{cum}). The dividend clearing process therefore ensured a correct dividend distribution. (Buettner et al., 2018).

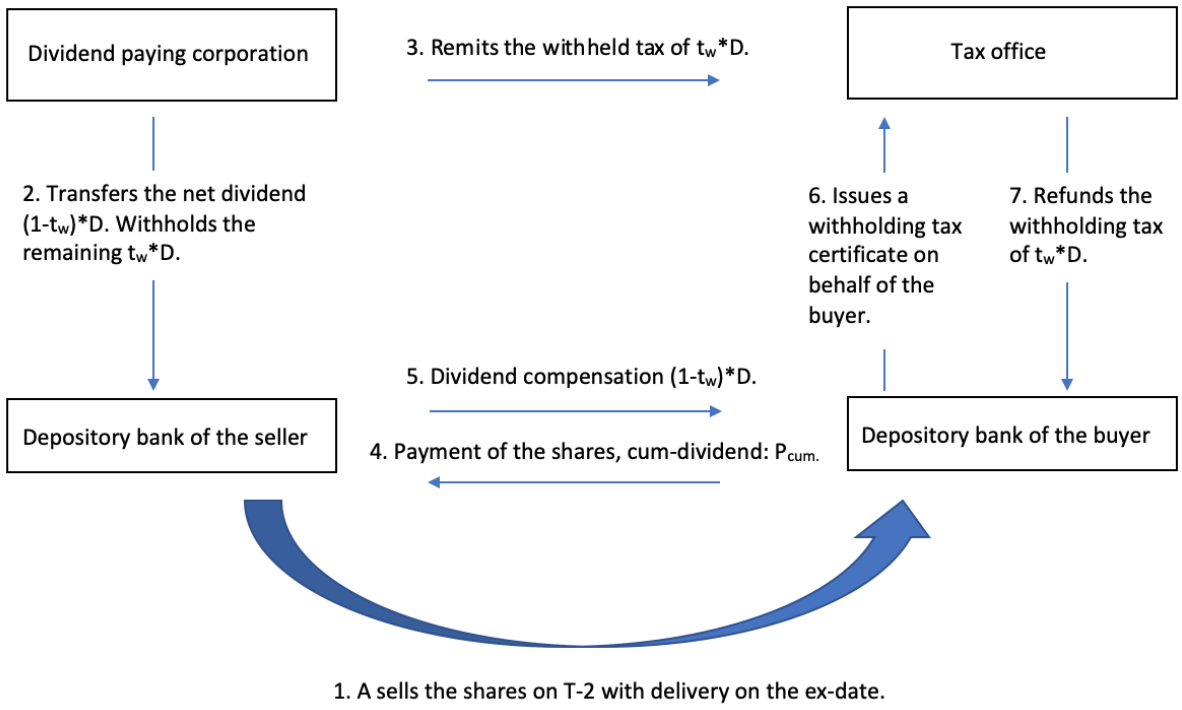


Figure 2 - The figure illustrates the cash flow (thin lines) and share transfer (thick lines) for a normal trade which forces a dividend clearing process.

2.5.2 The cum-ex structure in Germany

In the example of the normal transaction above, the amount refunded equals the withheld tax. For cum-ex schemes however, the idea is to receive refunds that exceed the amount of tax withheld (Buettner et al., 2018). In Germany, this was achievable through a specific set of transactions that made it possible to obtain multiple withholding tax certificates for the same

[4] For simplicity, we throughout the thesis assume that all the parties involved are entitled to a refund. Had they not been, cum-ex transactions would obviously not have worked.

share (Buettner et al., 2018). The method, which we will refer to as the "German method", is summarised, with cash flows and share transfers, in Figure 4.

According to Spengel (2016), cum-ex trades in Germany were perpetrated in the following manner. Firstly, an investor (A) short sold shares, which he was not in possession of, to a buyer (B), one or two days before the ex-date. The short seller was allowed to sell shares without having borrowed them beforehand, as long as he was able to acquire the shares from another party in time for delivery[5]. On the settlement date of the short sale, the short seller acquired the shares through a loan from a third party (C), and immediately delivered them to the buyer (B). If the short sale was conducted two days before the ex-date, the timeline would be as follows:

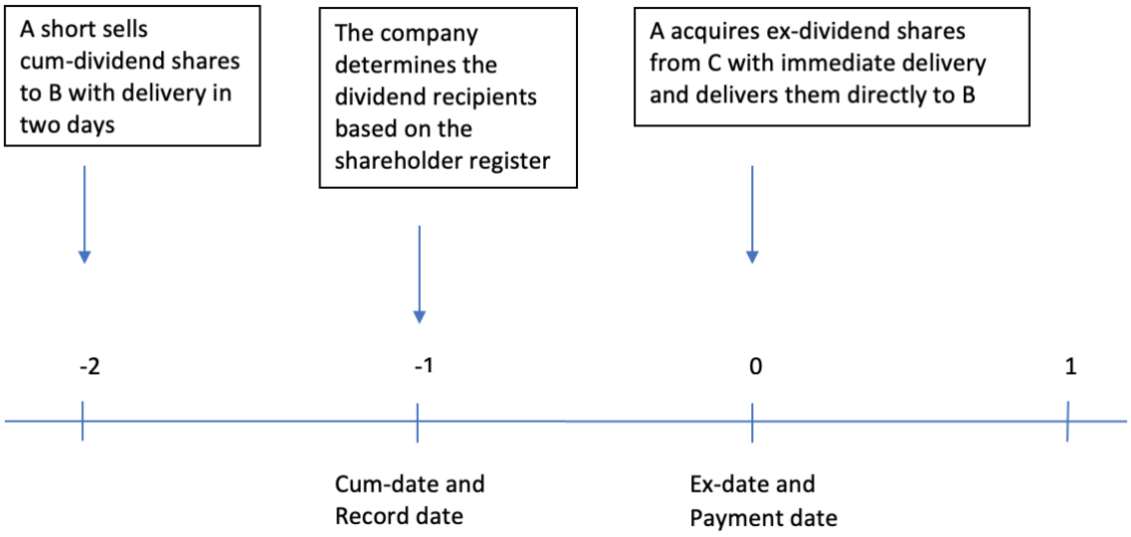


Figure 3 - Timing of dividend administration events for a cum-ex transaction on Ex-2 in a payment date system.

Even though the short sale was cum-dividend, the delivery of the shares happened after the record date and was thereby with ex-dividend shares. Hence, a cum-ex short sale. The dividend clearing process explained above was therefore necessary. In other words, the short seller was obligated to pay a dividend compensation to B equal to $[1 - t_w] * D$. Also as before, the depositary bank of the buyer (B) would issue a tax certificate of $t_w * D$ on behalf of the buyer.

[5] In the EU today, short selling shares without borrowing them beforehand is legal as long as the investor "has made alternative provisions resulting in a similar legal effect" to borrowing the shares. This can for instance involve having entered into an agreement to borrow the shares. Presumably, this type of short sale is therefore possible throughout the EU. Source: (European Parliament, 2012).

The original owner (C), who lent the shares to the short seller, was, however, the one in possession of the shares on the record date. C therefore received the net dividend payment from the company. Furthermore, the depositary bank of C would also issue a tax certificate on behalf of C. (Spengel, 2016)

In the end, there had been issued a tax certificate on behalf of both the original owner (C) and the buyer (B). The withholding tax was, however, only remitted upon distribution to C, by the dividend paying corporation (Buettner et al, 2018). In other words, the withholding tax was remitted once and refunded twice. The transaction therefore generated a combined profit for the parties involved equal to the additional certified refund of withholding tax ($t_w * D$).

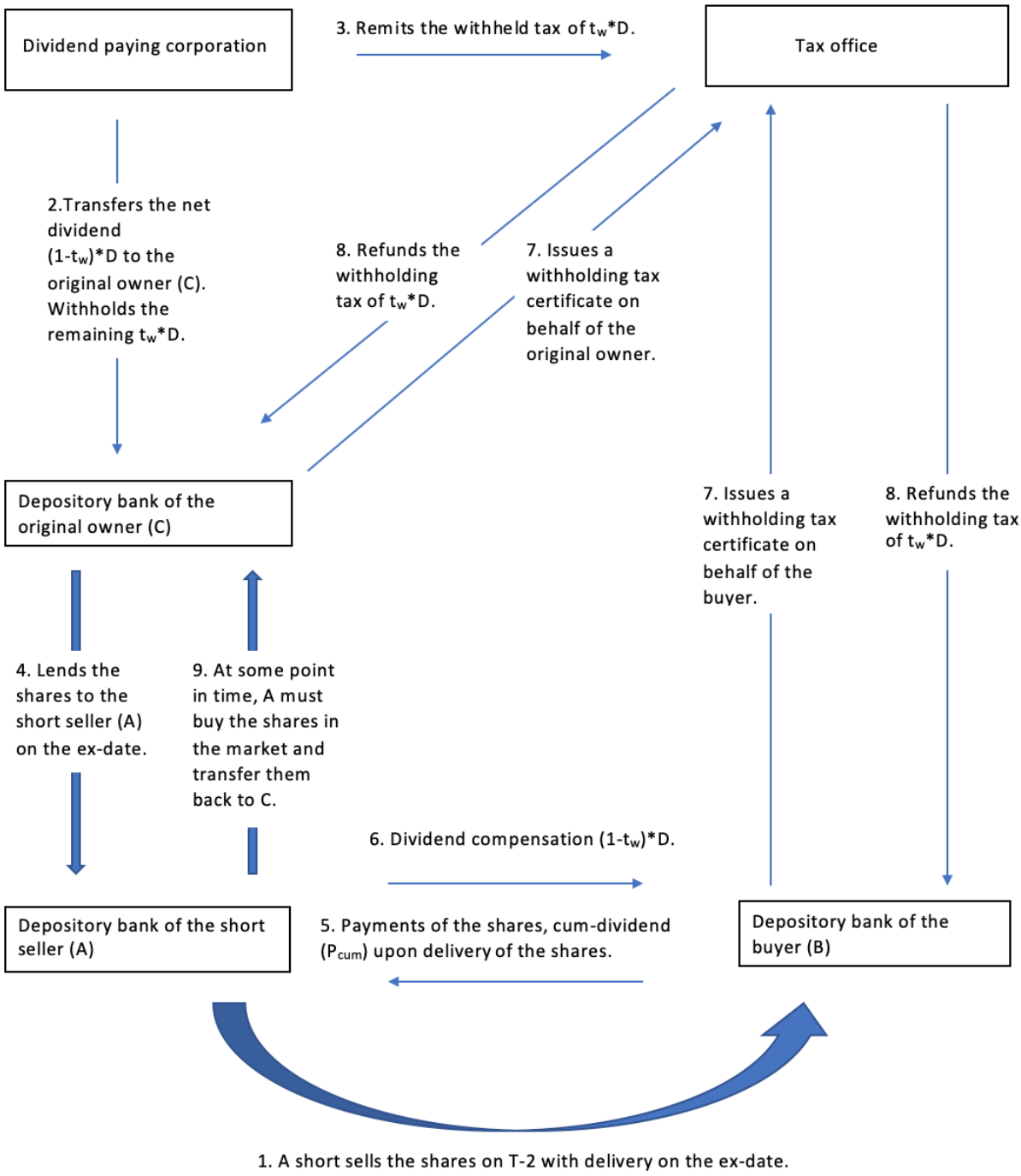


Figure 4 - The figure illustrates the cash flow (thin lines) and share transfer (thick lines) for a cum-ex transaction in a payment date country – The "German Method"

The allocation of the profit would depend on the difference between the cum-dividend price (P_{cum}) and the ex-dividend price (P_{ex}). If we assume that the price drop equalled the gross dividend[6], the profit for each party can be shown as follows[7]:

A. The short seller sold the shares cum-dividend (P_{cum}) and had to pay a dividend compensation equal to the net dividend $(1 - t_w)D$. He also had to buy the shares ex-dividend (P_{ex}) at some later point in order to deliver the shares back:

$$Profit_A = P_{cum} - P_{ex} - (1 - t_w)D = D - (1 - t_w)D = t_w D$$

B. The buyer of the shares bought the shares cum-dividend and received shares worth P_{ex} as well as a dividend compensation ($[1 - t_w]D$) and a tax refund ($t_w D$).

$$Profit_B = P_{ex} - P_{cum} + (1 - t_w)D + t_w D = -D + (1 - t_w)D + t_w D = 0$$

C. The original owner of the shares received the net dividend and a tax refund. He also received ex-dividend shares upon termination of the loan.

$$Profit_C = P_{ex} - P_{cum} + (1 - t_w)D + t_w D = -D + (1 - t_w)D + t_w D = 0$$

In other words, if the price drop more or less equalled the gross dividend, the whole profit ended up in the hands of the short seller (A). This is because the short seller benefitted from selling the shares cum-dividend and buying them ex-dividend, and only had to compensate the buyer of the shares for an amount equal to the net dividend. Both the original owner (C) and the buyer of the shares (B) made zero profit as the ex-dividend price, the net dividend payment, and the tax refund added up to the value of the shares cum-dividend.

In theory, it is even possible that the German method could have been conducted by the short seller (A) alone, without the other parties involved being aware of it. The shares could have been sold short to anyone in the market, and the share loan could have been arranged on the delivery date or planned with an unknowing party beforehand. It is, however, assumed that such trades were based on large scale transactions involving collusion between several parties (Spengel, 2016). According to Spengel (2016), this was because the transactions were often leveraged and offered by banks, targeting high-net individuals, and conducted through brokers which would hide the deals from the public. This was important in order to avoid price

[6] This assumption is made for the purpose of convenience. According to research, the price drop is normally somewhat smaller than the gross dividend (Leledakis, 2012).
[7] In this calculation we do not take into consideration transaction costs.

movements, and of course, to achieve anonymity (Spengel, 2016). In the case of such collusion, the parties would divide the profits between themselves (Spengel, 2016). Regardless of how this profit was divided, it was not an economic profit as it came at the expense of state funds, and ultimately, the taxpayers.

2.5.3 The flaws in the administration of withholding taxes in germany

In Germany, the fundamental problem was that two tax certificates were issued for the same share. One was issued for the normal net dividend payment and one was issued for the dividend compensation payment between the short seller (A) and the buyer (B).

Because tax was withheld from the dividend payment by the company, the tax certificate to the original owner (C) was rightfully issued (Spengel, 2016). The dividend compensation paid to B, however, had not been subject to a withholding tax, and followingly, a tax certificate should not have been issued (Spengel, 2016). For the depositary bank of the buyer, it was, however, not clear whether a transaction was a cum-ex trade or an ordinary trade (Buettner et al., 2018). The bank had no way of knowing whether shares bought by one of its clients were sold short, or not, and, followingly, whether there had been a previous withholding tax payment (Buettner et al., 2018). As a result, the depositary banks issued tax certificates for both cum-ex and ordinary trades.

This flaw in the withholding tax system came as a result of the discrepancy between the party issuing the tax certificate and the party that withheld tax. Up to 2012, the withholding tax was remitted by the dividend paying corporation, while the tax certificates were issued by depositary banks. (Buettner et al., 2018)

The flaw was not sufficiently addressed before 2012, when the Undertaking for Collective Investment in Transferable Securities Directive (UCITS) effectively prevented cum-ex trading (PKF, 2017). From this point, the dividend paying corporation paid the gross dividend to the depositary banks, and the obligation to withhold and remit taxes was now their responsibility (PKF, 2017). As the banks also issued the withholding tax certificates, the whole process was now carried out by one party. The discrepancy between the party issuing the withholding tax certificates and the party withholding tax, was thus eliminated (Buettner et al., 2018).

Interestingly, Buettner et al. (2018), referring to the Special Investigation Committee of the German Federal Parliament, states that similar flaws in the administration of withholding taxes exist in Belgium, France, Italy, Netherlands, Spain, and Switzerland.

2.5.4 Cum-ex in a record date system

Although Buettner et al. (2018) points to the discrepancy between the party withholding the tax and the party issuing tax certificates as the primary reason why cum-ex was possible, there was another aspect of the system in Germany which, in our opinion, also facilitated the trades. This was the lack of a record date system.

As mentioned in the introduction, the aim of a record date system is to ensure that investors who buy shares with dividend entitlement, are also registered as shareholders of record, and thereby receive the dividend from the company. This is achieved by having a system where the ex-date and the record date are set in relation to each other according to the settlement cycle, so that cum-dividend trades are settled before or on the record date, while ex-dividend trades are settled after the record date. For a T+2 settlement cycle this entails that the ex-date is set one trading day before the record date, while with T+3, the ex-date would be set two days before the record date. In practice, if a country administers dividends in this way, the record date is decided by the company, and then the ex-date is set as a result of the settlement cycle (Oslo Børs, 2017). This means that for companies that are traded on trading venues with different settlement cycles, the ex-date will differ from venue to venue (Oslo Børs, 2017).

As shown in 2.5.1, Germany, during the cum-ex period, had a somewhat different system. Their setup with the record date placed one trading day before the combined ex-date and payment date, led to the complications where the wrong investor would often receive the dividend from the company. For the remainder of the paper, we will refer to this system as a "payment date system".

For comparison, Figure 5 and Figure 6 shows the settlement of a transaction on the cum-date in a payment date system and a record date system respectively. Figure 6 in addition shows how ex-dividend trades settle after the record date in a record date system.

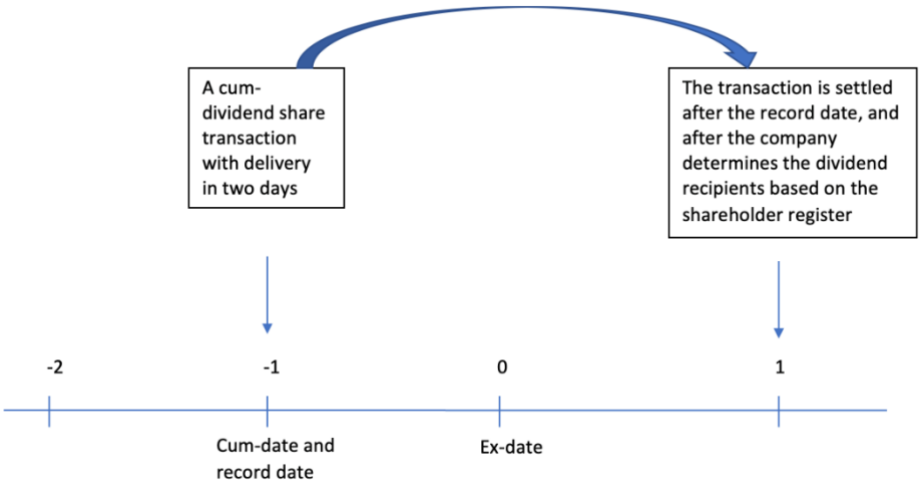


Figure 5 - Timing of dividend administration events for a regular transaction on Ex-1 in a payment date system

As seen above, in a payment date system, the problem is that the record date, being placed on the cum-date, is too early. A trade made one or two days before the ex-date will therefore settle after the record date, and investors who buy shares on these days will not receive dividends from the company.

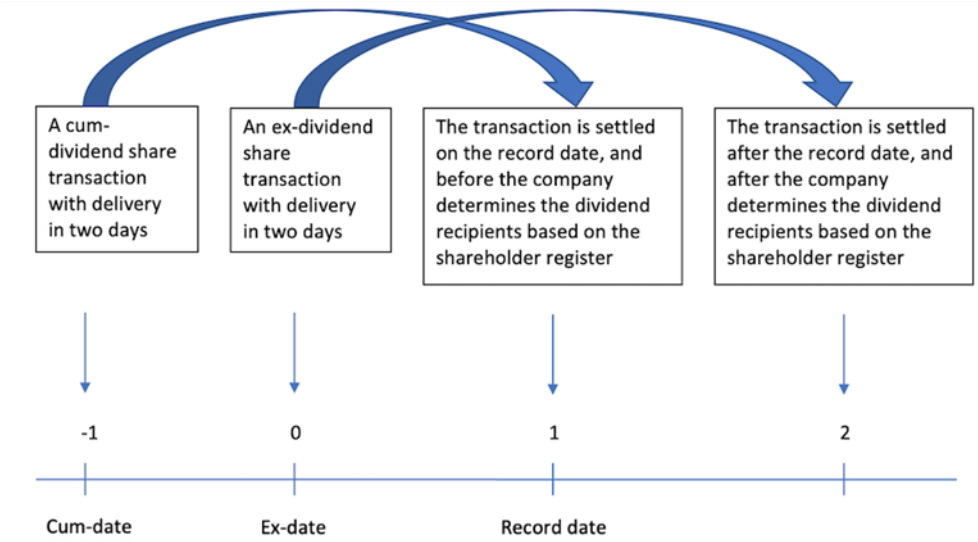


Figure 6 - Timing of dividend administration events for regular transactions on Ex-1 and the ex-date in a record date system.

As Figure 6 illustrates, having a record date system would avoid instances where the wrong investors receive the dividend. To illustrate why the exact cum-ex method described above would therefore not work in a record date system, consider a cum-ex transaction in an administrative system which, other than being a record date system, is similar to the one

Germany had until 2012. If the cum-ex short sale is conducted two days before the ex-date, the timeline would look as follows:

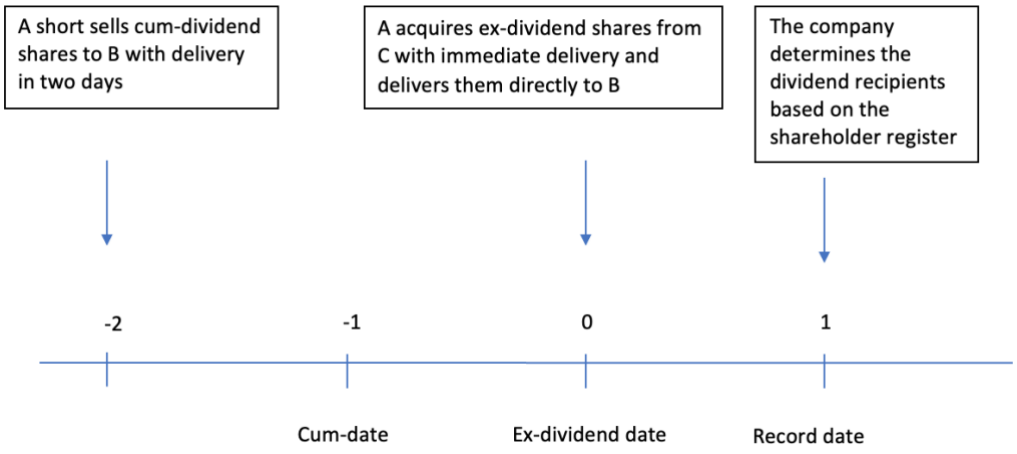


Figure 7 - Timing of dividend administration events for a cum-ex transaction on Ex-2 in a record date system

In this case, the short sale would settle before the record date. The buyer (B) would therefore, contrary to the situation in the German payment date system, be registered by the dividend paying company as the shareholder of record. The dividend clearing process between the buyer and the short seller would therefore not be needed, and a crucial part of the cum-ex structure would consequently fail.

