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Financial Transaction Taxes:
Announcement effects, short-run effects, and long-run effects

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Abstract: We analyze the impact of the French 2012 financial transaction tax (FTT) on trading volumes, stock prices, stock liquidity and volatility. We extend the empirical research by the identification of FTT announcement and short-run treatment effects, which may distort difference-in-differences estimates. In addition, we account not only for the intraday volatility but also for long-term volatility measures. While we find strong evidence for a positive FTT announcement effect on trading volumes, there is almost no statistically significant evidence for a long-run treatment effect. Thus, existing evidence on a strong reduction of trading volumes resulting from the French FTT might be biased by FTT announcement effects. We also find an increase of intraday volatilities in the announcement period and a significant reduction of weekly and monthly volatilities in the treatment period. Therefore, our findings support theoretical considerations suggesting a stabilizing impact of FTTs on financial markets. While some of our results suggest a reduction of stock prices in the announcement period, our results on bid-ask spreads and daily returns are not fully conclusive.

Keywords: Financial transaction taxes, market quality, volatility, trading volume, liquidity, price discovery, announcement effects, short-run treatment effects

JEL Classification: G02; G12; H24; M41

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1. Introduction

In recent years, the taxation of financial transactions has become a major topic in international economic policy due to the financial crisis 2008–2009 and the following sovereign debt crisis in European countries (e.g., Hemmelgarn and Nicodème, 2010; Shackelford, Shaviro, and Slemrod, 2010). Due to the latest efforts of a group of member states of the European Union to introduce a financial transaction tax (FTT), the interest in the impact of such taxes on market quality and stability has increased significantly (e.g., Becchetti, Ferrari, and Trenta, 2014; Di Wiesenhoff and Egori, 2013; Pomeranets and Weaver, 2013; Coelho, 2015).

There are two main arguments for the introduction of a FTT. First of all, legislators intend to generate tax revenue. Significant tax payments to be achieved with only a low tax rate (Shackelford, Shaviro, and Slemrod, 2010), low administrative costs and a small distortion of the real economy (Hemmelgarn and Nicodème, 2010) have been pointed out as benefits of such a type of tax. As a second argument, proponents claim an enhancement of the stability of financial markets. As FTT payments represent a significant portion of the returns that can be realized by short-term speculation, it has been argued that such a tax will reduce speculative noise trading and enhance financial stability (Stiglitz, 1989; Summers and Summers, 1989).

On the contrary, FTT opponents have seriously criticized such a form of taxation as ineffective and inefficient (e.g., Schwert and Seguin, 1993; Jones and Seguin, 1997; Umlauf, 1993, Baltagi, Li, and Li, 2006). A main argument is a high tax-elasticity of financial investments. Therefore, introducing a FTT in one market would result in a migration of trading activity to either untaxed assets or to tax-free markets and – as a consequence – in a strong reduction of trading volume. Thus, in spite of low tax rates, there might be a significant distortion of investment behavior. In addition, FTT opponents claim that such a tax might harm price efficiency and market liquidity, and – as a result – reduce stock values and increase volatility.

As there is no theoretical consensus on the impact of a FTT, the empirical analysis of FTT effects on stock markets is an important research topic. While there is a number of papers on FTT regulations in Asian markets (e.g., Hu, 1998; Baltagi, Li, and Li, 2006; Liu and Zhu, 2009; Hayashida and Ono, 2011; Su and Zheng, 2011; Deng, Liu, and Wei, 2014), the majority of recent research papers focuses on the introduction of a FTT on August 1, 2012 for French-headquartered stocks with a market capitalization of at least € 1 billion (Becchetti, Ferrari, and Trenta, 2014; Capelle-Blancard and Havrylchyk, 2013; Coelho, 2015; Colliard and Hoffmann, 2013; Colliard and Hoffmann, 2016; Gomber, Haferkorn, and Zimmermann, 2016; Haferkorn and Zimmermann, 2013; Meyer, Wagener, and Weinhardt, 2015; Parwada, Rui, and Shen,

2013). The rate of this FTT regulation amounts to 0.2% of turnover. The French government initially expected to raise about € 1.5 billion of tax revenue per year. However, the true tax revenue based on OECD data amounts to about € 700-800 million (approximately 50% of the expected revenue).

While existing studies do not provide consistent and significant evidence regarding the impact of the French FTT on liquidity, volatility and stock prices, an important outcome is a significant reduction of trading volume. Corresponding to previous estimates, the French FTT should have reduced trading volumes of taxable large-capitalization stocks by about 15% to 30%. Such a strong decrease in trading volumes might be induced by a migration of trading activities and could be connected to a reduction of stock prices and liquidity.

In our paper, we address these issues empirically and extend the existing research in three ways. First of all, while recent studies interpret the French FTT reform as a natural experiment and estimate its impact by difference-in-differences (in the following DiD) estimation, they do not identify potential FTT announcement effects,[1] which may lead to a violation of the common trends assumption. As the FTT legislation passed the French National Assembly on March 14, 2012, investors had a strong incentive to execute transactions of taxable stocks (large-capitalization stocks of the French stock market) earlier than initially planned. Thus, there might be a positive announcement effect of the FTT reform temporarily increasing trading volumes between March 14, 2012 and July 31, 2012 (FTT announcement period before the introduction date). In this case DiD estimates comparing observations of the announcement period and observations of the treatment period should lead to biased estimates of the FTT treatment effect.

Second and in contrast to most other studies (e.g., Beccetti, Ferrari, and Trenta, 2015; Parwada, Rui, and Shen, 2014; an exception considering short-term effects is Colliard and Hoffmann, 2016), we distinguish between short-run treatment effects and long-run treatment effects. While short-run market reactions might be strong, they are not necessarily a good predictor for long-run changes in the market structure. Therefore, short-run market reactions might lead to an overestimation of FTT impact. For example, estimates of Coelho (2015) are based on a very short time window of three weeks before and after the FTT implementation date on August 1, 2012.

[1] Colliard and Hoffmann (2016) discuss potential anticipation effects in a cross check in their Appendix B.5 but do not find corresponding evidence for trading volume. In addition, Coelho (2015) discusses a short-term anticipation effect surrounding the introduction date of the tax. However, resulting from her short observation period ignoring the announcement date, she does not fully consider that aspect.

Third, while existing studies on the French FTT concentrate on measures of intraday volatility (Beccheti, Ferrari, and Trenta, 2014; Capelle-Blancard and Havrylchyk, 2013; Coelho, 2015; Colliard and Hoffmann, 2013; Gomber, Haferkorn, and Zimmermann, 2016; Meyer, Wagener, and Weinhardt, 2015), we also test for long-term volatility measures, such as weekly volatility and monthly volatility. As pure day trading is not taxed by the French FTT, it seems questionable from a theoretical perspective if short-term volatility measures should be affected by the French FTT. Therefore, we lay a strong focus on long-term volatility measures that might be more relevant for stock market stability.

In preliminary tests, we are able to replicate existing findings on a strong reduction of trading volume after the introduction date of the FTT 2012. However, corresponding evidence becomes widely insignificant or even disappears if we control for announcement effects and short-run treatment effects on trading volume. While we find evidence for a strong and positive FTT announcement effect on trading volumes of treated stocks, there is almost no significant evidence for a long-run reduction of trading activity on regulated LIT markets. Our findings suggest that existing evidence on a strong reduction of trading volumes resulting from the French FTT might have been driven by FTT announcement effects while corresponding estimates on long-run FTT effects are biased.

Regarding volatility measures, we find an increase of intraday volatilities in the announcement period that might be due to a higher trading activity of noise traders before the FTT introduction date. In addition and more relevant, we observe a reduction of weekly and monthly volatilities in the treatment period. These findings fit well with Stiglitz (1989) and Summers and Summers (1989) who hypothesize a stabilizing effect of FTTs on stock markets. Some of our results suggest a reduction of stock prices in the announcement period, which might be driven by an anticipation of that tax. However, our results on bid-ask spreads and daily returns are not fully conclusive and should therefore be interpreted with caution.

The paper is organized as follows. Section 2 contains a brief overview of the French FTT introduced in 2012. Section 3 provides theoretical considerations on FTT effects and develops our hypotheses. Identification strategy and data are documented by Section 4. Section 5 provides the empirical results and Section 6 concludes.

2. The French FTT 2012

On January 29, 2012 it became publicly known that the French President Sarkozy was planning the introduction of a financial transaction tax (FTT). While the legislation process was initially

planned to be completed until April 2012, the reform became into effect on August 1, 2012. In January and February further publications informed the public about the intended FTT rate of 0.1% for stock transactions. As announced by February 6, 2012, the FTT should only apply to transactions of stocks of French-headquartered companies with a market capitalization of more than € 1 billion at January 1 of the respective year. Furthermore, the reform introduced a FTT on high-frequency trading and a FTT on transactions of sovereign credit swaps (both with a much lower rate of 0.01%). These additional FTTs generated low tax revenue and are not considered in the following, as they should be of minor relevance for our analysis of stock market reactions.

The first reading of the tax bill no. 2012-354 was on February 16. The bill finally passed the French National Assembly on March 14, 2012. Therefore, since the middle of March 2012 the introduction of a FTT on French large capitalization stocks on the first of August was a foreseeable event that might have been anticipated by stock market participants. Following the presidential elections in May, President Hollande announced the increase of the FTT rate on stock transactions from 0.1% to 0.2% on June 26, 2012. The National Assembly agreed upon the doubling of the FTT rate on July 31, one day before the FTT introduction on the first of August 2012. The final guidelines of the FTT were released one day later (August 2, 2012).

Compared to FTTs analyzed by previous research, the French FTT has a number of unique properties that should prevent a loss of stock market liquidity and a migration of stock market transactions to other markets (PriceWaterhousCoopers, 2012; Haferkorn and Zimmermann, 2013). These characteristics are important to understand the FTT impact on the French capital market. The French tax applies to the acquisition of securities that give access to capital and voting rights in the issuing company. Since December 2012, cross listings as well as European and American Depositary Receipts (EDRs, ADRs) are also taxed by the French FTT. Therefore, a simple migration of stock trading to other markets was and is virtually no way to escape the French FTT. As the French FTT has been limited to stocks with a minimum market capitalization of € 1 billion, stocks of smaller companies in terms of total capitalization should not have been affected directly by the tax.

A taxable transaction of the French FTT requires a change in the ownership of a security between two trading days. Therefore, pure day trading (buying and selling of a stock on the same trading day) is not taxed by the French FTT, which might mitigate the tax impact on stock market liquidity. Furthermore, the bill included a number of tax exemptions in order to avoid cascading effects and to ensure the provision of sufficient liquidity. These include a) market

making activities, b) transactions performed under liquidity agreements, c) exchangeable/convertible bonds, d) securities financing transactions, e) transactions performed by central securities depositories or clearinghouses, f) intra-group restructuring schemes and employee saving schemes, and g) primary market acquisitions.

Corresponding exemptions highlight the rigorous commitment of the French legislator to protect liquidity provision as market making and contractual liquidity provision has been excluded from being taxed. Regarding the taxation of derivatives, the scope of the French FTT is clearly limited. Apart from sovereign credit swaps, derivatives were not captured by the French FTT. Thus, the design of derivatives might have been a potential strategy to avoid FTT payments without the necessity of a migration of stock trading.

Figure 1 illustrates the described process of the French FTT reform. In addition, Figure 1 also considers the European discussion on a FTT introduction (for dates on the EU level see Di Wiesenhoff and Egori, 2013). As mentioned before, the European Commission has undertaken efforts to introduce an EU-wide FTT in September 2011. Although in summer 2012 no agreement between the European countries could be obtained, a group of EU member states has decided to introduce a joint FTT regulation. In November 2015 and October 2016 this enhanced cooperation has reaffirmed its intention.

[Figure 1 about here]

3. Theory, evidence and hypotheses

For the derivation of hypotheses, we refer to the existing theoretical and empirical literature. Table 1 gives an overview of the empirical research on FTT impact on trading volume, stock prices, market liquidity and market volatility.

[Table 1 about here]

In line with standard economic theory (e.g., Stiglitz, 1989; Schwert and Seguin, 1993), a considerable number of studies provides evidence for a negative effect of FTTs on the trading volume of stocks as the expected return of short-time trading strategies will be reduced by the tax payments. Note that this does not hold for (non-taxable) pure day trading in the case of the French FTT. Nevertheless, we hypothesize a negative long-run treatment effect on trading volume.

H1a: *The introduction of the French FTT on August 1, 2012 resulted in a long-run reduction of trading volumes for taxable stocks.*

As documented by Section 2, the French FTT had been announced before its introduction date on August 1, 2012. Market efficiency suggests that foreseeable future events are anticipated by stock markets (Fama, 1970). Therefore, we expect an impact of the FTT announcement effect on the French stock market. We focus on the March 14, 2012 as official announcement date, when the legislation passed the French National Assembly in a second reading. Since that date, the French FTT regulation can be regarded as a foreseeable and almost certain event for French and international investors.[2] In the following, we interpret the timespan between March 14, 2012 and July 31, 2012 as announcement period of the FTT.

The announcement of the FTT generated a strong incentive for investors to shift transactions of (taxable) large-capitalization stocks from the post-reform period to the tax-free pre-reform period in order to avoid FTT payments. Thus, in the announcement period (after the announcement date and before the introduction date), the FTT should have resulted in a positive bring-forward effect increasing trading volume and reducing trading volume in the period shortly after the introduction date. This suggests a negative short-run effect of the French FTT on trading volume as well as a positive announcement effect.

H1b: *The introduction of the French FTT on August 1, 2012 resulted in a short-run reduction of trading volumes for taxable stocks.*

H1c: *The announcement of the French FTT on March 14, 2012 resulted in a temporary increase of trading volumes for taxable stocks until the FTT introduction date on August 1, 2012.*

Regarding stock prices, the theoretical impact of a FTT is not fully obvious. Umlauf (1993) argues that the discounted value of foreseeable FTT payments will reduce the expected net cash flow of an asset and therefore reduces the net present value of that asset. Of course, this should only be an important factor for investors with relatively short holding periods. Furthermore, theory suggests a mispricing of stocks due to an increase in transaction costs, a reduction of trading volume and a reduction of market liquidity. While such a mispricing may result in overpricing and underpricing, it might also increase the costs of capital of risk-averse investors,

[2] While the French FTT had already been declared by President Sarkozy on January 29, 2012, the detailed regulations were still unspecified at that time. As corresponding regulations are important for our identification strategy (especially with regard to the limitation of the treatment group to stocks with a minimum market capitalization of € 1 billion), we decided to focus on the date, when the law had passed the French National Assembly. We note that investors had sufficient time to shift trading activities from the treatment period (since August 1, 2012) to the announcement period (from March 14, 2012 to July 31, 2012) after the second reading of the FTT legislation.

which should result in a reduction of stock prices (Hu, 1998; Bond, Hawkins, and Klemm, 2005; Westerholm, 2003).

An important argument against an economically significant impact of the French FTT on price discovery stems from arbitrage theory. If the underlying value of an asset depends on its cash flow stream (NPV of expected after-tax cash flows), then a mispricing exceeding the FTT payment and other transaction costs will induce an adjustment of market prices to their fundamental level. Thus, considering the low French FTT rate of 0.2%, its price impact might have been too small to be economically relevant. Note further that the French FTT exempts liquidity-relevant activities (e.g., market-making) and short term day-trading without a change of effective ownership between two trading days. Thus, the effective FTT burden will be zero for some investors. As there are no arguments for a positive FTT impact on stock prices, we hypothesize a negative effect of the reform date on daily returns. If stock price reductions were not enduring, one might expect return reversals in the long-run. This could be interpreted as a short-run overreaction of investors (Tetlock, 2011). Nevertheless, we hypothesize a reduction of daily returns in the short-run as well as in the long-run resulting from the FTT introduction date.

H2a: *The introduction of the French FTT on August 1, 2012 resulted in a long-run reduction of daily returns of taxable stocks.*

H2b: *The introduction of the French FTT on August 1, 2012 resulted in a short-run reduction of daily returns of taxable stocks.*

Stock market efficiency suggests that foreseeable future developments are considered by current stock prices (e.g., Fama, 1970). As stated by Brooks, Patel and Su (2003) it "(…) is only new – and especially new and unpredictable – information that moves prices (…)." Therefore, one might expect a stronger negative price impact in the announcement period of the French FTT.

