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The Effect of the 2016 Tax Reform Act on Cum-Cum Trading in Germany

An empirical study on trading volume of the 100 most traded stocks from 2012 to 2018

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Master thesis in Economics and Business Administration

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Preface

This thesis is written as part of our Master of Science degree in Financial Economics at the Norwegian School of Economics (NHH). The purpose of this thesis is to investigate the effect of the 2016 Tax Reform Act, aimed at combatting so-called cum-cum trading in Germany. Our data sample has required both programming and data cleaning in the statistical software Stata, which has also been applied in our empirical analysis. This thesis has been an educative process with enhanced insights into the financial stock market, as well as an improved understanding of econometrics and the methodologies used when conducting an empirical analysis in financial economics.

First and foremost, we wish to express a special gratitude to our supervisor, Associate Professor Floris Tobias Zoutman. He has given us invaluable insight and guidance, and his generous sharing of expertise in empirical studies has been critical for the quality of this thesis. Moreover, we would like to thank Skatt Vest and the Norwegian Centre for Taxation (NoCeT) for granting us the scholarship for this thesis written in the field of public finance. Additionally, we would like to thank family and friends for motivation and guidance during our writing process. All your support has been valuable and much appreciated.

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Abstract

Various cases of sophisticated tax-motivated trading practices have recently received public attention all across Europe. These practices, some of them considered frauds, have deprived the targeted jurisdictions of tremendous tax income. In Germany the size amounts to billions of euros, and authorities have throughout the last years introduced several legislations in order to prevent these practices.

In this thesis we investigate the effect of the 2016 Tax Reform Act, aimed at combatting cum-cum trading in Germany. The intention behind the reform is to reduce trading between foreign and domestic market participants around ex-dividend date, who have previously capitalized on a loophole that allowed foreign participants to avoid paying withholding tax on dividends. The Federal Central Tax Office (Bundeszentralamt für Steuern) in Germany introduced this reform only four years after prohibiting cum-ex trading, a similar, nonetheless more sophisticated tax-avoiding practice.

We conduct an event study to investigate whether the legislation has achieved its intended effect by analysing the trading volume for the 100 most traded German stocks in the period January 2012 to July 2018. By analysing the trading volume in a seven-day window around the stock going ex-dividend, we find a significant decrease in the trading volume for five out of the seven days for taxable dividends, after the tax legislation was introduced. We have further analysed whether the decrease in trading volume around ex-dividend date has been greater for high yielding dividends than low or medium yielding dividends, but our results are inconclusive on the matter.

Whether the tax legislation introduced in 2016 has achieved its desired effect will need further research, but we argue that the preventative reform is an improvement in reducing the cost to the German state and its taxpayers.

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Chapter 1

Introduction

Christoph Spengel, professor for International Taxation at the University of Mannheim, claims the German state has lost at least €31.8 billion in tax revenues since 2001. This robbery of the German state has been conducted by bankers and brokers through sophisticated trading practices such as manipulation of tax payments and refunds on dividends, and the professor proclaims it to be the biggest tax scandal in the history of the Federal Republic of Germany (Zeit, 2017).

These banking and broker practices, called cum-ex and cum-cum trades, have deprived the German state and its taxpayers of at least €7.2 billion and €24.6 billion, respectively. However, preventative measures against both practices have been enacted lately. Cum-ex trading was prohibited in 2012 through the *Undertakings for Collective Investment in Transferable Securities Directive* (UCITS), while the tax legislation to avert cum-cum trading was passed in July 2016, with retroactive effect from January 1st, 2016 (Junge & Kleutgens, 2016).

Cum-ex and cum-cum trading have similar traits as both structures aim to avoid paying the dividend withholding tax. The latter practice, which will be the focus in this thesis, is characterized by a foreign investor selling or lending its shares to a German taxpayer prior to the dividend distribution. The contractual obligation is agreed in advance with (cum) the dividend entitlement, and the subsequent delivery of the shares is also with (cum) the entitlement (Behnes, Brodersen, & Klein, 2016). This is conducted because the German taxpayer can have the withholding tax fully refunded or credited according to German tax law, while the foreign investor cannot. When the dividend is entitled to the German taxpayer, the shares are transferred back to the foreign investor. Exploiting this tax asymmetry makes it possible for the foreign investor to transform the dividend withholding tax into other types of income which are not subject to tax at the source. Contrary to its purpose, which is to generate income to the German state, the withholding tax is instead shared between the two parties. Cum-cum trading is per definition not illegal, but considered illegitimate as the purpose is to avoid the legal taxation of dividends (Spengel, 2016).

In cum-ex trading, shares are purchased with (cum) a dividend just before dividend record date and delivered without (ex) dividend, and through sophisticated constructions it is possible to have tax refunded multiple times (Büttner, Holzmann, Kreidl, & Scholz, 2018). Unlike cum-cum trading, cum-ex trading is considered illegal and was prohibited through the UCITS in 2012. In order to conduct either of these transactions, shares in a dividend distributing company have to change hands. This is reflected in the trading volume, and thus leading to excess trading around the dividend distribution date.

Besides the research by Spengel, the magnitude of cum-ex and cum-cum practices received substantial media attention in October 2018 in response to the *cum-ex files*, the collective cross-border investigation conducted by journalists from several European countries (Correctiv, 2018). The broad magnitude, showing how these highly sophisticated practices have affected several of the biggest economies in Europe, rose important questions with respect to tax legislations and their effect. The question now lingers whether similar practices are still in effect today.

Transnational tax-induced trading has been examined in previous literature. Büttner, Holzmann, Kreidl and Scholz (2018) investigated the noncompliance on withholding tax involving tax-induced trading in Germany, showing an increase in trading volume around ex-dividend date due to these transactions. However, their focus is cum-ex transactions, while we argue that cum-cum transactions needs further investigation. An interesting aspect to investigate in cum-cum transactions is whether there exist a preference discrepancy with regard to dividend yields. Haesner and Schanz (2013) analysed the effects on trading volume of the 2001 German tax reform, including an analysis for different dividend-yield groups, finding tax-motivated trading is most substantial for high yielding dividends.

With our thesis, we aim to contribute to the existing litterature by examining one of the most sophisticated tax-avoiding trading practices in Europe the last decade. We aim to bring further insight to the topic by empirically undertake the regulation German tax authorities introduced in order to prevent cum-cum trades. By analysing its effect on stock market trading behaviour, we hope this can lead to an increased understanding and insight that can be taken into consideration when constructing similar legislations in both Germany and other countries.

This has inspired us to examine the following two hypotheses:

> **H1**: *The trading volume within a three-day window [-3, 3] before and after ex-dividend date should decrease after July 26th 2016.*
>
> **H2**: *The decrease in trading volume is greater for high yielding dividends than medium and low yielding dividends after July 26th 2016.*

Our thesis will undertake these hypotheses by analysing trading volumes around ex-dividend date, and study whether the new tax reform has achieved its intended effect in preventing cum-cum trading. As cum-ex and cum-cum trading have many similar traits, with regard to trading around ex-dividend date and claims of tax credit, our research will look at trading data in the period from 2012 to 2018. This is due to the directive that came into effect on January 1st 2012 to stop cum-ex trades and the issuance of multiple withholding tax certificates. We exclude the effect of cum-ex trading on the trading volume by studying trading data after 2011. The magnitude of these transactions have been extensive, and excluding cum-ex trading allows us to examine whether there has been a decrease in trading volume around ex-dividend date in the post-legislation period (2016-2018) for cum-cum trading. The legislation was enforced with retroactive effect from January 1st 2016, however our post-legislation period will be from July 26th 2016 and onwards. This is in accordance with the InvTRA publishing date in the German Federal Gazette[1] (Junge & Kleutgens, 2016).

The rest of the thesis is structured as followed: Chapter 2 presents relevant literature providing a background for this thesis. Chapter 3 takes on the theoretical framework that we find relevant to present. The relevant literature and theoretical framework will form our hypotheses which we will present in Chapter 4. Next, in Chapter 5, the data sample and empirical methodology used to solve our hypotheses will be outlined, before we analyse and interpret our empirical findings in Chapter 6. In Chapter 7 we present our conclusion.

[1] Official publishing platform for publications and legally relevant corporate news.

Chapter 2

Relevant literature

Cum-ex and cum-cum trading have been prominently covered and discussed by German media in particular, but also grasped global media attention due to its broad latitude. However, there have not been many studies researching the distinctiveness of cum-cum trading and the impact of the 2016 tax legislation due to the recent enactment of preventative measures. This chapter will take on the relevant literature to undertake our hypotheses.

Our thesis contributes to the existing literature exploring stock market behavior, particularly trading volume around ex-dividend days and the impact of dividend-taxation, e.g. Lakonishok and Vermaelen (1986), Michaely and Vila (1995), McDonald (2001) and Liljeblom et al. (2001). Haesner and Schanz (2013) claim there were no significant decrease in the trading volume after the 2001 tax reform, a reform that fundamentally changed the relative taxation of dividend income and capital gains in Germany. They find that trading volume around ex-dividend day is not positively related to tax heterogeneity. Similarly, we will contribute by studying the change in trading volume before and after the 2016 reform, though with a cross-border concentration. Sander (2007) includes cross-border transactions in his analysis of Estonian stock market data and ownership structures around ex-dividend date from 2000 to 2006. He finds tax-induced trading around ex-dividend date, because of tax heterogeneity in dividend treatments for foreign and domestic market participants.

Miller and Modigliani's (1961) clientele theory states that tax heterogeneity can lead to tax-induced dividend clienteles, consistent with findings of tax-induced clientele effects by Elton and Gruber (1970). Both Lakonishok and Vermaelen (1986) and Haesner and Schanz (2013) find tax-motivated abnormal trading to be present where the tax benefits are highest, i.e. in the high yielding dividend group. This is consistent with the dynamic trading clientele theory of Michaely and Vila (1995), stating that trading volume is positively related to tax heterogeneity and dividend yield. Our research will contribute by looking at the dividend yields before and after the 2016 reform, that is, in which yield group the impact is most prominent.

Büttner et al. (2018) also investigates the stock market behaviour around ex-dividend date, and the effect of cum-ex trading strategy before the tax reform introduced in 2012. Their study

deliberates empirical predictions for cum-ex effects on the stock market in light of the reform, and find that positive significant trading volumes around ex-dividend date pre-period turns insignificant post-period. Our findings will contribute to this research, but with the focus targeted towards cum-cum trading rather than cum-ex trading.

Previous research covers trading activity around ex-dividend date and dividend taxation in terms of trading volume behaviour. The contribution by Büttner et al. (2018) on withholding-tax noncompliance with evidence from the cum-ex stock market transactions contributes with important empirical insight to one of the biggest tax fraud scandals in Europe. We will contribute to the existing literature on dividend taxation and withholding-tax noncompliance, with the investigation of cum-cum trading volume effects around ex-dividend day. We provide insight on the dividend-arbitrage strategy that cost several European countries an incredible amount of tax income, including Germany, France and Scandinavian countries among others (Podkul, 2016). We conduct an empirical analysis on whether the introduction of the tax legislation of 2016 in Germany have achieved its intended effect, and hence reduced the trading volume with respect to cum-cum trading around ex-dividend date.

Chapter 3

Theoretical framework

This chapter aims to provide a deeper understanding of the practices in Germany related to withholding tax and dividend distribution, as well as reasons for abnormality in trading around ex-dividend date. Our focus is on cum-cum transactions and the preventative 2016 legislation.