The example raises another issue though. With the transaction between the short seller (A) and the original owner (C) being conducted and settled after the cum-date but before the record date, the original owner will not receive a dividend from the company even though he was in position of the shares on the ex-date.

If we assume that the short seller (A) borrows the shares from the original owner (C), A will, as we described in 8.1, have to pay a manufactured dividend to C. This manufactured dividend is though unlikely to cause the same problems as the dividend compensation payments in the dividend clearing process looked at earlier. This is because we believe that, for share lending transactions, it is the borrower of the shares who may be entitled to apply for a refund[8]. The dividend compensation from A to C is therefore unlikely to cause C's depositary bank to issue

[8] Had this not been the case, cum-cum trading through share lending would not be possible. Without stating it directly, (LaBarge, 2010), and several other sources also imply that this is the case. We also assume that this is the case even if the share lending transaction is conducted after the share has stopped trading cum-dividend, as long as the borrower receives the shares prior to or on the record date.

a certificate for refund. Furthermore, *A*, the borrower, is not in position of the shares on the record date, so neither *A*'s depositary bank would issue a tax certificate. In the end, only *B* has received a refund certificate.

The lack of a record date system, is therefore, to our understanding, a necessity in order to execute the German cum-ex method, given that the trades follow the standard settlement cycle. It is therefore interesting that, today, all the countries we include in our analysis have a record date system[9]. There are though three countries, in addition to Germany, which have changed from a payment date system to a record date system after 2008. These countries are Switzerland in November 2009 (Global Custodian, 2008), Austria in November 2015 (Clearstream, 2015a), and Spain in April 2016 (The National Securities Market Commission of Spain, 2016). Interestingly, Buettner et al. (2018) claims that, according to the Special Investigation Committee of the German Parliament, in addition to Germany, some form of cum-ex trading has been reported in Austria and Switzerland as well. In other words, cum-ex has been reported in three of the four countries which previously had a payment date system. Furthermore, in Denmark, the only other country where Buettner et al. (2018) claims there have been reports of cum-ex trading, the cum-ex method used was, as we will get to, quite different from the German method. It is therefore possible that the specific method used in Germany has only been a problem in payment date systems.

2.5.5 OTC-trading

Our theory that a record date system makes the cum-ex method used in Germany impossible, only applies to trades that follow the standard settlement cycle. It is therefore interesting that over-the-counter (OTC) trades may allow investors to circumvent the standard settlement period. Because even though OTC trades follow the standard by default, the transaction parties may have the opportunity to agree upon a different settlement period (Oslo Børs, 2014). As a consequence, OTC will make it possible for the short seller and the buyer to agree upon a transaction with a longer settlement period than two days. The cum-ex short sale could therefore be cum-dividend but settle after the record date even in countries with a record date system. This would, given that such transactions are treated similarly to normal transactions in a payment date system, lead to the set-up with both a dividend from the company, as well

[9] See Clearstream Banking's securities administrations overviews, e.g. (Clearstream, 2017a) and (Clearstream, 2016b).

as a dividend clearing process. This may again lead to two tax certificates[10]. So, because OTC allows for different settlement periods than the national standard, cum-ex trades are, in theory at least, also possible in countries with a record date system.

With OTC trading in a record date system, we would also argue that it is theoretically possible that cum-ex transactions could be conducted in a slightly different manner. Instead of having the short sale settle after the record date, the second transaction, where the short seller (A) acquires the shares from the original owner (C), could be conducted through an OTC ex-dividend sale which, with a shorter than normal settlement period, settles before the record date. C has then sold the shares ex-dividend but will still not receive the dividend from the company as he is not the shareholder of record. A would therefore most likely have to pay a compensation payment to C (Clearstream, 2019). C's bank would, similar to B's bank in the German cum-ex method, probably also issue a certificate of refund on behalf of C. As the short sale settles before the record date, B is, however, the shareholder of record and therefore receives the net dividend from the company. Furthermore, as B bought the shares cum-dividend he is also entitled to receive a tax certificate. Consequently, as with the German method in 2.5.2, both B and C receive a tax certificate, even though the tax is only withheld once. In essence, the situation is the same as in Figure 7. However, the crucial difference is that the transaction between A and C is a sale and not a loan, which means that C and not A is originally entitled to the dividend.

Both with the German method and this second method, the "extra" certificate arises because both dividend payments, the one from the company and the dividend compensation, are received by investors whose depositary banks do not take into consideration A's short position. Consequently, the reason why the two methods could work is that the short seller receives none of the dividends[11]. In the German method, where the dividend compensation payment is paid from a seller (A) to a buyer (B), the compensation process is usually referred to as a market claim (Clearstream, 2019). While in this second method, where the dividend compensation payment is paid from a buyer (A) to a seller (C), the compensation process is

[10] Note that the loan transaction between the short seller and the original owner must still be conducted after the record date.
[11] Strictly speaking, if the German method and the reverse claim method are combined, that is, the short sale settles after the record date, and the normal transaction is an ex-dividend sale that settles before the record date, the cum-ex transaction would actually work even though the short seller would receive the dividend from the company. In this case there would be three dividend payments; one from the company to the short seller, and one "manufactured" dividend from the short seller to each of the other two. This will still only generate two certificates though, as the depositary bank of the short seller would not issue a tax certificate for the "real" dividend.

usually referred to as a reverse claim (Clearstream, 2019). The latter cum-ex method we will therefore refer to as the "reverse claim method".

Practical execution of the OTC version of the German method and the reverse claim method does however assume that, other than being a record date system, everything else is administered in the exact same way as in the former German system. Whether this is the case in other European countries is far from certain. In addition, as a record date system is designed to avoid incorrect registration regarding the shareholders of record, it is, to our understanding, likely that dividend clearing processes are a rarity in countries with this system. It is therefore to be expected that large dividend compensations could attract the attention of the financial institutions in charge of handling the compensations. So even though OTC trading may allow cum-ex traders to circumvent the "settlement cycle problem" of the record date system, it is, in our opinion, at least, much more cumbersome and riskier to conduct the trades in record date countries. Based on this reasoning, we believe that the necessary conditions for implementing cum-ex transactions are more likely to be present in countries without a record date system.

2.5.6 Cum-ex in other countries

Up to now, most of the theory on cum-ex has been based on the method used in Germany. It is important to note, however, that potential cum-ex methods used in other countries do not necessarily have to be completely similar to this one. In fact, given that there is likely to be some differences in the administration of dividends and dividend withholding taxes between countries, it is also likely that cum-ex perpetrators, when crossing borders, will have had to adapt the method. The Danish cum-ex case is possibly a good example of such an adaptation.

In the introduction, we highlighted Denmark as one of the more severely affected countries. This is at least the impression one gets from the media, and in particular from the CumEx-Files. Denmark is also, aside from Germany, one of the few European countries for which we have been able to find multiple reliable sources clearly stating that cum-ex in specific has been a major problem. In an EU Parliament hearing in November 2018, both Gerhard Schick, a Member of the German Bundestag, and Cristoph Spengel, a professor at the University of Mannheim, clearly state that cum-ex trades have been conducted in Denmark (Spengel & Schick, 2018). Furthermore, as mentioned earlier, Buettner et al. (2018) also claims that Denmark has been affected by cum-ex.

Even though it is clear that cum-ex has been an in issue in Denmark, it has proven difficult to find details about the method which was used. However, in an article in the New York Times, Cristoph Spengel, the formerly mentioned professor, explains the basics. The method is similar to the one used in Germany in that it revolves around a short sale shortly before the ex-date, and, crucially, where the short seller has not borrowed the shares beforehand. Specifically, the method was initiated by one of the participants placing an order to short a number of Danish shares. Then a collaborating party placed an order to buy these exact shares. However, according to Spengel, there was no actual settlement of the transaction. The parties merely agreed upon a transaction which they had no intention of committing to. The agreement of the transaction was apparently enough evidence for the Danish tax authorities to pay out a refund. After receiving the refund, the transaction would be cancelled. In other words, none of the parties were ever in position of the shares. (New York Times, 2018)

So, unlike the German method, the method used in Denmark never actually involved transferring of shares. Followingly, the method had nothing to do with dividend compensation payments for shares which settled too late or too early. Having a record date system was therefore of no relevance for preventing this scheme.

As mentioned in 2.5.4, cum-ex trades have also been reported in Austria and Switzerland. However, the information regarding cum-ex in these countries is very limited. In addition, several other countries are mentioned in the CumEx-Files. For these countries, it is, in our experience, often more difficult to be sure whether the journalists are actually referring to cum-ex specifically, or to tax-motivated trading in general. Spengel (2016), also points out that journalists and other sources sometimes use the term cum-ex, but clearly refer to transactions that are unrelated to cum-ex short selling. It is therefore difficult to know which countries have actually been severely affected by cum-ex.

2.6 Reasons for increased trading around ex-dividend date – Literature review

As illustrated in the 2.5.2, when the cum-ex method used in Germany involves trades following the normal settlement cycle, the short sales will have to be conducted one or two days before the ex-date. Also, even with OTC trading, we would expect the settlement period to be as short as possible, followingly, the short sale would still likely be conducted close to the ex-date. Occurrence of cum-ex trading would therefore, expectedly, be visible through

increased trading volume on days close to the ex-date. However, the presence of high trading volumes around the ex-date date could also be caused by other reasons than cum-ex trading. In this section, we therefore review the literature on abnormal trading around dividend distributions.

According to Michaely and Vila (1995), increased volume around the ex-date can be a result of tax heterogeneity between investors. Differences in the effective tax rate on dividends and capital gains between investors would make dividend related trading profitable, and therefore lead to abnormal trading volumes around the ex-date. However, contrary to this theory, Haesner and Schanz (2013) found no significant changes when they investigated the level of trading volume around the ex-date, before and after Germany abolished different tax treatment in 2001.

Similarly, Michaely and Murgia (1995) examined the effect of tax heterogeneity regarding different dividend taxation on two different types of shares on the Milan Stock Exchange. Dividends from saving shares were taxed 15 percent for all market participants, while the dividend tax rates for common shares varied between the market participants. The homogeneous tax rate for the saving shares indicated that there were no profitable tax-driven trades. Abnormal volume around the ex-date was therefore not expected. For the common shares, however, the difference in dividend tax across investors indicated profitable trading opportunities, and abnormally high trading volumes were therefore expected around the ex-date. In line with expectations, Michaely and Murgia (1995) detected no abnormal volume for saving shares, while the trading volume for common shares was higher than normal.

Lakonishok and Vermaelen (1986) investigated the trading volume around the ex-date for 2300 NYSE and AMEX companies from 1970 until 1980. They found similar results to those of Michaely and Murgia (1995). For taxable dividend distributions, the trading volume increased abnormally before and after the ex-date. The abnormal trading volume was positively correlated with dividend yield and negatively correlated with transaction costs, which is in line with the findings of Henry and Koski (2016).

Henry and Koski (2016) examined whether there is evidence that skilled institutions exploit positive abnormal ex-dividend returns. By using a dividend capturing strategy, skilled institutional investors can benefit from low transaction costs, and are able to obtain abnormal returns in cases where the price drops less than the gross dividend (Henry and Koski, 2016).

According to their findings, there was in fact significant abnormal institutional trading volume close to certain distributions.

Evidence of such dividend capturing strategies, causing increased volume around the ex-date, was also found by Dasilas (2009) when studying the Greek stock market between 2000 and 2004. Dasilas (2009) examined both the ex-dividend stock price anomaly[12] as well as the volume traded around dividend distributions. According to Dasilas (2009), the existing literature provides three explanations for why stock prices could decrease with less than the gross dividend amount. The first explanation is beneficial tax treatment of capital gains compared to dividends, the second is presence of transaction costs, and the third is microstructure impediments such as tick size and bid-ask spread[13]. However, at the time, Greece neither had personal taxes on dividends nor capital gains, and did not have other significant frictions that should prevent a share's price to drop less than the actual dividend amount. Nevertheless, consistent with earlier studies, Dasilas (2009), found a significant deviation from the one-to-one relationship between the dividend amount and the price drop. This deviation implied significant abnormal returns for those trading around the ex-date. The study also showed abnormally high trading volumes around dividend distributions due to buying pressure on the cum-date and selling pressure on the ex-date. As the market conditions ruled out preferential tax treatment of dividends, and other effects of microstructure impediments, the only plausible explanation for why the share prices dropped less than the dividend amount on the ex-date, is, according to Dasilas (2009) short-term trading.

Lastly, it is of course also possible that cum-cum trades are being conducted on days close to the ex-date.

Based on the research on trading volume around dividends it is therefore clear that there can be abnormal trading volume around the ex-date. Furthermore, the research also shows that the higher volume can be caused both by tax motivation and by non-tax motivated reasons.

[12] Stock prices drop less than the gross dividend amount (Dasilas, 2009).
[13] Tick size: the minimum price movement of an instrument. Bid-ask spread: the difference between the bid and ask quotes.

3. Research approach

In this chapter, we first reflect on some of the theoretical points in the previous chapter, and, in light of these, comment on the rationale for our previously introduced research questions. We then turn to the data, which serves as the basis for our empirical analysis, and the process of managing this data. In particular, we point towards some issues related to using trading volumes across exchanges in different countries. After this, we present the method we use for answering our research questions. This includes the regression models we use and the assumptions behind these models. Lastly, we discuss the appropriateness of our method.

3.1 Research questions

As pointed out in the theory section, the fact that Germany did not have a record date system, may have been a decisive factor for the occurrence and the scope of the German cum-ex scandal. We have shown how having a record date system, in our opinion, makes it impossible to conduct the German cum-ex method through exchanges or venues that consistently follow a standard settlement cycle. One could therefore argue that, as all the EU and EFTA countries we look at currently have this system, cum-ex is no longer possible in these countries. However, as we have already pointed out, OTC trading makes it theoretically possible to conduct cum-ex in countries with a record date system too. It would, however, entail having to deviate from the standard settlement cycle. Cum-ex transactions may therefore attract more attention in these countries, which would entail more risk. The fact that Buettner et al. (2018) states that cum-ex has been reported in three out of our four payment date countries, and only in one out of our 14 record date countries, also suggest that the lack of a record date system may have facilitated cum-ex.

We therefore find it interesting to examine whether cum-ex has primarily been a problem in countries that had a payment date system, and whether cum-ex was stopped when they implemented a record date system. Our first research question is then:

1. Does transaction data suggest that cum-ex trading primarily has been a problem in countries which, at the time, did not have a record date system?

In addition, because the European-wide awareness about cum-ex and cum-cum is a relatively new phenomenon, there has been very little research on the extent of the problem in the different European countries. As mentioned earlier, Denmark and Germany are really the only countries where we have a somewhat good understanding of how large the cum-ex problem has been. We therefore wish to contribute to the current research on the subject by looking at whether transaction data can give an indication of which countries are, or have been, heavily affected by cum-ex. Our second research question is therefore:

2. Do the trading patterns around dividend distributions in European countries indicate substantial cum-ex trading?

Hopefully, in answering these questions, we will contribute to the literature by providing an overview of potential cum-ex trading in European countries. An overview which can be used as a basis for further research.

3.2 Data management

3.2.1 Data sources

As a basis for our analysis, we use securities trading data from the Compustat database. From this database we have retrieved daily transactional data on securities issued by companies from EU and EFTA countries for the years 2009-2018. In addition to trading variables such as trading volumes and prices, the data, crucially, also provides information about the timing of several types of corporate actions, including the ex-date and record date of dividend distributions. The data is divided into separate daily observations for each company on each of the trading platforms included in the data. For many of the exchanges, the trading volumes likely also include reported transactions from OTC venues.

Because prices and dividends in the Compustat datasets are denominated in several different currencies, we had to convert a lot of the observations into Euros. So, as Compustat did not provide exchange rates for all the necessary currencies, we also retrieved data from the central bank of Norway on daily exchange rates for a number of different currencies.[14]

[14] Missing price or currency observations in the datasets were replaced by the nearest non-missing value for the issue/currency.

3.2.2 Data management process

Of the 32 EU and EFTA countries, Compustat provides separate datasets for all but Bulgaria. So, even though we early on ruled out looking at some of the smaller countries, due to them having too few liquid companies, we were still looking at more than 20 datasets with roughly 10.000 companies combined. Thus, with a ten-year period of daily observations for each company on all its exchanges, the amount of data was immense. In addition, there were a lot of country-specific flaws and weaknesses in the datasets. Preparing the data for the analysis was therefore a significant part of the thesis work. Some of the more important steps of our data management process are described superficially here.

In order to paint the most accurate picture possible of the true trading patterns around dividends, we did not restrict our data to the companies' trading volumes on domestic exchanges only, but rather included the companies' observations from all the trading platforms included in the Compustat data. We did not, however, include observations from trading platforms in countries which are not EU or EFTA members. This was due to a combination of there being very few companies listed in each of these countries[15], and the difficulty and workload of finding out the current national settlement cycle standards, and any changes that have occurred over the ten-year period.

Because we limit our focus to ordinary shares, we dropped all other types of securities[16]. Furthermore, for companies with more than one set of ordinary shares, that is, companies with A and B shares, each set of shares was essentially treated separately. So, if a company pays out dividends to both the A and B shareholders this is considered as two separate distributions in our analysis. The justification for doing this is that A and B shareholders do not necessarily have the same dividend rights (Vistra, 2019). We also dropped any set of shares which did not pay out dividends during the time period.

We then removed all the companies which were not among the 50 most liquid in each country. With liquidity being measured based on the total trading value for the entire ten-year period. As a common weakness of the datasets was that they included observations of many dates that

[15] US exchanges were not included in the Compustat data.
[16] Arguably, other types of securities such as depositary receipts and preference shares involve dividend payments and may therefore be used for some form of cum-ex trading as well. In fact, a new tax scheme referred to as "cum-fake" allegedly concerns the use of depositary receipts (Tellerreport, 2018). However, as our theory is based on ordinary shares, we have chosen not include other types of securities in the analysis.

were clearly not trading days, we also dropped any observations which we estimated as non-trading days in the country of the exchange. [17]

Another important issue was that for many of the shares listed in more than one country, the ex-date associated with a dividend distribution was only defined for one or a few of the exchanges. Missing ex-dates were therefore a recurring problem in our data. Furthermore, as we have previously described in 2.5.4 , the ex-date is, in a record date system, set according to the record date and the standard settlement cycle in the country. With different settlement cycles between two exchanges, the ex-date would therefore also be different. Moreover, different ex-dates could also be caused by countries having different trading days. For both of these reasons, the ex-date may be different from country to country, and we could not just, automatically, use the same ex-date in all the countries a share was listed on. With missing ex-dates we therefore had to place the ex-date according to the dividend administration system in the company's residence and, in the case of a record date system, the settlement cycle in the country of the exchange. Specifically, for distributions in countries which at the time followed a payment date system, we set the ex-date on each exchange on the first trading day after the record date. Whilst for distributions in a record date system, the ex-date was set one and two trading days before the record date for exchanges with T+2 and T+3 settlement respectively.[18]

For each set of shares on each exchange, we then determined a 61-day period with 30 days of trading before and after the ex-date. After this, we dropped any observations that were not within such a 61-day period. To avoid "gaps" in the dataset, due to missing observations, or a company being listed on, or delisted from, an exchange, we also dropped observations of exchanges where the 61-day period did not consist of continuous trading.

After having done this, we summed up the trading volume for the distributions for each day around the ex-date across all exchanges. It is important to keep in mind that these sums are in many instances the sum of trading volumes on different dates. This is, as mentioned, because the ex-date may differ between countries, and because countries have different trading days.

[17] To get as accurate estimates as possible of which dates were trading days, this was done based on the trading volumes in the raw datasets in each country, that is, before removing any companies or observations.
[18] In some countries, the ex-date was often set on a non-trading day. In these cases, we used a similar approach to move the ex-date to the "correct" trading day.

We then dropped any dividend distributions where the daily average trading value was less than 1 million Euros. The rationale for doing this is that in order for large cum-ex transactions to be possible, the company used for the scheme must be liquid.

Lastly, we also dropped any distributions that were classified as return of capital. As this type of distributions is usually not taxable, we had, initially, thought to do the same as Buettner et al. (2018), and look at differences between taxable and non-taxable dividends. However, we soon realised that, by looking at only the 50 most liquid companies in each country, we were left with extremely few capital return distributions. This is probably partly because large companies very rarely return capital, and partly because the Compustat database insufficiently identifies return of capital distributions.

After having made all these amendments to the data, many of the countries had very few dividend distributions left, and some of the smaller countries had none left. In our analysis, we therefore only include the countries which had at least 50 dividend distributions left.

3.2.3 Descriptive statistics

After the data management process, we are left with a balanced panel dataset with days before and after the ex-date as the time dimension and dividend distributions as the cross-sectional units. In total we have 6,101 dividend distributions from 698 different companies in 18 countries. The distributions are summarised by country, dividend administration system, and settlement period in Table 2.

Because the settlement cycle on an exchange is relevant for the cum-ex window, we distinguish between what we refer to as T+2 distributions and T+3 distributions. A distribution is considered as a T+3 distribution if the share, at the time of the distribution, is listed on at least one exchange which has T+3 as the standard settlement cycle.

Table 2 - Number of dividend distributions in the period 2009-2018 by country, dividend entitlement system, and settlement period[19].

	Payment date system		Record date system		Total
Country:	T+2	T+3	T+2	T+3	
Austria	18	87	45		150
Belgium			147	156	303
Denmark			145	116	261
Finland			134	181	315
France			229	320	549
Germany	317	22	94		433
Greece			21	35	56
Ireland			111	106	217
Italy			169	246	415
Luxembourg			65	57	122
Netherlands			211	271	482
Norway			129	117	246
Poland			67	91	158
Portugal			41	64	105
Spain	1[20]	470	147	35	653
Sweden			218	283	501
Switzerland		32	104	115	251
UK			356	528	884
Total	336	611	2,433	2,721	6,101

It is immediately clear that we have relatively few observations of payment date system distributions, and that those we have are predominantly from Spain and Germany.

3.3 Research method

The method we use to answer our research questions, is to examine whether there are signs of abnormal trading volumes in the relevant cum-ex window. This method is based on the one used by Buettner et al. (2018), which, as previously stated, looked at the extent of the cum-ex scandal in Germany, and at the effect of the administrative change in 2012. Because they were looking at a trading venue with T+2 settlement, cum-ex short sales in their data would have had to be conducted on Ex-2 or Ex-1. Hence, their relevant cum-ex window was Ex-2 and

[19] Spain transitioned to T+2 on the 29th of September 2016 (Clearstream, 2016c). Germany has had T+2 for the whole ten-year period. All the remaining countries transitioned from T+3 to T+2 on the 6th of October 2014 (Clearstream, 2014).
[20] This observation can seem weird as Spain changed to T+2 after introducing a record date system. However, it is not a mistake, but merely a dividend distribution where only a foreign T+2 exchange was included for the Spanish company.