H2c: *The announcement of the French FTT on March 14, 2012 resulted in a temporary reduction of daily returns of taxable stocks until the FTT introduction date on August 1, 2012.*

It is generally assumed that decreasing trading volumes lead to lower liquidity. Habermeier and Kirilenko (2003) as well as Song and Zhang (2005) point out that even speculators and noise traders might be relevant for the provision of stock market liquidity. Increased transaction costs should reduce the incentives of short-term trading strategies. As a consequence, noise traders

might be distracted from the market and market liquidity might be reduced. Pellizari and Westerhof (2009) argue that the described relation only applies to double auction markets (regular stock exchanges). If liquidity is provided exogenously by specialists (e.g., market-makers), there should be no corresponding reduction of market liquidity. This argument might be relevant in our case, as the French FTT exempts market-making activities and other transactions, which are relevant for liquidity provision.

Empirical studies mainly use the bid-ask spread to measure liquidity (e.g., Becchetti, Ferarrri, and Trenta, 2014; Colliard, and Hoffmann, 2013; Meyer, Wagener, and Weinhardt, 2015). An increase in bid-ask spread is interpreted as a decrease in liquidity. In line with most studies, we hypothesize a negative long-run and short-run FTT impact on liquidity. Following previous research, we use the bid-ask spread as liquidity measure.

H3a: *The introduction of the French FTT on August 1, 2012 resulted in a long-run increase of bid-ask-spreads for taxable stocks.*

H3b: *The introduction of the French FTT on August 1, 2012 resulted in a short-run increase of bid-ask-spreads for taxable stocks.*

As the announcement of the French FTT should have temporarily increased trading volumes (see H1c), we expect the opposite effect in the announcement period.

H3c: *The announcement of the French FTT on March 14, 2012 resulted in a temporary decrease of bid-ask-spreads of taxable stocks until the FTT introduction date on August 1, 2012.*

An important argument for the introduction of a FTT is its hypothesized positive influence on market stability implying a reduction of volatility (e.g., Stiglitz, 1989; Summers and Summers, 1989). Therefore, a FTT provides a negative incentive for noise trading and reduces destabilizing short-term speculation in the market (Hemmelgarn and Nicodème, 2010). While this consideration can be regarded as the traditional standard view, there are also contradicting perspectives in the literature, assuming a destabilizing effect of a FTT.

There are two main arguments for a positive FTT impact on market volatility. First of all, it has been argued that risk-seeking noise traders might be an important counterparty for hedging strategies and thus provide valuable liquidity to the market. Thus, if a FTT drives out noise traders, it gets harder to find a counter party for risky transactions. As a result, the liquidity of the treated stocks might decrease and the volatility of stock prices might increase (Schwert and Seguin, 1993; Hau, 2006; Becchetti, Ferrari, and Trenta, 2014). That holds especially for stock

markets with a high share of noise traders (so-called composition effect; Song and Zhang, 2005; Deng, Liu, and Wei, 2014). Second, a consequence of a FTT may be a mispricing of assets due to an increase in transaction costs. Thus, it might take longer until prices reflect the fundamental information leading to more noise in price discovery and a higher market volatility (Baltagi, Li, and Li, 2006; Parwada, Rui, and Shen, 2013).

It has already been mentioned that the French FTT regulation includes a significant number of characteristics to avoid a distortion of market liquidity and the pricing mechanism. Therefore, we follow standard theory and hypothesize a negative impact of the French FTT on market volatility. While intraday volatility has been widely used by papers on the French FTT (e.g., Becchetti, Ferrari, and Trenta, 2014; Capelle-Blancard and Havrylchyk, 2013; Gomber, Haferkorn, and Zimmermann, 2016), this measure does not account for the volatility of stock prices between trading days. As pure day trading is not captured by the French FTT, it seems questionable if intraday volatilities are significantly affected by the tax. Furthermore, one might doubt if a reduction of intraday volatilities would result in significant enhancement of financial stability. Therefore, we consider the intraday volatility as well as two long-term volatility measures on the stock level (the weekly volatility and the monthly volatility) in our regressions. A definition of these variables is provided by Section 4.

H4a: *The introduction of the French FTT on August 1, 2012 resulted in a long-run reduction of volatility of taxable stocks.*

H4b: *The introduction of the French FTT on August 1, 2012 resulted in a short-run reduction of volatility of taxable stocks.*

Considering the hypothesized positive bring-forward effect on trading volumes (H1c), we hypothesize an increase of volatility during the announcement period. As H1c suggests an activation of noise traders and short-term trading during the announcement period, this is the most reasonable assumption from our perspective.

H4c: *The announcement of the French FTT on March 14, 2012 resulted in a temporary increase of volatility of taxable stocks until the FTT introduction date on August 1, 2012.*

4. Identification strategy and data

4.1. Identification strategy

An important identification strategy of the existing literature on the market impact of FTTs is the interpretation of tax reforms as natural experiments. That holds especially for the recent introduction of the French FTT in 2012 (e.g., Beccheti, Ferrari, and Trenta, 2014; Capelle-

Blancard and Havrylchyk, 2013; Coelho, 2015; Colliard and Hoffmann, 2013; Colliard and Hoffmann, 2016; Gomber, Haferkorn, and Zimmermann, 2016; Meyer, Wagener, and Weinhardt, 2015; Parwada, Rui, and Shen, 2013). Note that the French FTT referred exclusively to France-based stocks (French headquarter) with a minimum market capitalization of € 1 billion.

The existing literature on the French FTT mainly relies on DiD comparisons of the treatment group (French large-capitalization stocks) and two types of control groups: a) large-capitalization stocks of European control markets (e.g., German DAX); b) nontaxable French stocks with a market capitalization of less than € 1 billion. While such a strategy might be well-suited for the identification of market reactions resulting from a FTT, a major requirement for DiD estimation is the common-trend assumption.

Therefore, the underlying (long-run) trend of the treatment group should be very close to the control group. Testing co-movements between the treatment group and potential control groups graphically (see Section 5.1), we find strong long-run correlations with the treatment group for European large-capitalization stocks (German CDAX and London Stock Exchange with a minimum market capitalization of € 1 billion in January 1, 2012), but not for French small capitalization stocks. That holds for measures of stock market volumes, prices, liquidity and volatility (liquidity and volatility not reported). As a consequence, our analysis is exclusively based on comparisons between the treatment group and a panel of German and United Kingdom large capitalization stocks, which can be regarded as an appropriate control group.

The selection of a well-suited control group is not sufficient to ensure the identification of long-run FTT effects in our setting. As mentioned before, stock trading of the French market in the pre-reform period (before August 1, 2012) might have been affected by the announcement of the new French FTT on March 14, 2012. As corresponding announcement effects imply an increase of trading volumes (H1c), the common trends assumption might not be satisfied. Under these conditions, DiD estimation will lead to an overestimation of the FTT effects on the trading volume. The same consideration holds for strong short-run market reactions resulting from a shifting of trades from the pre-reform period to the post-reform period (tax-induced bring-forward effect). Corresponding trading activities might result in a strong but temporary reduction of trading volumes shortly after the introduction date. Thus, short-run market reactions should not be considered as an indicator for the long-run impact of the French FTT and might lead to inconsistent estimates as well.

To account for FTT announcement effects as well as for short-run FTT effects, we consider two alternative approaches. As a preliminary step we perform a simple DiD estimation in order to replicate the result of the literature suggesting a strong reduction of trading volume (e.g., Beccheti, Ferrari, and Trenta, 2014; Capelle-Blancard and Havrylchyk, 2013; Coelho, 2015; Colliard and Hoffmann, 2013; Gomber, Haferkorn, and Zimmermann, 2016; Meyer, Wagener, and Weinhardt, 2015; Parwada, Rui, and Shen, 2013). Within this estimation, we analyze evaluation periods of two, four, and eight months before and after the FTT introduction date at August 1, 2012. We account for observations of treated (French) large-capitalization stocks and untreated large-capitalization stocks in the United Kingdom and Germany. This preliminary model with the logarithm of daily trading volume (measured in 1,000 units of traded stocks) as dependent variable can be described by

$$Trading\ Volume_{it} = \alpha + \beta_1 \cdot TPeriod_t + \beta_2 \cdot DiD_{it} + \gamma_k \cdot C_{kit} + \psi_t + \upsilon_i + u_{it}. \quad (1)$$

$TPeriod_t$ is a dummy variable with a value of one for observations of stocks *i* at time *t* after July 31, 2012 (treatment period). DiD_{it} is an interaction term of $TPeriod_t$ and a dummy variable for French large capitalization stocks that are subject to the FTT 2012. As we consider stock fixed effects υ_i, there is no need to consider a dummy variable for treated French stocks. C_{kit} is a vector of *k* control variables including the daily price-to-book ratio in percentage points (*Price-to-book ratio*), the logarithm of daily market capitalization (in million €) (*Market capitalization*) and the logarithm of the current-year EBITDA (in € 1,000) (*EBITDA*). We further include monthly fixed effects ψ_t to account for stock market seasonality and the error term u_{it}.

We assume that the results from Equation (1) might be distorted by announcement effects and short-run treatment effects and is therefore inconsistent as an estimate for long-run treatment effects. Therefore, we re-estimate the model, but exclude observations from the announcement period as well as observations shortly after the introduction date (short-run treatment period). As suggested by our graphical analysis (see Section 5.1), we consider a short-run treatment period of one month. This fits well with Colliard and Hoffmann (2016), who observe an especially strong capital market reaction in August 2012 and interpret this finding as a seasonality effect. Therefore, we compare the period before the announcement of the FTT (two, four and eight months before March 14, 2012) with the period after initial short-run market reactions (two, four, and eight months after August 31, 2012). The model can be rewritten as

$$Trading\ Volume_{it} = \alpha + \beta_1 \cdot LTPeriod_t + \beta_2 \cdot LDiD_{it} + \gamma_k \cdot C_{kit} + \psi_t + \upsilon_i + u_{it}, \quad (2)$$

with $LTPeriod_t$ as dummy for stock-year observations after August 31, 2012 and $LDiD_{it}$ (= interaction term of $LTPeriod_t$ with a dummy for treated stocks) as measure for the long-run FTT effect.

A disadvantage of Equation (2) is that it neither provides an estimate for short-run treatment effects nor for announcement effects. Therefore, (2) is not appropriate to test all of our hypotheses. Therefore, we generalize our analysis by including observations from four periods: (a) the pre-announcement period, (b) the announcement period, (c) the short-run treatment period, and (d) the long-run treatment period. As observations before the announcement of the French FTT can be regarded as undistorted, we use the pre-announcement period as reference point and include dummy variables and DiD interaction terms for the three other periods. Thus, we estimate

$$Y_{it} = \alpha + \beta_1 \cdot APeriod_t + \beta_2 \cdot ADiD_{it} + \beta_3 \cdot STPeriod_t + \beta_4 \cdot SDiD_{it} + \beta_5 \cdot LTPeriod_t + \beta_6 \cdot LDiD_{it} + \gamma_k \cdot C_{kit} + \psi_t + \upsilon_i + u_{it} \quad (3)$$

for different dependent variables Y_{it}. $APeriod_t$ is a dummy variable with a value of 1 in the announcement period. $ADiD_{it}$ is an interaction term of $APeriod_t$ and a dummy variable for treated stocks. It identifies the announcement effect. $STPeriod_t$ is a dummy variable for observations in the short-run period (August 1 to August 31, 2012) and $LTPeriod_t$ is a dummy variable for observations in the long-run period (two, four and eight months after August 31, 2012). $SDiD_{it}$ and $LDiD_{it}$ are the corresponding DiD interaction terms.

We use measures for trading volume, stock prices, liquidity and volatility as dependent variables Y_{it}. *Trading volume* is defined in the same way as in Equations (1) and (2) (logarithm of 1,000 traded stock units per day and stock). As measure for price effects, we use the daily return, respectively the relative change of the average stock prices between two trading days $\left(=\left(Price_{it} - Price_{it-1}\right)/Price_{it-1}\right)$. Stock market liquidity is measured by the relative bid-ask-spread, which is the difference of the average ask and the average bid price of a day, divided by the average daily stock price $\left(=\left(Ask\ price_{it} - Bid\ price_{it}\right)/Price_{it}\right)$. With regard to volatility, we use three simple alternative measures for the daily, weekly and monthly volatility of each stock. As daily measure we use the relative intraday volatility, respectively the difference between the highest and the lowest execution price per day divided by the average price of that day $\left(=\left(Highest\ price_{it} - Lowest\ price_{it}\right)/Price_{it}\right)$. As long-term weekly (monthly) volatility measure, we use the standard deviation of the average daily stock price in

€ over one week (one month) divided by the average stock price of that week (month) $\left(Relative\ weekly/monthly\ volatility = STD\left(Price_{it}\right)/Mean\left(Price_{it}\right)\right)$.

4.2. Data

Following most papers (e.g., Beccheti, Ferrari, and Trenta, 2014; Capelle-Blancard and Havrylchyk, 2013; Gomber, Haferkorn, and Zimmermann, 2016; Meyer, Wagener, and Weinhardt, 2015; Parwada, Rui, and Shen, 2013), our analysis is based on data from regulated LIT markets. By contrast, Colliard and Hoffmann (2013) and Colliard and Hoffmann (2016) also consider data from OTC, darkpools and other non-regulated markets. OTC data are also considered by Coelho (2015). Taking into account that the analyzed French stock market (the Paris Stock Exchange, part of NYSE Euronext) is one of the biggest markets in Europe, we select the two largest other Western European stock markets as the control group, namely those of the United Kingdom (the London Stock Exchange) and Germany (Frankfurt Stock Exchange). This can be justified as follows: 1) London and Frankfurt are geographically close to the French trade center Paris. 2) Germany and the United Kingdom are culturally and politically closely related to France. 3) The United Kingdom, Germany, and France are similar countries in terms of population size, land area, and economic development. 4) The London Stock Exchange can be interpreted as a leading trading place affecting other European stock markets. 5) There were no major tax reforms implemented in the control group during the relevant evaluation period.

We rely on stock market and financial statement information using the Datastream database from Thomson Reuters. While information on stock prices (including average prices, daily average bid and ask prices, highest and lowest prices) and trading volumes for each stock are available on a daily basis, financial statement data is available on an annual level. We use information on all relevant stocks for four time periods. (1) The pre-announcement period is the time before the announcement date of the French FTT (March 14, 2012). We consider two alternative time windows of two, four, and eight months (evaluation period) before that date as potential pre-announcement periods (starting days January 14, 2012, November 14, 2011, or July 14, 2011). (2) The announcement period ranges from March 14, 2012 (announcement date) until July 31, 2012. The period following the introduction date (August 1, 2012) is divided in the short-run treatment period (3) (one month until August 31, 2012) and the long-run treatment period (4), which begins on September 1, 2012. Similar to the pre-announcement period, we account for three alternative long-run treatment periods (two months until October 31, 2012, four months until December 31, 2012, or eight months until April 30, 2013).

These raw data are adjusted in two ways. 1) We exclude all observations with missing information on trading volumes, prices or control variables. 2) We do not consider observations with a negative book value.[3] Our final data is an unbalanced panel ranging from either January 14, 2012, November 14, 2011 or July 14, 2011 to either October 31, 2012, December 31, 2012, or April 30, 2013, with 78,499, 110,597, or 174,215 stock–day observations for all periods.

In Table 2, we provide descriptive statistics for an evaluation period of two months and an evaluation period of eight months (longer period in the following in brackets). In these periods, we have 20,867 (47,217) observations of French stocks, 17,436 (39,147) observations of German stocks, and 40,196 (87,851) observations of UK stocks. Thus, for each French observation, we have about 2.7 observations in the control group. On average, trading volumes are higher in the control group, which is driven by the high trading volumes in London. However, this is no problem for our analysis as time-invariant differences in means are captured by stock fixed effects and our graphical evidence suggests a strong degree of co-movement of trading volumes in the treatment group and the control group (see Section 5.1.).