3.1 Withholding tax and dividend distribution process in Germany

3.1.1 Withholding tax on dividend for a German and US investor

Germany is an attractive place for foreign investors to make investments, and according to Deutsche Bank Research (2017) foreign investors in the DAX[2] has risen from 45 per cent to 58 per cent in the period 2005 to 2015. Thus, in order to prevent illegal utilization of tax-avoidance, taxation rules should harmonize with cross-border capital flows. US investors are one of the the largest foreign market participants in Germany, and US investment funds are among the most extensive exploiters of both cum-ex and cum-cum transactions (Podkul, 2016). We will therefore present tax treatment rules that apply for a US investor in order to represent a foreign investor, an investor class necessary to conduct cum-cum transactions.

Table 1: Dividend taxation for a German and US investor

	German investor		US investor	
Gross dividend	€	1,000	€	1,000
Withholding tax, τ_w = 25%	-€	250	-€	250
Net dividend	€	750	€	750
Tax refund	€	250	€	100
Dividend	€	1,000	€	850

In Table 1, the tax treatment for a German investor and a US investor is illustrated with an example where the investor receives €1,000 in gross dividend from a German company, and

[2] Stock market index covering the 30 major companies trading on the Frankfurt Stock Exchange, with prices taken from the Xetra trading venue.

both investors are subject to a withholding tax[3], τ_w. The withholding tax of €250 is paid by the German shareholder's outstanding corporate income tax at the time the dividend is distributed, and can be refunded or credited on the shareholder's behalf against its outstanding taxes. However, this does not apply to the US investor as he is not eligible for fully credit or refunding of the €250. In the case of the US investor, a double tax treaty agreement exists, and the investor can have his withholding tax of €250 partially reimbursed. Depending on the case, there are three types of withholding tax reductions available for the US investor. For simplification, we will structure our theory around the general reduction rate, which is 15%. If a US investor originally is subject to a rate of 25%, but the treaty makes the rate 15%, the refunded amount is therefore €100.

Thus, in order to avoid paying this tax, the investor sells or lends his shares cum dividend to a German taxpayer, as the German is entitled to have the withholding tax on the dividend refunded or credited (Behnes et al., 2016) . A transaction is considered abusive according to § 42 in the German Tax Code (Abgabenordnung) if there is no reasonable economic justification for the transaction between the two parties, and the overall trade has tax-motivated structure. The legal consequence is that the German taxpayer will not receive its intended tax refund or credit (BaFin, 2017).

However, dividends distributed from the company's tax contribution account are not subject to withholding tax according to § 27 in the German Corporation Tax Act (Körperschaftsteuergesetz). That is, the dividend is withholding tax free, and whether or not the dividend is subject to taxation outside Germany is dependent upon the tax regulation authorities in the foreign investor's jurisdiction.

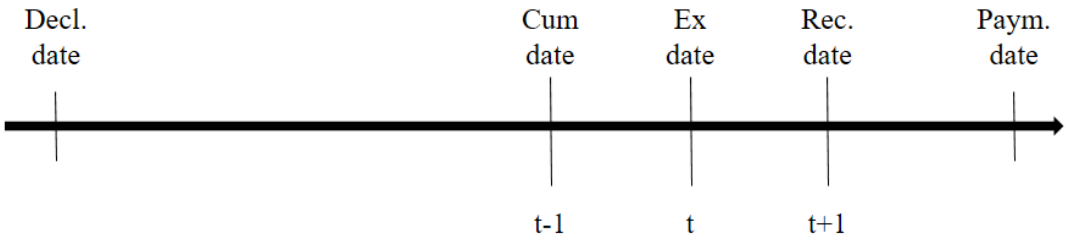
3.1.2 Dividend distribution process in Germany

Cum-cum trading is fundamentally structured around the dividend distribution process. A dividend is the amount or percentage of a firms generated profits that can, if declared by the board of directors and voted through, be distributed to the shareholders as a cash dividend, share repurchases or other types special designated dividends (Baker, Weigand, & Johnson, 2015). For this thesis, the focus will be on cash dividends, which is money paid directly to the

[3] Tax deducted from the dividend distributed to the shareholder in the source jurisdiction of the investment (Beegun & Schneider, 2018).

company's shareholders[4]. Dividends in German companies are usually distributed annually. The amount is based on the business' prospects and appropriated prospects for the following year, and is distributed on a per share basis. The dividend yields can vary, and especially high-yield dividend paying stocks are popular due to their stability in returns when markets are uncertain (Henne, Ostrowski, & Reichling, 2009).

Figure 1: Dividend distribution process in Germany



Source: Own contribution

Simultaneously as the dividend and its *payment date* is declared at the annual general meeting, a date in the future is set in which shareholders must be listed in the company's books. This date is the *record date*, illustrated in figure 1 as *t+1*, and is the date shareholders must be listed in the books to be the rightful receivers of the dividend. After the *declaration date*, the stock is trading *cum* dividend. For the shareholder to be recognized as an eligible owner of the stock on the record date, the shareholder must have initiated the transaction two days before the record date, according to German stock exchange rules (Clearstream Banking AG, 2018). Thus, in order to receive the dividend, the investor has to initiate the trade at the *cum-dividend date*, hereby *t-1*. At day *t*, the stock is traded *ex* dividend and symbols the first day in which the shareholder will not receive the dividend. If the stock is purchased on or after this date the stock is traded ex dividend. In order to conduct a cum-cum transaction, the domestic credit institution has to be in the company's books and be the rightful receiver of the dividend. Due to this, we expect to see an increase in trading volume around the ex-dividend date.

3.2 Abnormality in trading around ex-dividend date

The aim of this thesis is to analyse the abnormality in the trading volume around the ex-dividend date, and investigate whether we can observe a significant reduction in the trading

[4] Dividend distribution timeline may look different for other types of dividends.

volume after the cum-cum preventative tax legislation of 2016 came into effect. We thus find it relevant to present general reasons for observing abnormality, as well as a more specific reason related to cum-cum trading, namely cum-ex trading.

3.2.1 General reasons for abnormality

In stock market transactions, supply and demand is what drives the trading and creates a stock market equilibrium. Investors who want to buy stocks find investors who want to sell. To the fact that these market transactions are timed to capture or avoid the dividend, we expect to see abnormality in the trading volume around the stock going ex-dividend. Additionally, trade incentives should increase with dividend yield, implying that high yielding dividends are more incentivised due to its tax credit effects, e.g. Lakonishok and Vermaelen (1986) and Haesner and Schanz (2013). A highly reasonable trigger for increased trading volume is therefore the shareholder's tax motives, and trading with the purpose of avoiding taxes is a valid explanation for observing abnormality around ex-dividend date. However, the lack of cross-border tax harmonization across jurisdictions is just one of several reasons why we observe abnormal trading volumes related to dividend distribution events.

According to finance theory, the share price should drop similar to the dividend amount less taxes in a perfect capital environment. However, significant deviations from a one-to-one share price drop-to-dividend relationship implies abnormal return and thus makes it attractive for investors to invest around ex-dividend date due to tax effects (Michaely & Vila, 1995). This is a plausible explanation for why we see abnormality in this period.

However, in their investigation of trading volume behaviour at the Athens Stock Exchange, Milonas and Travlos (2001) find significantly positive abnormal volumes around ex-dividend date. That is despite the fact that Greece did not have any taxation on dividends and capital gains in 2001. Graham and Kumar (2006) find that dividend yield preferences are related to life cycle, indicating that older investors, in order to receive dividend, buy stocks cum-dividend date or earlier. Hence, tax-motivated dividend-capturing activities are not the only reason why we observe abnormality in trading volume.

Cum-cum transactions were, until 2016, conducted by either selling or lending the shares to the domestic counterpart. Spot transactions are reflected in the trading data, but that is not the case for stock lending transactions (Xetra, personal communication, 2018). That is, the effect of the

2016 tax reform is not assumed to be entirely reflected in the trading volume. However, Uno, Umeno and Muroi (2009) state in their study on the Japanese stock lending market that the greater the stock's liquidity is in the stock lending market, and the larger deviation the opinion is with regard to that particular stock, the larger the trading volume in the stock market becomes. With that taken into consideration, we can assume that some of the effect from stock lending is still reflected in the trading volume.

3.2.2 Specific reason for abnormality: Cum-ex trading

There are more specific reasons why we can observe abnormal trading volumes around ex-dividend date. Tax-avoiding practices such as dividend stripping[5] are among these, and one specific related to cum-cum transactions is cum-ex transactions. Until the end of 2011, both these sophisticated transactions were present in the German market, hence affecting the trading volume around dividend dates (Büttner et al., 2018). Cum-cum trading is considered a variant of the cum-ex trading strategy, and we therefore find it appropriate to present cum-ex transactions and why this made trading volumes abnormal until the 2012 legislation came into effect.

The laws that were in place until 2011, where the withholding tax was remitted by the dividend-paying company and the German credit institution issued the tax credit certificate, created a discrepancy between the remitting and the issuing party. This made the tax collection process exposed to fraud. Trades conducted to capitalize on this were facilitated, causing the trading volume around the dividend date to be abnormal (Büttner et al., 2018). In order to conduct a cum-ex trade, a cum-ex seller conducts short sales prior to the record date to a cum-ex buyer with the agreement to deliver the shares on the ex-dividend date. A third-party, the legal owner of the shares, receives the dividend from the German dividend distributing company. On the ex-dividend date, the seller delivers the shares to the buyer. The buyer then receives a compensation from the seller through a dividend clearing process, similar to the dividend net of tax. As the dividend distributing company withholds the tax, tax certificates for reimbursement are issued twice. One is issued to the legal third-party owner of the stock, and because the buyer's depository bank does not consider the short-sale aspect of the transaction, a tax certificate is also issued to the buyer. The withholding tax is thus refunded too many times.

[5] Tax-avoiding transactions around ex-dividend date. Occurs when what should have been a taxable dividend is converted into capital gain for the shareholder (Naik, 2018).

Investors conducting these sophisticated trades were therefore causing abnormality in the trading volume around ex-dividend date until the end of 2011 (Büttner et al., 2018).