Ex-1. However, as we also have exchanges with T+3 settlement, our relevant cum-ex window is, for some distributions, extended to Ex-3 as well.

Specifically, we examine whether there have been significant differences in trading patterns, and in abnormal volumes in the cum-ex window, between countries with and without a record date system, and between separate countries. When looking at each country separately, we use Germany and the UK as a basis for comparison. Comparing with the UK is beneficial as the UK is the only country where we are absolutely certain that cum-ex is not possible. Germany, on the other hand, serves as a good comparison because it is the one country in which we know for sure that cum-ex has been a big problem. In other words, similar volumes and patterns to the ones in Germany during the cum-ex period may indicate substantial cum-ex trading.

3.4 Econometric framework

First, we use a difference in differences model to see whether not having a record date system is an important determinant for the level of abnormal trading in the cum-ex window. Then, in order to look at the extent of abnormal trading in each country, we use a simple regression model with different intercepts for each country.

3.4.1 Standardised trading volumes

For both models, we use standardised trading volume as the dependent variable. Given the trading volume ($V_{i,d}$) for each day (d) around a dividend distribution (i), the standardised volume is equal to:

$$Standardised\ volume = S_{i,d} = \frac{V_{i,d} - \bar{V}_i}{\sigma_i}$$

The average volume ($\bar{V}_i$) and the standard deviation (σ_i) for each distribution are computed based on the 61-day period from thirty days before the ex-date to thirty days after the ex-date ($d \in \{-30; 30\}$).

By using standardised volumes instead of absolute volumes, we ensure that each dividend distribution contributes equally to the coefficients independently of the average trading volume and the volatility of the share. This is beneficial as it makes it possible to compare the coefficients across countries as we get a relative measure for abnormal trading. It also makes

sure that the large companies of some countries do not drive the results for coefficients where the countries are combined.

3.4.2 Difference in differences model – Record date system

We use a difference in differences model to examine whether not having a record date system is an important determinant for abnormal volume in the cum-ex window:

$$S_{i,d} = \beta_0 + \beta_1 P_i + \alpha_1 D_d + \alpha_2 D_d P_i + \varepsilon_{i,d}$$

D_d is a binary indicator that is equal to one if the observation is within the cum-ex window, that is, if $d = -1$ or $d = -2$. P_i is a binary variable which is equal to one if distribution i is conducted in a country which at the time had a payment date system, and equal to zero if distribution i is conducted in a country which at the time had a record date system.

α_1 thereby captures abnormal trading in the cum-ex window for all countries. Because of the various other reasons for higher trading volumes close to dividends, we expect this coefficient to be positive regardless of whether cum-ex is possible in record date countries or not. The most interesting coefficient is however α_2, which captures whether there is more abnormal trading in the cum-ex window for dividend distributions which follow a payment date system. Given our theory that cum-ex is more likely to have been conducted in countries with a payment date system, the hypothesis is that this coefficient is positive. β_1 is merely included to avoid underestimating the absolute value of α_2.

Because trading venues with T+3 settlement, in effect, extend the cum-ex window to Ex-3, it is interesting to see whether there is higher abnormal trading volume on Ex-3 for T+3 distributions. We therefore include an expanded difference in differences model:

$$\begin{aligned} S_{i,d} = {} & \beta_0 + \beta_1 S_i + \beta_2 P_i + \beta_3 P_i S_i \\ & + \alpha_1 D_d + \alpha_2 D_d P_i \\ & + \omega_1 D_d^{-3} + \omega_2 D_d^{-3} S_i + \omega_3 D_d^{-3} P_i + \omega_4 D_d^{-3} P_i S_i + \varepsilon_{i,d} \end{aligned}$$

In addition to the variables in the specification above, we here include the variables D_d^{-3} and S_i, plus some extra interactions. D_d^{-3} is a binary indicator for the extended cum-ex window and is therefore equal to one only if $d = -3$. S_i is a binary variable that is equal to one if the distribution is a T+3 distribution and is equal to zero if the distribution is a T+2 distribution.

Because the extended cum-ex window only applies for T+3 distributions in countries which have a payment date system, the assumption is that ω_4 is positive because it captures the extra effect on Ex-3 for these types of distributions. For countries with a record date system, a longer settlement cycle only entails that the ex-date would be set earlier. So, no matter the settlement period, any cum-dividend trades that follow the exchange's standard cycle will settle on or before the record date. Being listed on a T+3 exchange should therefore have no effect on the abnormal volume on Ex-3 for companies in a record date system. Followingly, ω_2 should, in theory, be zero. Furthermore, for distributions from companies that are not listed on any T+3 exchanges at the time of the distribution, we have no reason to believe that the abnormal volume on Ex-3 should in any way be affected by whether the country has a record date system or not. In other words, ω_3 should in theory also be zero. So, if $\omega_2, \omega_3 \approx 0$ and ω_4 is significant and positive, that would be a strong indication of substantial cum-ex trading in payment date system countries.

3.4.3 Country-specific intercept model

To look at the extent of abnormal trading in the cum-ex window in each country separately, we use a simple model with country-specific intercepts for each country c, where $c \in \{"Austria", \dots, "UK"\}$:

$$S_{i,d} = \beta_c + \delta_c D_d + \varepsilon_{i,d}$$

Here δ_c is a set of coefficients that capture the country-specific abnormal volume in the cum-ex window relative to the "normal" days (β_c). The reason we include "normal" intercepts that are country-specific (β_c), is to avoid underestimation and overestimation of the cum-ex window intercepts. Using a joint constant term for the normal observations (β_0) would imply using a too high normal constant term for countries with a lot of abnormal trading in the cum-ex window, and a too low normal constant term for countries with relatively little abnormal trading in the cum-ex window.[21]

[21] This is a consequence of us standardising the volumes based on the full 61-day period around the ex-date. If we had standardised the volumes based on the "normal" observations only, then β_c would per definition be 0 in all countries, and there would be no reason to include country-specific normal intercepts.

Because cum-ex is not possible in the UK, an interesting question is whether the coefficients in other countries are statistically higher than the coefficient in the UK. We therefore also run a slightly modified version of the specification above.

$$S_{i,d} = \beta_c + \delta_1 D_d + \delta_s D_d + \varepsilon_{i,d}$$

$$c \in \{\text{Austria}, \dots, \text{UK}\}$$

$$s \in \{"Austria", \dots, "Switzerland"\}, \quad s \notin "UK"$$

In effect, the model estimates the cum-ex window coefficients for the other countries (δ_s) relative to the UK coefficient (δ_1), and therefore allows us to run 17 tests for equality of coefficients from the results provided by the original specification.

Finally, in order to examine if any of the other countries show levels of abnormal trading volumes that are equivalent to that in Germany in the cum-ex period, we also run a similar regression specification where we look at the coefficients relative to the one for the cum-ex period in Germany (2009-2011).[22]

3.4.4 Pooled OLS and clustering of standard errors

With panel data, researchers often use some form of fixed effects model by including entity fixed effects, time fixed effects, or both, to reduce problems with omitted variable bias (Peterson, 2009). Omitted variable bias is a problem where variables which are correlated with both the dependent variable and one or more of the independent variables are not controlled for properly, something which leads to biased estimators. Including fixed effects is a way to control for some of these variables without including them in the model. This can be beneficial when there are many relevant variables or unobservable variables. We will therefore briefly explain why we believe that, for our models, running a pooled OLS regression is sufficient.

When including entity fixed effects, the idea is to control for all entity-specific, time-invariant characteristics. If we had used nominal trading volume as the dependent variable, it is obvious that we would have individual heterogeneity, and that using entity specific effects would perhaps be necessary. However, as we use standardised trading volumes, we have, by

[22] The details of this model specification are described along with the results in Table 8 in section 8.3 of the appendix.

subtracting the average volume from all observations, in effect, already removed any time-invariant heterogeneities across the distributions.

The idea of time fixed effects is to control for variables which can differ over time, but which have the same effect on all entities. Because some of our observations are, as mentioned in 3.2.2, a sum of separate observations on different dates, it would, strictly speaking, not be precise to include time fixed effects based on the date of each observation. This could potentially have been problematic as one has to assume that, because of macroeconomic variables and economic shocks, there will be some correlation between trading volumes for different distributions on the same date. For a couple of reasons, we do not, however, see this as a big issue. Firstly, macroeconomic variables such as inflation, economic growth and interest rates are all likely to have more or less the same effect in the short-term. So, as we standardise each distribution based on a relatively short time period, only 61 days, it is likely that most of these effects will have been controlled for. Secondly, although short and sudden time fixed effects such as disasters and stock market crashes can create correlation between our standardised observations on the same date, such events are very unlikely to be correlated with our independent variables. Disasters and stock market crashes are, by nature, sudden and unexpected events. Whilst the timing of dividend distributions is planned and announced beforehand, and decisions related to dividend administration and settlement cycles are long-term commitments. So, even though these short-term time effects have impact on our dependent variable, they are probably not correlated with any of our independent variables and will therefore not lead to biased estimates. Because the purpose of the models is to capture abnormal trading volume in the cum-ex window, it is obviously neither an option to include time fixed effects based on the number of days before or after the ex-date.

Although we use standardised observations, some correlation between grouped observations may still remain. In fact, Cameron & Miller (2013) points out that including entity fixed effects will generally only control for a part of the within-cluster error correlation. They therefore argue that clustered robust standard errors should be used even in models where entity fixed effects are included. We therefore use clustered standard errors in order to avoid problems with correlated residuals and, as a consequence, underestimated coefficient standard errors. However, as we really have four different levels of grouping; dividend distribution, security, company, and nationality of the company, it is not immediately clear which level we should cluster on. In Table 5 of section 8.2 in the appendix, we compare regression results with different methods for clustering.

Clustering of standard errors when there are too few clusters may lead to residuals which are too low (Cameron & Miller, 2013). Cameron & Miller (2013) states that there is really no clear answer for what amounts to "too few", and that it may vary from less than 20 to more than 50. With only 18 countries then, it is possible that this is not enough. From Table 5 it also seems clear that, when clustering at country level, we do in fact get way too low standard errors due to what Cameron & Miller (2013) refers to as "overfitting". Clustering on country level is therefore not an option. Furthermore, as very few companies in our dataset have more than one set of ordinary shares, clustering on security level is more or less the equivalent of clustering on company level. Thus, essentially, our question is whether to cluster at company level or distribution level.

As long as there are enough clusters, clustering at a more aggregate level will give more conservative estimates for the standard errors (Cameron & Miller, 2013). As there is no formal test for level of clustering, we therefore follow the consensus in research which is to cluster at the most aggregate level for which too few clusters are not an issue (Cameron & Miller, 2013). We therefore cluster at the company level. From Table 5 we also see that, to no surprise, clustering at the company level gives higher standard errors than clustering at the distribution level. Furthermore, as the differences in standard errors between the two regressions are not insignificant, this indicates that there is in fact some within company correlation, and that it, as a consequence, is most accurate to cluster on the company level.

Lastly, it could of course also be relevant to cluster the standard errors based on the date, or a combination of time and entity clustering as recommended, under certain circumstances, by Thompson (2011). However, same as with time fixed effects, this is not an option for us due to the nature of our observations.

3.5 Appropriateness of the model

The justification for the method of Buettner et al. (2018) of looking at abnormal trading on Ex-2 and Ex-1 is based on the assumption that, in a payment date system, cum-ex short sales with T+2 settlement would have to be conducted on either of these two days. However, because OTC trades can, as pointed out earlier, have longer settlement periods than the national standard, this raises the question of whether using Ex-2 and Ex-1 as the "normal" cum-ex window is appropriate. After all, with longer settlement periods, cum-ex short sales can also be conducted several days before this and still settle after the record date.

For distributions that follow a payment date system, we see no reason why cum-ex perpetrators would deviate from the standard settlement cycle when it is not necessary. Consequently, using Ex-2 and Ex-1 as the cum-ex window seems reasonable in payment date countries even though, technically, cum-ex short sales could also be conducted earlier.

For record date countries though, deviating from the standard settlement cycle is, as previously discussed, probably a necessary condition for conducting certain methods of cum-ex in the first place. The use of Ex-2 and Ex-1 as the cum-ex window is therefore more questionable. It can be argued, however, that the parties behind cum-ex transactions may want to avoid deviating too much from the standard settlement cycle, as it is possible that it may attract unwanted attention. Especially when they probably can, just as easily, conduct the short sale on Ex-1 with a settlement period that is only one day longer than the standard. Furthermore, in 2.5.5 we argued that in record date countries, cum-ex could potentially also be conducted by a method which we referred to as the reverse claim method. In this method, the short sale does not have to settle after the record date. Consequently, there would be no point in using a longer settlement cycle for the cum-ex short sale, and the short sale would therefore likely happen on Ex-2 or Ex-1. We would therefore argue that if cum-ex trades have been a substantial problem, most of the trades would likely have been conducted on these two days in record date systems as well.

So, even though we cannot exclude that there may be cum-ex transactions that are conducted earlier, we do believe that using Ex-2 and Ex-1 as the cum-ex window would capture most of any possible cum-ex short sales in both payment date and record date countries.

A special feature of the method used by Buettner et al. (2018) was that they looked at differences between taxable and non-taxable dividend distributions. The idea being that cum-ex would, naturally, only be possible for taxable distributions. Unlike Buettner et al. (2018), however, we do not, due to limited data, have the possibility to do this. Instead, when looking at cum-ex in each country specifically, we use the UK as a control for other reasons for abnormally high trading around the ex-date.

A problem with this approach is that we cannot guarantee that other reasons for more trading around dividends have the same impact in all countries. Still, seeing that all the countries we look at are mostly western European countries with well-developed financial markets, we would argue that most of the relative effects of these reasons would be more or less similar

over time and between the countries. If so, the level of abnormal trading in the UK would serve as a rough estimate for the relative effects on trading of these other reasons.

A bigger issue may be that, as we describe in 8.1, cum-cum is probably first and foremost a problem that is related to withholding taxes. This means that neither cum-ex nor cum-cum transactions are likely to be a big problem in the UK. Consequently, if there are large differences in abnormal volumes between the UK and other countries, it may actually be caused by cum-cum trading. If, however, cum-cum is predominantly conducted through share lending, which Spengel (2016) claims is the case in Germany, cum-cum would not show up in our data. We have though, no guarantee that this is also true in other countries, where it perhaps could be more common to use repurchase agreements.

Still, cum-cum trades made through repurchase agreements have a much wider window of opportunity than cum-ex trades. This is because the method only requires that the investor with the beneficial tax position acquires the shares cum-dividend. It is therefore no need to wait until the last moment possible. For companies that pay out dividends on a periodic basis, the cum-cum perpetrators would not even have to wait for the announcement of the dividend before making the transaction. One can therefore argue that cum-cum trades are probably more scattered throughout the days, and possibly even weeks, before the ex-date. Substantial cum-cum trading is therefore less likely to show up as huge spikes on Ex-2 and Ex-1, and will perhaps look more like a gradual top around the ex-date. If so, examining the trading pattern around the ex-date, in addition to the level of abnormal trading in the cum-ex window, could make it possible to distinguish between the two schemes.

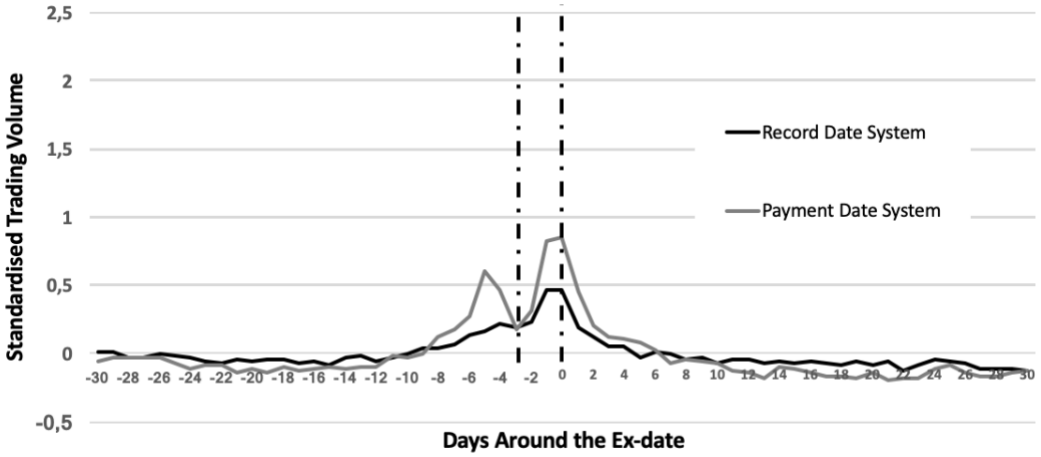
4. Analysis

In this chapter, we first present the results from our comparison of countries with and without a record date system. We then present the outcome of the country-specific analysis. The results are analysed on a general basis, but we also highlight and examine the, seemingly, most interesting countries in detail. Throughout the analysis we discuss possible explanations for what we see. In addition, at the end of the chapter, we also point to some more overall reasons for our general results.

4.1 Record date system

Table 3 provides the regression results from the difference in differences model. Our main hypothesis is, as mentioned, that not having a record date system may have facilitated cum-ex trading, or, at least, that cum-ex is more difficult in countries with a record date system. If cum-ex trading has been a major problem in other European countries than Germany, we would therefore expect significantly higher abnormal trading volumes, in the cum-ex window, in countries with a payment date system.

Column 1 presents the results of the comparison between the two systems, when all countries are included. The results are in line with what we would expect. The coefficient α_2 is 0.2253, and clearly statistically significant. In other words, countries with a payment date system have, seemingly, had relatively higher abnormal trading volumes in the cum-ex window. The trading patterns in the countries with the different systems, reflect this result:



Graph 1 - Average standardised trading volume for distributions that follow a record date system and distributions that follow a payment date system (2009-2018). The vertical dashed lines mark the normal cum-ex window (Ex-2 and Ex-1).

Table 3
Regression results: Standardised trading volume in the cum-ex window in record date countries and payment date countries

Variables/Countries	(1) All countries	(2) Not DEU, GBR	(3) AUT, ESP, CHE	(4) Not DEU, GBR
Cum-ex window T+2:				
D (α_1)	0.3659***	0.4282***	0.3498***	0.4323***
	(0.025)	(0.027)	(0.055)	(0.027)
D*P (α_2)	0.2253***	-0.1294**	-0.0511	-0.1302**
	(0.067)	(0.050)	(0.061)	(0.050)
Extended Cum-ex window T+3:				
D^{-3} (ω_1)				0.2206***
				(0.030)
D^{-3}*S (ω_2)				0.0434
				(0.043)
D^{-3}*P (ω_3)				0.2979
				(0.543)
D^{-3}*P*S (ω_4)				-0.3736
				(0.551)
Rest of the days:				
S (β_1)				-0.0007
				(0.001)
P (β_2)	-0.0074***	0.0042**	0.0017	0.0006
	(0.002)	(0.002)	(0.002)	(0.009)
R*P (β_3)				0.0061
				(0.009)
Constant (β_0)	-0.0120***	-0.0140***	-0.0115***	-0.0178***
	(0.001)	(0.001)	(0.002)	(0.001)
Estimation method	OLS	OLS	OLS	OLS
Observations	372,161	291,824	64,294	291,824
Distributions	6,101	4,784	1,054	4,784
R-squared	0.005	0.005	0.003	0.006

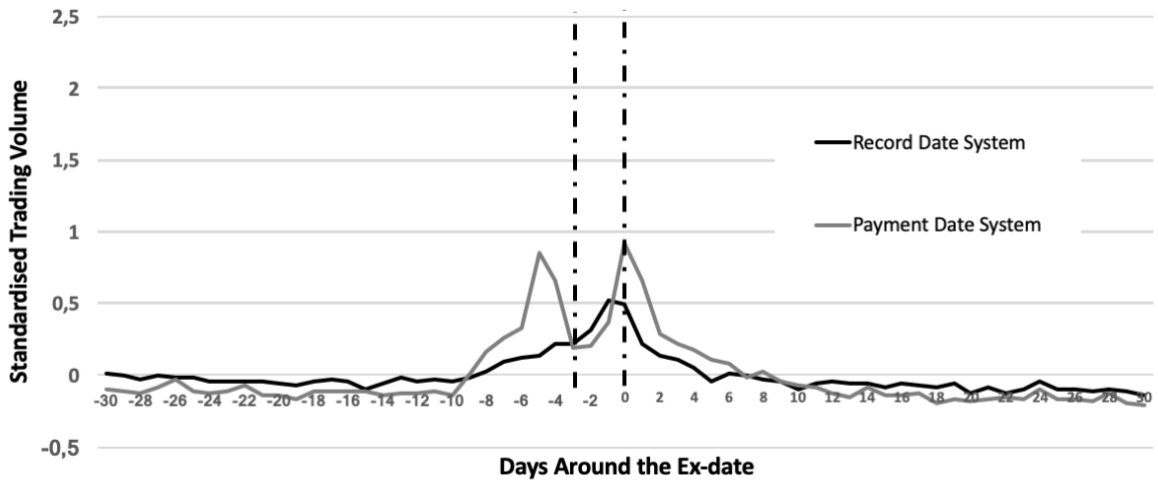
Cluster-robust standard errors (clustered at company level) in parentheses
Statistical significance: *** p<0.01, ** p<0.05, * p<0.1

$S_{i,d}$ is the standardised trading volume on day d around dividend distribution i. Where d is limited to the 61-day period around the ex-date ($d \in \{-30; 30\}$). D_d is a binary indicator that is equal to one if the observation is within the "normal" cum-ex window, that is, if $d = \{-1,-2\}$. D_d^{-3} is a binary indicator for the extended cum-ex window and is therefore equal to one only if $d = -3$. P_i is a binary variable which is equal to one if distribution i is conducted in a country which at the time had a payment date system, and equal to zero if distribution i is conducted in a country which at the time had a record date system. S_i is a binary variable that is equal to one if the distribution is a T+3 distribution and is equal to zero if the distribution is a T+2 distribution.

Because, as pointed out in 3.2.3, we predominantly have payment date distributions from Germany and Spain, the results in the regression and in Graph 1 mainly reflect the situation in these two countries. The two-peak pattern for the payment date countries, is, as we will get to, a consequence of a very distinct pattern in Spain.

In light of the above, it is possible that the results for payment date countries are driven by Germany. This is unfortunate as we already know for certain that cum-ex trading, to a large extent, has been conducted in Germany. So, as the intention is to examine whether other payment date countries have also been affected by cum-ex, it is not relevant to include Germany. Furthermore, as it in the UK is impossible to conduct cum-ex, due to other reasons than having a record date system, it is also unfortunate to include the UK.

In (2) we therefore remove Germany and the UK in order to isolate the effect of the other countries. Removing these two countries changes the effect of having a payment date system from positive to negative. The coefficient (α_2) is now -0.1294, and statistically significant at a 5% significance level. For the remaining countries, it therefore seems like those with a record date system have had higher abnormal trading volumes in the cum-ex window than those with a payment date system. This is in contrast to our expectations. Graph 2 compares the trading patterns without Germany and the UK. Still we have the distinct two-peak pattern, but after removing Germany there is no longer a spike on Ex-1.