Descriptive statistics of daily returns, the various volatility measures (relative intraday volatility, relative weekly volatility, relative monthly volatility), market capitalization are very close to each other in all three markets. The mean daily returns in both groups are very small and statistically not different from zero. Compared to the French market, German EBITDA values are higher and UK EBITDA values are lower. The same holds for the relative bid-ask spreads. Thus, the control group should fit quite well with average French EBITDA and average French relative-bid ask spreads. Average stock prices are similar in the French and the German market, and higher in the UK market, which is driven by the division of stocks into shares. The same holds for trading volumes and documents the strong position of the London Stock Exchange as the most relevant trading place in Europe. While the median price-to-book ratio is similar for all three markets, we find a very high mean price-to-book ratio for the UK market. This is due to a small number of observations with high price-to-book ratios.[4]

[Table 2 about here]

[3] We exclude these observations, since the trading of securities of loss firms and especially bankrupt firms might be affected by specific and untypical capital market reactions.

[4] I.e., observations with very small book value and observations with negative equity have been excluded from the analysis).

5. Results

5.1. Graphical evidence

For our graphical analysis, we calculate weekly mean values of the logarithm of trading volumes (in 1,000 units of traded stocks) and our other dependent variables for the treatment group and the control group. A main target of that analysis is to find out if our data meets the common trends assumption for both groups (French large capitalization stocks with a minimum market capitalization at January 1, 2012 of at least € 1 billion; German and United Kingdom large capitalization stocks). Our observation period includes a pre-announcement period of four months, the announcement period (March 14, 2012 until July 31, 2012), the short-run treatment period and a long-run treatment period of four months. We also provide graphical evidence for French small capitalization stocks as a potential alternative control group.

To account for the fact that average trading volumes and other market indicators differ between stocks, we de-mean all variables with their average value over the whole observation period (e.g., we subtract the mean of *Trading volume* over the whole period from the current value of *Trading volume* for all observations). De-meaning seems to be useful in order to address the question if trends (and not means) differ between the control and treatment group. Note that constant differences in mean values are captured by the stock fixed effects of our regression models and do not affect our regression results. Thus, de-meaning fits well with our regression approach.

Figures 2 and 3 show graphical evidence for de-meaned *Trading volume* (= logarithm of 1,000 units of traded stocks) of the treatment group in comparison to the control group (Figure 2) or in comparison to French small capitalization stocks (Figure 3) for trading weeks before and after the introduction date of the FTT. We center the observation period and define the reference point (week zero) as the week, where the French FTT has been introduced. The borders of the announcement period, the short-run treatment period and the long-run treatment period are marked by vertical lines. The announcement period ranges from week – 20 to week zero and the short-run treatment period from week 1 to week 4.

While we find strong co-movements between French stocks and the control group, French small capitalization stocks do not seem to be a well-suited alternative control group with regards to the common trends assumption. The graphical evidence of Figure 2 supports our hypotheses H1b and H1c. Thus, we observe higher trading volumes of treated stocks in the announcement period (H1c) and lower trading volumes of treated stocks in the short-run treatment period

(H1b). In a longer perspective (after week 4), we do not find large differences in trading volumes for the treatment group and the control group.

[Figure 2 about here]

[Figure 3 about here]

Figures 4 and 5 document corresponding de-meaned values for relative changes in stock prices (*Daily return*). Again, we observe a stronger correlation between the treatment group with the control group. It follows that French small capitalization stocks cannot be regarded as an appropriate alternative control group for our analysis. Thus, we do not consider corresponding stocks in the following. Apart from that, we do not find obvious graphical evidence for an impact of the French FTT on daily returns.

[Figure 4 about here]

[Figure 5 about here]

Figure 6 further documents graphical evidence for relative bid-ask spreads, relative intraday volatilities and relative weekly volatilities of the treatment group and the control group. We abstain from providing evidence for monthly volatilities, which do not fit well to a weekly illustration. Again we observe (strong) co-movements of both groups in the pre-announcement period and conclude that German and UK stocks with a minimum market capitalization of € 1 billion can be regarded as a well-suited control group for our analysis. As a result of the treatment, co-movements might be less pronounced in the announcement period, the short-run treatment period and the long-run treatment period.

[Figure 6 about here]

5.2. Effects on trading volume

In the following we present regression results for distorted and non-distorted long-run treatment effects (Equation 1, Equation 2) as well as for long-run treatment effects, short-run treatment effects and announcement effects (Equation 3). We focus on trading volume, as the existing literature provides by far the strongest empirical evidence for this dependent variable (e.g., Beccheti, Ferrari, and Trenta, 2014; Capelle-Blancard and Havrylchyk, 2013; Coelho, 2015; Colliard and Hoffmann, 2013; Gomber, Haferkorn, and Zimmermann, 2016; Meyer, Wagener, and Weinhardt, 2015; Parwada, Rui, and Shen, 2013).

The estimation is executed by ordinary least squares (OLS). We use robust standard errors clustered for each stock to account for heteroscedasticity and the autocorrelation of standard

errors. As documented by Petersen (2009), these clustered (Rogers) standard errors produce correct estimates and correctly sized confidence intervals in the presence of cross-sectional (stock effects) and time-series (time effects) correlations of standard errors and are more accurate than Fama–MacBeth estimates in the presence of stock effects. We report the adjusted *R*-squared considering the explanatory power of the stock fixed effects and the monthly fixed effects.

Results for trading volumes can be interpreted as semi-elasticities. Thus, the estimated dummy-variable coefficients have to be recalculated to determine the relative effect on the dependent variable. As shown by Kennedy (1981), the relative change can be approximated by $\exp\left(\hat{\beta}_i - \frac{1}{2} \cdot Var\left(\hat{\beta}_i\right)\right) - 1$ with the estimated regression coefficient $\hat{\beta}_i$ and the variance $Var\left(\hat{\beta}_i\right)$, which is defined as the squared estimated standard error of $\hat{\beta}_i$. As a preliminary step, we estimate Equation (1) for evaluation periods of two, four and eight months before and after the FTT introduction date in order to replicate the results of the existing literature. Results are provided by Models 1 to 3 of Table 3. In these models, we do not account for announcement and short-run treatment effects.

[Table 3 about here]

In line with the literature, these "naïve" models suggest a strong and significant reduction of trading volume resulting from the introduction of the French FTT. The FTT impact is larger for short evaluation periods and ranges from a reduction by 8.3% (Model 3 for an evaluation period of eight months before and after August 1, 2012) to a reduction by 16.8% (Model 1 for a corresponding period of two months). This is somewhat smaller than most of the existing evidence (e.g., Beccheti, Ferrari, and Trenta, 2014; Gomber, Haferkorn, and Zimmermann, 2016; Meyer, Wagener, and Weinhardt, 2015; Parwada, Rui, and Shen, 2013) but fits quite well with the fact that existing papers typically focus on smaller evaluation periods of 1 to 6 months, which are more strongly affected by short-term treatment effects (for corresponding evidence see Table 4). Thus, we are able to replicate previous findings if we do not account for announcement and short-run treatment effects of the FTT.

In Models 4 to 6 of Table 3 we estimate Equation (2) excluding observations of the announcement period and the short-run treatment period. Thus, our estimates for *LDiD* (long-run effect) are based on a comparison of observations before March 14, 2012 and after August 31, 2012. Results change dramatically. As should be expected, we obtain negative coefficients. However, the estimated FTT impact is very small and likewise not significant. Thus, accounting

for announcement effects as well as short-run treatment effects, we do not find significant empirical evidence that the French FTT reduced trading volumes of the treated stocks. Overall, Table 3 supports our expectation that results of the existing literature on the French FTT are biased by announcement and short-run treatment effects.

In the following we derive regression results corresponding to Equation (3). In these models, we explicitly measure the announcement effect and the short-run treatment effect by additional DiD interaction terms (*ADiD*, *SDiD*). Thus, we isolate announcement, short-run and long-run effects of the French FTT by considering observations from a) the pre-announcement period as reference period (two, four or eight months before March 14, 2012), b) the announcement period (March 14 until July 31, 2012), c) the short-run treatment period (August 1 until August 31, 2012), and d) the long-run treatment period (two, four or eight months after August 31, 2012). Regarding standard errors, estimation procedures and control variables, we use the same specifications as in Table 3. We abstain from reporting regression results for our controls (*Price-to-book ratio*, *Market capitalization*, *EBITDA*) for brevity.

Bertrand, Duflo, and Mullainathan (2004) argue and provide evidence that the standard errors of DiD estimates might be severely understated for serially correlated data. That holds especially for data with a high number of repeated observations like in our case. Thus, significance might be driven by the number of observations and not by the economic relevance of FTT effects. Therefore, we re-estimate Equation (3) with collapsed data in the Models 4 to 6 of Table 4. As suggested by Bertrand, Duflo, and Mullainathan (2004), we calculate collapsed average values for four periods: pre-announcement period, announcement period, short-run treatment period and long-run treatment period. Thus, the regression is based on a maximum of four observations for each stock, which reduces the number of observations for an evaluation period of eight months from 174,215 to 1,578.

[Table 4 about here]

In Table 4, we find a positive and (apart from Model 3) significant FTT announcement effect. The effect is larger for short evaluation periods as well as for collapsed models as suggested by Bertrand, Duflo, and Mullainathan (2004). The estimated impact ranges from 5.7% to 10.3% with higher announcement effects in the collapsed models. Thus, Table 4 provides strong evidence for a temporary increase of trading volumes after the announcement of the French FTT legislation.

We further observe a strong and significant reduction of trading volume shortly after the FTT introduction deadline, which is captured by *SDiD*. The effect is larger for long evaluation

periods and smaller for collapsed DiD models. Depending on the specification, the estimated reduction of trading volume ranges from 15.2% to 19.5%. Contradicting the existing literature, we cannot provide clear empirical evidence for a long-term reduction of trading volumes resulting from the French FTT. For short evaluation periods (Models 1 and 4) the estimated coefficient of *LDiD* is even positive but not significant. Only in one specification (regular DiD with an evaluation period of 8 months, Model 3), there is a negative coefficient suggesting a reduction of trading volume of 6.6%, which is only significant on a 10% level.

Table 4 supports our hypotheses H1b and H1c of a negative short-term FTT effect and a positive FTT announcement effect on trading volumes. However, we only find weak support for H1a hypothesizing a long-term impact on the volumes of treated stocks. The results also confirm the estimates in the Models 4 to 6 of Table 3. Overall, we find that the French FTT resulted in strong short-run stock market reactions that anticipated the introduction by antedating trades from the short-term treatment period to the announcement period. By contrast, there is almost no significant evidence for long-term FTT effects on trading volume.

Our results suggest that existing findings on a strong reduction of trading volumes by up to 30% are mainly driven by short-term market reactions surrounding the introduction date of the French FTT. Note that the aggregate impact of the announcement effect (up to 10.3% upwards) and the short-run treatment effect (up to 19.5% downwards) would suggest a reduction of trading volume of up to 27% if would ignore the short-term nature of these effects. Our findings do not imply that the French FTT had no impact on the French market in the long-term. However, the impact of this tax on trading volumes might have been too small to be clearly identified.

5.3. Effects on stock prices

We analyze pricing effects of the French FTT with the daily return (i.e. the relative change in the average price compared to the average price of the last trading day) as dependent variable. We use the same model specifications as for the trading volume in Table 4. Table 5 documents estimates for announcement effects, short-run treatment effects and long-run treatment effects for evaluation periods of two, four and eight months as well as for regular DiD models and collapsed models. We use the same specifications as in Table 4 and abstain from reporting results for regression controls. Note that the dependent variable is the unadjusted daily return. Thus, regression coefficients can be easily interpreted as changes of average daily returns in percentage points.

[Table 5 about here]

For the regular Models 1 to 3, we find significant evidence for a negative FTT announcement effect on stock prices supporting H2c. The impact is stronger for the short evaluation period and suggests an abnormal and negative average daily return in a range of 0.14 to 0.04 percentage points. Regarding short-run and long-run treatment effects, we also observe negative and significant abnormal returns, but only for short-term evaluation periods. In Model 2 and Model 3, corresponding coefficients become positive but are not significant. Thus, H2a and H2b are not supported in most specifications.

For the collapsed Models 4 to 6, the evidence on negative abnormal daily returns in the announcement period and the long-run treatment period is only significant in one specification (Model 4) and we do not find any evidence for short-run treatment effects. Overall, Table 5 provides significant evidence for a reduction of stock prices of treated stocks during the announcement period, but no conclusive evidence for the short-run and the long-run treatment periods.

As suggested by proponents of market efficiency, it is new and unexpected information that drives stock prices (Fama, 1970; Brooks, Patel, and Su, 2003). Therefore, one might expect that the declaration of President Sarkozy on January 29, 2012 to introduce a FTT had a stronger impact on stock prices than the second reading of the bill on March 14, 2012. In order to account for that aspect, we re-estimate Equation (3) for daily returns with an extended announcement period (January 29, 2012 until July 31, 2012). Corresponding results in Table 6 do not provide clear evidence on a significant anticipation effect. We find positive and negative coefficients, and only Model 1 provides evidence for a negative announcement effects. Also for the short-run and long-run treatment effects we find positive and negative coefficient estimates. Combining the evidence of Table 5 and Table 6, empirical support for H2a (pricing effect in the announcement period) is relatively weak and empirical support for H2b and H2c (pricing effects in the treatment period) is inconclusive. Thus, there is some weak evidence for a reduction of stock prices resulting from the announcement of the French FTT.

[Table 6 about here]

5.4. Effects on liquidity and volatility

In Table 7, we analyze the relative bid-ask-spread (= bid-ask spread divided by the daily average stock price) as a measure for stock market liquidity using the same specifications as in Table 4 and Table 5. In all specifications, we find negative coefficients in the announcement period, and positive coefficients in the short-run and long-run treatment period. However, we only find positive and significant effects in Model 6. Thus, while the evidence fits well with our

expectations, it is not sufficient to significantly support H3a to H3c. This is in line with the existing literature, which also does not find convincing evidence for an impact of the French FTT on bid-ask spreads (e.g., Capelle-Blancard and Havrylchyk, 2013; Becchetti et al., 2014, and Colliard and Hoffmann, 2016). An explanation for that outcome might be the design of the French FTT. As documented by Section 2, the French FTT includes a significant number of measures to ensure stock market liquidity (e.g., non-taxability of day trading, tax exemptions for market makers, focus on the most liquid large capitalization stocks).

[Table 7 about here]

In the Tables 8, 9, and 10, we address the impact of the French FTT on stock market volatility for relative intraday volatilities (= difference of the highest and smallest daily stock price divided by the average stock price) and weekly/monthly volatilities (= standard deviation of the average daily stock price in € over one week/month divided by the average stock price of that week/month). Thus, Table 8 is based on stock-day observations, Table 9 relies on stock-week observations, and Table 10 on stock-month observations. Again, we use the same specifications as in our other baseline regressions.

Supporting H4c, we find a positive and significant announcement effect in almost all specifications for intraday volatilities. Thus, intraday volatilities are extraordinarily high in a period with higher average demand (see Table 4), which should be driven by the incentive of the French FTT to antedate transactions from the post-reform period to the announcement period. Regarding short-run and long-run treatment effects, regression coefficients for *SDiD* and *LDiD* are typically negative as expected (H4a, H4b) but in most specifications not significant.

[Table 8 about here]

For weekly volatilities, we do not find conclusive evidence on announcement effects. However, we observe negative and significant treatment effects in the short-run and in the long-run in most specifications. Only for collapsed models with a short evaluation period of two months (Model 4), we do not obtain a significant long-run treatment effect. Thus, Table 9 provides empirical support for H4a and H4b, but not for H4c. Results for monthly relative volatilities are documented by Table 10 and provide additional support for our results in Table 9.

[Table 9 about here]

[Table 10 about here]

Considering the properties of the French FTT, the results of the Tables 8, 9 and 10 are not surprising. As pure day trading is not taxed by the French FTT, one might ask why there should be an impact on intraday volatility measures in the short-run and long-run treatment period. Nevertheless, the temporary increase in daily volatilities during the announcement period might well be driven by a shifting of stock trades from the post-reform period to the pre-reform period. Our findings on weekly and monthly volatility measures suggest further that the French FTT resulted in a reduction of long-term volatility measures. Thus, the results of Table 9 and Table 10 are consistent with the theoretical considerations of Stiglitz (1989) and Summers and Summers (1989) who suggest stabilizing power of FTTs on stock markets.

5.5. Accounting for seasonality

A potential estimation problem for our analysis might result from differences in seasonal effects between the treatment group and the control group. For example, generally there might be abnormally high trading volumes in the French stock market in spring, which would lead to a distorted estimate for the announcement effect of the FTT reform.