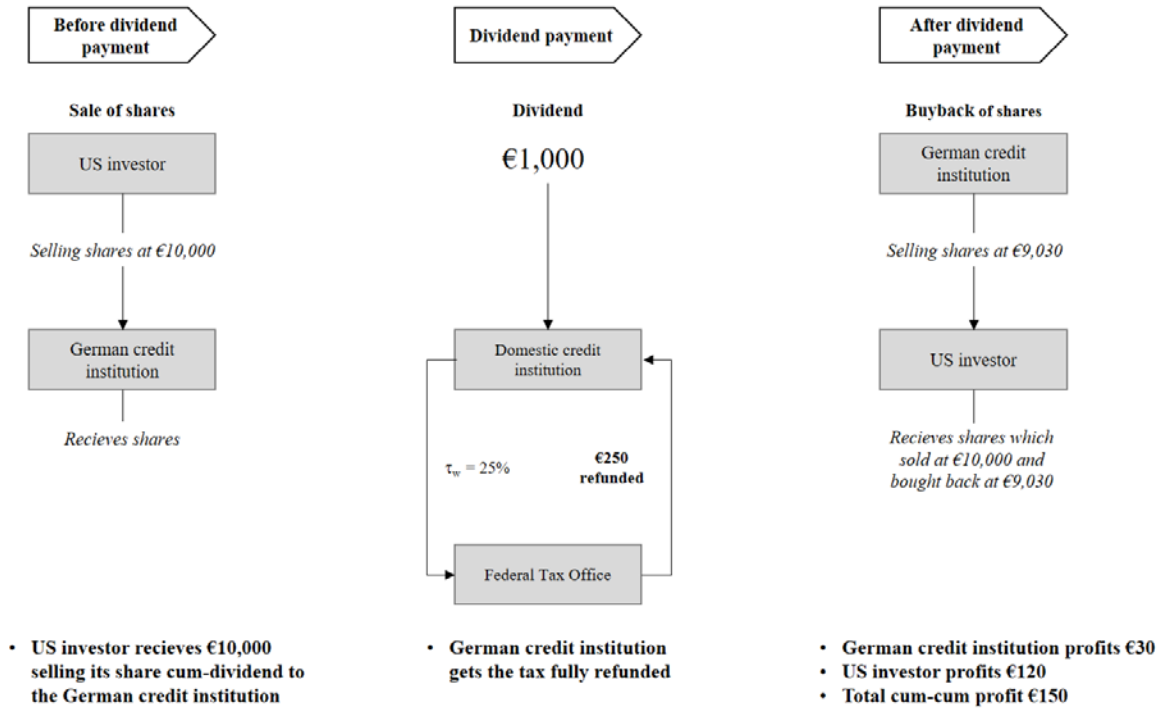
3.3 Cum-cum trading

Another reason for observing abnormal trading in Germany the last decades is due to withholding tax asymmetry exploited in the form of cum-cum transactions. Hence, we find it appropriate with an explanation of the mechanisms and the rationale behind. Different to cum-ex transactions, cum-cum trading is per definition not illegal, but considered illegitimate as the purpose is to avoid the legal taxation of dividends (Spengel, 2016).

3.3.1 The structure of a cum-cum spot transaction

In Figure 2, the basic structure of cum-cum trading is presented. The process illustrates a spot transaction, but other versions such as stock lending agreements can also be facilitated in order to conduct a cum-cum trade. However, our focus will be concentrated around spot transactions.

Figure 2: The basic structure of a spot transaction in the cum-cum period



Source: Own contribution inspired by Spengel **(**2016**)**

The idea is that a US investor, holding shares in a German dividend distributing company, sells its shares before the dividend record date to a German credit institution with the dividend

entitlement. The contractual obligation is agreed upon prior to the delivery of the shares. Then, the US investor repurchases the shares after the dividend payment date without the dividend entitlement. In order to gain a deeper understanding of a cum-cum transaction, a simplified example will be presented in the following two paragraphs.

Cum dividend, the US investor is the lawful owner of the shares in the German company. On this day, the shares are valued at €10,000. This generate dividends to the value of €1,000, which is to be distributed to the owner recorded in the company's books. Cum dividend, the US investor sells the shares to a German credit institution. Ex dividend, the German credit institution receives a net dividend of €750 after deducting a withholding tax of €250, and then has this amount refunded from the Federal Tax Office[6]. Thus, it receives a dividend of €1,000. This amount is reduced as a result of the share value redemption of €9,000 by a capital loss in the same amount[7]. The German credit institution thus has zero taxable income and will be reimbursed the certified withholding tax. After tax, a net income of €30 remains for the credit institution[8].

The US investor, who sells the shares and then repurchases in a price agreement, will gain a capital income of €970 in Germany instead of a net cash dividend of €850[9]. In addition, the US investor is once again in possession of the stock. This is similar to the investor receiving a tax-free dividend if we neglect the premium price of €30 paid to the German credit institution.

The example shows that the US investor generates a profit of €120 from the transaction[10]. This amount, including the price paid to the credit institution, corresponds to the refunded dividend tax. The fundamental aspect in these trades is the possibility to transform the withholding tax amount into other types of income that are not subject to tax at the source. Thus, instead of being subject to withholding tax at source, the US investor generates capital gain income. Because a double tax treaty with Germany exists, the tax liability lies with the US investor's jurisdiction (Flick Gock Schaumburg, 2016). For the German credit institution, the transaction isolated is a zero-sum game. In practice, however, the tax savings between the US investor and

[6] Due to simplification, the 5.5% solidarity surcharge is neglected.
[7] Value at time of sale €9,000 - initial cost €10,000 = €1,000 (loss).
[8] Net dividend €750 + refund of capital gains tax €250 + Premium €30 - loss on disposal €10,000 = €30.
[9] In a double tax treaty agreement, the US investor will have its withholding tax reduced to 15%.
[10] Capital income €970 compared to bet cash dividend €850 implies a difference of €120.

the German credit institution are split by price agreements during the transaction process. In this example, the amount is set to €30 for illustration purposes.

For the parties involved, these transactions can essentially be conducted without any financial risk, for instance by means of stock futures to hedge the price risk. However, the dominant variant of cum-cum transactions is in practice securities lending (Spengel, 2016). Security lending enables the German credit institution (borrower) to acquire full ownership of the shares from the US investor shortly before the dividend record date. At the end of the securities lending, which is usually a short time after the dividend record date, shares of the same type, quality and amount is returned to the US investor (lender). Unlike the spot transaction, there is no price risk at all to hedge because of the retransfer obligation.

In the basic model of a cum-cum spot transaction, the capital loss incurred by the German credit institution is replaced by the deduction of the securities lending fee as an operating expense, so that, in the absence of taxable income, the capital gains tax is refunded. The securities lending fee does not count among the income subject to limited taxation in Germany under Income Tax Act (ITA) § 49, which means that it is tax-free for the original owner of the shares. The capital gains tax savings can be divided between the contracting parties by the design of the securities lending fee.

3.3.2 Preventative measures to reduce cum-cum trading

In order to eliminate the asymmetry in the refunding of withholding tax, and accordingly reduce cum-cum transactions, the German Investment Tax Reform Act (InvTRA) was passed in the Federal Council of Germany in July 2016 (Junge & Kleutgens, 2016). The InvTRA introduced § 36a in the ITA to heavily reduce the benefits of cum-cum trading, with retroactive effect from January 1st 2016. The section is a broad anti-avoidance rule, with the aim to limit the full dividend withholding tax credit available to German domestic taxpayers, hence impact the German stock markets liquidity substantially. This is due to its applicability on all German shares which are kept in collective custody in Germany or enjoyment rights similar to equity like instruments (Behnes et al., 2016).

The reform allows us to isolate cum-cum transactions happening in the German stock market in the period from 2012 until 2016, as the intention of the reform is to reduce this trading activity

in German stocks. In order to receive a fully creditable or refundable certificate on withholding tax paid, § 36a provides the following requirements to be fulfilled (Junge & Kleutgens, 2016)[11]:

ITA (EStG) § 36a (1):

> *Full recognition of refunded or credited tax is received for the underlying only if the taxpayer*
>
> - *during minimum holding period referred to in (2) is an uninterrupted economic owner*
> - *second, during minimum holding period referred to in (2) continuously carries the minimum risk change referred to in (3)*
> - *third, is not obligated to remunerate the capital gains entirely or predominantly, directly or indirectly, to other persons*

ITA (EStG) § 36a (2):

> *The taxpayer has to be the continuous economic owner of the stock over a minimum holding period. The minimum holding period is 45 days and must be achieved within a period of 45 days prior to and 45 days after the dividend payment date.*

ITA (EStG) § 36a (3):

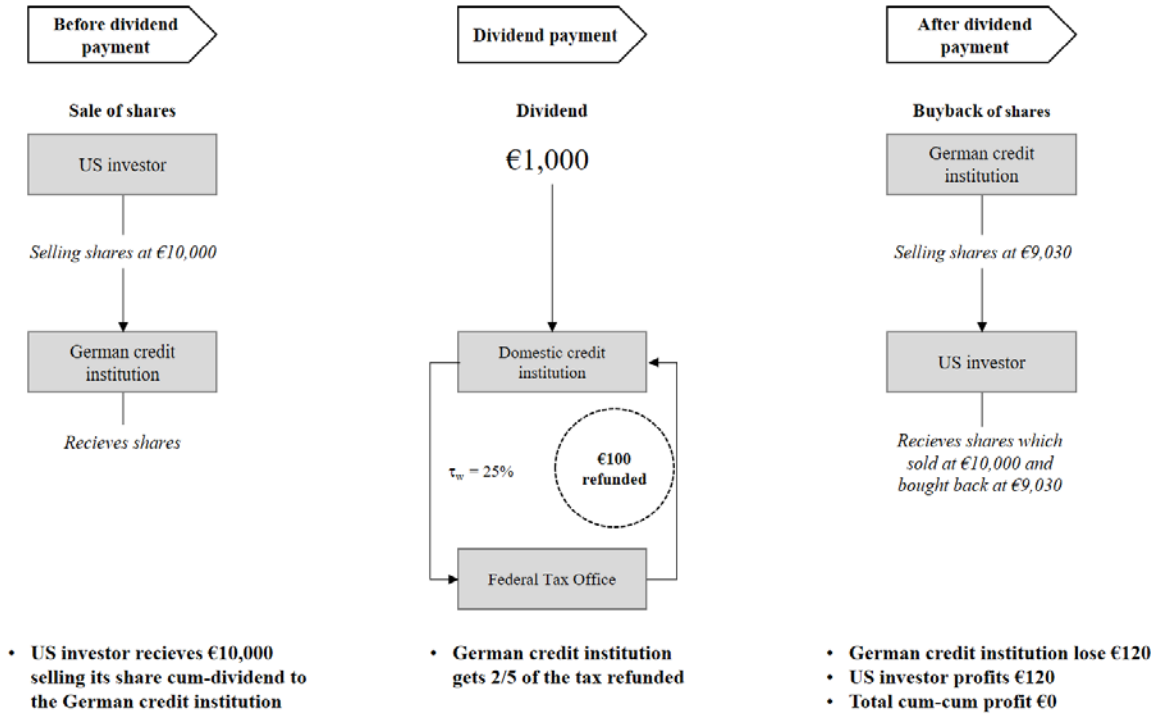
> *Days where the taxpayer bears less than 70 per cent of the risk devoted to the value change of the share or profit participation certificate from the acquisition value will not be included in the minimum holding period.*

In order to be entitled for full withholding tax credit, German taxpayers have to meet these requirements. § 36a (2) states that German taxpayers are only eligible for full credit or refunding if they have sufficient economic entitlement to the relevant stock or equity-like profit participation certificates within a 45-day before and after-window around the due date of the capital income, usually the ex-dividend date. § 36a (3) is meant to prevent the transfer of ownership to the domestic institution eligible for a tax refund or credit while the economic risk caused by transactions, such as future contracts, continues to remain with the share's former owner. This could be complicated for German credit institutions with hedging practices in place, as they have to prove their economic risk exposure in cum-cum investments to be at least

[11] For simplicity, relevant parts are summarized.

30 per cent. If they do not meet the demands in § 36a (2) and (3)[12], they will only be entitled to a credit of two-fifths of the withholding tax, i.e. 10% given a withholding tax rate of 25%[13]. The non-creditable portion of 15% corresponds with the tax treatment of foreign investors, in which benefit from a reduced rate under a tax treaty if present (Behnes et al., 2016).

Figure 3: The basic structure of a spot transaction in the post period



Source: Own contribution inspired by Spengel **(**2016**)**

In Figure 3 we have a cum-cum transaction happening after the legislation came into effect, hence not fulfilling the requirements in ITA § 36a. As we can see in the dotted circle, the refunded amount compared to Figure 2 is reduced to two-fifths of the withholding tax, in this case from €250 to €100. Since three-fifths of the tax will not be refunded, incentives to conduct a cum-cum transaction will not be present.