Graph 2 - Average standardised trading volume for distributions that follow a record date system and distributions that follow a payment date system (2009-2018). Germany and the UK are omitted. The vertical dashed lines mark the normal cum-ex window (Ex-2 and Ex-1).

It is possible, however, that there are other unrelated reasons for why some of the countries with a record date system have higher abnormal volumes in the cum-ex window. It may therefore be relevant to look only at the countries which have gone from a payment date system to a record date system during the ten-year period. In (3), we therefore examine whether the abnormal trading volumes were higher in Austria, Spain and Switzerland before they implemented a record date system. The results in (3) show that the coefficient α_2 is now -0.0511, and thereby still negative. However, it is not statistically different from zero. Thereby, we cannot say that the implementation of a record date system has had any effect on abnormal trading volumes in the cum-ex window. This contradicts what we would expect based on our theory.

Column (4) presents the results from the expanded model for all countries but Germany and the UK. As mentioned, ω_4 captures the extra effect of the possibility of conducting cum-ex on an additional day (Ex-3) for T+3 distributions in countries with a payment date system. In countries with a record date system, it will not be possible to execute cum-ex transactions on Ex-3, regardless of whether the distribution is a T+2 distribution (ω_1) or a T+3 distribution ($\omega_1 + \omega_2$), unless the trade is made through an OTC venue. The same is also true for T+2 distributions in a payment date country ($\omega_1 + \omega_3$). Therefore, if ω_4 had been positive, and ω_2 and ω_3 had been close to 0, this would have been a strong indication of cum-ex trading being conducted in payment date countries. However, this is not what we see in (4). Although ω_2 and ω_3 are not statistically different from 0, neither is ω_4. Furthermore, the estimated coefficient ω_4 is even negative.

The coefficients ω_3 and ω_4 are, however, estimated with very large standard errors. The large standard errors are likely a result of very limited data on T+2 distributions in countries with a payment date system. Because even though we have more than 300 such distributions to begin with, they are almost all distributions from German companies. The reason is that both Switzerland and Spain shifted from T+3 to T+2 after they had implemented a record date system, and that Austria implemented a record date system shortly after changing to T+2. In fact, after removing Germany, we only have 19 T+2 distributions in payment date countries left. Large standard errors for ω_3, and, as a consequence, for ω_4 as well, is therefore not surprising.

Limited data for distributions in payment date countries is also a more general problem for our analysis. Switzerland changed from a payment date system before the end of 2009, which

leave us with less than a year of payment date system distributions from Switzerland. Besides, we have since discovered that in the EU Parliament hearing referred to earlier, Gerhard Schick claims that Switzerland stopped cum-ex trading in 2008. Although we have not investigated this claim further, it may suggest that, for the purpose of looking at cum-ex trading in Switzerland, it would have been better to examine an earlier time period. Austria and Spain from 2009 to 2015 and 2016 respectively, are therefore the only periods with a payment date system and where cum-ex has not supposedly been stopped. In other words, when looking at whether cum-ex has been a problem in payment date countries, we really only have relevant observations from two countries. It is therefore obvious that other differences between countries may play a large role, and that we are therefore less likely to detect systematic differences in abnormal volume between record date and payment date countries.

Based on our analysis, we cannot state that cum-ex trading has been a bigger issue in countries with a payment date system, compared to countries with a record date system. Still, our results do not exclude the possibility that this has been the case. As already stated, with very limited observations of payment date distributions the results are possibly a bit arbitrary. Furthermore, the appropriateness of the model is really dependent on cum-ex having been a problem in several European countries, and although this is a perception one may get from reading the CumEx-Files, it is not necessarily true.

Interestingly though, the results from the regressions clearly indicate that there is abnormal trading around dividends. From (2) it is also clear that, even after omitting Germany, there is still a lot of abnormal volume in the cum-ex window. This in itself, could indicate cum-ex, especially if the coefficients are driven by very high volumes in some countries. In the next section we delve deeper into these findings by looking at the country-specific coefficients.

4.2 Country-specific analysis

Table 4 provides the results from the country-specific intercept model. The coefficients marked with *, **, and *** are statistically different from zero at a 10%, 5%, and 1% significance level respectively, while the coefficients marked in bold are statistically different from the UK cum-ex window coefficient at a 5% significance level[23]. Column 1 provides the country-specific coefficients for the whole period (2009-2018), while in columns 2 – 4, we divide the ten-year period into three separate subperiods. This division is based on important tax-related events in Germany. The first period, 2009-2011, is based on the German cum-ex period. The administrative change in January 2012, presented in 2.5.3, makes the second period, 2012-2015, presumably, cum-ex free. Because Germany implemented laws to prevent cum-cum trading in 2016 (Buettner et al., 2018), the third period, 2016-2018, is supposed to be without both cum-cum trading and cum-ex trading.

Generally, most of the coefficients for the various countries are statistically different from zero at a 5% significance level. In fact, all countries except Austria, Greece, and the UK are significantly different from zero over the whole period. There are in other words, on a broad level, higher than average trading volumes on the two days before the ex-date. In addition, Finland, Germany, Italy, the Netherlands, Norway, Poland, Portugal, Spain, Sweden, and Switzerland also have coefficients that are statistically different from the UK, when looking at the whole period. So, if we are right in assuming that the UK coefficient is a good estimate for the effects of other reasons than cum-cum and cum-ex for abnormally high trading around dividends, this would at least suggest that the extra volumes in these other countries are tax motivated.

In the remainder of this section, we, country wise, examine the most interesting findings from the country-specific regression model. First, we will look at the UK where we know cum-ex is not possible. Then we look at Germany, a country that, undoubtedly, has been substantially affected by cum-ex trading. For Germany, we will examine the effects of the above-mentioned changes in 2012 and 2016. Our observations from Germany and the UK will then serve as an interesting basis for comparison for the other countries.

[23] This is shown in Table 7 of the Appendix.

Table 4
Regression results: Standardised trading volume in the cum-ex window in 18 EU and EFTA countries

Countries/Period	(1) 2009-2018	(2) 2009-2011	(3) 2012-2015	(4) 2016-2018
Austria*D	0.0999	0.1771	0.0816	0.0442
	(0.068)	(0.144)	(0.085)	(0.127)
Belgium*D	**0.3431*** **	**0.1471***	**0.3680*** **	**0.4668*** **
	(0.082)	(0.087)	(0.117)	(0.135)
Denmark*D	0.1227**	-0.0333	0.0197	0.2936***
	(0.056)	(0.044)	(0.082)	(0.105)
Finland*D	**0.4347*** **	**0.4300*** **	**0.5268*** **	**0.3227*** **
	(0.080)	(0.098)	(0.114)	(0.103)
France*D	0.1412**	**0.1265**	0.1680**	0.1183*
	(0.057)	(0.081)	(0.080)	(0.064)
Germany*D	**1.0382*** **	**1.6763*** **	**0.8236*** **	**0.7621*** **
	(0.106)	(0.202)	(0.109)	(0.106)
Greece*D	0.1519*	0.1682	0.1908	0.1119
	(0.080)	(0.149)	(0.170)	(0.087)
Ireland*D	0.1792**	0.0336	0.2475**	0.1773*
	(0.070)	(0.135)	(0.112)	(0.091)
Italy*D	**0.6287*** **	**0.7460*** **	**0.6544*** **	**0.4703*** **
	(0.059)	(0.070)	(0.093)	(0.115)
Luxembourg*D	0.1159**	-0.1108	0.1983**	0.1813**
	(0.056)	(0.097)	(0.100)	(0.077)
Netherlands*D	**0.7500*** **	**0.6562*** **	**0.8184*** **	**0.7494*** **
	(0.100)	(0.144)	(0.117)	(0.130)
Norway*D	**0.3991*** **	**0.4598*** **	**0.3056*** **	**0.4682*** **
	(0.095)	(0.129)	(0.106)	(0.155)
Poland*D	**0.2576** **	**0.3594** **	0.2768*	0.1481
	(0.105)	(0.151)	(0.155)	(0.092)
Portugal*D	**0.3517*** **	**0.3764*** **	0.3525	0.3153*
	(0.125)	(0.138)	(0.255)	(0.178)
Spain*D	**0.3701*** **	**0.6456*** **	0.1522***	**0.3864*** **
	(0.052)	(0.096)	(0.044)	(0.087)
Sweden*D	**0.8420*** **	**0.8820*** **	**0.8757*** **	**0.7688*** **
	(0.103)	(0.135)	(0.111)	(0.118)
Switzerland*D	**0.3227*** **	**0.1683***	**0.5610*** **	0.2322**
	(0.074)	(0.087)	(0.134)	(0.101)
UK*D	0.0299	-0.0667	0.0621	0.0886*
	(0.033)	(0.050)	(0.050)	(0.054)
Estimation method	OLS	OLS	OLS	OLS
Observations	372,161	105,896	147,315	118,950
Distributions	6,101	1,736	2415	1950
R-squared	0.008	0.013	0.008	0.007

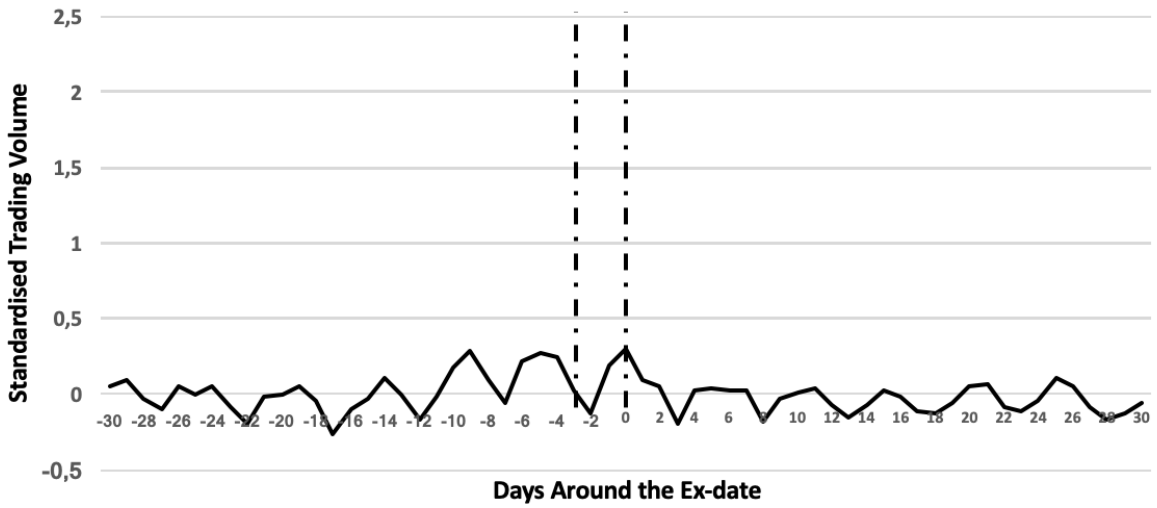
Cluster-robust standard errors (clustered at company level) in parentheses
Statistical significance: *** p<0.01, ** p<0.05, * p<0.1

Note: The coefficients that are in bold are statistically different from the UK coefficient at a 5% significance level. The tests for equality of coefficients are from a regression of the country-specific intercepts relative to the UK intercept. The result of this regression is included in Table 7 in the appendix.
Country-specific intercepts for the days that are not in the cum-ex window are omitted from the regression table. The full regression with variable specifications is included in section 8.3 of the appendix.

4.2.1 The United Kingdom

One of the most interesting findings is that there seems to be very little, if any, abnormal trading around dividends in the UK. None of the coefficients are statistically different from zero at a 5% significance level. We cannot therefore reject a hypothesis that there is not higher than average trading volume in British companies around dividend distributions. This fits well with our hypothesis that not only cum-ex, but also cum-cum trading, is first and foremost related to withholding taxes. Furthermore, it also suggests that any other tax-motivated, and non-tax motivated, reasons for higher volumes around dividend distributions have very limited impact in the cum-ex window. Given that we see no reason why these other motivations should have a larger effect in other European countries, there is reason to believe that large abnormal volumes on Ex-2 and Ex-1 in other countries are caused by cum-ex or cum-cum.

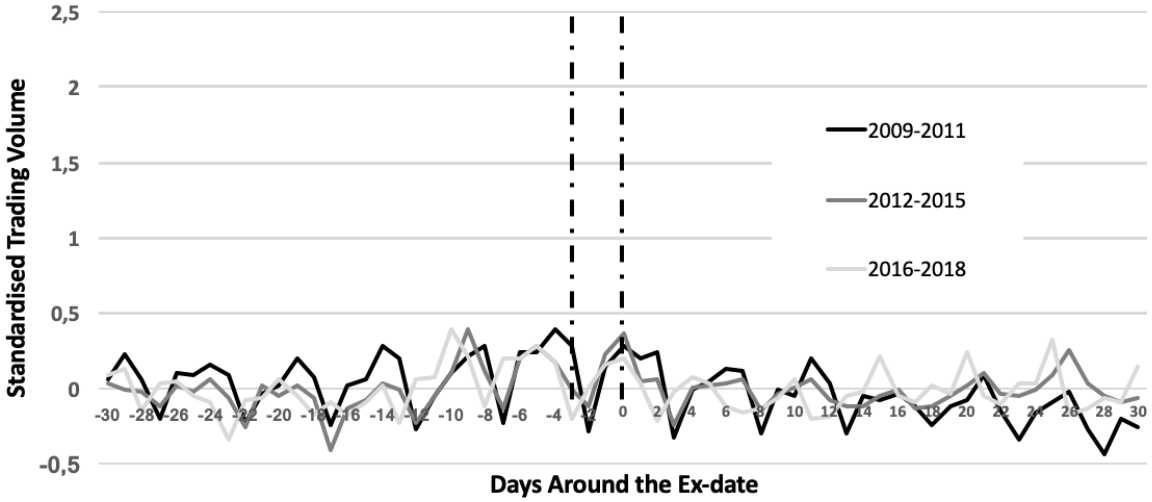
That there is little, if any, abnormal trading around dividends in the UK is also shown in the graph bellow. It shows the average trading pattern for UK dividend events between 2009 and 2018[24]:



Graph 3 - Average standardised trading volume in the United Kingdom on days around the ex-date for the whole ten-year period (2009-2018). The vertical dashed lines mark the normal cum-ex window (Ex-2 and Ex-1).

[24] For the purpose of enhancing the comparison between countries, the same y-axis scale is used for all the country-specific graphs that show standardised trading volume.

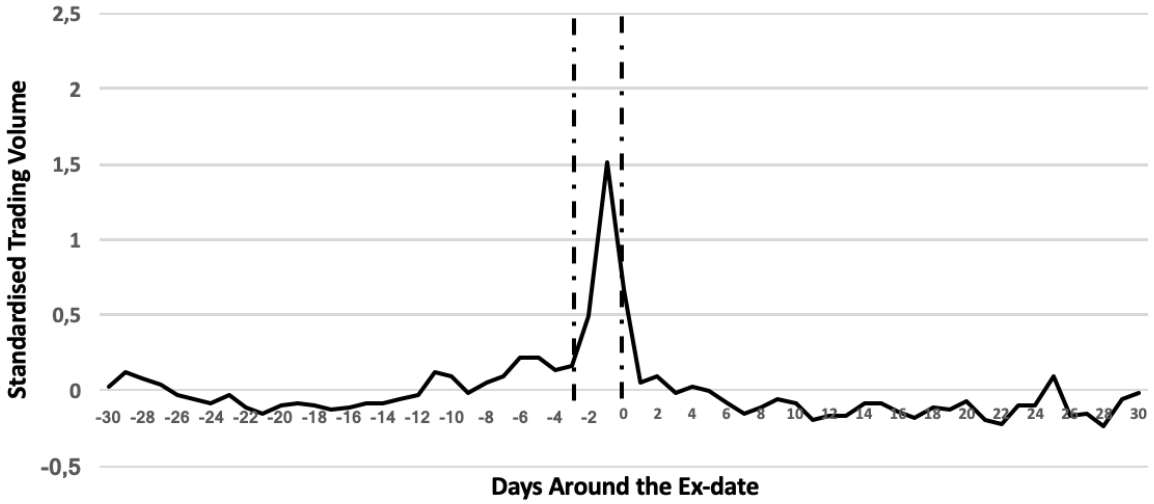
The standardised trading volume is relatively stable and ranges well within the interval of half a standard deviation away from average. Nor does it seem like there is any form of trend in the volumes. If we graph the trading patterns for the three different periods separately, we see similar results for all periods:



Graph 4 - Average standardised trading volume in the United Kingdom on days around the ex-date for the separate subperiods. The vertical dashed lines mark the normal cum-ex window (Ex-2 and Ex-1).

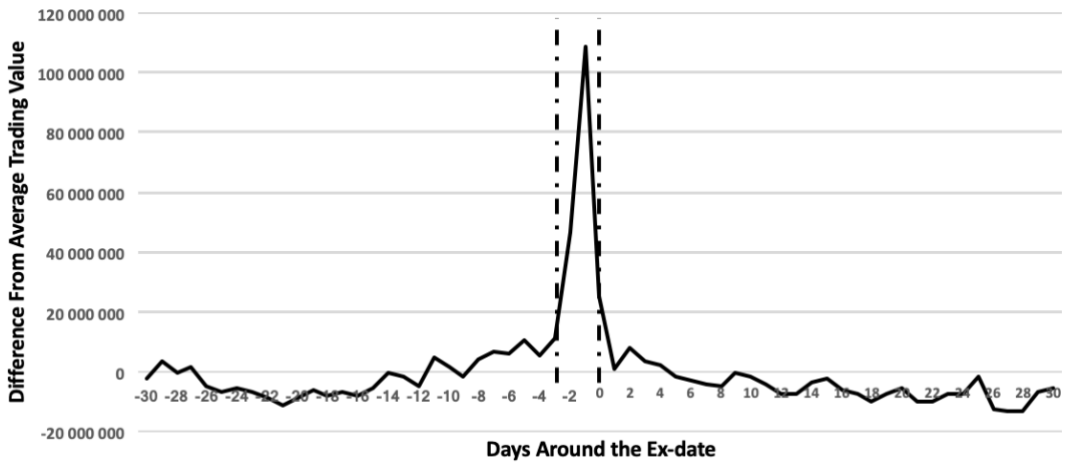
4.2.2 Germany

Given the cum-ex scandal, it is not unexpected that Germany, over the whole period, has the highest coefficient of the listed countries. Over the ten-year period, the volume traded on the two days before the ex-date is, on average, 1.0382 standard deviations above normal volume. To put it in perspective, the average coefficient for the rest of the countries is 0.33 standard deviations. Graph 5 shows the average trading pattern in Germany for dividend events between 2009 and 2018. As the graph reveals, the cum-ex window coefficient is primarily driven by abnormal trading volume on Ex-1. The volume on Ex-2 is actually not particularly high, while the average volume on the Ex-1, on the other hand, is about 1.5 standard deviations above normal volume.



Graph 5 - Average standardised trading volume in Germany on days around the ex-date for the whole ten-year period (2009-2018). The vertical dashed lines mark the normal cum-ex window (Ex-2 and Ex-1).

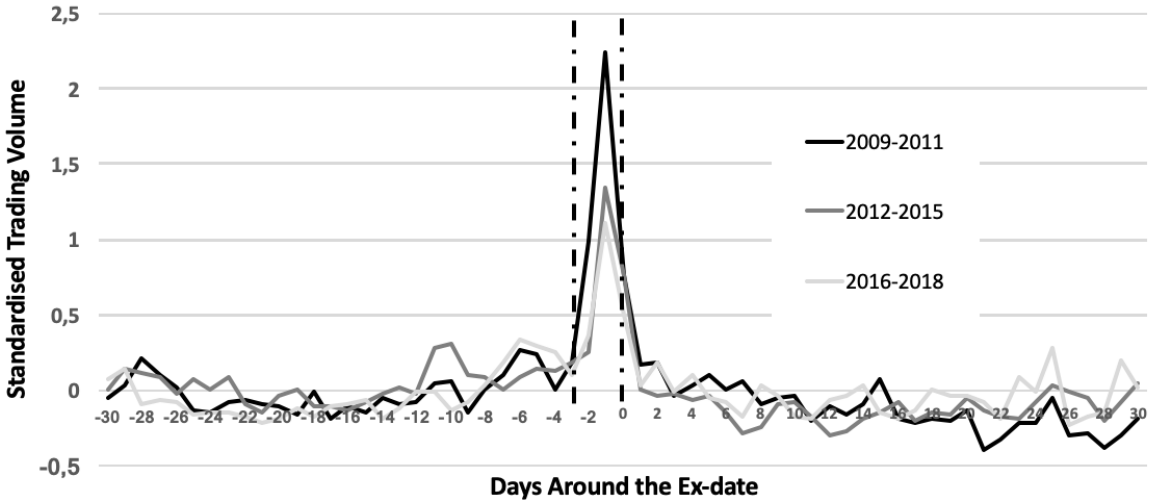
To examine this abnormality in terms of value, we have in Graph 6 graphed the difference from average trading value in the same period. As expected, the enormous spike in value on Ex-1 is striking. On average, for the dividend distributions between 2009 and 2018, the difference from average trading value[25], on Ex-1 alone, is about 110 million Euros.



Graph 6 - Average difference from average trading value in Germany on days around the ex-date for the whole ten-year period (2009-2018). Trading value is denominated in Euros. The vertical dashed lines mark the normal cum-ex window (Ex-2 and Ex-1).

[25] We use value instead of volume when looking at differences from the average. If we had used volume, the difference would be dependent on the number of shares outstanding. Companies with relatively many shares, i.e., relatively low price per share, would therefore have an unjustified large impact on average differences. Besides, when it comes to the extent of tax-motivated trading, value is really what is interesting. With standardised variables the number of shares is not an issue.