As preliminary evidence, the Figures 7 and 8 provide de-meaned values of the logarithm of trading volume in the same way as in Figure 2 for the years 2011 and 2013. Both provide graphical evidence if similar effects on trading volume can be observed in the following year or the previous year that could be driven by seasonality. While we find no evidence for a strong increase of French trading volumes in the announcement period (from week -20 to week 0), there seems to be an abnormally low trading volume of the French stock market in the weeks 1 to 4 (August) in case of the year 2013. This fits well with Colliard and Hoffmann (2013) and Colliard and Hoffmann (2016), who also find evidence for seasonality effects in August. Therefore, our results with regard to short-run treatment effects of the French FTT might be partially or even fully driven by seasonality.

[Figure 7 about here]

[Figure 8 about here]

In order to account for that aspect, we use an alternative triple difference specification. Thus, we do not only compare developments of the treatment group and the control group but also developments in treated periods (2012) with control periods (2010, 2011, 2013, and 2014). The regression model can be described by

$$
\begin{aligned}
Y_{it} = {} & \alpha + \beta_1 \cdot APeriodS_t + \beta_2 \cdot APeriodS\ 2012_t + \beta_3 \cdot APeriodS\ France_{it} + \beta_4 \cdot ADiDiD_{it} \\
& + \beta_5 \cdot STPeriodS_t + \beta_6 \cdot STPeriodS\ 2012_t + \beta_7 \cdot STPeriodS\ France_{it} + \beta_8 \cdot SDiDiD_{it} \\
& + \beta_9 \cdot LTPeriodS_t + \beta_{10} \cdot LTPeriodS\ 2012_t + \beta_{11} \cdot LTPeriodS\ France_{it} + \beta_{12} \cdot LDiDiD_{it} \\
& + \gamma_k \cdot C_{kit} + \psi_t + \upsilon_i + u_{it}.
\end{aligned} \tag{4}
$$

In this model, $APeriodS_t$, $STPeriodS_t$, and $LTPeriodS_t$ are variables controlling for seasonal effects in the treatment period, the short-run treatment period and the long-run treatment period. Thus, the variables have a value of one for observations between March 14 and July 31 ($APeriodS_t$), August 1 and August 31 ($STPeriodS_t$), and September 1 until December 31 ($LTPeriodS_t$) in all years. $APeriodS\ 2012_t$, $STPeriodS\ 2012_t$, and $LTPeriodS\ 2012_t$ are interaction terms of these seasonal dummy variables and a dummy variable for 2012. Hence, $APeriodS\ 2012_t$, $STPeriodS\ 2012_t$, and $LTPeriodS\ 2012_t$ are equivalent to $APeriod_t$, $STPeriod_t$ and $LTPeriod_t$ in our baseline specification and control for period specific effects in the year 2012 that are relevant for the treatment group and the control group.

$APeriodS\ France_{it}$, $STPeriodS\ France_{it}$, and $LTPeriodS\ France_{it}$ are interaction terms of the seasonal dummies with a dummy variable for treated French stocks. These variables control for France-specific effects in the corresponding periods that cannot only be observed in 2012 but also in the control periods. The impact of the French FTT in the announcement period, the short-run treatment period and the long-run treatment period is captured by $ADiDiD_{it}$, $SDiDiD_{it}$, and $LDiDiD_{it}$. These are interaction terms of $APeriodS_t$, $STPeriodS_t$, and $LTPeriodS_t$ with a dummy variable for 2012 and a dummy variable for treated French stocks.

We estimate three alternative specifications of Equation (4). The first specification is in fact equivalent to a regular DiD model, as we only consider observations from 2012 and do not account for control periods and corresponding triple difference controls ($APeriodS\ 2012_t$, $STPeriodS\ 2012_t$, $LTPeriodS\ 2012_t$, $APeriodS\ France_{it}$, $STPeriodS\ France_{it}$ and $LTPeriodS\ France_{it}$). In the other two specifications, we include these variables as well as observations from 2011 to 2013 (two control years, specification two) or from 2010 to 2014 (four control years, specification three). Regressions are estimated by OLS. Standard regression controls and specifications conform to our baseline models. We also calculated collapsed triple difference models. The results are consistent with the regular triple difference models. We abstain from reporting results for brevity. For the same reason, we abstain from reporting regression results for standard controls or triple difference control dummy variables.

Table 11 documents regression results for *Trading volume* (Models 1 to 3) and *Daily return* (Models 4 to 6). Similar to our baseline models (Table 4), we find evidence for a significant

and positive announcement effect ranging from 7.2% (Model 3) to 14.4% (Model 2). Thus, controlling for seasonality, we find still significant evidence for H1c. The short-run effect on trading volume is negative in all specifications, but only significant in Model (1) (regular DiD) and Model (3) (triple difference with four control periods). Thus, the short-run treatment effect of Table 4 might be partially driven by seasonality effects (see also Colliard and Hoffmann, 2013). Regarding daily returns, we obtain similar results as in Table 5. We conclude that the estimated impact on *Daily return* is not affected by seasonality.

[Table 11 about here]

Table 12 provides corresponding estimates for the relative bid-ask spread (Models 1 to 3) and the relative intraday volatility. Results fit very well with the existing evidence in the Tables 7 and 8. Thus, apart from one significant and slightly negative coefficient for the announcement period, there is no empirical evidence for a significant impact of the French FTT on bid-ask spreads. For intraday volatilities we find a positive announcement effect supporting H4c, but no significant effects in the short-run or long-run treatment period.

[Table 12 about here]

Table 13 documents triple difference results for the relative weekly volatility (Models 1 to 3) and the relative monthly volatility. Again the results are in line with our previous findings. Thus, the triple difference estimates support H4a as well as H4b and we can provide evidence that the introduction of the French FTT is significantly linked to a reduction of long-run volatility measures in the short run (measured by $SDiDiD_{it}$) and in the long-run (measured by $LDiDiD_{it}$).

[Table 13 about here]

5.6. Matched control groups

A crucial conjecture of our identification strategy is the common trend of the treatment group and the control group. While this common trends assumption cannot be tested formally (and especially not for the treatment period), a strong co-movement between the treatment group and the control group in the pre-announcement period can be regarded as a strong indicator. While Section 5.1 provides compelling graphical evidence for co-movements before the announcement of the FTT, one might consider if the suitability of the control group could be enhanced by matching strategies.

Addressing that aspect, we use propensity score matching in order to increase the correlation between the treatment and the control group in the pre-announcement period. For each

dependent variable (e.g., *Trading volume*), we define a specific control group (that means a subgroup of the full control sample) with an especially strong co-movement regarding that variable. Our matching approach is as follows. In a first step, we estimate a probit model for each stock with treatment status as dependent variable (treated = 1, untreated = 0). Right hand-side variables are de-meaned values of the relevant dependent variable on a weekly basis (e.g., the weekly average of the logarithm of trading volume) over a pre-announcement period of four months. We de-mean values in order to obtain a measure for weekly trends over the four-month period before March 14, 2012. Furthermore, de-meaning fits well with our fixed effects regression approach. Thus, the basic idea of the probit model is to use weekly trends as explanatory variables of treatment status. In a second step, we interpret fitted values of the probit model as a propensity score in order to derive an optimized matched sample accounting for co-movements of all relevant dependent variables. For each treated firm we match one control firm considering the firms with the highest propensity scores.

In Table 14 we document weekly correlation coefficients for the dependent variables *Trading volume*, *Daily return*, *Bid-ask spread*, *Intraday volatility* and *Weekly volatility* between the treatment group and the control group for the matched subgroups and the unmatched full control group. It turns out that estimated correlations are already high for the unmatched control group and become even higher for the matched control groups.

[Table 14 about here]

We re-estimate our basic regression specification (Equation 3) using matched subsamples of our control group instead of the unmatched full control sample. As should be expected, the number of observations and stocks becomes smaller. Results are provided by Tables 15, 16, and 17 and are fairly in line with our previous findings. Most relevant, we find 1) evidence for an announcement effect on *Trading volume*, 2) evidence for a significant and negative short-run treatment effect on *Trading volume*, 3) no significant evidence for a negative long-run treatment effect on *Trading volume*, and 4) evidence for a short-run and long-run treatment effect on *Weekly volatility* and *Monthly volatility*. Moreover, we also find evidence for a significant and positive impact of the French FTT on bid-ask spreads in the long-run and in the short-run. Thus, our results from matched samples fit will with the hypotheses H3a and H3b. Concluding, our robustness checks using matched samples provide additional support for our primary specification.

[Table 15 about here]

[Table 16 about here]

[Table 17 about here]

6. Conclusion

In this paper, we analyzed the impact of the French FTT 2012 on trading volume, the price level, liquidity and volatility. We contribute to the existing research in this area (e.g., Becchetti, Ferrari, and Trenta, 2014; Colliard and Hoffmann, 2013; Gomber, Haferkorn, and Zimmermann, 2016; Meyer, Wagener, and Weinhardt, 2015; Parwada, Rui, and Shen, 2013 for the French FTT) in three ways. While the existing literature typically compares observations of treated and untreated stocks directly before and after the introduction date of the FTT (August 1, 2012), we consider the possibility of announcement effects, resulting from a shifting of share trades from the post-reform period to the announcement period (tax-induced bring-forward effect). As a result, trading in the announcement period might have been affected by the reform, making observations of the announcement period invalid as a reference point for the treatment period.

An important target of our study lies in the identification of announcement effects and the disentangling of announcement and treatment effects. We account for short-run and long-run treatment effects as short run market reactions in the post-reform period might be closely related to announcement effects and may distort estimates for long-run treatment effects as well. In addition, we do not only account for daily volatility measures (intraday volatility), but also for corresponding long-term measures (weekly volatility and monthly volatility). As pure day trading is not taxed by the French FTT, long-term volatility measures should be better suited for our analysis.

We provide evidence that simple DiD estimates on the French FTT may be biased due to a violation of the common trends assumption, and provide corrected estimates based on an appropriate control group (German and UK large capitalization stocks) accounting for announcement effects and short-run treatment effects. Existing research suggests a strong reduction of trading volume of taxable French stocks ranging from 15% to about 30%. In baseline regressions using similar methods as existing research, we obtain similar estimates. We can show further that corresponding results hold only if we do not control for FTT announcement effects and short-run treatment effects. We find robust evidence for strong FTT announcement effects, resulting in a temporary increase in trading volumes of French large-capitalization stocks between the FTT announcement date on March 14, 2012 and the introduction of the FTT on August 1, 2012.

The outcome also shows a negative short-run effect on trading volume after the introduction of the FTT on August 1, 2012. Thus, our results suggest that trades from the taxable short-run treatment period have been shifted to the "tax-free" announcement period. Furthermore, there is almost no significant evidence for long-run FTT effects on trading volume. Our findings suggest that existing evidence on a decrease of trading volumes of 15% to 30% resulting from the French FTT might be largely driven by a temporal increase of trading volume in the announcement period of the French FTT reform**.** Thus, the true long-run impact might be much smaller and is not statistically significantly different from zero in most of our regressions. An explanation for this weak long-run treatment effect of the French FTT on trading volumes could be that day trading is effectively not taxed by the French FTT. Thus, there might be a tax incentive for some short-term oriented traders for day trading, which could even result in higher trading volumes for some investors.

Analyzing daily returns as a measure for stock prices, we obtain contradicting results. For the regular announcement period beginning on March 14, 2012, we find some evidence for a reduction of daily returns after the announcement date, but no effects in the treatment period. For an extended announcement period (January 29, 2012 until July 31, 2012) we find almost no significant evidence. Therefore, we are somewhat reluctant to interpret the abnormal returns in the announcement period as causal effects.

Similarly, we find no conclusive evidence for FTT effects on liquidity measured by the relative bid-ask spread. This fits well with the existing literature on the French FTT finding no consistent evidence for bid-ask spreads. A potential reason might be the special properties of the French FTT. First of all, the French FTT rate is small, which is also reflected by the relatively small tax revenue raised. Second, the French FTT only refers to large-capitalization stocks with smaller liquidity problems than untreated small-capitalization stocks. Third, the French FTT grants generous tax exemptions for transactions being relevant for liquidity provision (e.g., transactions resulting from restructurings, market-making).

In addition and more relevant, we find evidence for a temporary increase of intraday volatilities in the announcement period and a significant reduction of weekly and monthly volatilities in the short-run and long-run treatment period. Thus, our findings are consistent with more noise trading in the announcement period, but a stabilizing influence of the FTT on the French stock market in the short-run and long-run. These results provide strong support for the theoretical considerations of Stiglitz (1989) and Summers and Summers (1989).

Note that our research is exclusively based on LIT market data from NYSE Euronext Paris compared to London and Frankfurt stock exchange data. Thus, we do not consider alternative trading facilities like OTC or darkpools that have been addressed by Colliard and Hoffmann (2013), Coelho (2015) and Colliard and Hoffmann (2016). For further research it might be an interesting question, if the identified FTT announcement effects on trading volume as well as the FTT treatment effects on long-term volatility measures are also relevant for other market places (especially OTC) and similar FTT regulations like the Italian FTT 2013.

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Figure 1: FTT introduction process in France and EU-wide developments