The cum-cum preventing tax legislation generally applies to all German taxpayers, irrespective of whether any tax arbitrage transaction is intended or undertaken (Junge & Kleutgens, 2016). In the United States and Australia, in which the 45-day rule is modelled on, dividend income

[12] The rules do not apply if the dividend during the annual assessment period is less than EUR 20,000 or the taxpayer had been the legal and beneficial owner of the shares for at least one year at the time of receipt of the dividend.
[13] The solidarity surcharge of 5.5% remains fully creditable.

becomes fully taxable in situations where the holding period is not detected (Behnes et al., 2016). Similar to other anti-avoidance rules around the world, the new legislation is assumed to cause collateral damage, uncertainty and complexity that affects tax-induced trades, as well as other stock-related transactions that also has an unpretentious purpose around the ex-dividend day (Junge & Kleutgens, 2016).

As trading practices to exploit tax systems become more sophisticated, introducing a new legislation aimed at closing a loophole can open up for a new one. An interesting aspect with regard to § 36a (2) is whether this actually reduces, or if it merely shifts, the abnormal trading volume in either direction of the ex-dividend date. However, the answer to this question is not ambiguous. The new rule requires the shareholder to maintain the stock for 45 consecutive days in a 91-day window around ex-dividend date, thus at which date prior to ex-dividend we may observe a spike in the abnormal trading volume is currently undetermined. We have therefore decided it to be outside the scope of this thesis to answer whether the problem has been solved or simply shifted away from dates around ex-dividend.

Chapter 4

Hypotheses

From the existing research covering withholding tax, trading behaviour around ex-dividend day and its stock market effect in the scope of tax legislations is undertaken. However, we believe cum-cum trading is an important aspect that is missing in the literature. With our thesis, we aim to contribute in narrowing this litterature gap by examining cum-cum transactions in the scope of abnormal trading volume around ex-dividend date, as presented in the theoretical framework. The two questions we want to empirically undertake are:

> **H1**: *The trading volume within a three-day window [-3, 3] before and after ex-dividend date should decrease after July 26th 2016.*

Our first hypothesis relates to the intended effect of the tax legislation. If § 36a in the ITA has achieved its desired effect in preventing the tax-induced cum-cum transactions, we expect to see a significant reduction in the abnormal trading volume around ex-dividend date after July 26th 2016 for dividend paying stocks.

> **H2**: *The decrease in trading volume is greater for high yielding dividends than medium and low yielding dividends after July 26th 2016.*

Our second hypothesis is constructed in order to gain deeper insight into the ex-dividend date trading behaviour in the cum-cum period and the post period, respectively. We will therefore conduct an analysis to see if the decrease in trading volume is greater for high yielding dividends than medium and low yielding dividends.

Chapter 5

Methodology

In this chapter we are going to present our data and go further into detail on the sample selected. Moreover, we will present the econometric framework to help the reader understand our considerations behind the choice of method. Lastly, we outline and explain the models and variables utilized in our empirical analysis.

5.1 Data

5.1.1 Data source

In order to assess whether the new tax legislation has achieved its intended effect on the trading volume around dividend payment, we have obtained and structured a considerable amount of data for the most traded German stocks. Our data source is the *Compustat – Capital IQ*[14], where we have collected daily security data on German stocks. Capital IQ is a detailed database containing global market information on active and inactive publicly held companies. The database lets you specify the stock characteristics of interest, whether it is closing price, shares traded, shares outstanding or dividend information such as value and taxation code.

5.1.2 Sample selection

In our study, our collected data has been set to cover the time period from January 2nd 2012 to July 10th 2018[15]. The period is chosen to avoid a bias in our data with regard to the cum-ex tax-evasion practice that was, as previously mentioned, prohibited through the UCITS in January 2012.

It is common for the most traded German stocks to be either domestically cross listed within Germany or dually listed in both Germany and USA (Gruson, 2001). Hence, a company can have multiple stocks traded on different stock exchanges, but each stock has its own Identification Security ID (ISIN) to differentiate them. When a company pays a dividend, it

[14] Extracted from the Wharton Research Data Services (WRDS).
[15] The most recent observation available at the Compustat – Capital IQ on WRDS was from July 10th, 2018.

typically pays out an equal[16] dividend to all shareholders. Thus, to avoid the counting of duplicate dividends for stocks from the same company we focus solely on stocks traded in Germany, and only stocks that are traded through the Xetra trading venue. Xetra is the reference market and primary trading venue for trading of German stocks. The venue is the most liquid, as more than 90 per cent of all trading in stocks at all German stock exchanges is made through the Xetra trading venue (Deutsche Börse Group AG, 2018). The trading volume gathered from Xetra covers, among other things, continuous trading and bilateral[17] over-the-counter (OTC) trading. German stock exchange rules such as the two-day-settlement process apply for trades on Xetra. However, there are other liquid trading venues besides the Xetra that can be used for trading of German stocks. These do not necessarily come with ideal trading transparency and uniform access to all investors, thus these trades are not captured in our data (Büttner et al., 2018).

We have limited our sample selection to shares traded at German stock exchanges since the shares have to be traded there in order to be eligible for tax credit. Xetra was chosen due to its broad magnitude and thus high trading volume. We further limit our data set to only contain the 100 most traded stocks[18] over the time period, and only stocks with more than 250 observations[19].

5.1.3 Descriptive statistics

Our selected sample contains 160,435 observations distributed between 1,653 trading days and 100 stocks. Sixty-three stocks have paid dividends every year, while six stocks have not paid any dividends over the same period. Table 2 summarizes the distribution of total dividends paid in the sample.

[16] A firm can have several share classes, e.g. preferred and ordinary shares. We have occasionally observed in our data that the dividend entitled to preferred shares is slightly higher than for ordinary shares. At most times, however, the entitled dividend is equal.
[17] Trading between two parties only.
[18] Most traded stocks are defined by the total value traded, i.e. the closing price at date *t* multiplied by shares traded for stock *i* over the whole period, grouped by stocks. The reason for grouping them at stock level and not at company level is because some companies have both ordinary and preferred stocks. We are only interested in the most frequently traded stock of the two, nevertheless they are not mutually exclusive.
[19] We required the stock to have more than 250 observations to be included in the sample. One stock was omitted.

Table 2: Distribution of total dividends paid (2012-2018)

No. of dividends paid	Stocks	Cumulative
0	6	6
1	2	8
2	2	10
3	1	11
4	1	12
5	10	22
6	15	37
7	63	100
Total	100	100

Dividend payments also exhibit seasonality. More than 90 per cent of the dividend payments in the sample take place in April, May and June. There were no dividend payments from September until year end. Table 3 summarizes the monthly distribution of the 594 dividend payments in our sample.

Table 3: Distribution of monthly dividends (2012-2018)

Month	No. of dividends paid	Per cent	Cumulative (in per cent)
Jan	17	2.86	2.86
Feb	19	3.20	6.06
Mar	7	1.18	7.24
Apr	116	19.53	26.77
May	333	56.06	82.83
Jun	86	14.48	97.31
Jul	14	2.36	99.66
Aug	2	0.34	100.00
Sep	0	0.00	100.00
Oct	0	0.00	100.00
Nov	0	0.00	100.00
Dec	0	0.00	100.00
Total	594	100.00	100.00

Table 4 lists relevant characteristics of the 594 dividends. The table shows there is a vast variation with regard to dividend yields. Approximately 39 per cent of the dividends paid have

a dividend yield less than 2%, about 42 per cent of the firms have a dividend yield between 2% and 4%, while the remaining 19 per cent have a dividend yield larger than 4%.

Table 4: Dividend characteristics

		Cum-cum period		Post period	
		Taxable	Tax-free	Taxable	Tax-free
Absolute dividend					
Mean (in euros)		1.50	0.80	1.75	1.03
Standard deviation		1.30	0.81	1.81	0.77
Dividend yield					
Mean (in %)		2.61	4.17	2.40	3.58
Standard deviation		1.42	3.49	1.41	1.44
Yield groups					
Low yield	0-2%	139	13	74	3
Mid yield	2-4%	155	28	56	11
High yield	> 4%	58	26	24	7
No. of dividend payments		352	67	154	21

Notes: Descriptive statistics for the cum-cum period from January 2012 to July 25th, 2016 and the post-period from July 26th, 2016 to July 2018, separately. We have distinguished between taxable and tax-free dividends. Dividends subject to withholding tax are distributed from current profits, thus suitable for cum-cum transactions. Dividends not subject to withholding tax are distributed from the contribution account, thus not suitable for cum-cum transactions.

5.2 Econometric framework

Our empirical analysis makes use of panel data, event study, dummy variable regression and multiple fixed effects. This section aims at helping the reader understand the thoughts behind the choice of method and variables used.

5.2.1 Unbalanced panel data

Our panel data set is an unbalanced panel, which means that not all variables have the same number of time periods (Wooldridge, 2016). This could potentially be an issue, and the matter is addressed. In our collected data sample we have the 100 most traded stocks at the Xetra, given the requirement that the stock has more than 250 observations. Our panel is therefore unbalanced as some stocks have acquired a sufficient trading volume with fewer trading days. If stocks have been publicly listed, taken private or gone out of business during the sample

period, we may have outliers in terms of volume which could be an issue. If this is the case, one can debate whether our unbalanced panel truly is a non-random sample. We have however tried to limit the stock's criteria to be part of the sample, apart from the one-year minimum trading requirement. As long as the missing data for some stocks at various dates is not correlated with the idiosyncratic errors, the unbalanced panel causes no problem (Wooldridge, 2016). The unbalanced panel is therefore not a concerning matter. Additionally, we have performed a robustness test addressing this.

5.2.2 Multiple fixed effects

Panel data holds a broad amount of information to be analysed, and some of the characteristics within an entity in our panel might therefore bias our independent variables. The question thus arises whether our estimators will be unbiased, or at least consistent, if they are correlated with the error term. To isolate the effect of these time-invariant characteristics, the two most common methods is to either include a fixed effect or a random effect in the model, and then formally test for statistically significant differences in the coefficients on the time-varying explanatory variables (Wooldridge, 2016).

However, we argue directly in favour of using fixed effects to capture the individual stock-specific effect, which relates to how the trading of some stocks are more volatile than other stocks. This is due to unobserved individual effects containing factors such as cyclicality of business, managerial skills or other abilities not captured by the explanatory variables. In a model with fixed effects, the unobserved variables are allowed to have any associations with the observed variables whatsoever (Allison, 2009). This is a more relaxed assumption compared to the random effects model, and hence an argument favouring the choice of including fixed effects in our model.

Another argument in favour of the fixed effects model is related to the time variable. The markets experience macroeconomic events and news affecting the trading volume such as changes in the interest rate and periods of booms and busts. These factors are not easily controlled for, but will correlate with the error term for longer periods, which is an argument to use the fixed effects model. The individual stock-specific effect and the time-specific effect contained in our panel data set are therefore best captured and analysed by the use of a multiple fixed effects model. We make use of dummy variable regression to estimate a parameter for

each stock-specific *i* and time-specific *t* to capture some of the unobserved effect. Further, we make use of cluster-robust standard errors at the stock-level to allow for heteroscedasticity and serial correlation (Wooldridge, 2016).

5.2.3 Event study on trading volume

Having isolated the individual stock-specific and time-specific effects to resolve the problem with biased estimators, we return to our main research question of interest which is whether the tax legislation of July 2016 has achieved its desired impact on the trading volume.