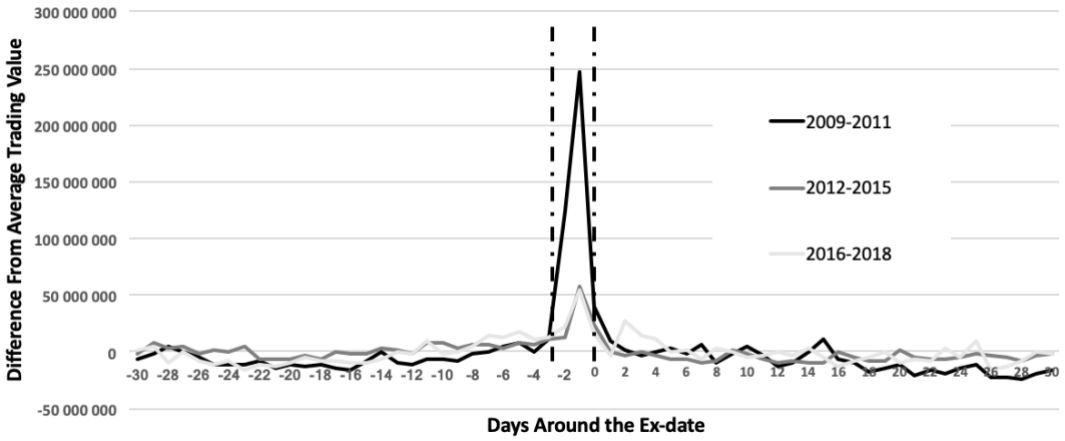
It is important to keep in mind, however, that cum-ex was supposedly stopped in Germany in 2012. So, in our data, cum-ex transactions should only show up in the three years from 2009 to 2011. It is therefore not surprising that, when looking at the individual coefficients for each subperiod, it becomes clear that a lot of the overall abnormal trading is driven by these exact years. The first period (2009-2011) has a coefficient of 1.6763, while the second (2012-2015) and third period (2016-2018) has a coefficient of 0.8236 and 0.7621 respectively. The graph below shows the pattern in standardised trading volume for the separate periods:



Graph 7 - Average standardised trading volume in Germany on days around the ex-date for the separate subperiods. The vertical dashed lines mark the normal cum-ex window (Ex-2 and Ex-1).

The coefficients and the graph clearly show a decline in the abnormal trading volume between the first and second period. As shown by Table 8 in the appendix, this decline is statistically significant. This is in line with the findings of Buettner et al. (2018) and suggests that the administrative change implemented in 2012 had an effect.

When looking at the differences above, it is, however, important to keep in mind that in Graph 7 we are looking at differences in standardised volumes. Looking at standardised variables is beneficial as it enables relative comparisons between countries, however, it may also give a skewed picture of the absolute problem as large and small companies are weighted equally. This is illustrated in Graph 8, where we look at the difference from average trading value for the separate periods. The graph illustrates that, in terms of economic value, the decline in tax motivated trading is actually much more significant than what one may get the impression of by looking at standardised volumes.



Graph 8 - Average difference from average trading value in Germany on days around the ex-date for the separate subperiods. The vertical dashed lines mark the normal cum-ex window (Ex-2 and Ex-1).

Still, it is surprising that the abnormal trading volumes in the second and third period are as high as they are. In fact, the coefficients, which are equal to 0.82 and 0.76 for the second and third subperiod respectively, are both the second highest country coefficients in their period. This suggests that Germany, even after cum-ex was supposedly stopped, has actually been one of the countries that have been most affected by tax-motivated trading.

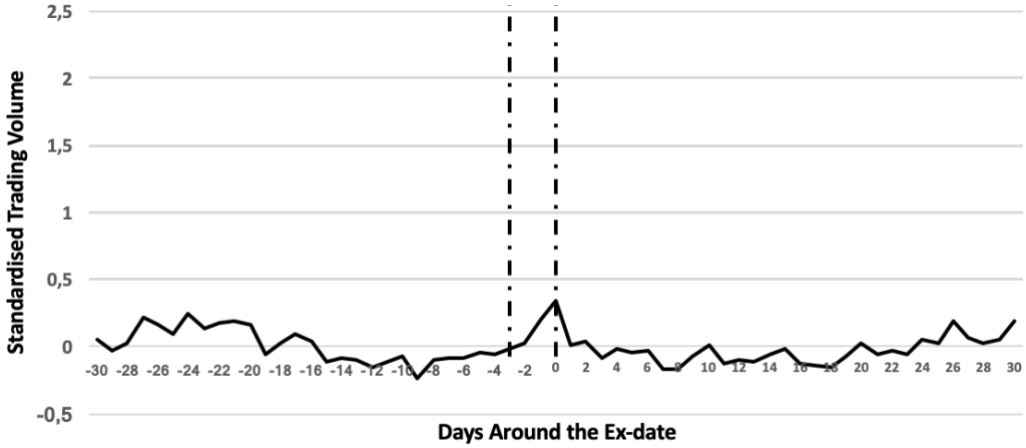
One potential explanation for this is that the high volumes could be caused by cum-cum trading. Because, even though Spengel (2016) claims that cum-cum transactions are predominantly conducted through share lending, which would, as mentioned, not show up in our data, it is possible that a significant amount of cum-cum transactions are also conducted through repurchase agreements. Repurchase agreements on Ex-1 may therefore be the cause behind the spikes. A problem with this theory, however, is that we see very little, if any, difference between the second and the third period. This does not fit well with the implementation of the new German law in 2016 aimed at combatting cum-cum. If the spike we see for 2012-2015 is caused by cum-cum, we would expect it to be significantly reduced by this law. It could of course be that the law was ineffective in combatting cum-cum. In fact, according to the CumEx-Files, cum-cum trading, in a less aggressive form, is still conducted in Germany (CumEx-Files, 2018).

If the spikes we see in 2012-2015 and 2016-2018 are in fact caused by cum-cum, and if Spengel is correct in stating that cum-cum in Germany is mostly conducted through share lending, we arrive at the worrying conclusion that the spikes only reflect a fraction of the actual problem.

Still, and although the spikes in the second and third period are not nearly as high, the patterns are worryingly similar to the pattern in the cum-ex period. The sharp peaks are also more in line with how we assumed substantial cum-ex trading would look like. As mentioned, we expect that substantial cum-cum trading would materialise more as a smoother top which gradually decreases with the number of days from the ex-date. We cannot therefore exclude the possibility that the cum-ex perpetrators have designed a new cum-ex method which makes it possible to circumvent the administrative change made in 2012. Either way, it is worrying that Germany, as a country which have implemented measures to combat both cum-ex and cum-cum, is, seemingly, this much affected by tax motivated trading.

4.2.3 Denmark

Earlier, we highlighted Denmark as one of the countries which, according to the media, have been most severely affected by cum-ex trading. Based on our general theory, we would therefore expect to see a substantial spike in the abnormal trading volumes in the cum-ex window. However, as previously stated, unlike the method used in Germany, the transactions in Denmark were actually never settled. The cum-ex perpetrators only made it appear as they had purchased Danish shares and paid taxes on distributed dividends. The method is therefore undetectable in transactional data. As a result, the trading pattern in one of the, supposedly, most affected countries, should reveal no abnormalities. This is also reflected in our results. In fact, if we look at the whole period, the coefficient for Denmark (0.1227) is actually one of the smallest ones. Moreover, by looking at the coefficients for the subperiods, it is also clear that the little abnormal trading volume we see is from the last period, which would, supposedly, be after the Danish cum-ex period.

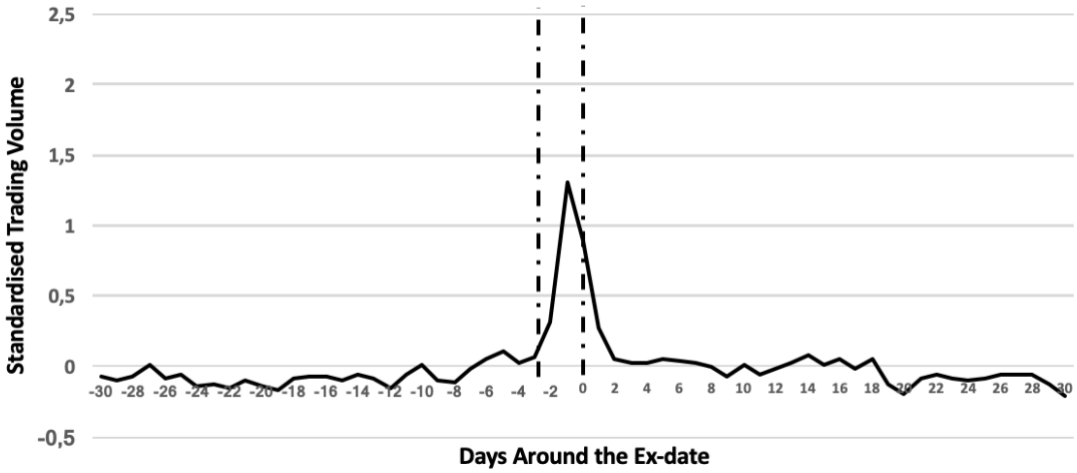


Graph 9 - Average standardised trading volume in Denmark on days around the ex-date for the whole ten-year period (2009-2018). The vertical dashed lines mark the normal cum-ex window (Ex-2 and Ex-1).

This shows that there may be cum-ex transactions that do not show up in our data. As a consequence, it is far from certain that countries, which do not have the expected cum-ex pattern, have not been affected by cum-ex. This emphasises the importance of interpreting the results carefully.

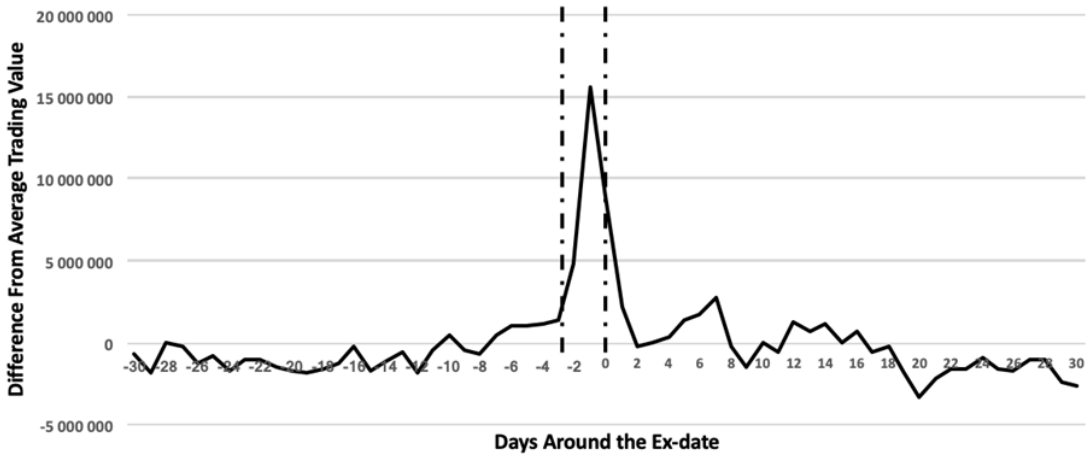
4.2.4 Sweden

After Germany, the country with the highest coefficient for the whole period is Sweden. Sweden's coefficient of 0.8420 indicates widespread tax-motivated trading. By looking at the trading pattern around dividend distributions things get even more interesting.



Graph 10 - Average standardised trading volume in Sweden on days around the ex-date for the whole ten-year period (2009-2018). The vertical dashed lines mark the normal cum-ex window (Ex-2 and Ex-1).

The trading pattern is strikingly similar to the one in Germany and fits well with how we expect substantial cum-ex trading would look like. Furthermore, here as well, the coefficient for the cum-ex window is evidently driven by Ex-1. Because of this distinct pattern, it is interesting to look at the difference from average trading value as well, in order to get an idea of the economic extent.



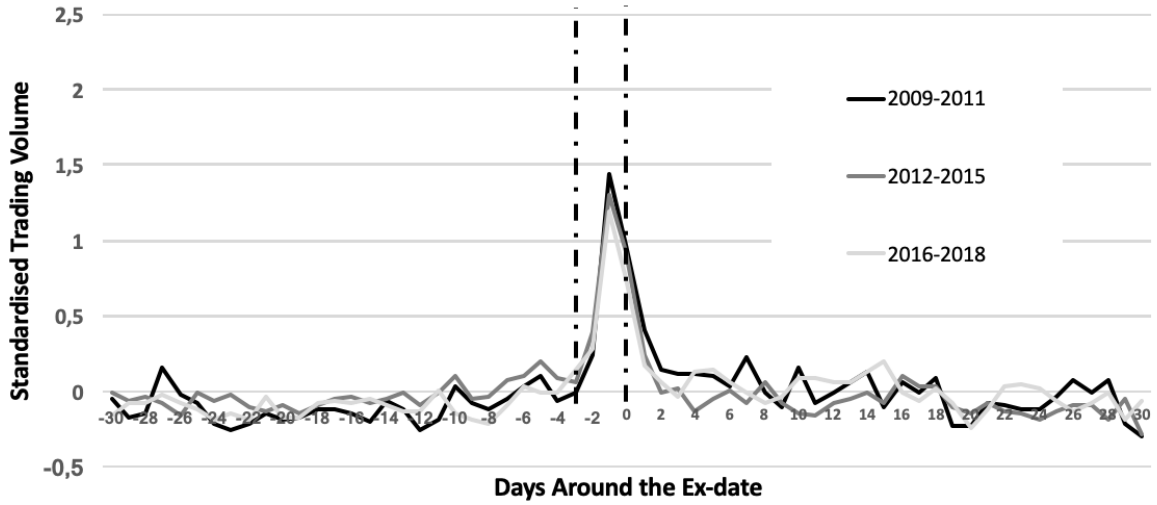
Graph 11 - Average difference from average trading value in Sweden on days around the ex-date for the whole ten-year period (2009-2018). Trading value is denominated in Euros. The vertical dashed lines mark the normal cum-ex window (Ex-2 and Ex-1).

As we see in Graph 11, the trading pattern still shows a substantial spike on Ex-1. However, the difference from average trading value on Ex-1 of 15 million Euros is, relatively to Germany´s 250 million Euros in the cum-ex period, very moderate. This shows that the extent of abnormal trading is far from as extensive as in Germany. Dependent on the reasons for the spikes, the difference in value traded could of course be a result of larger and more liquid companies in Germany.

Whether the substantial spike is a result of cum-ex trading or other reasons is, however, unclear. Interestingly though, according to TT, Sweden´s national news agency, cum-ex trading has been conducted in Sweden. As one of the media sources collaborating in the CumEx-Files, TT became aware of potential cum-ex trading in Sweden and asked the tax authorities to investigate their refunding of withholding taxes. The investigation concluded that the tax authorities had granted illegitimate refunds of 64 million Swedish Kroners. This modest sum, which is equivalent to about 6 million Euros, was calculated based on Swedish refunds to companies and persons mentioned in the Danish investigation of cum-ex trading. Apparently, some of the parties involved in the fraud in Denmark had, in eleven cases in 2015, received refunds in Sweden as well. (SVT, 2018a).

When Swedish tax authorities, in 2016, became aware of this, they immediately started to deny the applications for refunds from these investors (SVT, 2018a). However, according to TT, there is reason to believe that there are several other cum-ex perpetrators which were not named in the Danish investigation (SVT, 2018a). If any of these were involved in cum-ex in Sweden, they would not have been automatically denied by the Swedish tax authorities (SVT, 2018a). So, as the estimated amount in Sweden was solely based on the names in the Danish investigation, it is not unthinkable that this amount only reflects the tip of the iceberg.

If cum-ex trading has been a major problem in Sweden prior to 2016, it is likely that the discovery, and possibly any new preventive measures, should at least have led to a decline in such trades. So, if the spike we see in the abnormal trading volume is related to cum-ex, we would expect to see a decline in the abnormal trading volume between the second and the third period. However, as seen in Graph 12, the trading volumes in Sweden have a relatively stable pattern for the whole ten-year period. This is also reflected in the regression results with coefficients for the subperiods of 0.8820, 0.8757 and 0.7688. In fact, considering the coefficients' standard errors of around 0.1, we cannot state with any certainty that there has been a decline at all. The decline between the second and third period is, in other words, at best moderate.



Graph 12 - Average standardised trading volume in Sweden on days around the ex-date for the separate subperiods. The vertical dashed lines mark the normal cum-ex window (Ex-2 and Ex-1).

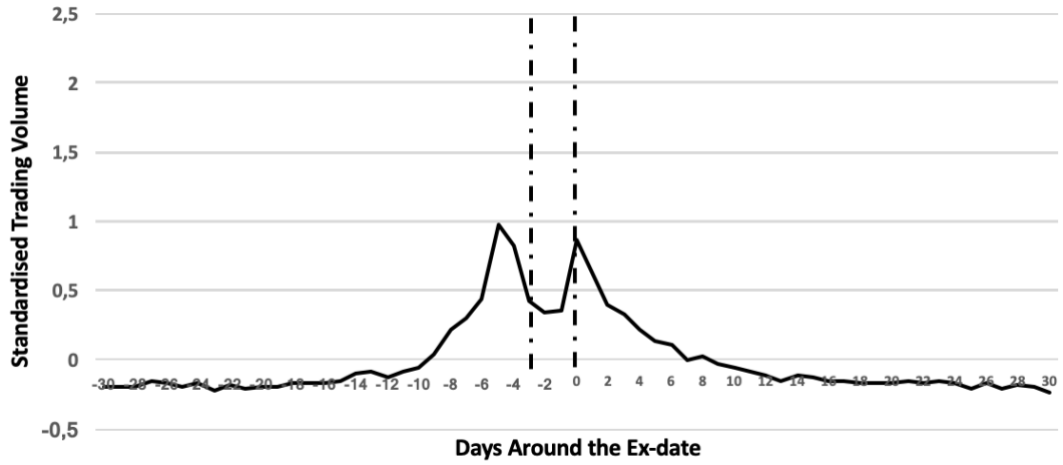
It is therefore possible that the Swedish tax authorities´ modest estimate of cum-ex trading is right, and that the spike in Sweden is caused by something else. Moreover, given that there clearly is a link to the Danish case, it is possible that the cum-ex trades referred to by TT were conducted in the same manner as in Denmark. If they were, the trades would, regardless of the extent, not be reflected in our data.

Another potential explanation for the spikes, and, seemingly, a major concern for Sweden, is cum-cum trading. According to SVT, another Swedish media source involved in the CumEx-Files, the Swedish state paid out 14.3 billion Swedish Kroners in withholding tax refunds between 2006 and 2017. A considerable proportion of these refunds is considered to be related to cum-cum trading (SVT, 2018b). A former manager at SEB´s headquarter in Frankfurt, supposedly, confirmed this suspicion, stating that cum-cum transactions are considered to be standard transactions in Sweden (SVT, 2018c). Whether the graph captures this cum-cum trading is, however, unclear, and depends, as mentioned, on whether the transactions have been conducted through sales transactions or borrowing.

On the other hand, it is also possible that the awareness in 2016 may not have stopped cum-ex trades, and that the extent of cum-ex trades may be greater than the Swedish tax authorities believe. So, same as in Germany after 2011, we cannot really be sure whether what we see in Sweden is cum-ex or cum-cum. Regardless, it seems obvious that Sweden as well has been, and is, severely affected by tax-motivated trading.

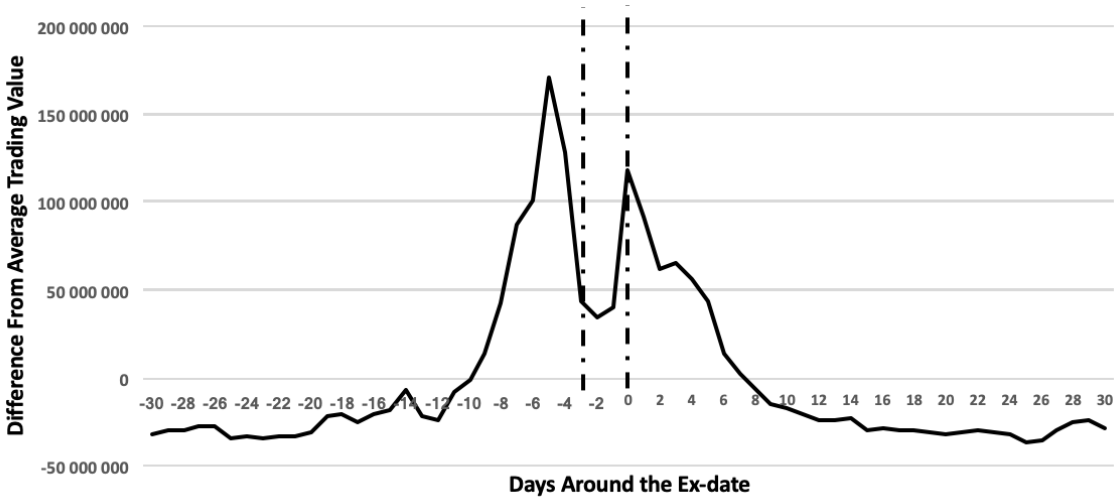
4.2.5 Spain

Based on the regression results, Spain does not look particularly interesting. A coefficient over the whole period of 0.370 is, compared to other countries, not very high. However, when examining the trading pattern, Spain turns out to be one of the most intriguing countries:



Graph 13 - Average standardised trading volume in Spain on days around the ex-date for the whole ten-year period (2009-2018). The vertical dashed lines mark the normal cum-ex window (Ex-2 and Ex-1).

The graph reveals an extremely defined trading pattern in Spain. The two clear spikes are a rarity, and form a kind of valley. Because the cum-ex window falls within this valley, the coefficient in our regression is relatively low. Interestingly, the two-peak pattern is also surprisingly consistent in the years 2011-2015[26]. The difference from average trading value also reveals the staggering amounts that lies behind the standardised volumes:



Graph 14 - Average difference from average trading value in Spain on days around the ex-date for the whole ten-year period (2009-2018). Trading value is denominated in Euros. The vertical dashed lines mark the normal cum-ex window (Ex-2 and Ex-1).

[26] This is illustrated in graphs 29-31 in section 8.4 of the appendix.

As we see, Ex-5 is, alone, on average about 170 million Euros above normal trading value. So, the accumulated difference from average value, traded from Ex-10 to Ex-1, is enormous. The same goes for the accumulated value from the ex-date to Ex+8.

We have not been able to come up with a good explanation for this remarkable pattern. As the two spikes are before and on the ex-date respectively, the trading pattern could be caused by major use of cum-cum repurchase agreements. Due to OTC trading, and the fact that it has been claimed that Spain have had similar flaws in the administration of withholding taxes as Germany had, it is also possible that the pattern is caused by cum-ex trading. Either way, it is not clear to us, however, why the peak is so many days before the ex-date. What is clear though, is that if we look at a wider time-window around the ex-date, our data suggests that Spain is by far the country which is most affected by tax motivated trading.

4.2.6 Other interesting countries

In graphs 15-18 we have plotted the trading patterns around dividend distributions for some of the other countries that stand out from the rest in our analysis. To avoid repeating ourselves, and due to lack of specific information, the review of these countries will be less detailed than the previous ones.