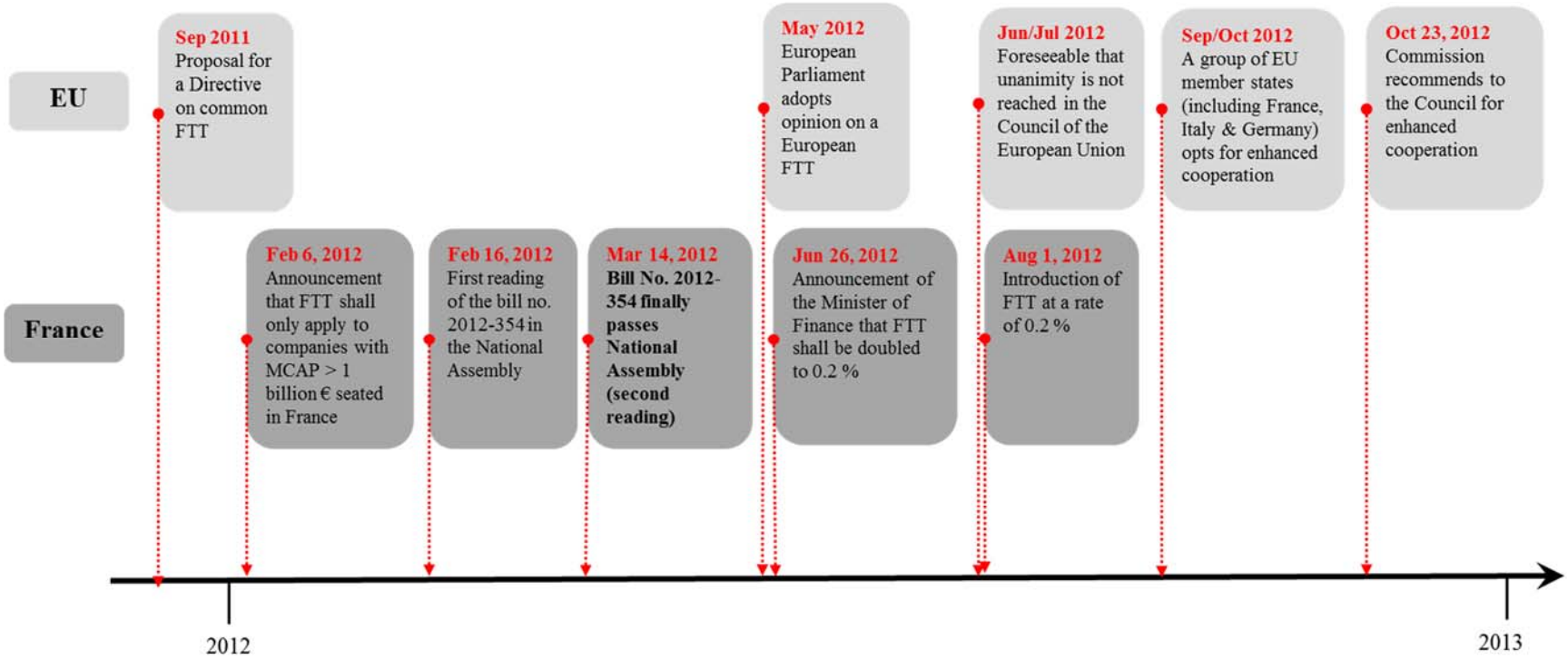
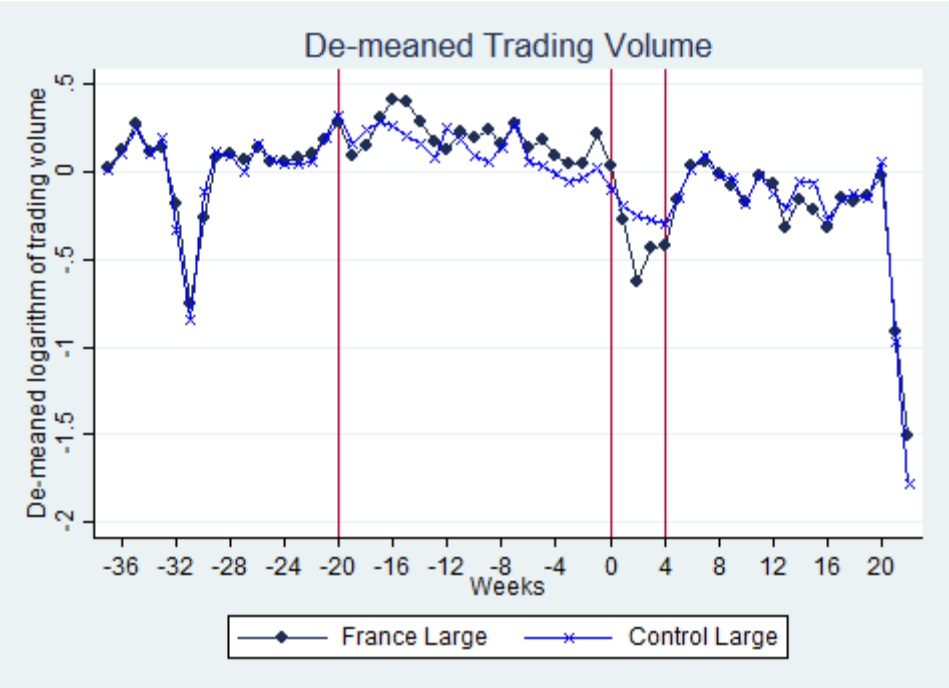
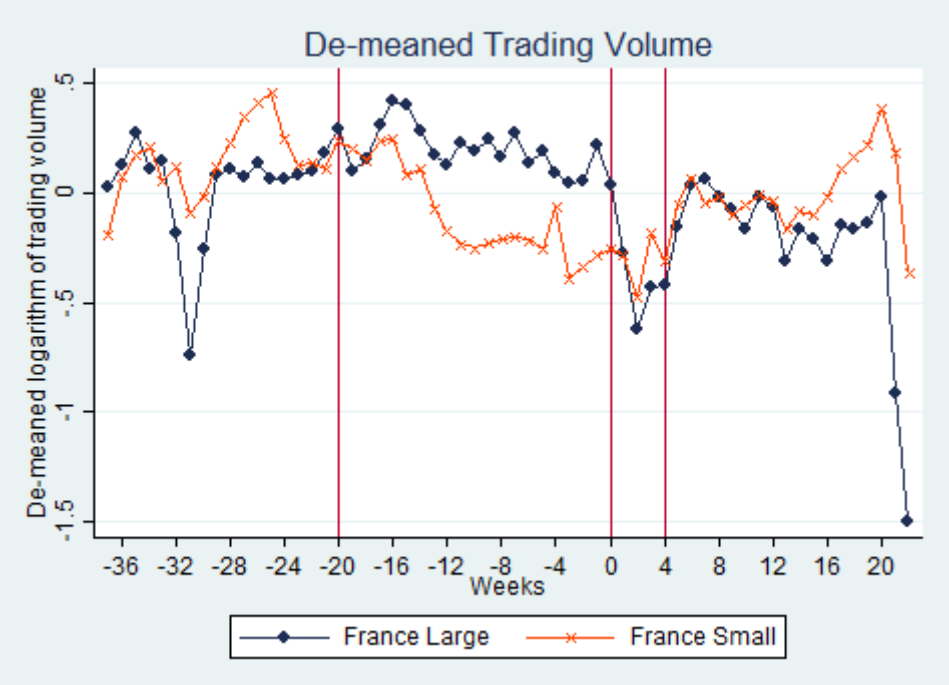


Figure 2: Trading volume – Large German and UK stocks



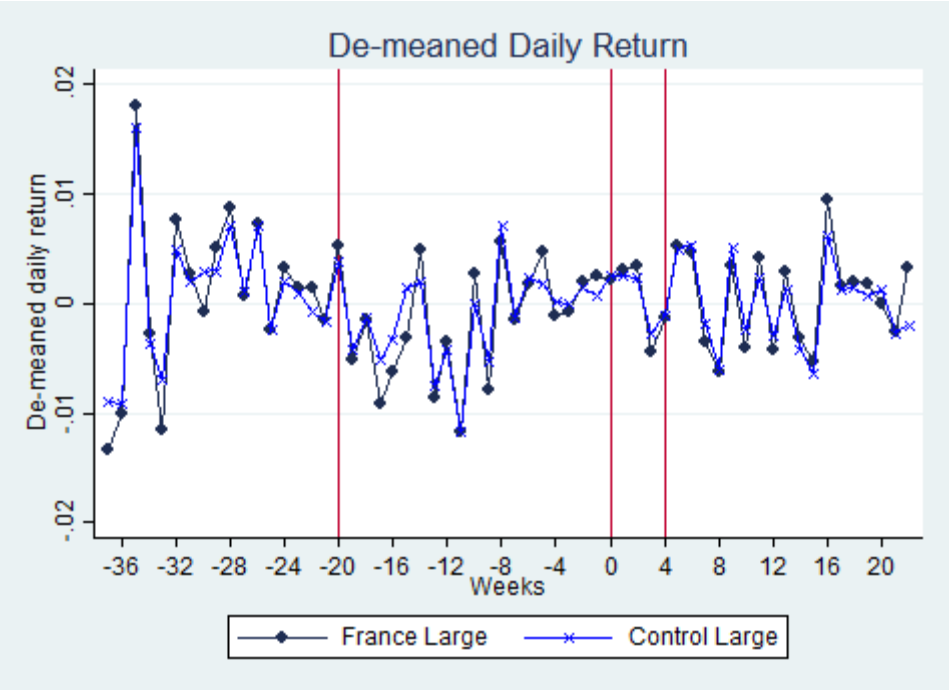
Note: Week -20 indicates the announcement date (March 14, 2012) and week 0 the introduction date (August 1, 2012). The period between those dates is the announcement period. The period from week 0 to week 4 is the short-run treatment period and the time-span from week 4 onwards the long-run treatment period.

Figure 3: Trading volume – Small French stocks



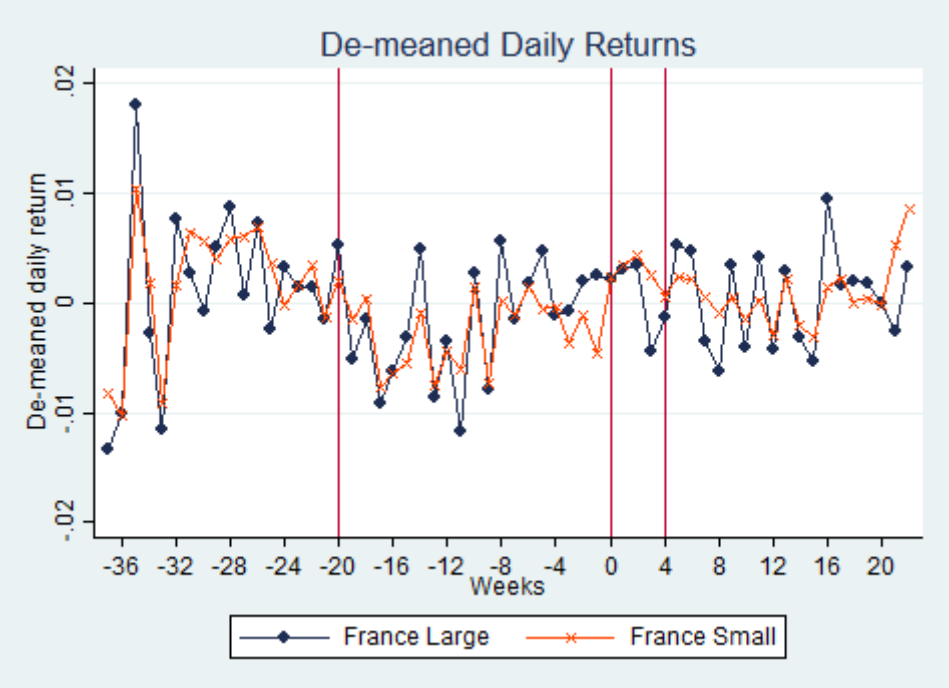
Note: Week -20 indicates the announcement date (March 14, 2012) and week 0 the introduction date (August 1, 2012). The period between those dates is the announcement period. The period from week 0 to week 4 is the short-run treatment period and the time-span from week 4 onwards the long-run treatment period.

Figure 4: Daily returns – Large German and UK stocks



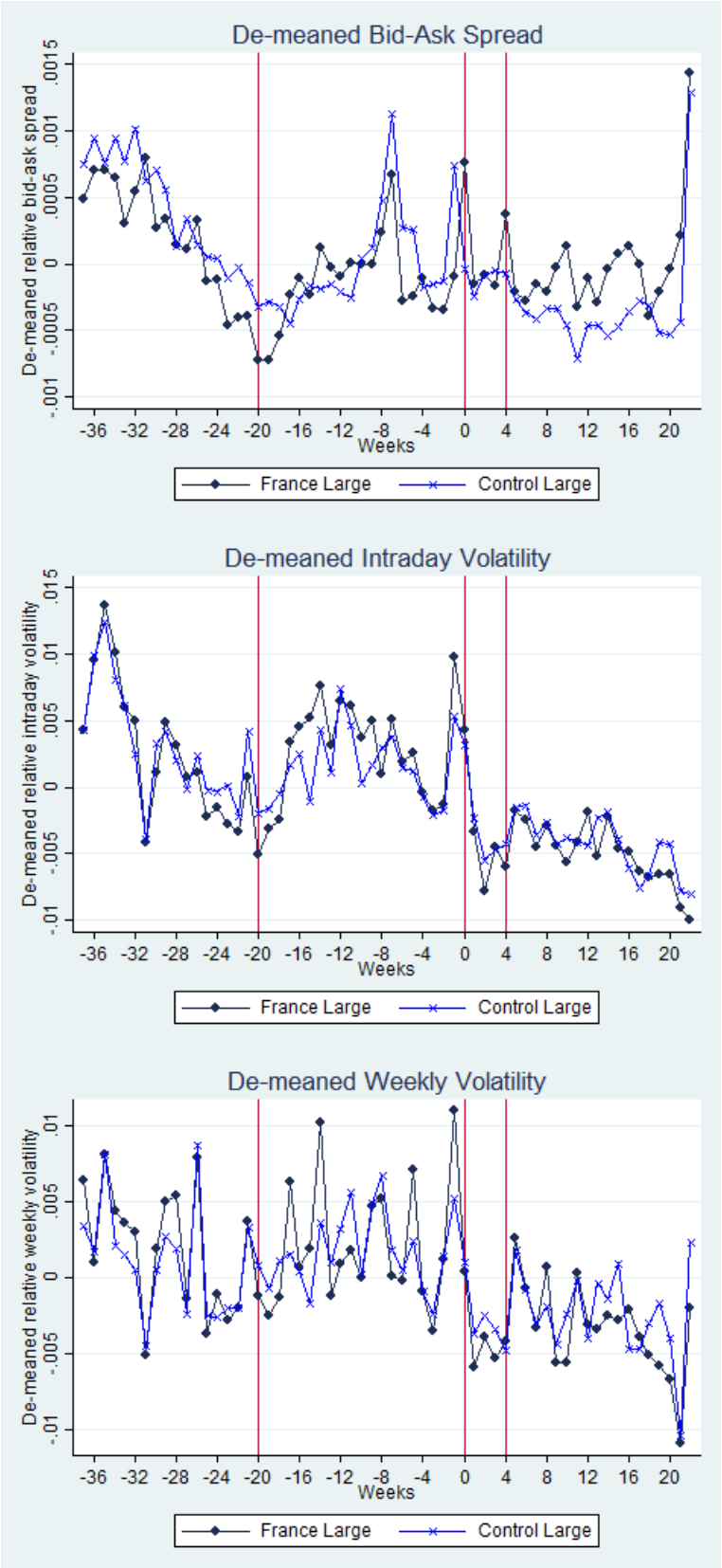
Note: Week -20 indicates the announcement date (March 14, 2012) and week 0 the introduction date (August 1, 2012). The period between those dates is the announcement period. The period from week 0 to week 4 is the short-run treatment period and the time-span from week 4 onwards the long-run treatment period.

Figure 5: Daily returns – Small French stocks



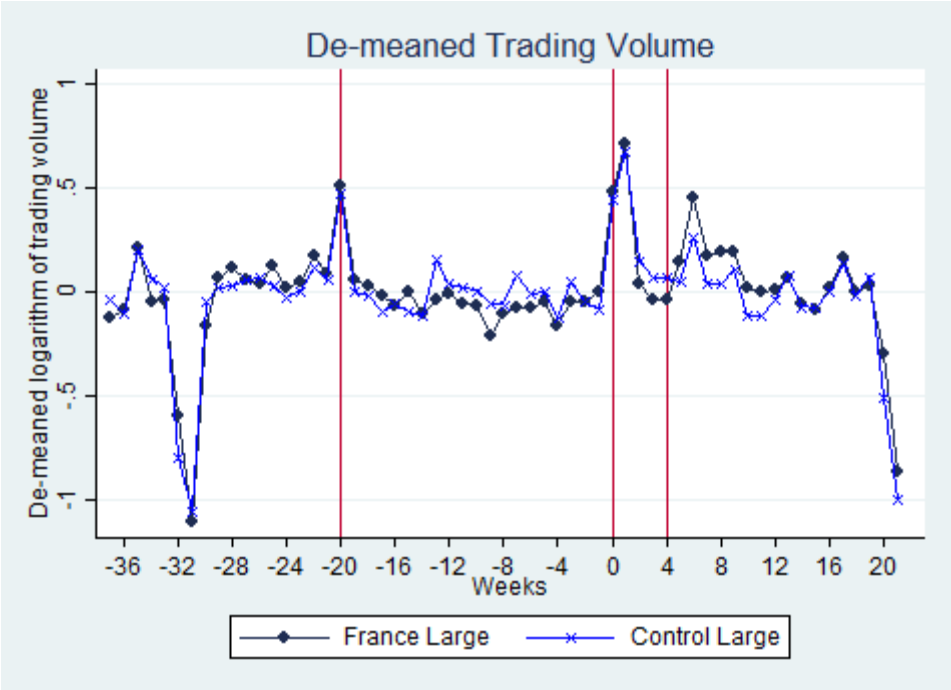
Note: Week -20 indicates the announcement date (March 14, 2012) and week 0 the introduction date (August 1, 2012). The period between those dates is the announcement period. The period from week 0 to week 4 is the short-run treatment period and the time-span from week 4 onwards the long-run treatment period.