We are utilizing event study to make inference about our research question, where we distinguish between the main event and the event window. The main event in our model is defined as the introduction of the new tax legislation, distinguishing between the cum-cum period and the post period. Our event window is defined around a stock's dividend payment, with a periodic dummy that takes the value of unity in the days [-3, 3] around the ex-dividend date. That is, for each event window we define the ex-dividend day as day 0, and make use of a binary dummy variable for a seven-day period with an equal weighted three days before and after.

Further, we distinguish between the dividends subject to regular German taxes and those free of German tax. The binary dummy variable is equal to one if the dividend is subject to regular German taxes, zero otherwise. We are thus testing how 594 dividend payments are affecting the trading volume in the days around ex-dividend date, distributed between 419 dividends prior to and 175 dividends subsequent to the new tax legislation.

5.3 Regression model

To make inference about our two hypotheses, we make use of several models which will be defined and explained in the following sections.

5.3.1 The average abnormal volume model

To first establish whether there has been a decrease in the abnormal trading volume between the two periods, we utilize the following model:

$$\begin{aligned} log\ relative\ volume_{it} = \ & \beta_0 + \beta_1 E_i + \beta_2 E_i * T_i + \beta_3 E_i * P_t \\ & + \beta_4 E_i * P_t * T_i + \beta_5 D_{stock_i} + \beta_6 D_{date_t} \\ & + \beta_7 \text{Price}_{it} + L1.\beta_8 \text{Price}_{it} + v_{it.} \end{aligned} \quad \text{(I)}$$

We use the natural logarithm of the relative volume as the dependent variable in our model, defined as:

$$log(relative\ volume_{it}) = log(\frac{shares\ traded_{it}}{shares\ outstanding_{it}}^{20}) \quad \text{(II)}$$

relative volume$_{it}$ is the relative trading volume for stock *i* on date *t*, i.e. shares traded divided by the number of shares outstanding for stock *i* on a given day *t*. Due to the large span between the market sizes of the company stocks as well as individual characteristics such as price, shares outstanding and occasional stock splits, we needed a dependent variable that would be stable in identifying abnormal trading between periods, thus the choice above in equation (II). We thus have a log-linear relationship where the dependent variable is logged and all independent variables are either dummies or raw data.

E_i is a binary indicator that takes the value of unity for observations on days *i* around the ex-dividend date, where $i \in [-3,3]$ and ex-dividend date is identified by $i = 0$. The dummy represents our event window, and captures the trading volume in the three days prior to and three days subsequent to the ex-dividend date, including the ex-dividend date. The variable thus reports the average abnormal trading volume of these seven days surrounding each dividend, compared to the trading volume for all observations outside the event window[21].

T_i is a binary indicator that equals one in the case of regular taxable dividends and zero in the case of withholding-tax-free dividends, thus capturing the effect on the trading volume if the dividend is subject to taxation or not.

[20] Because several stocks in our data set have performed stock splits over the sample period, the shares outstanding variable is matched with the shares traded for stock *i* as well as on date *t*.
[21] We have included all observations and let the fixed effect capture the normal trade, thus not made use of an explicit estimation window.

P_t is a binary indicator that takes value of zero in the cum-cum period from January 2012 to July 25th, 2016 and one for observations in the post period, i.e. from July 26th, 2016 to July 2018.

The interaction variable $E_i * T_i$ captures the average abnormal trading volume in the cum-cum period for dividends subject to taxation, while the interaction variable $E_i * P_t$ captures the average abnormal trading volume for tax-free dividends in the post period. $E_i * P_t * T_i$ captures the average abnormal trading volume around ex-dividend for dividends subject to taxation in the post-period. This dummy variable is important for our analysis to distinguish the abnormal trading volume around ex-dividend date, and whether there has been a change in trading volume for taxable dividends after the 2016 tax legislation was enforced.

The individual stock-specific effect and the time-specific effect is handled through the use of dummy variable regression[22] to produce the fixed effects estimator (Wooldridge, 2016). The variable $stock_i$ uniquely identifies each group within the panel data set, taking the values [1, 100], while the date variable, $date_t$, ranges from January 2nd, 2012 to July 10th, 2018 and captures date-specific effects.

$Price_{it}$ controls for the effect price has on the trading volume. A one-day lag of the variable is also included in the simple model by $L1.\beta_2 Price_{it}$, as autocorrelation is likely to be present in a panel data set containing daily stock market data (Campbell, Grossman, & Wang, 1993). Even though the expected negative relationship is essentially without interest for our hypothesis, we argue it is a natural variable to control for in the initial model.

The coefficient β_0 is the intercept of the regression equation, capturing the relative trading volume for stocks outside the event window. We acknowledge that β_7 and β_8 are important to include, as the stock's price to a great extent determine the attractiveness of a stock. However, we are mainly interested in the coefficients β_1 to β_4, with the latter interaction variable being the main variable of interest to make inference about our first hypothesis. Given that the tax legislation has had the intended effect, the coefficient on β_4 should be negative whereas we should not necessarily observe the same trend for the coefficient β_3.

[22] This is represented by the letter *D* in the equation.

5.3.2 The day-specific abnormal volume model

As we anticipate to observe an effect of the tax legislation, we are further interested if any days in particular have been more affected than others around ex-dividend date. In order to gain a deeper insight into our first hypothesis, our extendend model is defined by the following equation:

$$\begin{aligned} \textit{log relative volume}_{it} = \; & \beta_0 + \beta_1 E_{i,d} + \beta_2 E_{i,d} * T_i \\ & + \beta_3 E_{i,d} * P_t + \beta_4 E_{i,d} * P_t * T_i \\ & + \beta_5 D_{stock_i} + \beta_6 D_{date_t} + \nu_{it.} \end{aligned} \tag{III}$$

The interpretation of the dependent variable as well as the individual stock-specific and date-specific variables remain unaltered, while the coefficients β_1 to β_4 have gotten a more comprehensive interpretation. Both coefficients on price have been dropped from the previous regression model given their lack of relevance for our first hypothesis.

While the coefficients in the first model reported the average abnormal trading volume of the seven days around each dividend, the coefficients β_1 to β_4 now capture the abnormal trading volume on each of the days in the event window. The coefficients now include an extended variable $E_{i,d}$, which is a dummy variable of indicators that capture the abnormal trading volume for stock i on day d around ex-dividend date, where $d \in$ [-3,3] and ex-dividend date is represented by $d = 0$. This variable is similar to D_i in the simple regression model, however it captures the abnormal trading on each day d, totalling a dummy variable with seven indicators.

The interpretation of the interaction terms remains the same, where we separate the dividends into four groups to distinguish between both periods and whether the dividend is subject to regular taxation or not. Our main coefficient of interest to answer in our first hypothesis is β_4, which we expect to be overall negative.

5.3.3 The dividend yield model

Our second hypothesis of interest is whether the decrease in high yielding dividends have been greater than the decrease in medium and low yielding dividends. We make use of Blume's (1980) definition of dividend yield:

$$Dividend\ yield_{it} = \frac{Dividend\ per\ share_{it}}{Year\text{-}end\ share\ price_{it-1}} \quad \text{(IV)}$$

where our dividend yield is the dividend per share by company *i* in year *t* divided by the year-end share price of stock *i* in the previous year, at *t-1*.

To answer the hypothesis, we have categorised our dividends into three groups of dividend yields. Low yielding dividends are below 2%, high yielding dividends are above 4%, and those in between are defined as medium yielding dividends. Using dummy interaction variables for each of these groups, we first aim to answer if there is a difference between the two periods. The model is defined by the following formula:

$$\begin{aligned} log\ relative\ volume_{it} = \quad & \beta_0 + \beta_1 E_{i,d} * rdy_i \\ & + \beta_3 E_{i,d} * P_t * rdy_i \\ & + \beta_5 D_{stock_i} + \beta_6 D_{date_t} + \nu_{it.} \end{aligned} \quad \text{(V)}$$

where the dependent variable remains defined as the natural logarithm of the traded number of stocks relative to the stock's outstanding shares, as portrayed in equation (II). The coefficients β_1 and β_3[23] now contain the interaction dummy variable rdy_i that captures the impact the type of dividend yield has on the abnormal trading volume, where $i = 1$ is the dummy indicator for the low yielding dividends and $i = 3$ is the dummy indicator for high yielding dividends.

Further, we want to make inference whether there is a difference between dividends subject to taxation and those that are tax-free in both periods. For the different groups of dividend yields, we add the taxable dividend dummy to the model and get the following formula to answer the question:

$$\begin{aligned} log\ relative\ volume_{it} = \quad & \beta_0 + \beta_1 E_{i,d} * rdy_i + \beta_2 E_{i,d} * T_i * rdy_i \\ & + \beta_3 E_{i,d} * P_t * rdy_i + \beta_4 E_{i,d} * P_t * T_i * rdy_i \\ & + \beta_5 D_{stock_i} + \beta_6 D_{date_t} + \nu_{it.} \end{aligned} \quad \text{(VI)}$$

[23] For consistency purposes and ease of interpretation in the regression model, the coefficients and their associated interaction variables are persistent throughout the thesis.

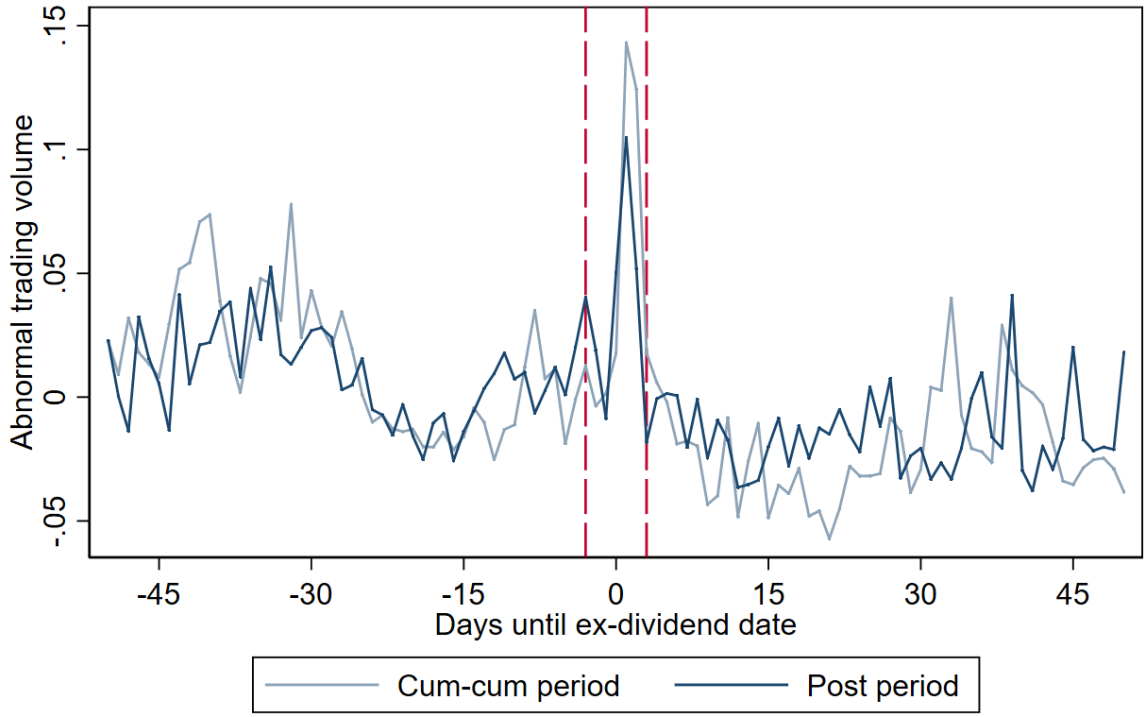
The additional interaction dummies add the two coefficients β_2 and β_4 to the equation, but the interpretation remains the same for all variables. Our main coefficient of interest is β_4, to make inference whether the high yielding dividend group have been more affected than other groups in the post period, with all groups being subject to taxation.