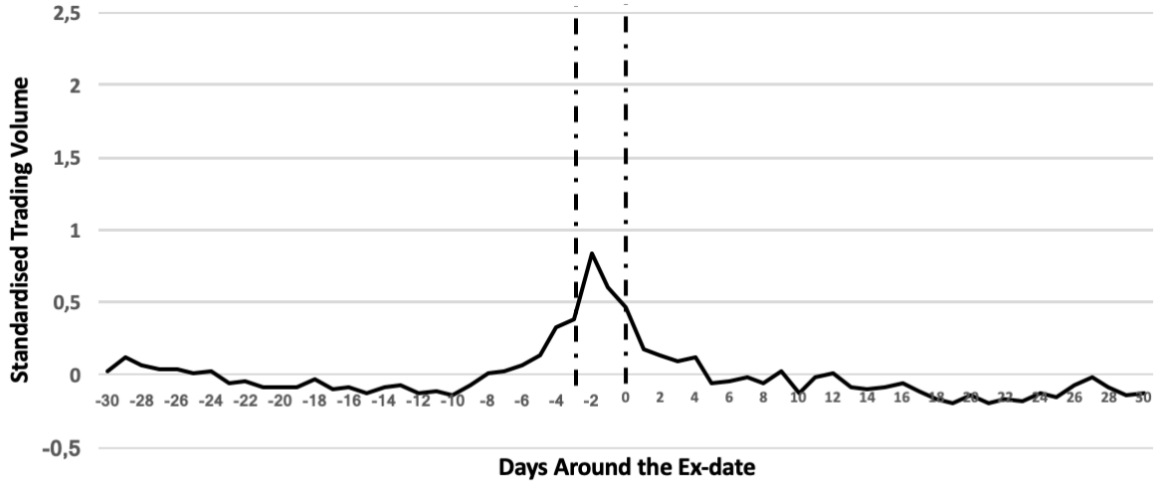
After Germany and Sweden, the Netherlands has, over the whole period, the highest coefficient (0.7500). In the last period, between 2016 and 2018, the Netherlands actually has the highest coefficient (0.7974) of all the countries. These numbers would, based on our theory, indicate substantial tax-motivated trading. When examining the trading pattern in the Netherlands (Graph 15), one could argue that this suspicion gets substantiated. There is undoubtedly a similarity to the spike we see in Germany. However, on the other hand, the spike is not as high as the ones seen in Germany and Sweden. In addition, we would argue that the more gradual increase and decrease in trading volume before and after the spike, is more in line with what we would expect from substantial cum-cum trading.

The last country that stands out with a very high coefficient is Italy, with a coefficient for the cum-ex window of 0.6287 standard deviations above normal. The trading pattern in Italy, illustrated in Graph 16, makes us, once again, consider cum-cum trading as most likely.

Interestingly, however, both the Netherlands and Italy were among the countries mentioned in the CumEx-Files, where cum-ex trading, presumably, should work. Furthermore, as mentioned in section 2.5.3, both Italy and the Netherlands are also among the countries which, allegedly, have similar flaws in the administration of withholding taxes as Germany had during the cum-ex period. We therefore cannot rule out the possibility that what we see in Italy and the Netherlands is due to some form of cum-ex transactions.

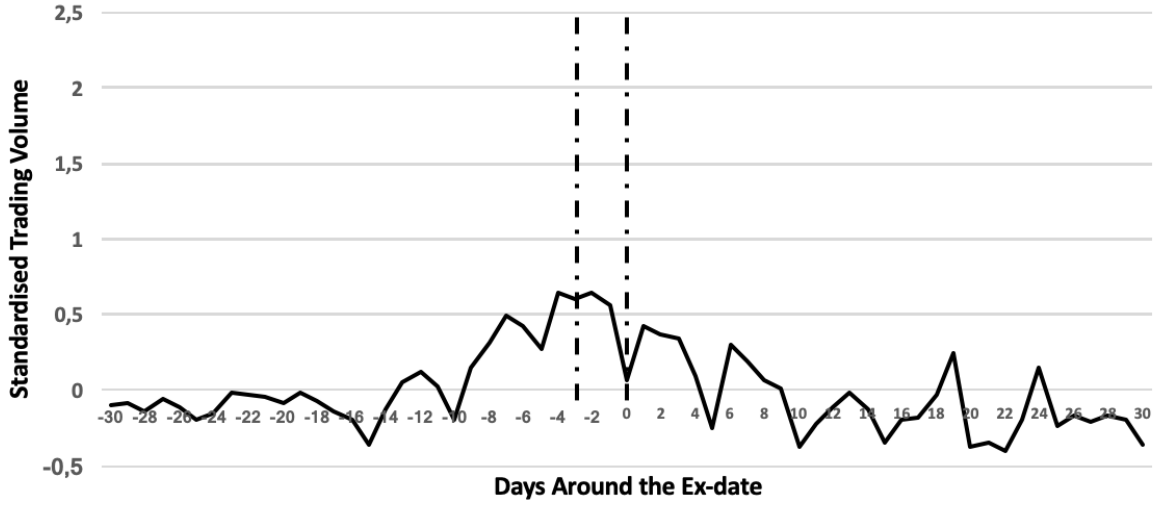
Lastly, Finland and Norway are both countries which have slightly lower coefficients for the cum-ex window, but which have interesting trading patterns around dividend distributions. For both countries there is some similarity to Germany and Sweden with a sharp increase in abnormal volumes on Ex-1. Unlike these countries, however, we see that the highest volumes are on the ex-date. Besides, the peaks are in no way as high.

The Netherlands



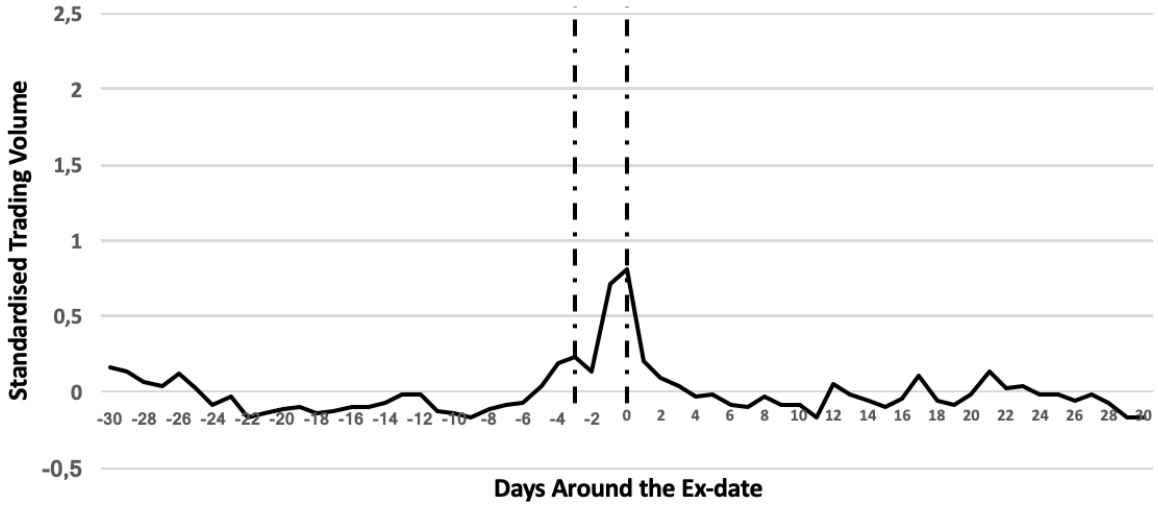
Graph 15 – Average standardised trading volume in the Netherlands on days around the ex-date for the whole ten-year period (2009-2018). The vertical dashed lines mark the normal cum-ex window (Ex-2 and Ex-1).

Italy



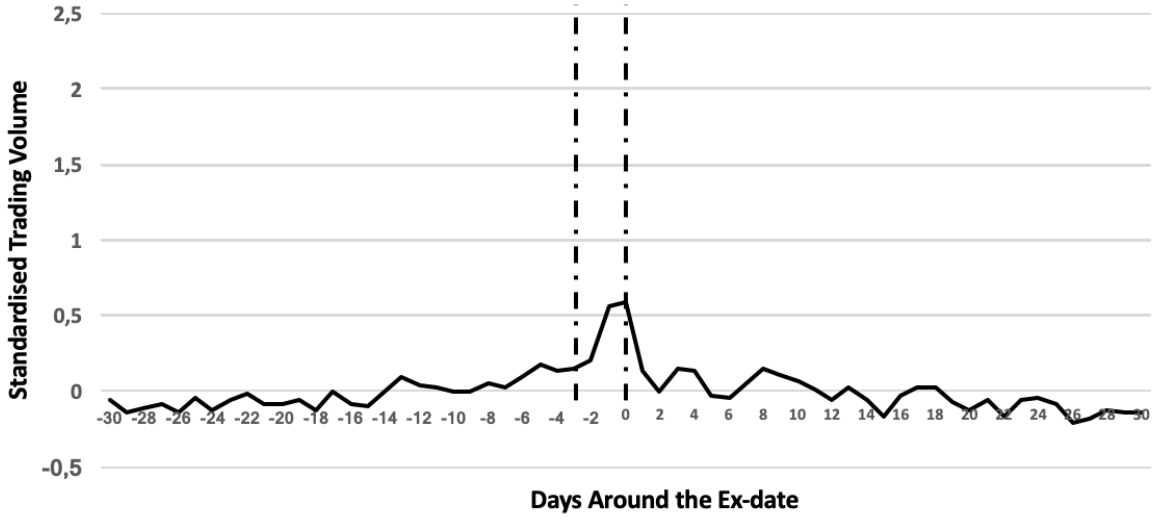
Graph 16 – Average standardised trading volume in Italy on days around the ex-date for the whole ten-year period (2009-2018). The vertical dashed lines mark the normal cum-ex window (Ex-2 and Ex-1).

Finland



Graph 17 - Average standardised trading volume in Finland on days around the ex-date for the whole ten-year period (2009-2018). The vertical dashed lines mark the normal cum-ex window (Ex-2 and Ex-1).

Norway



Graph 18 - Average standardised trading volume in Norway on days around the ex-date for the whole ten-year period (2009-2018). The vertical dashed lines mark the normal cum-ex window (Ex-2 and Ex-1).

Graphs for all the countries that are not explicitly mentioned in the analysis are included in the appendix.

4.3 Potential explanations for our results

Overall, our analysis does not clearly indicate that cum-ex is or has been a substantial problem in any European countries other than Germany prior to 2012. There are no subperiod coefficients which show similar levels of abnormal trading to the one in Germany during the cum-ex period. As we show in Table 8 in the appendix, the coefficient for the German cum-ex period is also statistically higher than all the other coefficients. It could of course still be possible that cum-ex has been conducted, although to a smaller extent, in other countries as well. The trading pattern in Sweden does, for instance, look worryingly similar to the pattern in Germany prior to 2012. Still, as Germany even after the cum-ex period has just as high levels of abnormal trading as Sweden, it is perhaps not very likely that the Swedish spike is caused by cum-ex.

One possible explanation for why it looks like cum-ex has not been a large problem in other countries may be that record date systems have made it difficult to move the German method across borders. Because even though our analysis shows higher abnormal trading for distributions that follow a record system, this may merely be a result of cum-ex trading not really having been a problem in any of the countries, and that higher abnormal trading in record date system countries is caused by other reasons.

Another possible reason why no other countries seem to have been largely affected by the German cum-ex method may be because of an indirect barrier of European withholding tax systems, the relief at source system. As described in 2.1.2, a relief at source system makes it possible for shareholders to benefit from a lower tax rate already at the time of the distribution. In other words, there is, in effect, an option to have the tax refunded immediately. In our opinion, it is therefore likely that most investors will make use of this option, rather than applying for a refund. Considering that in some countries, unlike Germany, the refunding time could be years (IMSDG, 2010), this timing advantage would often be substantial. In countries with a relief at source system, it is therefore likely that refund applications are uncommon, and especially from large investors, who have all the more to earn by receiving the funds as early as possible. Comprehensive use of cum-ex trades, leading to large refund claims, would therefore be very visible and, followingly, much more risky. It is therefore possible that having a relief at source system may serve as a barrier against cum-ex trades.

This is interesting seeing that, according to a European Commission working paper in 2010, nine of the countries we have looked at had a relief at source system back in 2009 (IMSDG, 2010). Furthermore, in the paper, the authors, arguing that using relief at source provides an efficient way of ensuring that shareholders are taxed correctly, also strongly recommended that the EU countries which did not have a relief at source system should implement one. Thus, it is possible that most European countries have such a system by now.

Interestingly, Germany was one of the EU countries which did not have a relief at source system in 2009 (IMSDG, 2010). All the shareholders that were entitled to be taxed at a lower rate than the standard would therefore have to be given a tax refund or a tax credit. Because this entailed a massive flow of refund claims, it was most likely necessary with a more or less automated process. In fact, in the Commission Working Paper (2010), Germany was praised for its refund system being "efficient and quick" (IMSDG, 2010). According to the authors, this efficiency was achieved by allowing for German and foreign depositary banks to file refund claims combined for all their clients instead of individually for each one. This system therefore obviously relied heavily on the refund claims being legitimate, which time has shown were often not the case. The German combination of a lack of a relief at source option and an automated process for refunds, in addition to a payment date system and the discrepancy mentioned by Buettner et al. (2018), may, in our opinion, have contributed to an extreme combination of conditions that made the enormous cum-ex scandal possible. It is therefore possible that this combination is unique to Germany, and that this may be the reason why the German cum-ex method has seemingly only been a major problem there.

A final reason why we seemingly do not see any clear indications of large-scale cum-ex trading may be because our data does not include cum-ex trades that have been conducted. This can be because the perpetrators, in search for anonymity, have primarily conducted the trades on less transparent OTC trading venues that do not report their transactions to any of the exchanges included in our data. According to Spengel (2016), from the cases heard in German courts, cum-ex transactions were in fact mostly conducted on less transparent OTC venues. Furthermore, our method of research is also based upon the method used in Germany. This entails that if there are other methods with characteristics that differ from the method used in Germany, our approach may very well not be capable of detecting it. This would for instance be the case with the Danish cum-ex trades which would not show in transaction data at all.

5. Conclusion

In this thesis, we have attempted to get a broad overview of possible cum-ex trading in European countries. In order to do so we have looked at theoretical aspects related to the cum-ex method used in Germany and discussed whether this method would be feasible in other European countries. In light of our theories we have also used an empirical approach to see whether our theoretical claims were backed by empirical evidence.

For the theoretical points regarding cum-ex in Europe, we have relied heavily on a paper by Buettner, Holzmann, Kreidl, & Scholz, (2018) and the research of Christoph Spengel (2016). However, as the literature on cum-ex trading is fairly limited, we have also had to come up with our own theories and contributions where the literature has fallen short. We have shown how the exact method described by Buettner et al. (2018) and Spengel (2018) should, at the present time, not be feasible to conduct in any EU or EFTA country. This is due to all the countries having a record date system, which is a different dividend administration system to the payment date system used in Germany during the cum-ex period.

On the other hand, we have also pointed out that this theoretical claim only holds if all trades have to be conducted through exchanges or other venues which consistently use the standard settlement cycle. So, as some OTC trading venues may allow investors to deviate from the standard settlement period, the German method is, in theory, still feasible if the cum-ex perpetrators agree upon a longer settlement period for the cum-ex short sale. Furthermore, we also argue that a slightly modified version of the German method, which we refer to as the "reverse claim method", is possible trough OTC transactions in record date countries. So, contrary to our initial belief, having a record date system is not necessarily an effective hindrance against cum-ex trades. Nevertheless, we still believe that conducting cum-ex is riskier in record date countries. This is because both the German method and the reverse claim method are dependent on a dividend clearing process which is likely to be uncommon in record date countries, and which may therefore attract scrutiny from various financial institutions. Through the case in Denmark, we have, however, also seen that cum-ex has been conducted in a way that altogether bypasses the preventive effect of having a record date system.

Contrary to our theoretical understanding, the results from the difference in differences analysis do not indicate substantially higher abnormal volumes in payment date countries. However, this does not rule out the theory that cum-ex may be easier to conduct in payment

date countries. As pointed out, the data for the analysis is so limited that the payment date observations of interest are really only from Austria and Spain. Moreover, it is possible that these two countries, even when they had a payment date system, had other mechanisms in place to stop cum-ex from happening in a large scale.

From the country-specific analysis, we do not have any clear evidence that cum-ex trades have been a substantial problem in other countries than Germany. No countries have comparable abnormal volumes around dividend distributions to that in Germany in the cum-ex period. Still, this does not exclude the possibility that cum-ex has been conducted in other countries. The pattern we see in Sweden is worryingly similar to the one in Germany during the cum-ex period, even if the extent of abnormal trading is smaller. Interestingly, this pattern is also seen in Germany in the years after cum-ex was supposedly stopped. This can indicate that what see in Sweden and in Germany after 2012 is cum-cum. Alternatively, it can also be that the administrative change implemented in Germany was only partly effective in stopping cum-ex trades. Either way, when comparing Germany, Sweden, and many of the other EU and EFTA countries with the UK, it is clear that many European countries are likely affected by considerable tax motivated trading.

So, although we find no clear evidence that cum-ex in specific has been a European-wide problem, it seems clear from the empirical results that tax-motivated trading is at least a significant problem in European countries, and that there are remarkable differences in the amount of abnormal trading around dividends. The fact that Germany, which has implemented rules aimed at combating both cum-ex and cum-cum trades, is still, apparently, one of the most heavily affected countries, could also indicate that the tax authorities of Europe are struggling to cope with the creativity of lawyers and other tax experts whose aim is to exploit loopholes in the system.

6. Contributions and proposals for further research

6.1 Contribution to the research

Even though we do not provide any clear evidence as to whether various European countries are affected by cum-ex trading, we would argue that this thesis could still provide some contributions to the current research on the subject.

As far as we can see, the distinction between record date and payment date systems has not been emphasised as an important issue when it comes cum-ex trading. In Buettner et al. (2018), for instance, the authors do not touch on this subject at all. The theoretical points we present in our research about how a record date system impacts the feasibility of cum-ex trading may therefore be a useful contribution to the knowledge on the subject.

In addition, even though our model is not perfect for distinguishing between cum-ex and cum-cum, our country specific analysis could at least give an indication of which countries may be heavily affected by tax motivated trading in general. At the very least, the results regarding trading volumes and trading patterns provide an interesting comparison between European countries.

It also seems to us that very little, if any, of the current research on abnormal trading volumes around dividends examine trading volumes across exchanges in different countries. As described in 3.2.2, this leads to a couple of issues related to different practices in different countries. With countries having different trading days and settlement cycles, it is, for instance, not straight forward to sum up trading volumes across different exchanges on the same date, at least not when looking at trading days around the ex-date. Naturally, some of these issues may also be relevant in research on other types of corporate actions or other events. Our experience in working with cross national trading volumes, and the problems that arise as a consequence, may therefore be helpful for future research.

6.2 Proposals for future research

For further research, we would propose to look more thoroughly at some of the countries which our analysis suggests may be heavily affected by tax motivated trading. Going more into the details will make it easier to assess whether the effects we see on trading around dividends are caused by cum-ex, cum-cum, or something else.

A very interesting idea would be to look at short selling data specifically. A significant increase of short selling in the cum-ex window would be a strong indication of cum-ex trading. At least if this increase is much larger than the increase in normal transactions. Given that cum-ex transactions require OTC trading in record date system countries, another method would be to look at OTC trading relative to volumes on normal exchanges. However, a problem with this is that OTC venues would arguably also be preferred for cum-cum transactions. Still, it would at least strengthen the suspicion that tax motivation is behind the trades. With our data, OTC trades are merely included in the observations of normal exchanges, so we have no way of distinguishing OTC trades from normal trades.

Another method which may be better suited to distinguish between cum-ex and cum-cum is to look at share lending around dividend distributions. The reason is that, for share lending used for the German cum-ex method, the lender would have to be the shareholder of record, while in share lending transactions used in cum-cum schemes the borrower would have to be the shareholder of record[27]. An increase in share lending prior to or on the record date would therefore indicate cum-cum trading whilst a similar increase after the record date would indicate cum-ex transactions.

All of these empirical approaches do, however, require data which it may be difficult to obtain. Especially, as much of the trades are likely to be conducted through less transparent trading venues. Another option is therefore to take a more theoretical approach. For the countries with a lot of abnormal trading around dividends, it would, for instance, be interesting to examine whether these countries differ from the others when it comes to the administration of dividends and withholding taxes. An idea would be to look at how refund applications are handled and what kind of evidence is necessary to achieve tax refunds. In relation to the German cum-ex

[27] This rests on the assumption that the borrower would be the taxable shareholder as long as he is the shareholder of record, independently of whether the loan was conducted after the share had stopped trading cum-dividend.

method, it would be especially interesting to look at how dividend compensations are treated for tax purposes. Looking into these aspects of the administrative systems is crucial in assessing whether different forms of cum-ex trading is, or has been, possible in any of these countries.

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8. Appendix

8.1 Cum-cum trading and income taxes

Here we shortly explain why we believe cum-cum trading is predominantly a problem related to withholding taxes. Because this assumption is, for our analysis, mostly relevant for UK companies, the arguments are mostly based on the British tax system. We do, however, believe that the points are generalisable.

Firstly, most of the investors who have large enough holdings to justify using resources on tax-avoidance schemes, would usually not pay any dividend income tax in the first place. This is because these shareholders will often hold their shares through holding companies and inter-corporate dividends are in many countries free of corporate tax regardless of whether the dividend is received from a foreign or a domestic company. For instance, both the UK (GOV.UK, 2019) and Germany (Deloitte, 2019) essentially exempt inter-corporate dividends from corporate tax.

Secondly, investors who do have to pay an income tax on dividends, are, in our opinion, unlikely to be able to avoid the tax burden through cum-cum transactions. A crucial condition for cum-cum to work, is that the original owner is able to transform the dividend income into a form of non-taxable income. In a share loan, the lender of the share would usually receive a "manufactured dividend" as a compensation from the borrower (Day, Castelijn, & van der Veen, 2014). While in a repurchase agreement, the transaction would for the original owner lead to a realisation of a capital gain at the time of the sale, or a reduction in capital losses (or an increase in a capital gain) in the future. So, for a cum-cum transaction to work, the original owner must be able to either avoid taxation of manufactured dividends or capital gains. In our opinion, this is unlikely to be achievable for investors who are subject to an income tax on dividends. British citizens, for instance, would have to pay income taxes on both manufactured dividends and capital gains (GOV.UK, 2018b). Consequently, for British shareholders, a temporary shift in ownership would often just transform the dividend income into other forms of taxable income.

We also believe that this would be the case for many foreign shareholders who attempt to avoid income tax on dividends in their own country. In Norway for instance, citizens would have to pay tax on both capital gains in foreign companies (The Norwgian Tax Administration,

2018a) and on dividend compensation payments received through share lending (The Norwegian Tax Administration, 2018b).

The reason why cum-cum works in relation to withholding taxes on dividends is because the country levying the withholding tax on the dividend, does not, and is often unable to, levy a comparable withholding tax on manufactured dividends and on capital gains.

8.2 Test of clustering level

Table 5
Comparison of estimated standard errors with different levels of clustering.