Figure 6: De-meaned bid-ask spread and volatility – Large stocks



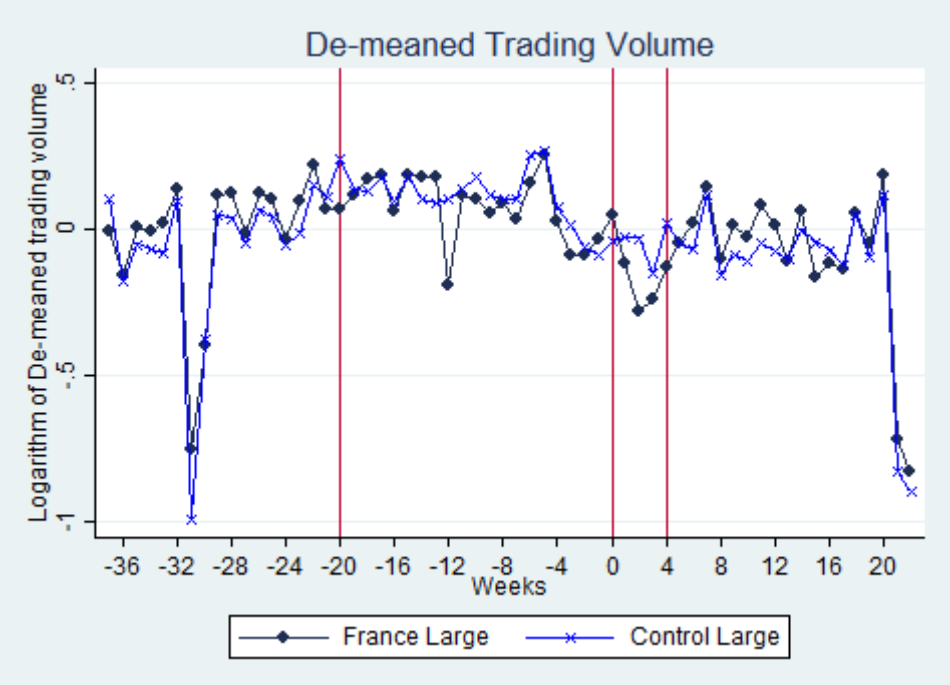
Note: Week -20 indicates the announcement date (March 14, 2012) and week 0 the introduction date (August 1, 2012). The period between those dates is the announcement period. The period from week 0 to week 4 is the short-run treatment period and the time-span from week 4 onwards the long-run treatment period.

Figure 7: De-meaned trading volume in 2011



Note: Week -20 indicates the placebo announcement date (March 14, 2011) and week 0 the placebo introduction date (August 1, 2011). The period between those dates is the placebo announcement period. The period from week 0 to week 4 is the placebo short-run treatment period and the time-span from week 4 onwards the placebo long-run treatment period.

Figure 8: De-meaned trading volume in 2013



Note: Week -20 indicates the placebo announcement date (March 14, 2013) and week 0 the placebo introduction date (August 1, 2013). The period between those dates is the placebo announcement period. The period from week 0 to week 4 is the placebo short-run treatment period and the time-span from week 4 onwards the placebo long-run treatment period.

Table 1: Empirical evidence on FTT (part 1/2)

+	… positive and significant correlation between transaction tax and dependent variable
-	… negative and significant correlation between transaction tax and dependent variable
n.sig.	… results are not significant and indicate no change

Please do note that the table presents a greatly simplified view of the results of the studies. Some studies define and examine additional variables which cannot be displayed here. Price and volume measures are not shown as they are commonly measured as daily share price and trading volume respectively.

[1)] Some studies use Volume as a measure for Liquidity. In order to avoid confusion and repetition only other Liquidity measures than Volume are displayed in the column Liquidity.

Studies	Countries under examination	Collected Data	Control Group	Dependent variables			
				Price	Volume	Volatility	Liquidity[1)]
America							
Pomeranets, and Weaver (2013)	US	1971 to 1981	None or NASDAQ	+	-	+ Individual stock volatilities n.sig. Portfolio volatilities	+ Bid-ask-spread, Amihud illiquidity
Mulherin (1990)	US	1897 to 1988	None		-	+ Hardouvelis model	
Asia Pacific							
Hu (1998)	Hong Kong, Japan, Korea, Taiwan	1975 to 1994	None	-	inconclusive	inconclusive Std. dev. of returns, CAPM residuals	
Baltagi et al. (2006)	China	1996 to 1997	None		-	+ GARCH, Variance of returns	
Su, and Zheng (2011)	China	1991 to 2008	None		-	+/- Increase and decrease of TC lead to higher volatility SGARCH	
Deng et al. (2014)	China	1990 to 2009	Crosslistings Hong Kong and Mainland China			+ Mature market - Immature market Std. dev. of returns	
Liu (2007)	Japan	1987 to 1991	ADRs	-	-		
Hayashida, and Ono (2011)	Japan	1995 to 2003	None		-		
Chou, and Wang (2006)	Taiwan	1999 to 2001	None		-	n.sig. Realized volatility, High-low price dispersion	- Bid-ask-spread
Liau et al. (2012)	Taiwan	1998 to 2007	None			+ AC-GARCH	
EMEIA (part 1/2)							
Colliard, and Hoffmann (2015)	France	2009 to 2012	Untaxed Euronext Paris, Euronext stocks of Luxembourg and Netherlands		-	n.sig. Realized volatility, Intraday high-low-price dispersion	n.sig. Spreads - Depth , Resiliency
Becchetti et al. (2014)	France	2012	Untaxed Euronext Paris		-	- high-low-price dispersion, daily stock-price volatility	n.sig. Bid-ask-spread, Amihud price impact measure

Table 1: Empirical evidence on FTT (part 2/2)

Studies	Countries under examination	Collected Data	Control Group	Dependent variables			
				Price	Volume	Volatility	Liquidity[1)]
EMEIA (part 2/2)							
Parwada et al. (2013)	France	2012 to 2013	Untaxed Euronext Paris/ Large UK stocks		-		- Bid-ask-spread
Capelle-Blancard, and Havrylchyk (2013)	France	2012 to 2013	Untaxed Euronext Paris/ German stocks		-	n.sig. Squared returns, High-low price dispersion, Conditional variance	n.sig. Relative Bid-ask-spread, Liquidity ratio
Gomber et al. (2016)	France	2012 to 2013	German stocks (DAX 30)		-	n.sig. std. dev. of prices, high to low measure	- executed trades,rel. bid-ask spread, depth
Meyer et al. (2015)	France	2012	UK stocks (FTSE 100)		-		complex Bid-ask-spread, Price impact, Depth
Capelle-Blancard (2016)	France	2007 to 2008	Untaxed Euronext stocks	-	-	n. sig. absolute return, conditional variance, high-low range	n.sig. Turnover, estimated Bid-ask-spread, liquidity ratio
Capelle-Blancard (2015)	Italy	2011 to 2013	Untaxed German and Italian stocks	-	-	n.sig. squared return, conditional variance, high-low range	n.sig. Trading value, turnover ratio, Bid-ask spread, liquidity ratio
Hvozdyk, and Rustanov (2016)	Italy	2012 to 2013	None			n. sig. Log. returns, adjusted returns, market model residuals	Announcement period: increase; Tax period: decrease Quoted spread, quoted relative spread
Coelho (2015)	France, Italy	2011 to 2013	Untaxed French and Italien stocks, For France: Dutch and Belgian stocks, For Italy: Spanish stocks, ADRs	-	-	n.sig. Std. dev. of closing prices, Daily std. dev. of high, low, closing & opening prices, Bid-ask-spread as percentage of closing price	
Phylaktis, and Aristidou (2007)	Greece	1997 to 2003	None			n.sig. Normal period + Bull-period n.sig. Bear-period (All Share Index) - (Bear period FTSE/ASE20) GARCH-M, EGARCH-M –ARMA	
Umlauf (1993)	Sweden	1980 to 1987	None or NYSE or FTSE	-	-	n. sig. Variance of returns	
Westerholm (2003)	Sweden, Finland	1987 to 1998	NYSE Dow Jones/CRSP	-	-	+ Intraday high-low-price dispersion	
Saporta, and Kan (1997)	UK	1987 to 1996	ADRs	-	-	n.sig. GARCH, Variance of returns	
Bond et al. (2005)	UK	1984, 1986, 1990		-			

Table 2: Descriptive statistics

Evaluation period: 2 months	French stocks			German stocks			UK stocks		
Observations	20,867			17,436			40,196		
Variable	Mean	Median	Standard deviation	Mean	Median	Standard deviation	Mean	Median	Standard deviation
Trading volume (1,000s)	1,675.87	331.70	4,698.83	1419.72	349.75	2877.97	4529.05	1321.15	16,485.61
Daily return (%)	0.054	0.000	2.04	0.085	0.064	1.980	0.066	0.052	1.88
Share price (€)	52.74	34.47	67.19	50.10	37.84	56.20	1004.45	613.78	1027.14
Relative bid-ask spread (%)	0.25	0.11	0.53	0.59	0.44	0.65	0.13	0.09	0.14
Relative intraday volatility (%)	2.53	2.21	1.47	2.17	1.85	1.51	2.44	2.06	1.64
Relative weekly volatility (%)	1.71	1.44	1.16	1.61	1.38	1.11	1.53	1.26	1.10
Relative monthly volatility (%)	3.07	2.69	1.83	2.99	2.59	1.79	2.83	2.36	1.78
Market capitalization (million €)	10,308.34	4,443.62	15,521.68	10,489.27	3,784.786	14,745.55	9,894.72	2,927.59	18,943.05
Price-to-book ratio (%)	1.54	1.27	1.485419	2.63	1.73	5.19	389.97	1.7	5,484.28
EBITDA (1,000 €)	2,391.34	889.00	4,342.20	3,368.17	919.00	6,754.51	1,914.02	437.23	5,151.77
Evaluation period: 8 months	French stocks			German stocks			UK stocks		
Observations	47,217			39,147			87,851		
Variable	Mean	Median	Standard deviation	Mean	Median	Standard deviation	Mean	Median	Standard deviation
Trading volume (1,000s)	1,629.59	310.30	4,491.55	1,487.38	361.6	3,143.54	4,277.21	1,276.8	15,363.73
Daily return (%)	0.016	0.000	2.225	0.0390	0.0291	2.254	0.043	0.040	2.035
Share price (€)	55.58	35.00	79.19	50.66	37.02	58.44	995.73	607.48	1,020.90
Relative bid-ask spread (%)	0.27	0.12	0.59	0.61	0.46	1.03	0.13	0.08	0.15
Relative intraday volatility (%)	2.72	2.28	1.77	2.46	1.97	1.93	2.63	2.18	1.80
Relative weekly volatility (%)	1.80	1.47	1.29	1.79	1.47	1.31	1.62	1.30	1.24
Relative monthly volatility (%)	3.33	2.80	2.05	3.35	2.76	2.18	3.02	2.50	1.94
Market capitalization (million €)	10,486.43	4,512.31	15,690.03	10,491.86	3,740.2	14,904.66	9,751.76	2,892.57	18,620.45
Price-to-book ratio (%)	1.58	1.30	1.50	2.69	1.73	5.88	428.92	1.78	6,078.02
EBITDA (1,000 €)	2,400.45	909.00	4,375.62	3,240.07	820.00	6,241.67	1,916.89	423.80	5,245.05

The number of observations is smaller for relative weekly (monthly) volatilities.

Table 3: Trading volume: Preliminary specification

Model	1	2	3	4	5	6
Reference period	APeriod	APeriod	APeriod	Pre-APeriod	Pre-Aperiod	Pre-APeriod
Evaluation period	2 months	4 months	8 months	2 months	4 months	8 months
DiD	**-0.183*** **	**-0.156*** **	**-0.0859*** **			
	(0.0285)	**(0.0286)**	**(0.0305)**			
TPeriod	-0.0961***	-0.103***	-0.121***			
	(0.0135)	(0.0141)	(0.0150)			
LDiD				**-0.0238**	**-0.0298**	**-0.0512**
				(0.0411)	**(0.0385)**	**(0.0373)**
LTPeriod				-0.141***	0.175***	0.172***
				(0.0258)	(0.0262)	(0.0274)
Market capitalization	0.0851	-0.0251	-0.0270	0.258	0.0474	-0.119
	(0.172)	(0.150)	(0.114)	(0.162)	(0.133)	(0.0878)
Price-to-book ratio	1.41e-05***	3.40e-07	-1.54e-06	1.16e-05***	-6.92e-06***	-3.10e-06***
	(1.77e-06)	(1.65e-06)	(9.49e-07)	(2.21e-06)	(1.50e-06)	(8.34e-07)
EBITDA			-1.01e-05		-0.000121**	-1.09e-05
			(2.74e-05)		(5.53e-05)	(3.79e-05)
Stock FE and month FE	YES	YES	YES	YES	YES	YES
Number of observations	32,617	65,693	128,373	32,881	64,979	128,597
Number of stocks	393	393	397	393	396	397
Adjusted R–squared	0.964	0.963	0.958	0.961	0.955	0.957

The dependent variable is the logarithm of the number of traded shares (in thousands). Estimates are calculated by OLS with stock and monthly fixed effects. Heteroscedasticity-robust standard errors are clustered by stock level and documented in parentheses. The superscripts ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. *TPeriod* is a dummy variable with a value of one in the treatment period after July 31, 2012. *LTPeriod* is a dummy variable with a value of one in the long-run treatment period after August 31, 2012. *DiD* and *LDiD* are interaction terms of *TPeriod* and *LTPeriod* with a dummy variable for treated French stocks. We consider *Price-to-book ratio*, the logarithm of market capitalization in million € (*Market capitalization*) and the ratio of EBITDA to market capitalization (*EBITDA*) as controls.

Table 4: Trading volume: Baseline specification

Model	1	2	3	4	5	6
Evaluation period	2 months	4 months	8 months	2 months	4 months	8 months
Collapsed model	NO	NO	NO	YES	YES	YES
ADiD	**0.0571***	**0.0558****	**0.0228**	**0.0862****	**0.0861****	**0.0990****
	(0.0293)	**(0.0281)**	**(0.0277)**	**(0.0392)**	**(0.0388)**	**(0.0402)**
SDiD	**-0.179*****	**-0.182*****	**-0.216*****	**-0.164*****	**-0.171*****	**-0.174*****
	(0.0423)	**(0.0416)**	**(0.0402)**	**(0.0431)**	**(0.0424)**	**(0.0426)**
LDiD	**-0.0188**	**-0.0332**	**-0.0658***	**-0.00253**	**-0.0263**	**-0.0464**
	(0.0390)	**(0.0380)**	**(0.0368)**	**(0.0400)**	**(0.0398)**	**(0.0408)**
APeriod	0.0690***	0.0711***	-0.134***	-3.483*	-5.023*	1.424
	(0.0169)	(0.0168)	(0.0185)	(1.946)	(2.860)	(1.286)
STPeriod	-0.131***	-0.125***	-0.378***	-6.147**	-8.212***	-0.547**
	(0.0233)	(0.0228)	(0.0238)	(2.500)	(3.163)	(0.260)
LTPeriod	0.0692***	0.0806***	-0.170***	-5.580**	-8.370**	0.179
	(0.0260)	(0.0252)	(0.0258)	(2.477)	(3.278)	(1.835)
Controls	YES	YES	YES	YES	YES	YES
Stock fixed effects	YES	YES	YES	YES	YES	YES
Monthly fixed effects	YES	YES	YES	YES	YES	YES
Number of observations	78,499	110,597	174,215	1,572	1,575	1,578
Number of stocks	393	396	397	393	396	397
Within R-squared	0.0884	0.0945	0.0836	0.436	0.441	0.454
Adjusted R–squared	0.971	0.967	0.966	0.995	0.995	0.995

The dependent variable is the logarithm of the number of traded shares (in thousands). Estimates are calculated by OLS with stock fixed effects and monthly fixed effects. Heteroscedasticity-robust standard errors are clustered by stock level and documented in parentheses. The superscripts ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. *APeriod* is a dummy variable with a value of one in the announcement period (March 14, 2012 until July 31, 2012). *LTPeriod* (*STPeriod*) are dummy variables with a value of one in the long-run (short-run) treatment periods after August 31, 2012 (from August 1, 2012 until August 31, 2012). *ADiD*, *LDiD*, and *SDiD* are interaction terms of *APeriod*, *LTPeriod*, and *STPeriod* with a dummy variable for treated French stocks. As control variables, we consider *Price-to-book ratio*, the logarithm of market capitalization measured in million € (*Market capitalization*) and the ratio of EBITDA to market capitalization (*EBITDA*).