Chapter 6

Empirical analysis

In this chapter we are going to present the findings from our empirical analysis. We initiate the chapter by showing a graphical illustration of how the trading volume spikes around ex-dividend date for the two periods. The abnormal trading volume in figure 4 is defined as the difference between shares traded over shares outstanding for stock *i* at date *t*, and the average relative trading volume for stock *i*. The vertically dashed lines establish the boundaries of our event window at [-3,3] around ex-dividend date.

Figure 4: The abnormal trading volume in Germany around ex-dividend date



Notes: The x-axis is centred at ex-dividend date. The figure is only meant for illustration purposes, as trading volume has not been adjusted for either stock fixed effects nor time fixed effects. Source: Own contribution.

We have further structured the analysis discussion in accordance with the hypotheses, where the first hypothesis is discussed in 6.1 and the second in 6.2. In extent, we examine if the results are in line with the theory previously presented, and whether or not they support our hypotheses. Lastly, we assess the robustness of our results followed by potential limitations in our thesis.

The dependent variable for all regressions presented in this chapter is defined as the natural logarithm of the traded number of stocks relative to the stock's outstanding shares. The estimation includes 594 dividends events by 100 stocks, where six of the hundred stocks in the sample did not pay any dividends. All regressions are estimated using stock level fixed effects and time fixed effects, indicated at the bottom of each table. All standard errors are clustered at the stock-level to allow for serial correlation and heteroscedasticity.

6.1 Trading volume in the post period

6.1.1 The average abnormal volume

Table 5 shows our regression results as defined in equation (I). In regression (1) the coefficient on $Price_{it}$ is negative, as expected, however only significant at a 10% level. A much more interesting feature in this regression is that we can observe clear indications supporting our hypothesis that there is a difference in the abnormal trading volume between the two periods, ceteris paribus.

Table 5: Average abnormal trading around ex-dividend date

	(1)	(2)	(3)
Cum-cum period			
E_i	.167***	.178***	.166***
	(.0199)	(.0564)	(.0560)
$E_i * T_i$		-.008	-.003
		(.0641)	(.0636)
Post period			
$E_i * P_t$	-.066**	.199	.216*
	(.0315)	(.1230)	(.1200)
$E_i * P_t * T_i$		-.305**	-.327**
		(.1390)	(.1370)
$Price_{it}$	-.003*	.004	
	(.0017)	(.0049)	
L1.$Price_{it}$		-.007*	
		(.0040)	
Estimation method	OLS(FE)	OLS(FE)	OLS(FE)
Stock level fixed effects	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes
Adj. R^2	.634	.623	.631
Observations	160,434	126,434	160,434

Notes: E_i is a binary indicator that takes the value of one for observations on days d [-3,3] around the ex-dividend date and zero otherwise. Hence, it captures the average abnormal trading volume in the 3 days prior to and 3 days subsequent to the ex-dividend date, including the ex-dividend date, totalling 7 days surrounding each dividend. T_i is a binary indicator that equals one in the case of regular taxable dividends and zero in the case of tax-free dividends, thus capturing the effect on the trading volume if the dividend is subject to taxation or not, ceteris paribus. P_t is a binary indicator that takes value of zero in the cum-cum period from January 2012 to July 25th, 2016 and one for observations in the post period from July 26th, 2016 to July 2018. Standard errors are presented in the parentheses, and (***), (**) and (*) indicated significance at 1%, 5% and 10%, respectively.

The coefficient on the variable E_i captures the average abnormal trading volume over the seven-day interval around ex-dividend date in the cum-cum period, and suggest the abnormal trading volume is significantly higher at a 5% level. On the contrary, the coefficient on the variable $E_i * P_t$, which captures the average abnormal trading volume over the seven day interval around the ex-dividend in the post period, suggest the abnormal trading volume is significantly lower at 5% level, ceteris paribus. These results are in accordance with our theory and hypothesis.

Having observed this curious result inquires us to add additional variables in regression (2) to control for both taxation and for the lagged effect of the price of the stock. When controlling for taxation of dividends, the results indicate the tax-free dividends in the post-period are no longer negative nor significant, whereas the abnormal trading volume for taxable dividends in the post period are significantly lower at a 5% level. These results show the importance of controlling for taxation to make inference about which dividends that have actually been affected by the legislation. The conclusion follows naturally, since the targeted dividends should be those subject to taxation. The coefficient is significant with regard to the discussed tax evasion practices, and hence our results are in accordance with what we expect to observe.

However, when adding the additional lagged price variable, the price coefficient is no longer significant nor negative. The lagged price variable is now the negative coefficient, but only at a 10% significance level. Despite some significance, the lagged price variable provides little additional information weighted against the reduction in observations, i.e. the cost in degrees of freedom. Hence, both price variables are dropped in the succeeding regressions.

Regression (3) therefore displays the coefficients without the two price variables. The value of the coefficients, the standard errors and significance level remain fairly unaffected, supporting the decision to drop the price variables. The most notable from regression (3) is that the abnormal trading volume for the tax-free dividend in the post period is actually higher at a 10% significance level. However, the abnormal trading volume for dividends subject to taxation in the post period is still negative at a 5% significance level.

6.1.2 The day-specific abnormal volume

As there seem to be statistical evidence supporting our first hypothesis, we are further inclined to investigate whether there are any particular days around ex-dividend where the abnormal

trading volume has decreased. Table 6 exhibits only one regression[24], and shows the regression results as defined in equation (III). However, we have only chosen to exhibit the coefficients subject to taxation in the post period. The other coefficients in equation (III) have been controlled for, as indicated at the bottom of the table, but left out of the regression table as their coefficient values are of limited relevance for our first hypothesis.

Table 6: Day-specific abnormal trading volume around ex-dividend date

		(4)
Post period with taxes		
$E_{i,-3} * P_t * T_i$		-.437**
		(.169)
$E_{i,-2} * P_t * T_i$		-.406**
		(.179)
$E_{i,-1} * P_t * T_i$	cum-dividend date	-.405**
		(.156)
$E_{i,0} * P_t * T_i$	ex-dividend date	-.119
		(.144)
$E_{i,1} * P_t * T_i$	record date	-.358**
		(.148)
$E_{i,2} * P_t * T_i$		-.245
		(.158)
$E_{i,3} * P_t * T_i$		-.314**
		(.141)
Estimation method		OLS(FE)
Stock level fixed effects		Yes
Time fixed effects		Yes
$E_{i,d}$	$d \in$ [-3,3]	Yes
$E_{i,d} * T_i$	$d \in$ [-3,3]	Yes
$E_{i,d} * P_t$	$d \in$ [-3,3]	Yes
Adj. R^2		.631

Notes: The other variables $E_{i,d}$, $E_{i,d} * T_i$ and $E_{i,d} * P_t$ are controlled for in the regression, but their coefficients have been absorbed due to lack of importance for our hypothesis. All standard errors are clustered at the stock-level to allow for serial correlation and heteroscedasticity. Standard errors are presented in the parentheses, and (***), (**) and (*) indicated significance at 1%, 5% and 10%, respectively.

The coefficients listed in regression (4) suggest the abnormal trading volume has decreased for all days around the ex-dividend date for dividends subject to regular taxation in the post period, with five out of seven days being significant at a 5% level. But there are also two out seven days where we lack the empirical evidence to advocate that the new tax legislation has had the intended effect, as the coefficients are negative but not significant at any level.

However, the results are more evident than we initially expected, given the limited time period in our sample. Our results suggest there has been a significant drop in the abnormal trading volume in all three days prior to the stock starting to trade without dividend, suggesting the

[24] Table 9 exhibits all the coefficients in equation (III).

German tax authorities has had some success in stopping the cum-cum transactions. The abnormal trading on ex-dividend date is negative, however not significant at any level. A valid explanation for this could be the fact that timing, particularly ex-dividend, in cum-cum transactions are simply not that crucial compared to cum-ex transactions, where the timing is essential in order to generating multiple tax credit certificates (Büttner et al., 2018). Observing a significant decrease in the three days prior to the ex-dividend date substantiates this, which we expect as the stock has to be traded cum-dividend in order to receive the dividend entitlement. However, the legislation will also have a general impact on the stock market's liquidity, which can have inferred our results on the trading volume.

Given the information provided through the *Cum-ex files*, our results are simultaneously surprising. The investigation claims tax-evasion practices around dividend payment to still be at large, whereas our results suggest otherwise. The report does however cover multiple countries and practices, and it might actually be that cum-cum transactions have been slowed down or prevented to some degree in Germany, as our results indicate. The significant coefficients suggest nonetheless the new tax legislation to decrease the abnormal trading volume around ex-dividend date, thus hopefully reducing the cost to the German state and its taxpayers.

6.2 Trading volume by dividend yield groups

6.2.1 The dividend yield

Given the conclusion on our first hypothesis, we aim to answer our second hypothesis, whether the decrease in high yielding dividends have been greater than the decrease in medium and low yielding dividends. As outlined in equation (IV), we have categorised our dividends into three groups of dividend yields and utilize dummy variable regression to make inference whether the high yielding dividend has been more affected than the lower yielding dividends in the post period.

In Table 7, the interaction variable $E_{i,d} * rdy_j$ captures the average abnormal trading volume in the seven-day event window through the variable E_i, and distinguishes between the three

dividend yield groups by the variable rdy_j. The three groups are identified by the indicator j, where $j \in [1,3]$[25].

Table 7: Difference by dividend yield

		(5)	(6)
Cum-cum period			
$E_i * rdy_1$	0-2%	.090**	
		(.0375)	
$E_i * rdy_2$	2-4%	.150***	
		(.0296)	
$E_i * rdy_3$	>4%	.336***	
		(.0367)	
Post period			
$E_i * rdy_1 * P_t$	0-2%	-.130	
		(.0889)	
$E_i * rdy_2 * P_t$	2-4%	-.011	
		(.0814)	
$E_i * rdy3 * P_t$	>4%	-.016	
		(.0952)	
With taxes (T_i)			
$E_i * rdy_1 * P_t * T_i$	0-2%		-.103
			(.1450)
$E_i * rdy_2 * P_t * T_i$	2-4%		-.336
			(.2100)
$E_i * rdy_3 * P_t * T_i$	>4%		-.233
			(.1780)
Estimation method		OLS(FE)	OLS(FE)
Stock level fixed effects		Yes	Yes
Time fixed effects		Yes	Yes
$E_i * rdy_y$	$y \in [1,3]$	-	Yes
$E_i * rdy_y * T_i$	$y \in [1,3]$	-	Yes
$E_i * rdy_y * P_t$	$y \in [1,3]$	-	Yes
Adj. R^2		.631	.631

Notes: The control variables at the bottom of the table are as defined in previous tables, and a detailed description is presented in table 8. All standard errors are clustered at the stock-level to allow for serial correlation and heteroscedasticity. Standard errors are presented in the parentheses, and (***), (**) and (*) indicate significance at 1%, 5% and 10%, respectively.