Countries /Clustering level	(1) No clustering	(2) Distribution Level	(3) Company Level	(4) Country level
Austria*D	0.0701	0.0701	0.0701	0.0701***
	(0.063)	(0.064)	(0.075)	(0.000)
Belgium*D	0.3133***	0.3133***	0.3133***	0.3133***
	(0.048)	(0.065)	(0.088)	(0.000)
Denmark*D	0.0928*	0.0928*	0.0928	0.0928***
	(0.050)	(0.053)	(0.065)	(0.000)
Finland*D	0.4049***	0.4049***	0.4049***	0.4049***
	(0.047)	(0.057)	(0.087)	(0.000)
France*D	0.1113***	0.1113**	0.1113*	0.1113***
	(0.039)	(0.043)	(0.066)	(0.000)
Germany*D	1.0083***	1.0083***	1.0083***	1.0083***
	(0.042)	(0.066)	(0.111)	(0.000)
Greece*D	0.1221	0.1221	0.1221	0.1221***
	(0.099)	(0.098)	(0.087)	(0.000)
Ireland*D	0.1494***	0.1494**	0.1494*	0.1494***
	(0.054)	(0.063)	(0.077)	(0.000)
Italy*D	0.5989***	0.5989***	0.5989***	0.5989***
	(0.043)	(0.055)	(0.068)	(0.000)
Luxembourg*D	0.0860	0.0860	0.0860	0.0860***
	(0.069)	(0.068)	(0.065)	(0.000)
Netherlands*D	0.7201***	0.7201***	0.7201***	0.7201***
	(0.041)	(0.062)	(0.105)	(0.000)
Norway*D	0.3693***	0.3693***	0.3693***	0.3693***
	(0.052)	(0.065)	(0.101)	(0.000)
Poland*D	0.2278***	0.2278***	0.2278**	0.2278***
	(0.062)	(0.080)	(0.110)	(0.000)
Portugal*D	0.3218***	0.3218***	0.3218**	0.3218***
	(0.074)	(0.099)	(0.129)	(0.000)
Spain*D	0.3402***	0.3402***	0.3402***	0.3402***
	(0.037)	(0.045)	(0.062)	(0.000)
Sweden*D	0.8122***	0.8122***	0.8122***	0.8122***
	(0.040)	(0.056)	(0.108)	(0.000)
Switzerland*D	0.2928***	0.2928***	0.2928***	0.2928***
	(0.051)	(0.060)	(0.081)	(0.000)
D (UK)	0.0299	0.0299	0.0299	0.0299***
	(0.024)	(0.026)	(0.033)	(0.000)
Country-specific constants				
1, Austria	-0.0033	-0.0033*	-0.0033	-0.0033***
	(0.011)	(0.002)	(0.002)	(0.000)
2, Belgium	-0.0112	-0.0112***	-0.0112***	-0.0112***
	(0.007)	(0.002)	(0.003)	(0.000)
3, Denmark	-0.0040	-0.0040***	-0.0040**	-0.0040***
	(0.008)	(0.002)	(0.002)	(0.000)

	(1)	(2)	(3)	(4)
4, Finland	-0.0143*	-0.0143***	-0.0143***	-0.0143***
	(0.007)	(0.002)	(0.003)	(0.000)
5, France	-0.0046	-0.0046***	-0.0046**	-0.0046***
	(0.006)	(0.001)	(0.002)	(0.000)
6, Germany	-0.0340***	-0.0340***	-0.0340***	-0.0340***
	(0.006)	(0.002)	(0.003)	(0.000)
7, Greece	-0.0050	-0.0050	-0.0050*	-0.0050***
	(0.017)	(0.003)	(0.003)	(0.000)
8, Ireland	-0.0059	-0.0059***	-0.0059**	-0.0059***
	(0.009)	(0.002)	(0.002)	(0.000)
9, Italy	-0.0206***	-0.0206***	-0.0206***	-0.0206***
	(0.006)	(0.002)	(0.002)	(0.000)
10, Luxembourg	-0.0038	-0.0038*	-0.0038**	-0.0038***
	(0.012)	(0.002)	(0.002)	(0.000)
11, Netherlands	-0.0246***	-0.0246***	-0.0246***	-0.0246***
	(0.006)	(0.002)	(0.003)	(0.000)
12, Norway	-0.0131	-0.0131***	-0.0131***	-0.0131***
	(0.008)	(0.002)	(0.003)	(0.000)
13, Poland	-0.0084	-0.0084***	-0.0084**	-0.0084***
	(0.010)	(0.002)	(0.003)	(0.000)
14, Portugal	-0.0115	-0.0115***	-0.0115***	-0.0115***
	(0.013)	(0.003)	(0.004)	(0.000)
15, Spain	-0.0121**	-0.0121***	-0.0121***	-0.0121***
	(0.005)	(0.001)	(0.002)	(0.000)
16, Sweden	-0.0276***	-0.0276***	-0.0276***	-0.0276***
	(0.006)	(0.002)	(0.003)	(0.000)
17, Switzerland	-0.0106	-0.0106***	-0.0106***	-0.0106***
	(0.008)	(0.002)	(0.002)	(0.000)
18, UK	-0.0010	-0.0010	-0.0010	-0.0010***
	(0.004)	(0.001)	(0.001)	(0.000)
Estimation method	OLS	OLS	OLS	OLS
Number of clusters	-	6,101	698	18
Observations	372,161	372,161	372,161	372,161
R-squared	0.008	0.008	0.008	0.008
Cluster-robust standard errors in parentheses				
Statistical significance: *** p<0.01, ** p<0.05, * p<0.1				

8.3 Regression results

Table 6
Regression results: Standardised trading volume in the cum-ex window in 18 EU and EFTA countries.

Countries/Period	(1) 2009-2018	(2) 2009-2011	(3) 2012-2015	(4) 2016-2018
Austria*D	0.0999	0.1771	0.0816	0.0442
	(0.068)	(0.144)	(0.085)	(0.127)
Belgium*D	0.3431***	0.1471*	0.3680***	0.4668***
	(0.082)	(0.087)	(0.117)	(0.135)
Denmark*D	0.1227**	-0.0333	0.0197	0.2936***
	(0.056)	(0.044)	(0.082)	(0.105)
Finland*D	0.4347***	0.4300***	0.5268***	0.3227***
	(0.080)	(0.098)	(0.114)	(0.103)
France*D	0.1412**	0.1265	0.1680**	0.1183*
	(0.057)	(0.081)	(0.080)	(0.064)
Germany*D	1.0382***	1.6763***	0.8236***	0.7621***
	(0.106)	(0.202)	(0.109)	(0.106)
Greece*D	0.1519*	0.1682	0.1908	0.1119
	(0.080)	(0.149)	(0.170)	(0.087)
Ireland*D	0.1792**	0.0336	0.2475**	0.1773*
	(0.070)	(0.135)	(0.112)	(0.091)
Italy*D	0.6287***	0.7460***	0.6544***	0.4703***
	(0.059)	(0.070)	(0.093)	(0.115)
Luxembourg*D	0.1159**	-0.1108	0.1983**	0.1813**
	(0.056)	(0.097)	(0.100)	(0.077)
Netherlands*D	0.7500***	0.6562***	0.8184***	0.7494***
	(0.100)	(0.144)	(0.117)	(0.130)
Norway*D	0.3991***	0.4598***	0.3056***	0.4682***
	(0.095)	(0.129)	(0.106)	(0.155)
Poland*D	0.2576**	0.3594**	0.2768*	0.1481
	(0.105)	(0.151)	(0.155)	(0.092)
Portugal*D	0.3517***	0.3764***	0.3525	0.3153*
	(0.125)	(0.138)	(0.255)	(0.178)
Spain*D	0.3701***	0.6456***	0.1522***	0.3864***
	(0.052)	(0.096)	(0.044)	(0.087)
Sweden*D	0.8420***	0.8820***	0.8757***	0.7688***
	(0.103)	(0.135)	(0.111)	(0.118)
Switzerland*D	0.3227***	0.1683*	0.5610***	0.2322**
	(0.074)	(0.087)	(0.134)	(0.101)
UK*D	0.0299	-0.0667	0.0621	0.0886*
	(0.033)	(0.050)	(0.050)	(0.054)
Country-specific constants				
1, Austria	-0.0033	-0.0058	-0.0027	-0.0014
	(0.002)	(0.005)	(0.003)	(0.004)
2, Belgium	-0.0112***	-0.0048*	-0.0121***	-0.0153***
	(0.003)	(0.003)	(0.004)	(0.004)
3, Denmark	-0.0040**	0.0011	-0.0006	-0.0096***
	(0.002)	(0.001)	(0.003)	(0.003)

	(1)	(2)	(3)	(4)
4, Finland	-0.0143***	-0.0141***	-0.0173***	-0.0106***
	(0.003)	(0.003)	(0.004)	(0.003)
5, France	-0.0046**	-0.0041	-0.0055**	-0.0039*
	(0.002)	(0.003)	(0.003)	(0.002)
6, Germany	-0.0340***	-0.0550***	-0.0270***	-0.0250***
	(0.003)	(0.007)	(0.004)	(0.003)
7, Greece	-0.0050*	-0.0055	-0.0063	-0.0037
	(0.003)	(0.005)	(0.006)	(0.003)
8, Ireland	-0.0059**	-0.0011	-0.0081**	-0.0058*
	(0.002)	(0.004)	(0.004)	(0.003)
9, Italy	-0.0206***	-0.0245***	-0.0215***	-0.0154***
	(0.002)	(0.002)	(0.003)	(0.004)
10, Luxembourg	-0.0038**	0.0036	-0.0065**	-0.0059**
	(0.002)	(0.003)	(0.003)	(0.003)
11, Netherlands	-0.0246***	-0.0215***	-0.0268***	-0.0246***
	(0.003)	(0.005)	(0.004)	(0.004)
12, Norway	-0.0131***	-0.0151***	-0.0100***	-0.0154***
	(0.003)	(0.004)	(0.003)	(0.005)
13, Poland	-0.0084**	-0.0118**	-0.0091*	-0.0049
	(0.003)	(0.005)	(0.005)	(0.003)
14, Portugal	-0.0115***	-0.0123***	-0.0116	-0.0103*
	(0.004)	(0.005)	(0.008)	(0.006)
15, Spain	-0.0121***	-0.0212***	-0.0050***	-0.0127***
	(0.002)	(0.003)	(0.001)	(0.003)
16, Sweden	-0.0276***	-0.0289***	-0.0287***	-0.0252***
	(0.003)	(0.004)	(0.004)	(0.004)
17, Switzerland	-0.0106***	-0.0055*	-0.0184***	-0.0076**
	(0.002)	(0.003)	(0.004)	(0.003)
18, UK	-0.0010	0.0022	-0.0020	-0.0029*
	(0.001)	(0.002)	(0.002)	(0.002)
Estimation method	OLS	OLS	OLS	OLS
Observations	372,161	105,896	147,315	118,950
Distributions	6,101	1,736	2415	1950
R-squared	0.008	0.013	0.008	0.007

Cluster-robust standard errors (clustered at company level) in parentheses
Statistical significance: *** p<0.01, ** p<0.05, * p<0.1

The dependent variable is the standardised trading volume on day d around dividend distribution i. Where d is limited to the 61-day period around the ex-date ($d \in \{-30; 30\}$). D_d is a binary indicator that is equal to one if the observation is within the cum-ex window, that is, if $d = \{-1, -2\}$.

Table 7
Regression results: Standardised trading volume in the cum-ex window in 18 EU and EFTA countries. Cum-ex window intercepts are relative to the UK intercept.

Countries/Period	(1) 2009-2018	(2) 2009-2011	(3) 2012-2015	(4) 2016-2018
Austria*D	0.0701	0.2439	0.0194	-0.0444
	(0.075)	(0.152)	(0.098)	(0.138)
Belgium*D	0.3133***	0.2138**	0.3058**	0.3782***
	(0.088)	(0.101)	(0.127)	(0.145)
Denmark*D	0.0928	0.0334	-0.0424	0.2050*
	(0.065)	(0.066)	(0.096)	(0.117)
Finland*D	0.4049***	0.4968***	0.4647***	0.2341**
	(0.087)	(0.110)	(0.125)	(0.116)
France*D	0.1113*	0.1932**	0.1058	0.0297
	(0.066)	(0.095)	(0.095)	(0.083)
Germany*D	1.0083***	1.7430***	0.7614***	0.6735***
	(0.111)	(0.208)	(0.120)	(0.118)
Greece*D	0.1221	0.2350	0.1286	0.0233
	(0.087)	(0.157)	(0.177)	(0.102)
Ireland*D	0.1494*	0.1003	0.1854	0.0887
	(0.077)	(0.144)	(0.123)	(0.105)
Italy*D	0.5989***	0.8127***	0.5922***	0.3817***
	(0.068)	(0.086)	(0.106)	(0.126)
Luxembourg*D	0.0860	-0.0441	0.1362	0.0927
	(0.065)	(0.109)	(0.112)	(0.094)
Netherlands*D	0.7201***	0.7229***	0.7562***	0.6608***
	(0.105)	(0.153)	(0.127)	(0.140)
Norway*D	0.3693***	0.5265***	0.2435**	0.3796**
	(0.101)	(0.138)	(0.117)	(0.164)
Poland*D	0.2278**	0.4262***	0.2147	0.0595
	(0.110)	(0.159)	(0.163)	(0.106)
Portugal*D	0.3218**	0.4431***	0.2903	0.2267
	(0.129)	(0.147)	(0.260)	(0.186)
Spain*D	0.3402***	0.7123***	0.0901	0.2978***
	(0.062)	(0.108)	(0.067)	(0.102)
Sweden*D	0.8122***	0.9487***	0.8136***	0.6802***
	(0.108)	(0.144)	(0.121)	(0.130)
Switzerland*D	0.2928***	0.2350**	0.4988***	0.1436
	(0.081)	(0.100)	(0.143)	(0.115)
D (UK)	0.0299	-0.0667	0.0621	0.0886*
	(0.033)	(0.050)	(0.050)	(0.054)
Country-specific constants				
1, Austria	-0.0033	-0.0058	-0.0027	-0.0014
	(0.002)	(0.005)	(0.003)	(0.004)
2, Belgium	-0.0112***	-0.0048*	-0.0121***	-0.0153***
	(0.003)	(0.003)	(0.004)	(0.004)
3, Denmark	-0.0040**	0.0011	-0.0006	-0.0096***
	(0.002)	(0.001)	(0.003)	(0.003)
4, Finland	-0.0143***	-0.0141***	-0.0173***	-0.0106***
	(0.003)	(0.003)	(0.004)	(0.003)

	(1)	(2)	(3)	(4)
5, France	-0.0046**	-0.0041	-0.0055**	-0.0039*
	(0.002)	(0.003)	(0.003)	(0.002)
6, Germany	-0.0340***	-0.0550***	-0.0270***	-0.0250***
	(0.003)	(0.007)	(0.004)	(0.003)
7, Greece	-0.0050*	-0.0055	-0.0063	-0.0037
	(0.003)	(0.005)	(0.006)	(0.003)
8, Ireland	-0.0059**	-0.0011	-0.0081**	-0.0058*
	(0.002)	(0.004)	(0.004)	(0.003)
9, Italy	-0.0206***	-0.0245***	-0.0215***	-0.0154***
	(0.002)	(0.002)	(0.003)	(0.004)
10, Luxembourg	-0.0038**	0.0036	-0.0065**	-0.0059**
	(0.002)	(0.003)	(0.003)	(0.003)
11, Netherlands	-0.0246***	-0.0215***	-0.0268***	-0.0246***
	(0.003)	(0.005)	(0.004)	(0.004)
12, Norway	-0.0131***	-0.0151***	-0.0100***	-0.0154***
	(0.003)	(0.004)	(0.003)	(0.005)
13, Poland	-0.0084**	-0.0118**	-0.0091*	-0.0049
	(0.003)	(0.005)	(0.005)	(0.003)
14, Portugal	-0.0115***	-0.0123***	-0.0116	-0.0103*
	(0.004)	(0.005)	(0.008)	(0.006)
15, Spain	-0.0121***	-0.0212***	-0.0050***	-0.0127***
	(0.002)	(0.003)	(0.001)	(0.003)
16, Sweden	-0.0276***	-0.0289***	-0.0287***	-0.0252***
	(0.003)	(0.004)	(0.004)	(0.004)
17, Switzerland	-0.0106***	-0.0055*	-0.0184***	-0.0076**
	(0.002)	(0.003)	(0.004)	(0.003)
18, UK	-0.0010	0.0022	-0.0020	-0.0029*
	(0.001)	(0.002)	(0.002)	(0.002)
Estimation method	OLS	OLS	OLS	OLS
Observations	372,161	105,896	147,315	118,950
Distributions	6,101	1,736	2,415	1,950
R-squared	0.008	0.013	0.008	0.007

Cluster-robust standard errors (clustered at company level) in parentheses
Statistical significance: *** p<0.01, ** p<0.05, * p<0.1

The dependent variable is the standardised trading volume on day d around dividend distribution i. Where d is limited to the 61-day period around the ex-date ($d \in \{-30; 30\}$). D_d is a binary indicator that is equal to one if the observation is within the cum-ex window, that is, if $d = \{-1, -2\}$.

Table 8
Regression results: Standardised trading volume in the cum-ex window in 18 EU and EFTA countries. In (1-2) the cum-ex window intercepts are relative to the German intercept. In (3-4) the cum-ex window intercepts are relative to the German intercept for 2009-2011.

Countries/Period	(1) 2009-2018	(2) 2009-2011	(3) 2012-2015	(4) 2016-2018
Austria*D	-0.9383***	-1.4991***	-1.5947***	-1.6321***
	(0.126)	(0.248)	(0.219)	(0.238)
Belgium*D	-0.6951***	-1.5291***	-1.3083***	-1.2094***
	(0.134)	(0.220)	(0.233)	(0.243)
Denmark*D	-0.9155***	-1.7096***	-1.6566***	-1.3827***
	(0.120)	(0.207)	(0.218)	(0.227)
Finland*D	-0.6034***	-1.2462***	-1.1494***	-1.3535***
	(0.133)	(0.225)	(0.232)	(0.227)
France*D	-0.8970***	-1.5498***	-1.5083***	-1.5580***
	(0.121)	(0.218)	(0.217)	(0.212)
Greece*D	-0.8862***	-1.5080***	-1.4855***	-1.5644***
	(0.133)	(0.251)	(0.264)	(0.220)
Ireland*D	-0.8589***	-1.6426***	-1.4287***	-1.4989***
	(0.127)	(0.243)	(0.231)	(0.221)
Italy*D	-0.4094***	-0.9303***	-1.0219***	-1.2060***
	(0.122)	(0.214)	(0.223)	(0.232)
Luxembourg*D	-0.9223***	-1.7871***	-1.4779***	-1.4949***
	(0.120)	(0.224)	(0.225)	(0.216)
Netherlands*D	-0.2882**	-1.0201***	-0.8579***	-0.9268***
	(0.146)	(0.248)	(0.234)	(0.240)
Norway*D	-0.6390***	-1.2165***	-1.3707***	-1.2081***
	(0.143)	(0.240)	(0.228)	(0.255)
Poland*D	-0.7806***	-1.3168***	-1.3994***	-1.5281***
	(0.149)	(0.252)	(0.255)	(0.222)
Portugal*D	-0.6865***	-1.2999***	-1.3238***	-1.3609***
	(0.164)	(0.245)	(0.326)	(0.269)
Spain*D	-0.6681***	-1.0307***	-1.5241***	-1.2899***
	(0.118)	(0.224)	(0.207)	(0.220)
Sweden*D	-0.1961	-0.7942***	-0.8005***	-0.9075***
	(0.148)	(0.243)	(0.230)	(0.234)
Switzerland*D	-0.7155***	-1.5080***	-1.1153***	-1.4441***
	(0.130)	(0.220)	(0.242)	(0.226)
UK*D	-1.0083***	-1.7430***	-1.6141***	-1.5877***
	(0.111)	(0.208)	(0.208)	(0.209)
D (Germany)	1.0382***	1.6763***	1.6763***	1.6763***
	(0.106)	(0.202)	(0.202)	(0.202)
Germany*D*T^2			-0.8527***	
			(0.175)	
Germany*D*T^3				-0.9142***
				(0.196)
Country-specific constants				
1, Austria	-0.0033	-0.0058	-0.0027	-0.0014
	(0.002)	(0.005)	(0.003)	(0.004)
2, Belgium	-0.0112***	-0.0048*	-0.0121***	-0.0153***
	(0.003)	(0.003)	(0.004)	(0.004)

	(1)	(2)	(3)	(4)
3, Denmark	-0.0040**	0.0011	-0.0006	-0.0096***
	(0.002)	(0.001)	(0.003)	(0.003)
4, Finland	-0.0143***	-0.0141***	-0.0173***	-0.0106***
	(0.003)	(0.003)	(0.004)	(0.003)
5, France	-0.0046**	-0.0041	-0.0055**	-0.0039*
	(0.002)	(0.003)	(0.003)	(0.002)
6, Germany	-0.0340***	-0.0550***	-0.0270***	-0.0250***
	(0.003)	(0.007)	(0.004)	(0.003)
- (2009-2011)			-0.0280***	-0.0300***
			(0.006)	(0.006)
7, Greece	-0.0050*	-0.0055	-0.0063	-0.0037
	(0.003)	(0.005)	(0.006)	(0.003)
8, Ireland	-0.0059**	-0.0011	-0.0081**	-0.0058*
	(0.002)	(0.004)	(0.004)	(0.003)
9, Italy	-0.0206***	-0.0245***	-0.0215***	-0.0154***
	(0.002)	(0.002)	(0.003)	(0.004)
10, Luxembourg	-0.0038**	0.0036	-0.0065**	-0.0059**
	(0.002)	(0.003)	(0.003)	(0.003)
11, Netherlands	-0.0246***	-0.0215***	-0.0268***	-0.0246***
	(0.003)	(0.005)	(0.004)	(0.004)
12, Norway	-0.0131***	-0.0151***	-0.0100***	-0.0154***
	(0.003)	(0.004)	(0.003)	(0.005)
13, Poland	-0.0084**	-0.0118**	-0.0091*	-0.0049
	(0.003)	(0.005)	(0.005)	(0.003)
14, Portugal	-0.0115***	-0.0123***	-0.0116	-0.0103*
	(0.004)	(0.005)	(0.008)	(0.006)
15, Spain	-0.0121***	-0.0212***	-0.0050***	-0.0127***
	(0.002)	(0.003)	(0.001)	(0.003)
16, Sweden	-0.0276***	-0.0289***	-0.0287***	-0.0252***
	(0.003)	(0.004)	(0.004)	(0.004)
17, Switzerland	-0.0106***	-0.0055*	-0.0184***	-0.0076**
	(0.002)	(0.003)	(0.004)	(0.003)
18, UK	-0.0010	0.0022	-0.0020	-0.0029*
	(0.001)	(0.002)	(0.002)	(0.002)
Estimation method	OLS	OLS	OLS	OLS
Observations	372,161	105,896	154,574	126,209
Distributions	6,101	1,736	2,534	2,069
R-squared	0.008	0.013	0.011	0.011

Cluster-robust standard errors (clustered at company level) in parentheses
Statistical significance: *** p<0.01, ** p<0.05, * p<0.1

The dependent variable is the standardised trading volume on day d around dividend distribution i. Where d is limited to the 61-day period around the ex-date ($d \in \{-30; 30\}$). D_d is a binary indicator that is equal to one if the observation is within the cum-ex window, that is, if $d = \{-1, -2\}$.