Table 5: Daily return: Baseline specification

Model	1	2	3	4	5	6
Evaluation period	2 months	4 months	8 months	2 months	4 months	8 months
Collapsed model	NO	NO	NO	YES	YES	YES
ADiD	**-0.00138*****	**-0.000877*****	**-0.000404****	**-0.00128****	**-0.000566**	**-0.000280**
	(0.000389)	**(0.000301)**	**(0.000202)**	**(0.000501)**	**(0.000435)**	**(0.000328)**
SDiD	**-0.000672***	**-0.000176**	**0.000295**	**-0.000547**	**0.000185**	**0.000533**
	(0.000394)	**(0.000338)**	**(0.000325)**	**(0.000479)**	**(0.000447)**	**(0.000401)**
LDiD	**-0.00141*****	**-0.000272**	**0.000100**	**-0.00136*****	**2.91e-05**	**0.000322**
	(0.000380)	**(0.000217)**	**(0.000165)**	**(0.000456)**	**(0.000338)**	**(0.000277)**
APeriod	-0.00311***	-0.00324***	-0.00336***	-0.0296	-0.0292	-0.0500
	(0.000306)	(0.000300)	(0.000300)	(0.0216)	(0.0287)	(0.0342)
STPeriod	-0.00325***	-0.00337***	-0.00350***	-0.0299	-0.0324	-0.0614
	(0.000390)	(0.000386)	(0.000387)	(0.0292)	(0.0359)	(0.0428)
LTPeriod	-0.00295***	-0.00325***	-0.00335***	-0.0257	-0.0266	-0.0224
	(0.000403)	(0.000396)	(0.000394)	(0.0257)	(0.0334)	(0.0393)
Controls	YES	YES	YES	YES	YES	YES
Stock FE and month FE	YES	YES	YES	YES	YES	YES
Number of observations	78,499	110,597	174,215	1,572	1,575	1,578
Number of stocks	393	396	397	393	396	397
Adjusted R–squared	0.00777	0.00689	0.00968	0.220	0.153	0.299

The dependent variable is the daily return measured as the relative change in the stock price compared to the last trading day. Estimates are calculated by OLS with stock fixed effects and monthly fixed effects. Heteroscedasticity-robust standard errors are clustered by stock level and documented in parentheses. The superscripts ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. *APeriod* is a dummy variable with a value of one in the announcement period (March 14, 2012 until July 31, 2012). *LTPeriod* (*STPeriod*) are dummy variables with a value of one in the long-run (short-run) treatment periods after August 31, 2012 (from August 1, 2012 until August 31, 2012). *ADiD*, *LDiD*, and *SDiD* are interaction terms of *APeriod*, *LTPeriod*, and *STPeriod* with a dummy variable for treated French stocks. As control variables, we consider *Price-to-book ratio*, the logarithm of market capitalization measured in million € (*Market capitalization*) and the ratio of EBITDA to market capitalization (*EBITDA*).

Table 6: Daily return: Extended announcement period

Model	1	2	3	4	5	6
Evaluation period	2 months	4 months	8 months	2 months	4 months	8 months
Collapsed model	NO	NO	NO	YES	YES	YES
EADiD	**-0.00158****	**-0.000349**	**9.79e-05**	**-0.000981**	**0.000165**	**0.000301**
	(0.000728)	**(0.000295)**	**(0.000173)**	**(0.000903)**	**(0.000466)**	**(0.000350)**
SDiD	**-0.00118***	**4.72e-05**	**0.000491**	**-0.00102**	**0.000503**	**0.000677***
	(0.000689)	**(0.000355)**	**(0.000333)**	**(0.000844)**	**(0.000486)**	**(0.000390)**
LDiD	**-0.00192*****	**-4.91e-05**	**0.000297**	**-0.00185****	**0.000332**	**0.000445**
	(0.000658)	**(0.000239)**	**(0.000185)**	**(0.000776)**	**(0.000363)**	**(0.000279)**
EAPeriod	-0.00718***	-0.00717***	-0.00730***	0.176	0.0173	-0.00758
	(0.000686)	(0.000633)	(0.000631)	(0.130)	(0.132)	(0.157)
STPeriod	-0.00723***	-0.00722***	-0.00735***	0.176	0.0161	-0.0159
	(0.000737)	(0.000686)	(0.000683)	(0.122)	(0.122)	(0.147)
LTPeriod	-0.00694***	-0.00710***	-0.00720***	0.178	0.0179	0.0260
	(0.000711)	(0.000659)	(0.000655)	(0.121)	(0.122)	(0.144)
Controls	YES	YES	YES	YES	YES	YES
Stock FE and month FE	YES	YES	YES	YES	YES	YES
Number of observations	78,499	110,597	174,215	1,572	1,575	1,578
Number of stocks	393	396	397	393	396	397
Adjusted R–squared	0.00811	0.00713	0.00982	0.184	0.0745	0.314

The dependent variable is the daily return measured as the relative change in the stock price compared to the last trading day. Estimates are calculated by OLS with stock fixed effects and monthly fixed effects. Heteroscedasticity-robust standard errors are clustered by stock level and documented in parentheses. The superscripts ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. *EAPeriod* is a dummy variable with a value of one in the announcement period (January 29, 2012 until July 31, 2012). *LTPeriod* (*STPeriod*) are dummy variables with a value of one in the long-run (short-run) treatment periods after August 31, 2012 (from August 1, 2012 until August 31, 2012). *EADiD*, *LDiD*, and *SDiD* are interaction terms of *EAPeriod*, *LTPeriod*, and *STPeriod* with a dummy variable for treated French stocks. As control variables, we consider *Price-to-book ratio*, the logarithm of market capitalization measured in million € (*Market capitalization*) and the ratio of EBITDA to market capitalization (*EBITDA*).

Table 7: Bid-ask spread: Baseline specification

Model	1	2	3	4	5	6
Evaluation period	2 months	4 months	8 months	2 months	4 months	8 months
Collapsed model	NO	NO	NO	YES	YES	YES
ADiD	**-2.37e-06**	**-8.60e-05**	**-5.25e-06**	**-0.000240**	**-8.14e-05**	**-0.000193**
	(8.99e-05)	**(0.000103)**	**(0.000140)**	**(0.000289)**	**(0.000272)**	**(0.000423)**
SDiD	**0.000304**	**0.000220**	**0.000316**	**0.000557**	**0.000655**	**0.000638****
	(0.000185)	**(0.000176)**	**(0.000194)**	**(0.000503)**	**(0.000633)**	**(0.000276)**
LDiD	**0.000212**	**0.000109**	**0.000295**	**9.91e-05**	**9.49e-05**	**0.000495***
	(0.000145)	**(0.000166)**	**(0.000188)**	**(0.000218)**	**(0.000319)**	**(0.000275)**
APeriod	-7.92e-05	-5.21e-05	-7.63e-05	0.0259	0.0809***	0.123**
	(5.40e-05)	(5.73e-05)	(5.02e-05)	(0.0217)	(0.0307)	(0.0521)
STPeriod	-4.51e-05	-4.56e-06	-4.33e-05	-0.0209	0.0302	0.0346
	(8.04e-05)	(8.33e-05)	(7.63e-05)	(0.0430)	(0.0311)	(0.0511)
LTPeriod	-0.000228***	-0.000172*	-0.000238***	-0.0277	-0.000141	-0.0131
	(7.94e-05)	(9.25e-05)	(8.56e-05)	(0.0422)	(0.0435)	(0.0602)
Controls	YES	YES	YES	YES	YES	YES
Stock FE and month FE	YES	YES	YES	YES	YES	YES
Number of observations	78,499	110,597	174,215	1,572	1,575	1,578
Number of stocks	393	396	397	393	396	397
Within R-squared	0.00450	0.00284	0.00604	0.145	0.138	0.303
Adjusted R–squared	0.645	0.311	0.387	0.919	0.910	0.940

The dependent variable is the relative bid-ask spread (= difference between the average bid and the average ask price divided by the average price). Estimates are calculated by OLS with stock fixed effects and monthly fixed effects. Heteroscedasticity-robust standard errors are clustered by stock level and documented in parentheses. The superscripts ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. *APeriod* is a dummy variable with a value of one in the announcement period (March 14, 2012 until July 31, 2012). *LTPeriod* (*STPeriod*) are dummy variables with a value of one in the long-run (short-run) treatment periods after August 31, 2012 (from August 1, 2012 until August 31, 2012). *ADiD*, *LDiD*, and *SDiD* are interaction terms of *APeriod*, *LTPeriod*, and *STPeriod* with a dummy variable for treated French stocks. As control variables, we consider *Price-to-book ratio*, the logarithm of market capitalization measured in million € (*Market capitalization*) and the ratio of EBITDA to market capitalization (*EBITDA*).

Table 8: Intraday volatility: Baseline specification

Model	1	2	3	4	5	6
Evaluation period	2 months	4 months	8 months	2 months	4 months	8 months
Collapsed model	NO	NO	NO	YES	YES	YES
ADiD	**0.00213*** **	**0.000992** **	**0.000713**	**0.00272*** **	**0.00175*** **	**0.00262*** **
	(0.000453)	**(0.000428)**	**(0.000515)**	**(0.000596)**	**(0.000576)**	**(0.000731)**
SDiD	**-0.000208**	**-0.00134** **	**-0.00163** **	**0.000108**	**-0.000961**	**-0.000421**
	(0.000651)	**(0.000663)**	**(0.000784)**	**(0.000745)**	**(0.000782)**	**(0.000986)**
LDiD	**0.000201**	**-0.000895**	**-0.00133**	**0.000562**	**-0.000485**	**-0.000385**
	(0.000671)	**(0.000703)**	**(0.000829)**	**(0.000761)**	**(0.000837)**	**(0.00106)**
APeriod	-0.00261***	-0.00230***	-0.00224***	-0.0859***	-0.0784**	-0.121*
	(0.000364)	(0.000353)	(0.000362)	(0.0292)	(0.0352)	(0.0724)
STPeriod	-0.00482***	-0.00450***	-0.00448***	-0.124***	-0.119***	-0.133*
	(0.000472)	(0.000465)	(0.000470)	(0.0398)	(0.0417)	(0.0783)
LTPeriod	-0.00400***	-0.00368***	-0.00363***	-0.116***	-0.124***	-0.121
	(0.000494)	(0.000501)	(0.000496)	(0.0369)	(0.0437)	(0.0874)
Controls	YES	YES	YES	YES	YES	YES
Stock FE and month FE	YES	YES	YES	YES	YES	YES
Number of observations	78,499	110,597	174,215	1,572	1,575	1,578
Number of stocks	393	396	397	393	396	397
Within R-squared	0.0409	0.0775	0.157	0.372	0.525	0.700
Adjusted R–squared	0.289	0.301	0.359	0.846	0.852	0.865

The dependent variable is the relative intraday volatility (= difference between the highest and the lowest stock price divided by the average price). Estimates are calculated by OLS with stock fixed effects and monthly fixed effects. Heteroscedasticity-robust standard errors are clustered by stock level and documented in parentheses. The superscripts ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. *APeriod* is a dummy variable with a value of one in the announcement period (March 14, 2012 until July 31, 2012). *LTPeriod* (*STPeriod*) are dummy variables with a value of one in the long-run (short-run) treatment periods after August 31, 2012 (from August 1, 2012 until August 31, 2012). *ADiD*, *LDiD*, and *SDiD* are interaction terms of *APeriod*, *LTPeriod*, and *STPeriod* with a dummy variable for treated French stocks. As control variables, we consider *Price-to-book ratio*, the logarithm of market capitalization measured in million € (*Market capitalization*) and the ratio of EBITDA to market capitalization (*EBITDA*).

Table 9: Weekly volatility: Baseline specification

Model	1	2	3	4	5	6
Evaluation period	2 months	4 months	8 months	2 months	4 months	8 months
Collapsed model	NO	NO	NO	YES	YES	YES
ADiD	**0.000355**	**-0.000590**	**-0.000440**	**0.000356**	**-0.000432**	**0.000298**
	(0.000559)	**(0.000489)**	**(0.000497)**	**(0.000677)**	**(0.000636)**	**(0.000694)**
SDiD	**-0.00188*** **	**-0.00278*** **	**-0.00260*** **	**-0.00168** **	**-0.00254*** **	**-0.00199** **
	(0.000680)	**(0.000671)**	**(0.000721)**	**(0.000741)**	**(0.000770)**	**(0.000879)**
LDiD	**-0.000443**	**-0.00172*** **	**-0.00217*** **	**-8.10e-05**	**-0.00142** **	**-0.00182** **
	(0.000660)	**(0.000581)**	**(0.000635)**	**(0.000734)**	**(0.000708)**	**(0.000826)**
APeriod	-0.00209***	-0.00185***	-0.00193***	-0.0605**	-0.0328	-0.117
	(0.000547)	(0.000537)	(0.000539)	(0.0263)	(0.0323)	(0.0715)
STPeriod	-0.00508***	-0.00491***	-0.00507***	-0.0900***	-0.0663*	-0.127*
	(0.000670)	(0.000666)	(0.000667)	(0.0318)	(0.0351)	(0.0746)
LTPeriod	-0.00290***	-0.00264***	-0.00267***	-0.0875***	-0.0788**	-0.143*
	(0.000703)	(0.000695)	(0.000686)	(0.0311)	(0.0343)	(0.0819)
Controls	YES	YES	YES	YES	YES	YES
Stock FE and month FE	YES	YES	YES	YES	YES	YES
Number of observations	16,483	23,432	36,822	1,572	1,575	1,578
Number of stocks	393	396	397	393	396	397
Adjusted R–squared	0.257	0.258	0.319	0.727	0.750	0.784

The dependent variable is the relative weekly volatility (= standard deviation of the stock price over one week divided by the average stock price of the week). Estimates are calculated by OLS with stock fixed effects and monthly fixed effects. Heteroscedasticity-robust standard errors are clustered by stock level and documented in parentheses. The superscripts ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. *APeriod* is a dummy variable with a value of one in the announcement period (March 14, 2012 until July 31, 2012). *LTPeriod* (*STPeriod*) are dummy variables with a value of one in the long-run (short-run) treatment periods after August 31, 2012 (from August 1, 2012 until August 31, 2012). *ADiD*, *LDiD*, and *SDiD* are interaction terms of *APeriod*, *LTPeriod*, and *STPeriod* with a dummy variable for treated French stocks. As control variables, we consider *Price-to-book ratio*, the logarithm of market capitalization measured in million € (*Market capitalization*) and the ratio of EBITDA to market capitalization (*EBITDA*).

Table 10: Monthly volatility: Baseline specification

Model	1	2	3	4	5	6
Evaluation period	2 months	4 months	8 months	2 months	4 months	8 months
Collapsed model	NO	NO	NO	YES	YES	YES
ADiD	**5.66e-05**	**-0.00320****	**-0.00224**	**0.000576**	**-0.00188**	**-0.000276**
	(0.00160)	**(0.00140)**	**(0.00136)**	**(0.00152)**	**(0.00162)**	**(0.00176)**
SDiD	**-0.00494*****	**-0.00806*****	**-0.00708*****	**-0.00404****	**-0.00686*****	**-0.00559*****
	(0.00181)	**(0.00170)**	**(0.00163)**	**(0.00178)**	**(0.00183)**	**(0.00198)**
LDiD	**-0.00121**	**-0.00529*****	**-0.00481*****	**-0.000316**	**-0.00404****	**-0.00416****
	(0.00163)	**(0.00147)**	**(0.00141)**	**(0.00161)**	**(0.00160)**	**(0.00180)**
APeriod	-0.00749	-0.00416	-0.00291	-0.100*	-0.0382	-0.0969
	(0.0151)	(0.0156)	(0.0151)	(0.0573)	(0.0787)	(0.191)
STPeriod	-0.0112	-0.00790	-0.00680	-0.114	-0.0474	-0.0701
	(0.0152)	(0.0156)	(0.0152)	(0.0730)	(0.0870)	(0.191)
LTPeriod	-0.00975	-0.00611	-0.00495	-0.107	-0.0538	-0.0490
	(0.0152)	(0.0156)	(0.0152)	(0.0714)	(0.0795)	(0.199)
Controls	YES	YES	YES	YES	YES	YES
Stock FE and month FE	YES	YES	YES	YES	YES	YES
Number of observations	3,930	5,494	8,535	1,572	1,575	1,578
Number of stocks	393	396	397	393	396	397
Adjusted R–squared	0.404	0.433	0.472	0.606	0.649	0.695

The dependent variable is the relative monthly volatility (= standard deviation of the stock price over one month divided by the average stock price of the month). Estimates are calculated by OLS with stock fixed effects and monthly fixed effects. Heteroscedasticity-robust standard errors are clustered by stock level and documented in parentheses. The superscripts ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. *APeriod* is a dummy variable with a value of one in the announcement period (March 14, 2012 until July 31, 2012). *LTPeriod* (*STPeriod*) are dummy variables with a value of one in the long-run (short-run) treatment periods after August 31, 2012 (from August 1, 2012 until August 31, 2012). *ADiD*, *LDiD*, and *SDiD* are interaction terms of *APeriod*, *LTPeriod*, and *STPeriod* with a dummy variable for treated French stocks. As control variables, we consider *Price-to-book ratio*, the logarithm of market capitalization measured in million € (*Market capitalization*) and the ratio of EBITDA to market capitalization (*EBITDA*)..