In regression (5), the variable $E_i * rdy_j$ captures the average abnormal trading volume by yield group around ex-dividend in the cum-cum period, and the results indicate there is a difference in the abnormal trading volume for the three groups of dividend yields. All three groups are significantly different from the mean of zero, and increasingly greater than zero in accordance with the relative size of the dividend yield.

The variable $E_{i,d} * rdy_j * P_t$ captures the average abnormal trading volume by yield group around ex-dividend in the post period. Contrarily to the results in the cum-cum period, all three dividend yield groups are negative in the post period, however none of the three are significant

[25] Low yield is identified by $j = 1$, medium yield $j = 2$ and high yield $j = 3$.

at either significance level. However, we have previously seen that the results can change when controlling for the taxation of dividends.

Regression (6) includes taxation as an additional interaction term. Accordingly, the variable $E_i * rdy_j * P_t * T_i$ captures the abnormal trading volume by yield group around ex-dividend date in the post period for dividends subject to regular taxation. Neither in this regression do we find empirical evidence to suggest the abnormal trading volume is significantly lower for any class of dividend yield. The coefficients on the medium yielding and high yielding dividends in the post period are lower in regression (6) than suggested in regression (5), but correspondingly are the associated standard errors.

Even though somewhat surprising, the results are mixed. First and foremost, judging by the coefficients the decrease is greater for high yielding dividends than low yielding dividends, while the same is not true between the high yielding and medium yielding dividends. Further, none of the coefficients in the post period are statistically significant from zero, hence we are reluctant to conclude on any results in particular. Thus, we lack the statistical evidence to make inference whether the decrease in high yielding dividends have been greater than the decrease in medium and low yielding dividends, as outlined in our second hypothesis.

One explanation why none of the coefficients in the post period exhibit the expected results might be the limited observations, as our 594 dividends have been divided into twelve sub-categories. For instance, there are only 24 observations of the high yielding dividends in the post period that is subject to taxation, as portrayed in Table 4. Given the lack of observations per group, outliers will have a huge impact on the results.

Another explanation is that we have compared the average abnormal trading volume over a seven-day window as well as between dividend yields. By comparing each day against each other between the dividend yields might prevail different results. However, our scope of interest is in the overall effect, as exhibited in regression (6).

6.3 Robustness of results

In order to ensure robust results, we have applied several alterations to the regressions. The robustness tests are exhibited in the appendix with a detailed description of their distinction compared to the regressions presented in this chapter.

The robustness tests provide assorted results dependent upon the alteration to our model. When expanding the event window by two days at either side of the ex-dividend date to [-5,5], i.e. containing eleven days around ex-dividend date, the results are supportive of our conclusion. Further, we have aimed to ensure robust results by changing to a linear dependent variable, defined as shares traded divided by shares outstanding. The regression suggests mixed results, as some coefficients are positive and some coefficients negative, however none are significant at either level.

Regression (10) addresses the unbalanced panel issue. In the regression we remove stocks that only exist in either of the two periods. This is to prevent the unbalanced panel to contain huge outliers in terms of volume which only exists in one period due to entering or bankruptcy. The regression results suggest this is not an issue. Additionally, we have dropped both Commerzbank and Deutsche Bank from our sample, exhibited in regression (11). The reason is that these banks have been central in the cum-cum trading practice (Podkul, 2016), and thus it would be interesting to see whether this impacted our results. Nonetheless, our results and conclusion remain unearthed.

However, the more surprising and interesting results are those exhibited in Table 11, where we have adjusted the tax legislation dummy to come into effect on January 1st, 2016. As the tax legislation had retroactive effect from this particular date, one can debate whether we should observe effects already from this date. The results are however mixed, and not straightforward interpreted as to whether we can see an effect from January 1st, 2016. For instance, in regression (15) the coefficients for all seven days surrounding ex-dividend date for dividends subject to taxation in the post period are negative, but only two significant at a 5% level. On the contrary, five out seven coefficients are significant in Table 6 where the identical variables have been employed. Given the decrease in significant negative coefficients, we are inclined to infer that the loophole used by cum-cum traders was not really closed until the tax legislation came into effect in July 2016.

6.4 Limitations

In this section, we will summarize potential limitations in our analysis that may have affected our results. Cum-cum trading can be done through different transaction methods. Even though more than 90 per cent of all trading of shares at German stock exchanges is transacted through

Xetra, there are some limitations in terms of catching all transactions in our data. With the wide spectre of liquid trading venues and trading options, cum-cum traders using other trading venues that do not necessarily come with ideal transparency makes it difficult to capture all sorts of trades in our data.

Our analysis is concentrated on spot transactions, which is reflected in a stock's trading volume. However, stock lending transactions are stated to be the dominant part of cum-cum transactions, but these are not reflected in the trading data from Xetra. From our results we see a significant decrease in trading volume, but we cannot be certain that this is due to the reform. Including data on stock lending transactions such as short-interest data, we could make more confident inference about cum-cum transactions and the effect of its preventive legislation.

Another weakness is the limited time period available. Given the seasonality of the dividend payments, we are comparing five years in the cum-cum period versus two years in the post period, or essentially 419 versus 175 dividend payments. The ratio itself is not problematic, but one could argue whether there is a lag in the implementation of the legislation. In our robustness test we observed a difference with respect to significant decreases when changing the date of the tax legislation to January 1st, 2016. Thus, more data will enhance the certainty of our results.

Chapter 7

Conclusion

This master thesis aims at investigating whether the German tax legislation of 2016 has achieved its intended effect. Cum-cum trading has cost the German state substantial tax revenue losses, as foreign investors have evaded withholding taxation on dividends by collusive stock trading around ex-dividend date. To our awareness, we are the first to investigate the effect of the preventative measures aimed at combatting cum-cum transactions in Germany. In order to make inference whether the legislation has achieved its intended effect, we developed the following two hypotheses:

> **H1**: *The trading volume within a three-day window [-3, 3] before and after ex-dividend day should decrease after July 26th 2016.*
>
> **H2**: *The decrease in trading volume is greater for high-yield paying dividend than low-yield paying dividends after July 26th 2016.*

To answer these, we have presented a theoretical explanation on how the tax legislation impacts the withholding tax credited to domestic investors, and our intended methodology to isolate and capture this effect on the trading volume. Both hypotheses suggest that the abnormal trading volume of stocks in the post period should decrease compared to the cum-cum period. We expect this to be true for dividends subject to regular taxation, since these dividends are the intended target.

Using transaction data from the German stock market, we have tested the empirical predictions. The empirical results related to our first hypothesis suggest the abnormal volume of stocks traded does in fact decrease significantly for dividends subject to taxation in the post period. We have empirical evidence supporting that the decrease in abnormal trading is significant at a 5% level for five out of seven trading days around ex-dividend date. All coefficients are negative, but we do not have statistical support that the decrease we observe is significant for all days within in the seven-day window. Numerous robustness tests support these results.

Further, we have separated the dividends in the sample into three dividend yield groups in order to answer our second hypothesis. We investigate whether high yielding dividends have been more affected than lower yielding dividends in the post period. Our empirical results with regard to this hypothesis have come up inconclusive, hence we cannot conclude on any decrease with regard to a specific dividend yield class. These results hold when we control for both taxable and non-taxable dividends, as well as taxable dividends only.

We use the conclusion on these two hypotheses to make an overall assessment with regard to whether the 2016 legislation, ITA § 36a, has achieved its desired effect in closing the loophole exploited through cum-cum transactions. The cost of this practice has been substantial for the German state, losing billions in withholding tax revenue. We find a significant decrease in the trading volume around ex-dividend date for dividends subject to withholding tax in the post period. However, we are not able to conclude that this decrease is solely due to cum-cum transactions, as the German stock market is assumed to be less liquid overall after the introduction of ITA § 36a. Nonetheless, the significant variables indicate that the legislation have decreased the abnormal trading volume around ex-dividend date, thus hopefully reducing the cost to the German state and its taxpayers.

Our research contributes to the existing literature on tax-avoiding practices and trading around ex-dividend date in Germany. We offer insight into the regulations aimed at combatting cum-cum trading, providing an increased understanding that can be taken into consideration when constructing similar preventitive measures later. However, the potential for future research is sufficient. As the magnitude of cum-cum trading is extensive and the impact has been substantial in multiple European countries, investigations on preventive measures made by authorities in other countries may provide further insight. This can potentially aid the harmonization of cross-border tax legislations. By including stock lending data, stock market price effects and detailed ownership data in the analysis, future research can hopefully identify additional insight into cum-cum trading.

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Appendix

Variable definitions, tables and regressions

Table 8 list all variables employed in the empirical analysis with the corresponding definitions. The variable name is presented in column (1), column (2) provides a description of the variable, while column (3) and (4) lists the tables and regressions where the variables have been utilized. The source of the variables is listed in column (5).

Table 8: Variable definitions

Variable (1)	Description (2)	Table (3)	Regression (4)	Source (5)
$Logrelvol_{it}$	The natural logarithm of the traded number of stocks relative to the stock's outstanding shares for the 100 most traded stocks at the XETRA trading venue.	5-7, 9-11	1-10, 12-16	Compustat Global, estimated
$Relvol_{it}$	A linear variable. Defined as the traded number of stocks relative to the stock's outstanding shares for the 100 most traded stocks at the XETRA trading venue.	10	11	Compustat Global, estimated
$Price_{it}$	Measures the effect the price for a given stock *i* at day *t* has on the trading volume, ceteris paribus.	5	1 - 2	Compustat Global
$L1.Price_{it}$	Measures the effect the price on the previous day (*t-1)* for a given stock *i* at day *t* has on the trading volume	5	2	Compustat Global
Taxable dividend, T_i	A binary indicator that equals one in the case of regular taxable dividends and zero in the case of withholding-tax-free dividends, thus capturing the effect on the trading volume if the dividend is subject to taxation or not.	5-7, 9-11	2-4, 6, 8-13, 15-16	Own contribution
Post period, P_t	A binary indicator that takes value of zero in the cum-cum period from January 2012 to July 25th, 2016 and one for observations in the post period (after the tax legislation was enforced) from 26th, July 2016 to July 2018.	5-7, 9-11	1-16	Own contribution
Event window, E_i	A binary indicator that takes the value of one for observations on days *d* and zero otherwise around the ex-dividend date, where $d \in [-3,3]$. It reports the average abnormal trading volume of these 7 days surrounding each dividend, compared to the all observations outside this window.	5, 11	1-3, 14-15	Own contribution
$E_i * T_i$	An interaction variable capturing the abnormal trading volume around ex-dividend date in the cum-cum period for dividends subject to regular taxation.	5, 11	2-3, 15	Own contribution
$E_i * P_t$	An interaction variable capturing the abnormal trading volume around ex-dividend date in the post period.	5, 11	1-3, 14-15	Own contribution
$E_i * P_t * T_i$	An interaction variable capturing the abnormal trading volume around ex-dividend date in the post period for dividends subject to regular taxation.	5, 11	2-3, 15	Own contribution
$E_{i,d}$	Takes the value of unity on day *d* around ex-dividend, where $d \in [-3,3]$. Thus it captures the abnormal trading volume on day *d*, totalling seven indicators. This variable is similar to E_i explained above, however it captures the abnormal trading on each day *d*.	6, 9-11	4, 7-13, 16	Own contribution
$E_{i,d} * P_t * T_i$	An interaction variable measuring the effect the tax legislation has had on the trading volume on the days *d* around the ex-dividend date for taxable dividends.	6, 9-11	4, 8-13, 16	Own contribution

Table continued on next page.