(1-2) Are based on the following specification:

$$S_{i,d} = \beta_c + \delta_1 D_d + \delta_s D_d + \varepsilon_{i,d}$$

(3) Is based on the following specification:

$$S_{i,d} = \beta_c + \beta_1 T^1_{GER} + \delta_1 D_d + \delta_2 T^2_{GER} D_d + \delta_s D_d + \varepsilon_{i,d}$$

(4) Is based on the following specification:

$$S_{i,d} = \beta_c + \beta_1 T^1_{GER} + \delta_1 D_d + \delta_2 T^3_{GER} D_d + \delta_s D_d + \varepsilon_{i,d}$$

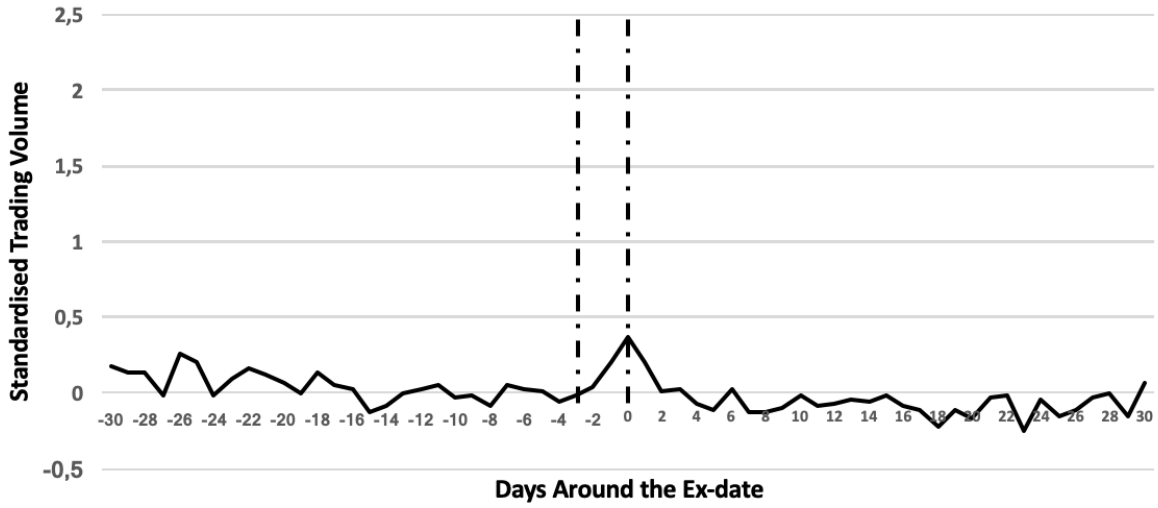
Where:

- $c \in \{"Austria", \dots, "UK"\}$
- $s \in \{"Austria", \dots, "UK"\}, \quad s \notin "Germany"$
- T^p_{GER} is dummy variable that is equal to one if the distribution is from a German company in period p

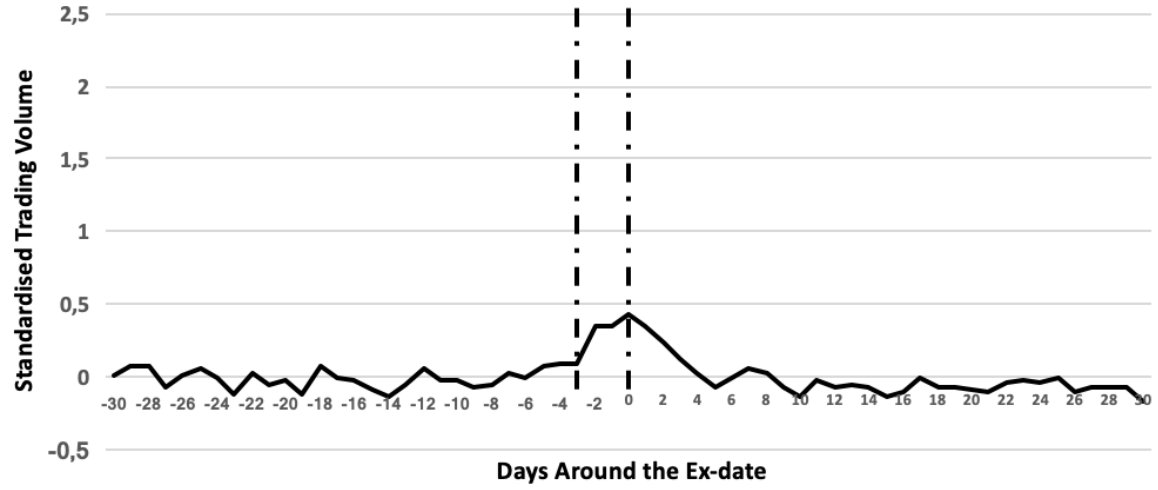
8.4 Graphs with trading paterns

Graphs 19-28 show average standardised trading volume in various countries on days around the ex-date for the whole ten-year period (2009-2018). The vertical dashed lines mark the normal cum-ex window (Ex-2 and Ex-1).

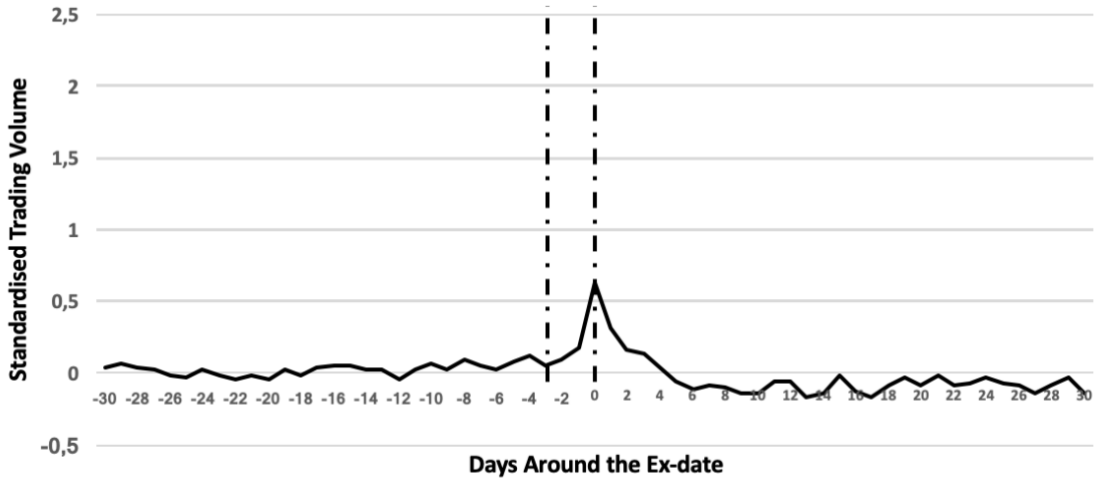
Graph 19 - Austria



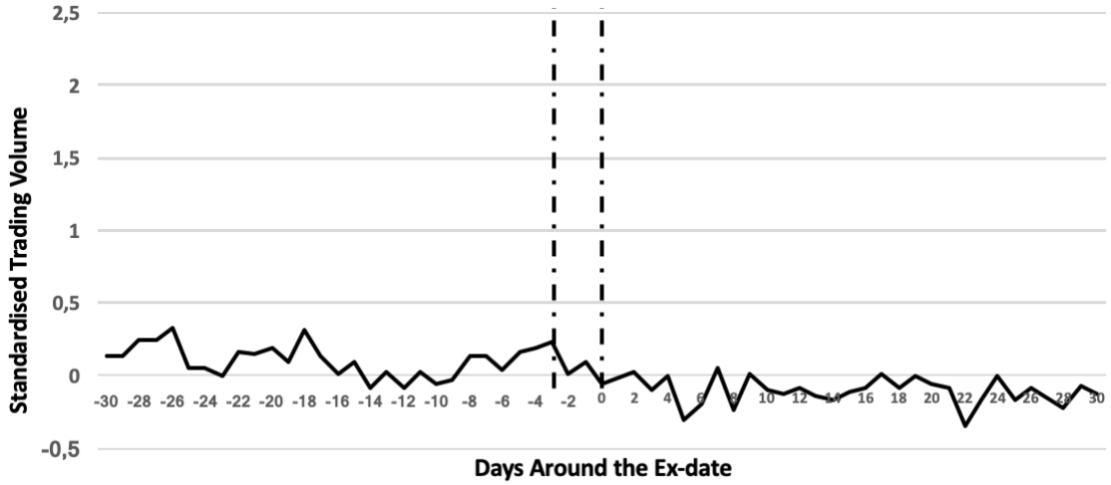
Graph 20 - Belgium



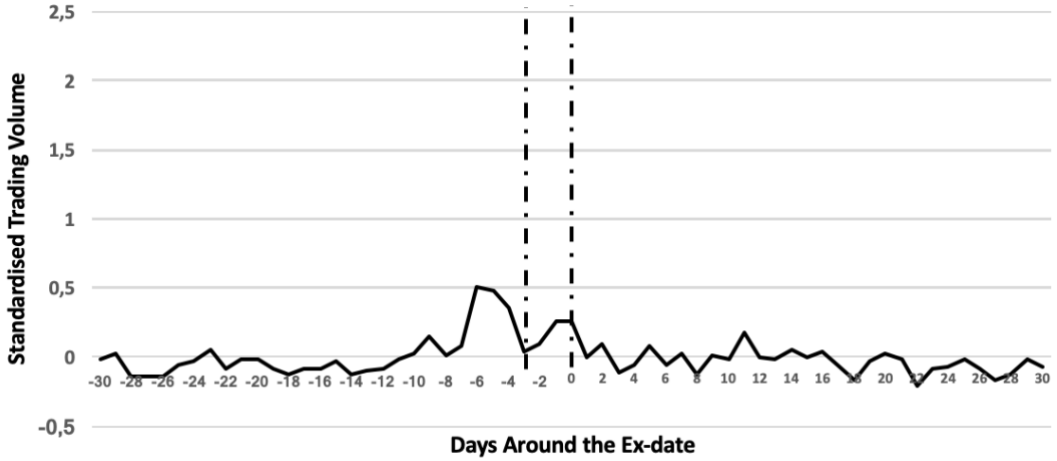
Graph 21 - France



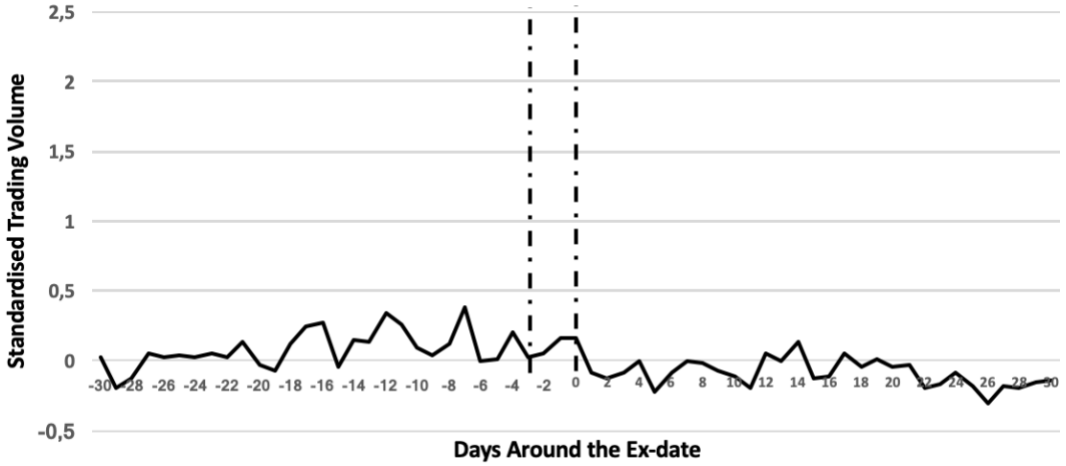
Graph 22 - Greece



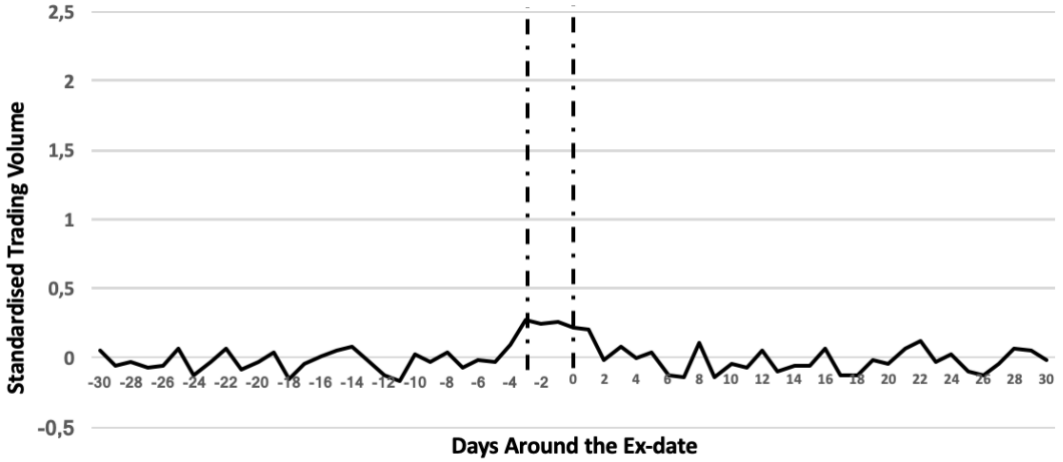
Graph 23 - Ireland



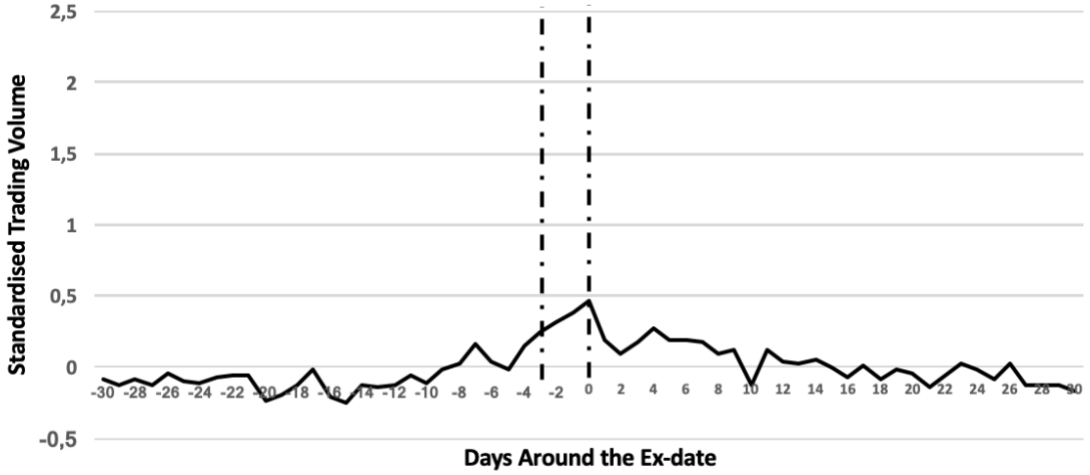
Graph 24 - Luxembourg



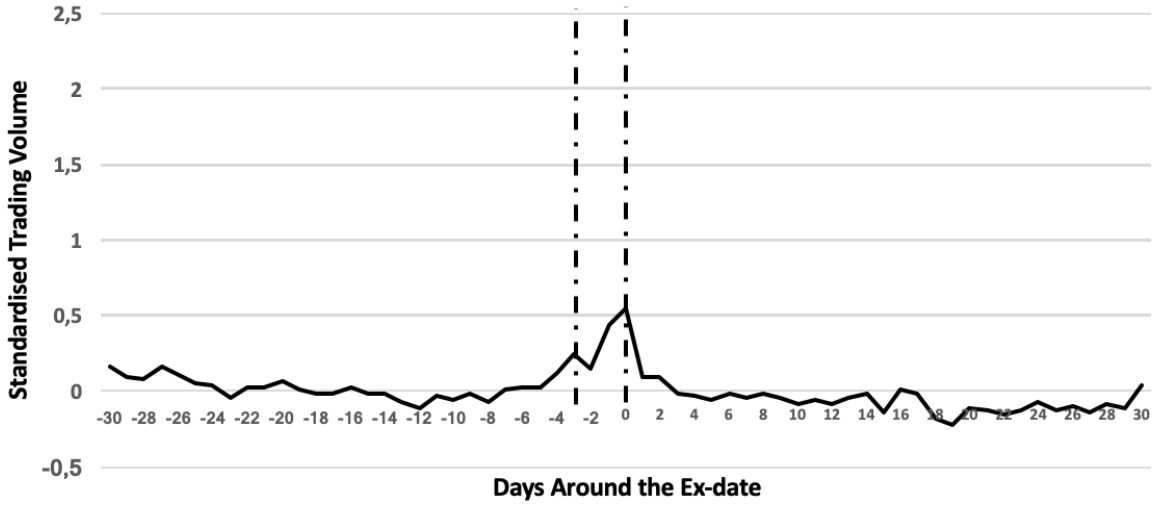
Graph 25 - Poland



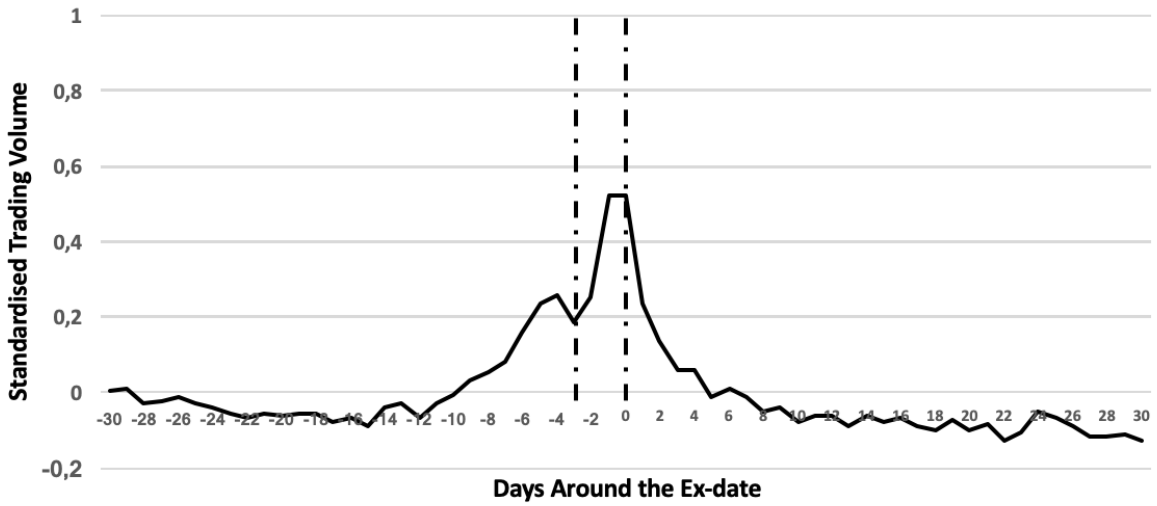
Graph 26 - Portugal



Graph 27 - Switzerland



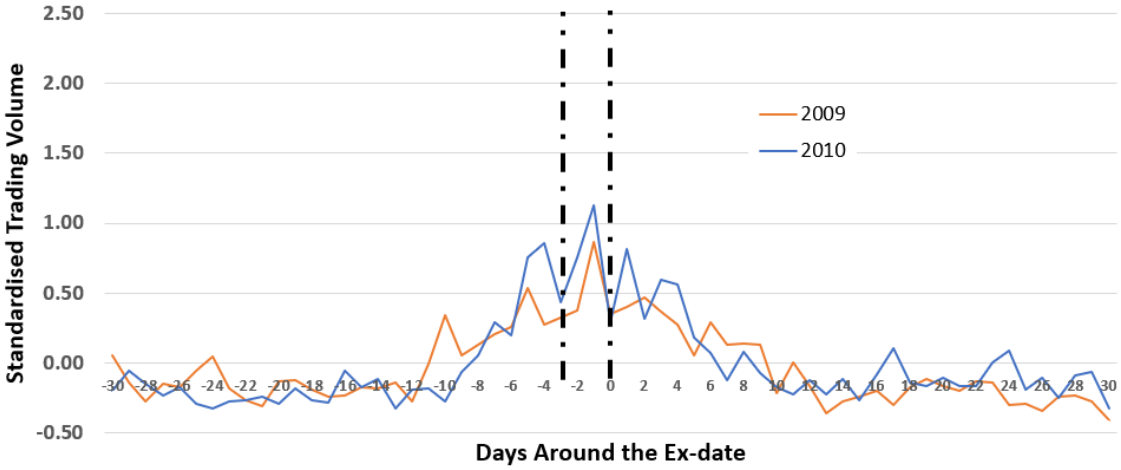
Graph 28 - All countries combined



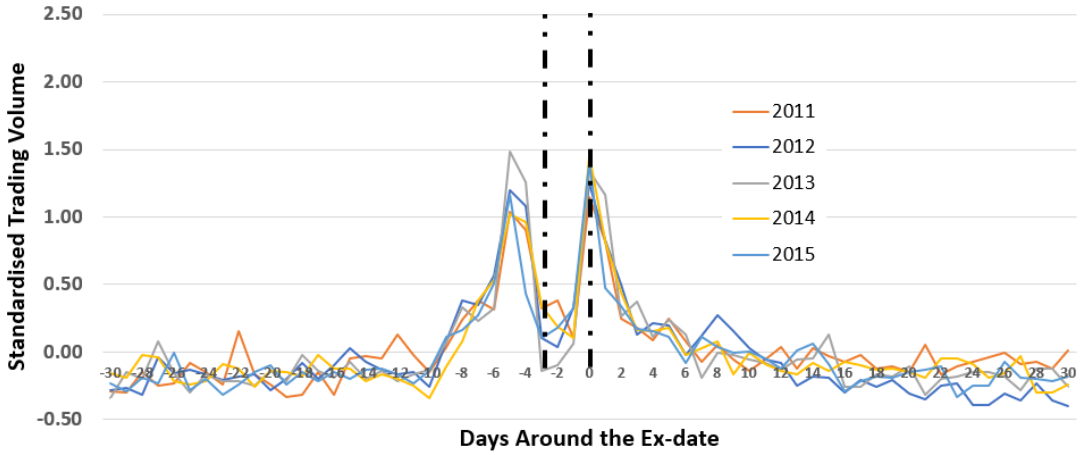
Graphs 29-31 show average standardised trading volume in Spain on days around the ex-date for all the years from 2009 to 2018 separately. The vertical dashed lines mark the normal cum-ex window (Ex-2 and Ex-1).

Graph 30 shows that the distinct two-peak trading pattern in Spain is remarkably consistent for the years 2011-2015.

Graph 29 – Spain 2009-2010



Graph 30 – Spain 2011-2015



Graph 31 – Spain 2016-2018