Table 11: Trading volume and daily return: Triple difference specification

Model	1	2	3	4	5	6
Observation period	2012	2011-2013	2010-2014	2012	2011-2013	2010-2014
Dependent variable	Trading volume			Daily return		
ADiDiD	**0.0714****	**0.135*****	**0.0703****	**-0.00102****	**-0.000753****	**-0.000961****
	(0.0288)	**(0.0308)**	**(0.0304)**	**(0.000400)**	**(0.000380)**	**(0.000383)**
SDiDiD	**-0.167*****	**-0.0387**	**-0.0917****	**-0.000314**	**4.18e-05**	**2.82e-05**
	(0.0440)	**(0.0487)**	**(0.0458)**	**(0.000387)**	**(0.000467)**	**(0.000426)**
LDiDiD	**-0.0224**	**-0.0435**	**-0.0852***	**-0.000415**	**0.000199**	**-1.04e-05**
	(0.0391)	**(0.0499)**	**(0.0460)**	**(0.000294)**	**(0.000299)**	**(0.000311)**
Standard controls	YES	YES	YES	YES	YES	YES
Triple difference controls	YES	YES	YES	YES	YES	YES
Stock fixed effects	YES	YES	YES	YES	YES	YES
Market-year fixed effects	YES	YES	YES	YES	YES	YES
Monthly fixed effects	YES	YES	YES	YES	YES	YES
Number of observations	97,849	288,126	475,464	97,849	288,126	475,464
Number of stocks	393	400	402	393	400	402
Adjusted R–squared	0.939	0.929	0.915	0.00752	0.00915	0.00847

The dependent variable is either the logarithm of the number of traded shares (in thousands) or the daily return (= relative change in stock prices compared to the previous trading day). Estimates are calculated by OLS with stock fixed effects and monthly fixed effects. Heteroscedasticity-robust standard errors are clustered by stock level and documented in parentheses. The superscripts ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. As standard control variables, we consider *Price-to-book ratio*, the logarithm of market capitalization measured in million € (*Market capitalization*) and the ratio of EBITDA to market capitalization (*EBITDA*). In addition, we consider (triple) difference dummy variables as controls. In the Models 1 and 4 we only include *APeriodS* (dummy for period from March 14 and July 31 in any year), *STPeriodS* (dummy for period from August 1 to August 31 in any year), *LTPeriodS* (dummy for period after July 31 in any year) as DiD dummy variables. These models are equivalent to a regular DiD specification. In the other models, we further consider *APeriodS 2012*, *STPeriodS 2012*, *LTPeriodS 2012* (interaction terms of corresponding period dummies with a dummy for the year 2012), *APeriodS France*, *STPeriodS France*, and *LTPeriodS France* (interaction terms of corresponding period dummies and a dummy variable for French stocks.

Table 12: Bid-ask spread and intraday volatility: Triple difference specification

Model	1	2	3	4	5	6
Observation period	2012	2011-2013	2010-2014	2012	2011-2013	2010-2014
Dependent variable	Bid-ask spread			Intraday volatility		
ADiDiD	**-4.03e-05**	**-0.000191**	**-0.000267***	**0.00198*****	**0.00266*****	**0.00193*****
	(8.81e-05)	**(0.000170)**	**(0.000138)**	**(0.000441)**	**(0.000497)**	**(0.000461)**
SDiDiD	**0.000259**	**0.000381**	**0.000281**	**-0.000359**	**0.00109**	**0.000641**
	(0.000181)	**(0.000262)**	**(0.000225)**	**(0.000643)**	**(0.000994)**	**(0.000795)**
LDiDiD	**0.000155**	**-2.44e-05**	**-1.60e-05**	**8.77e-05**	**-0.00112**	**-0.000568**
	(0.000151)	**(0.000258)**	**(0.000215)**	**(0.000684)**	**(0.000924)**	**(0.000769)**
Standard controls	YES	YES	YES	YES	YES	YES
Triple difference controls	YES	YES	YES	YES	YES	YES
Stock fixed effects	YES	YES	YES	YES	YES	YES
Market-year fixed effects	YES	YES	YES	YES	YES	YES
Monthly fixed effects	YES	YES	YES	YES	YES	YES
Number of observations	97,849	288,126	475,464	97,849	288,126	475,464
Number of stocks	393	400	402	393	400	402
Adjusted R–squared	0.284	0.287	0.217	0.292	0.334	0.310

The dependent variable is either the relative bid-ask spread (= difference between the average bid and the average ask price divided by the average price) or the relative intraday volatility (= difference between the highest and the lowest stock price divided by the average price). Estimates are calculated by OLS with stock fixed effects and monthly fixed effects. Heteroscedasticity-robust standard errors are clustered by stock level and documented in parentheses. The superscripts ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. As standard control variables, we consider *Price-to-book ratio*, the logarithm of market capitalization measured in million € (*Market capitalization*) and the ratio of EBITDA to market capitalization (*EBITDA*). In addition, we consider (triple) difference dummy variables as controls. In the Models 1 and 4 we only include *APeriodS* (dummy for period from March 14 and July 31 in any year), *STPeriodS* (dummy for period from August 1 to August 31 in any year), *LTPeriodS* (dummy for period after July 31 in any year) as DiD dummy variables. These models are equivalent to a regular DiD specification. In the other models, we further consider *APeriodS 2012*, *STPeriodS 2012*, *LTPeriodS 2012* (interaction terms of corresponding period dummies with a dummy for the year 2012), *APeriodS France*, *STPeriodS France*, and *LTPeriodS France* (interaction terms of corresponding period dummies and a dummy variable for French stocks.

Table 13: Weekly and monthly volatility: Triple difference specification

Model	1	2	3	4	5	6
Observation period	2012	2011-2013	2010-2014	2012	2011-2013	2010-2014
Dependent variable	Weekly volatility	Weekly volatility	Weekly volatility	Monthly volatility	Monthly volatility	Monthly volatility
ADiDiD	**-1.20e-05**	**-0.000267**	**-0.000186**	**-7.88e-05**	**-0.000380**	**-0.000536**
	(0.000558)	**(0.000611)**	**(0.000581)**	**(0.00158)**	**(0.00171)**	**(0.00164)**
SDiDiD	**-0.00223*****	**-0.00189***	**-0.00219****	**-0.00512*****	**-0.00394**	**-0.00465****
	(0.000701)	**(0.00104)**	**(0.000876)**	**(0.00181)**	**(0.00242)**	**(0.00210)**
LDiDiD	**-0.00103**	**-0.00329*****	**-0.00235*****	**-0.00234**	**-0.00598*****	**-0.00456*****
	(0.000650)	**(0.000871)**	**(0.000706)**	**(0.00159)**	**(0.00187)**	**(0.00161)**
Standard controls	YES	YES	YES	YES	YES	YES
Triple difference controls	YES	YES	YES	YES	YES	YES
Stock fixed effects	YES	YES	YES	YES	YES	YES
Market-year fixed effects	YES	YES	YES	YES	YES	YES
Monthly fixed effects	YES	YES	YES	YES	YES	YES
Number of observations	20,412	60,296	99,171	4,716	13,843	22,834
Number of stocks	393	400	402	393	400	402
Adjusted R–squared	0.260	0.169	0.177	0.400	0.434	0.380

The dependent variable is either the relative weekly volatility (= standard deviation of the stock price over one week divided by the weekly average price) or the relative monthly volatility (= standard deviation of the stock price over one month divided by the monthly average price). Estimates are calculated by OLS with stock fixed effects and monthly fixed effects. Heteroscedasticity-robust standard errors are clustered by stock level and documented in parentheses. The superscripts ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. As standard control variables, we consider *Price-to-book ratio*, the logarithm of market capitalization measured in million € (*Market capitalization*) and the ratio of EBITDA to market capitalization (*EBITDA*). In addition, we consider (triple) difference dummy variables as controls. In the Models 1 and 4 we only include *APeriodS* (dummy for period from March 14 and July 31 in any year), *STPeriodS* (dummy for period from August 1 to August 31 in any year), *LTPeriodS* (dummy for period after July 31 in any year) as DiD dummy variables. These models are equivalent to a regular DiD specification. In the other models, we further consider *APeriodS 2012*, *STPeriodS 2012*, *LTPeriodS 2012* (interaction terms of corresponding period dummies with a dummy for the year 2012), *APeriodS France*, *STPeriodS France*, and *LTPeriodS France* (interaction terms of corresponding period dummies and a dummy variable for French stocks.

Table 14: Correlation coefficients for a pre-announcement period of four months

Model	1	2	3	4	5
Variable	Trading volume	Daily return	Bid-ask spread	Intraday volatility	Weekly volatility
Weekly correlation coefficient between treatment group and					
Unmatched control group	0.9173	0.9594	0.5429	0.9757	0.9475
Matched control group	0.9268	0.9696	0.6054	0.9816	0.9491
Daily correlation coefficient between treatment group and					
Unmatched control group	0.9289	0.9405	0.4511	0.9046	0.8745
Matched control group	0.9482	0.9480	0.4966	0.9112	0.9191

Table 15: Trading volume and daily return: Matched control groups

Model	1	2	3	4	5	6
Evaluation period	2 months	4 months	8 months	2 months	4 months	8 months
Dependent variable	Trading volume			Daily return		
ADiD	**0.0653***	**0.0706***	**0.0646**	**-0.00104****	**-0.000632**	**-0.000241**
	(0.0372)	**(0.0393)**	**(0.0401)**	**(0.000491)**	**(0.000392)**	**(0.000302)**
SDiD	**-0.168*****	**-0.163*****	**-0.169*****	**-0.000892**	**-0.000523**	**-0.000138**
	(0.0501)	**(0.0518)**	**(0.0523)**	**(0.000568)**	**(0.000477)**	**(0.000439)**
LDiD	**0.00459**	**-0.0286**	**-0.0365**	**-0.000802***	**0.000234**	**0.000552****
	(0.0502)	**(0.0501)**	**(0.0504)**	**(0.000480)**	**(0.000330)**	**(0.000272)**
Standard controls	YES	YES	YES	YES	YES	YES
DiD controls	YES	YES	YES	YES	YES	YES
Stock fixed effects	YES	YES	YES	YES	YES	YES
Market-year fixed effects	YES	YES	YES	YES	YES	YES
Monthly fixed effects	YES	YES	YES	YES	YES	YES
Number of observations	40,793	57,697	91,599	40,793	57,697	91,599
Number of stocks	204	206	207	204	206	207
Adjusted R–squared	0.948	0.941	0.941	0.0120	0.00944	0.0122

The dependent variable is either the logarithm of the number of traded shares (in thousands) or the daily return (= relative change in stock prices compared to the previous trading day). Estimates are calculated by OLS with stock fixed effects and monthly fixed effects. Heteroscedasticity-robust standard errors are clustered by stock level and documented in parentheses. The superscripts ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. As standard control variables, we consider *Price-to-book ratio*, the logarithm of market capitalization measured in million € (*Market capitalization*) and the ratio of EBITDA to market capitalization (*EBITDA*). In addition, we consider DiD dummy variables as controls. We include *APeriodS* (dummy for period from March 14 and July 31 in any year), *STPeriodS* (dummy for period from August 1 to August 31 in any year) and *LTPeriodS* (dummy for period after July 31 in any year).

Table 16: Bid-ask spread and intraday volatility: Matched control groups

Model	1	2	3	4	5	6
Evaluation period	2 months	4 months	8 months	2 months	4 months	8 months
Dependent variable	Bid-ask spread			Intraday volatility		
ADiD	**4.66e-06**	**3.01e-05**	**0.000173**	**0.00235*** **	**0.00153*** **	**0.00179*** **
	(0.000127)	**(0.000154)**	**(0.000201)**	**(0.000602)**	**(0.000562)**	**(0.000673)**
SDiD	**0.000385***	**0.000416** **	**0.000567** **	**0.000195**	**-0.000612**	**-0.000361**
	(0.000197)	**(0.000196)**	**(0.000225)**	**(0.000782)**	**(0.000806)**	**(0.000954)**
LDiD	**0.000383** **	**0.000473*** **	**0.000657*** **	**0.000819**	**-0.000223**	**-0.000198**
	(0.000162)	**(0.000178)**	**(0.000219)**	**(0.000873)**	**(0.000936)**	**(0.00105)**
Standard controls	YES	YES	YES	YES	YES	YES
DiD controls	YES	YES	YES	YES	YES	YES
Stock fixed effects	YES	YES	YES	YES	YES	YES
Market-year fixed effects	YES	YES	YES	YES	YES	YES
Monthly fixed effects	YES	YES	YES	YES	YES	YES
Number of observations	40,793	57,697	91,599	40,793	57,697	91,599
Number of stocks	204	206	207	204	206	207
Adjusted R–squared	0.548	0.570	0.565	0.281	0.292	0.357

The dependent variable is either the relative bid-ask spread (= difference between the average bid and the average ask price divided by the average price) or the relative intraday volatility (= difference between the highest and the lowest stock price divided by the average price). Estimates are calculated by OLS with stock fixed effects and monthly fixed effects. Heteroscedasticity-robust standard errors are clustered by stock level and documented in parentheses. The superscripts ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. As standard control variables, we consider *Price-to-book ratio*, the logarithm of market capitalization measured in million € (*Market capitalization*) and the ratio of EBITDA to market capitalization (*EBITDA*). In addition, we consider DiD dummy variables as controls. We include *APeriodS* (dummy for period from March 14 and July 31 in any year), *STPeriodS* (dummy for period from August 1 to August 31 in any year) and *LTPeriodS* (dummy for period after July 31 in any year).

Table 17: Weekly and monthly volatility: Matched control groups

Model	1	2	3	4	5	6
Evaluation period	2 months	4 months	8 months	2 months	4 months	8 months
Dependent variable	Weekly volatility			Monthly volatility		
ADiD	**4.85e-06**	**-0.000536**	**4.24e-05**	**-0.000412**	**-0.00230**	**-0.000369**
	(0.000692)	**(0.000613)**	**(0.000612)**	**(0.00202)**	**(0.00176)**	**(0.00166)**
SDiD	**-0.00154***	**-0.00205** **	**-0.00144***	**-0.00458** **	**-0.00638*** **	**-0.00446** **
	(0.000810)	**(0.000792)**	**(0.000835)**	**(0.00224)**	**(0.00206)**	**(0.00203)**
LDiD	**-0.000345**	**-0.00150** **	**-0.00156** **	**-0.00233**	**-0.00577*** **	**-0.00357** **
	(0.000826)	**(0.000760)**	**(0.000783)**	**(0.00208)**	**(0.00188)**	**(0.00175)**
Standard controls	YES	YES	YES	YES	YES	YES
DiD controls	YES	YES	YES	YES	YES	YES
Stock fixed effects	YES	YES	YES	YES	YES	YES
Market-year fixed effects	YES	YES	YES	YES	YES	YES
Monthly fixed effects	YES	YES	YES	YES	YES	YES
Number of observations	8,552	12,180	19,298	2,040	2,860	4,477
Number of stocks	204	206	207	204	206	207
Adjusted R–squared	0.268	0.266	0.325	0.397	0.427	0.473

The dependent variable is either the relative weekly volatility (= standard deviation of the stock price over one week divided by the weekly average price) or the relative monthly volatility (= standard deviation of the stock price over one month divided by the monthly average price). Estimates are calculated by OLS with stock fixed effects and monthly fixed effects. Heteroscedasticity-robust standard errors are clustered by stock level and documented in parentheses. The superscripts ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. As standard control variables, we consider *Price-to-book ratio*, the logarithm of market capitalization measured in million € (*Market capitalization*) and the ratio of EBITDA to market capitalization (*EBITDA*). In addition, we consider DiD dummy variables as controls. We include *APeriodS* (dummy for period from March 14 and July 31 in any year), *STPeriodS* (dummy for period from August 1 to August 31 in any year) and *LTPeriodS* (dummy for period after July 31 in any year).

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