Table 9 (cont.): Variable definitions

Yield class, $E_i * rdy_j$	An interaction variable capturing the average abnormal trading volume in the seven day event window E_i, but distinguishes between three dividend yield groups: low yield (0-2%), medium yield (2-4%) and high yield (>4%). The three yield classes are identified by the indicator j, where $j \in [1,3]$. Low yield is identified by $j = 1$, medium yield when $j = 2$ and high yield when $j = 3$.	7	5-6	Own contribution
$E_i * rdy_y * T_i$	An interaction variable capturing the average abnormal trading volume by yield group around ex-dividend date in the cum-cum period for dividends subject to regular taxation.	7	6	Own contribution
$E_i * rdy_y * P_t$	An interaction variable capturing the average abnormal trading volume by yield group around ex-dividend date in the post period.	7	5-6	Own contribution
$E_i * rdy_y * P_t * T_i$	Our variable of interest for hypothesis 2. An interaction variable capturing the average abnormal trading volume by yield group around ex-dividend date in the post period for dividends subject to regular taxation.	7	6	Own contribution

Table 10: Day-specific abnormal trading volume around ex-dividend date (extended)

	(7)	(8)	(9)
Cum-cum period			
$E_{i,-3}$	.0618***		.0385
	(.0228)		(.0696)
$E_{i,-2}$	.0754***		.0936
	(.0212)		(.0624)
$E_{i,-1}$	.0985***		.138**
	(.023)		(.0693)
$E_{i,0}$	.123***		.168**
	(.0227)		(.0656)
$E_{i,1}$	.309***		.295***
	(.0325)		(.0686)
$E_{i,2}$	.342***		.349***
	(.0308)		(.0625)
$E_{i,3}$	.132***		.0831
	(.0264)		(.0626)
With taxes (T_i)			
$E_{i,-3} * T_i$			.0277
			(.0769)
$E_{i,-2} * T_i$			-.0217
			(.0702)
$E_{i,-1} * T_i$			-.0473
			(.0784)
$E_{i,0} * T_i$			-.0547
			(.0724)
$E_{i,1} * T_i$			.0171
			(.0797)
$E_{i,2} * T_i$			-.00745
			(.0731)
$E_{i,3} * T_i$			.0586
			(.0724)
Post period			
$E_{i,-3} * P_t$	.00206		.384**
	(.0438)		(.153)
$E_{i,-2} * P_t$	-.00573		.351**
	(.039)		(.163)
$E_{i,-1} * P_t$	-.0748*		.282**
	(.0391)		(.139)
$E_{i,0} * P_t$	-.0684		.0378
	(.0441)		(.116)
$E_{i,1} * P_t$	-.0357		.277**
	(.039)		(.129)
$E_{i,2} * P_t$	-.162***		.0528
	(.0415)		(.139)
$E_{i,3} * P_t$	-.151***		.122
	(.0437)		(.125)
With taxes (T_i)			
$E_{i,-3} * P_t * T_i$		-.437**	-.437**
		(.169)	(.169)
$E_{i,-2} * P_t * T_i$		-.406**	-.406**
		(.179)	(.179)
$E_{i,-1} * P_t * T_i$		-.405**	-.405**
		(.156)	(.156)
$E_{i,0} * P_t * T_i$		-.119	-.119
		(.144)	(.144)

Table continued on next page.

Table 11 (cont.): Day-specific abnormal trading volume around ex-dividend date (extended)

	(7)	(8)	(9)
$E_{i,1} * P_t * T_i$		-.358**	-.358**
		(.148)	(.148)
$E_{i,2} * P_t * T_i$		-.245	-.245
		(.158)	(.158)
$E_{i,3} * P_t * T_i$		-.314**	-.314**
		(.141)	(.141)
Estimation method	OLS(FE)	OLS(FE)	OLS(FE)
Stock level fixed effects	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes
$E_{i,d}$ $d \in [-3,3]$	-	Yes	-
$E_{i,d} * T_i$ $d \in [-3,3]$	-	Yes	-
$E_{i,d} * P_t$ $d \in [-3,3]$	-	Yes	-
Adj. R^2	.631	.631	.631

Notes: The dependent variable is defined as the natural logarithm of the traded number of stocks relative to the stock's outstanding shares The estimation includes 160,434 observations for 594 dividend events by 100 firms. The coefficients in regression (7) shows the abnormal trading volume on day *d* in the days around ex-dividend for dividends in the cum-cum period and the post period. Regression (8) and (9) includes the interaction term T_i for both periods, and both regressions show the same results. The difference is that regression (9) lists all coefficients while regression (8) only lists the coefficients of interest, as in Table 6. Hence, the coefficients on $E_{i,d} * I_i * T_i$ in regression (8) and (9) captures the effect the tax legislation has had on the trading volume on the days *d* around the ex-dividend date for regular taxable dividends, i.e. the dividends subject to credit on the withholding tax. The other control variables at the bottom of the table are as defined in previous tables. All standard errors are clustered at the stock-level to allow for serial correlation and heteroscedasticity. Standard errors are presented in the parentheses, and (***), (**) and (*) indicated significance at 1%, 5% and 10%, respectively.

Table 12: Robustness (I) – with regard to hypothesis 1

	(10)	**(11)**	**(12)**	**(13)**
Post period				
$E_{i,-5} * P_t * T_i$	-.287**			
	(.141)			
$E_{i,-4} * P_t * T_i$	-.468***			
	(.165)			
$E_{i,-3} * P_t * T_i$	-.435**	-.0007	-.442**	-.436**
	(.169)	(.0005)	(.169)	(.17)
$E_{i,-2} * P_t * T_i$	-.405**	-.0008	-.403**	-.397**
	(.178)	(.0006)	(.18)	(.179)
$E_{i,-1} * P_t * T_i$	-.405**	-.0006	-.404**	-.404**
	(.156)	(.0005)	(.156)	(.156)
$E_{i,0} * P_t * T_i$	-.119	.0005	-.119	-.129
	(.143)	(.0005)	(.145)	(.145)
$E_{i,1} * P_t * T_i$	-.358**	-.001	-.354**	-.37**
	(.148)	(.0007)	(.149)	(.149)
$E_{i,2} * P_t * T_i$	-.245	-.0007	-.244	-.251
	(.158)	(.0006)	(.159)	(.159)
$E_{i,3} * P_t * T_i$	-.313**	-.0007	-.307**	-.319**
	(.141)	(.0005)	(.141)	(.142)
$E_{i,4} * P_t * T_i$	-.313*			
	(.16)			
$E_{i,5} * P_t * T_i$	-.233*			
	(.137)			
Estimation method	OLS(FE)	OLS(FE)	OLS(FE)	OLS(FE)
Dependent variable	Natural log	Linear	Natural log	Natural log
Distinction	**Window size**	**Dep. variable**	**No outliers**	**No banks**
Stock level fixed effects	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes
$E_{i,d}$ $d \in [-5,5]$	Yes	-	-	-
$E_{i,d} * T_i$ $d \in [-5,5]$	Yes	-	-	-
$E_{i,d} * P_t$ $d \in [-5,5]$	Yes	-	-	-
$E_{i,d}$ $d \in [-3,3]$		Yes	Yes	Yes
$E_{i,d} * T_i$ $d \in [-3,3]$		Yes	Yes	Yes
$E_{i,d} * P_t$ $d \in [-3,3]$		Yes	Yes	Yes
Dividends paid	594	594	591	587
Adj. R^2	.631	.352	.640	0.621
Observations	160,434	160,434	158,079	157,128

Notes: In order to ensure robust results, the four regressions in Table 10 shows adjustments to the model in regression in Table 6. The distinction for each regression is specified in bold. In regression (10), $E_{i,d}$ takes a value of one on day d [-5,5] before or after the ex-dividend date. The coefficients suggest when expanding the event window, there seem to have been a significant decrease in the abnormal trading volume for days (-5), (-4), (4) and (5) as well. The decrease in day (-5) is significant at a 5% level, whereas day (-4) has significant decreased at a 1% level. Regression (11) suggests the linear dependent variable is inferior to the natural logarithm dependent variable used in all other regressions. This argument is based on the notably lower determination coefficient and the lack of significant coefficients at a 5% level compared to the regression in Table 6. Regression (12) ensures robust results by removing stocks that only existed in either of the periods. By removing these observations in the robustness test, we aim to ensure the unbalanced panel does not contain a huge outlier in terms of volume that only exists in one period due to entering or bankruptcy. The regression results suggest this is not an issue, as the coefficients are similar to the coefficients in Table 6. Regression (13) excludes Commerzbank and Deutsche Bank from the sample as they have been named central in the cum-cum scandal, however the conclusion of our results remain unchanged. The other control variables at the bottom of the table are as defined in previous tables. All standard errors are clustered at the stock-level to allow for serial correlation and heteroscedasticity.. Standard errors are presented in the parentheses, and (***), (**) and (*) indicated significance at 1%, 5% and 10%, respectively.

Table 13: Robustness regression (II) – Tax legislation dummy January 1st, 2016

	(14)	(15)	(16)
Cum-cum period			
E_i	.162***	.165**	
	(.021)	(.0663)	
With taxes (T_i)			
$E_i * T_i$		-.00573	
		(.075)	
Post period			
$E_i * P_t$	-.0344	.134	
	(.026)	(.103)	
With taxes (T_i)			
$E_i * P_t * T_i$		-.2*	
		(.119)	
$E_{i,-3} * P_t * T_i$			-.281**
			(.136)
$E_{i,-2} * P_t * T_i$			-.216
			(.159)
$E_{i,-1} * P_t * T_i$			-.129
			(.119)
$E_{i,0} * P_t * T_i$			-.0783
			(.123)
$E_{i,1} * P_t * T_i$			-.276**
			(.136)
$E_{i,2} * P_t * T_i$			-.218
			(.143)
$E_{i,3} * P_t * T_i$			-.2
			(.123)
Estimation method	OLS(FE)	OLS(FE)	OLS(FE)
$Price_{i,t}$	Yes*	-	-
Stock level fixed effects	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes
$E_{i,d}$ $d \in [-3,3]$	-	-	Yes
$E_{i,d} * T_i$ $d \in [-3,3]$	-	-	Yes
$E_{i,d} * P_t$ $d \in [-3,3]$	-	-	Yes
Adj. R^2	.634	.631	.631

Notes: The dependent variable is defined as the natural logarithm of the traded number of stocks relative to the stock's outstanding shares. The estimation includes 160,434 observations for 594 dividend events by 100 firms. Table 11 ensures robust results by adjusting the binary indicator, P_t, which now assumes the tax legislation to come into effect on January 1st, 2016, compared to July 26th, 2016. Hence, P_t takes value of zero in the cum-cum period from January 2012 to December 2015 and one for observations in the post cum-cum period (after the tax legislation was enforced) from January 1st, 2016 to July 2018. The tax legislation was enforced on July 26th 2016, but had retroactive effect from January 1st, 2016. We aim to see if we could observe the same trading volume trend around ex-dividend by adjusting the variable P_t. All the coefficients in regression (16) are negative, but only two coefficients are significant on a 5% level. Thus, this is evidence towards the tax legislation having an effect after it became enforced in July 2016. The other control variables at the bottom of the table are as defined in previous tables. All standard errors are clustered at the stock-level to allow for serial correlation and heteroscedasticity.. Standard errors are presented in the parentheses, and (***), (**) and (*) indicated significance at 1%, 5% and 10%, respectively.