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Financial transaction taxes: Announcement effects, short-run effects, and long-run effects

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Financial Transaction Taxes: Announcement Effects, Short-run Effects, and Long-run Effects*

Abstract

We analyze the impact of the French 2012 financial transaction tax (FTT) on trading volumes, stock prices, liquidity, and volatility. We extend the empirical research by identifying FTT announcement and short-run treatment effects, which can distort difference-in-differences estimates. In addition, we consider long-run volatility measures that better fit the French FTT's legislative design. While we find strong evidence of a positive FTT announcement effect on trading volumes, there is almost no statistically significant evidence of a long-run treatment effect. Thus, evidence of a strong reduction of trading volumes resulting from the French FTT might be driven by announcement effects and short-term treatment effects. We find evidence of an increase of intraday volatilities in the announcement period and a significant reduction of weekly and monthly volatilities in the treatment period. Our findings support theoretical considerations suggesting a stabilizing impact of FTTs on financial markets.

Keywords: financial transaction tax, market quality, announcement effect, short-run treatment effect

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 of 2008–2009 and the ensuring sovereign debt crisis in European countries (e.g., Hemmelgarn and Nicodème, 2010; Shackelford et al., 2010). Due to the latest efforts of a group of European Union member states to introduce a financial transaction tax (FTT), interest in the impact of such taxes on market quality and stability has increased significantly (e.g., Pomeranets and Weaver, 2013; Becchetti et al., 2014; Capelle-Blancard, 2016; Coelho, 2016).

There are two main arguments for the introduction of an FTT. First, legislators intend to generate tax revenue. Significant tax payments to be achieved with only a low tax rate (Shackelford et al., 2010), low administrative costs, and minor distortion of the real economy (Hemmelgarn and Nicodème, 2010) have been noted as benefits of such a type of tax. As a second argument, proponents claim an enhancement of the stability of financial markets. Since 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; Umlauf, 1993; Jones and Seguin, 1997; Aliber et al., 2003; Baltagi et al., 2006). A main argument is a high tax elasticity of financial investments. Therefore, introducing an FTT in one market would result in the migration of trading activity to either untaxed assets and/or to tax-free markets. Consequently, one should expect a strong reduction in the trading volume of the taxed assets. Thus, in spite of low tax rates, there might be a significant distortion of investment activities and the allocation of capital. In addition, FTT opponents claim that such a tax might harm liquidity

and the pricing mechanism, which could lead to a reduction of stock values and even an increase in volatility.

Since there is no theoretical consensus on the impact of an FTT, the empirical analysis of FTT effects on stock markets is an important research topic. While a number of papers cover FTT regulations in Asian markets and Italy (e.g., Hu, 1998; Baltagi et al., 2006; Liu and Zhu, 2009; Deng et al., 2014; Capelle-Blancard, 2015; Coelho, 2016), the majority of recent papers focus on the introduction of an FTT on August 1, 2012, for French-headquartered stocks with a market capitalization of more than €1 billion (e.g., Becchetti et al., 2014; Meyer et al., 2015; Coelho, 2016; Colliard and Hoffmann, 2017; Gomber et al., 2016). While research regarding the impact of the French FTT on liquidity, volatility, and stock prices is not fully conclusive (for a review of the literature, see Matheson, 2011), a main finding is a strong reduction of trading volume. Estimates suggest a reduction of trading volumes after the FTT introduction date ranging from 10% 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 the liquidity of the French stock market.

We address these issues empirically and extend the research in two main directions. Previous studies interpret the French FTT as a natural experiment and estimate its impact by a difference-in-differences (DiD) estimation. Thus, they compare trading volumes and other related variables (stock prices, volatilities) before and after the FTT introduction deadline. We focus more on the dynamic pattern of the tax reform, which might also be relevant for other FTT reforms.[1] We find evidence of strong announcement effects and short-run treatment effects that differ from the long-run impact of the French FTT on the French stock market and

[1] We are not aware of any research interpreting the impact of FTT tax reforms in a dynamic setting as ours does. Colliard and Hoffmann (2017) discuss potential anticipation effects as part of their appendix but find no corresponding evidence. They also account for market anomalies in August 2012 but do not interpret them as short-run treatment effects. Coelho (2016) discusses anticipation effects. However, due to the author's short observation window of three weeks before and after the French FTT introduction deadline, no announcement effects or short-run treatment effects were able to be identified.

which might therefore bias estimates of long-run treatment effects. Since the French National Assembly passed the FTT legislation on March 14, 2012, investors had an incentive to antedate transactions of taxable stocks (large-capitalization stocks of the French stock market) to avoid FTT payments. Thus, we expect a positive FTT announcement effect to temporarily increase trading volumes between March 14, 2012, and July 31, 2012 (the FTT announcement period before the introduction date). We further distinguish between short-run and long-run treatment effects and show that short-run market reactions are not necessarily a good predictor of long-run changes in the market structure. In case of the French FTT, we expect a strong negative short-term treatment effect on trading volumes as a consequence of the positive announcement effect (antedating of trading activities) and legal uncertainty shortly after the FTT introduction deadline.

We pay more attention to the design of the French FTT and provide evidence that an FTT with similar legal settings could contribute to a market's financial stability. The French FTT encompasses a considerable number of regulations to avoid or at least mitigate a negative impact on liquidity. For example, the tax is limited to the most liquid large-cap stocks (market capitalization of more than €1 billion) and a significant number of trading activities are tax exempt (e.g., market making, clearinghouses, primary market acquisitions, securities financing transactions). Most relevant, due to intraday netting, pure day trading is not taxed by the French FTT. This has two important implications. First, the French FTT provides an incentive for day trading (i.e., the opening and closing of positions on the same day), which might even increase trading activity for some investors. Second, since pure day trading is not taxable, the impact of the tax on intraday volatility measures might be small, while there could be a relevant impact on long-term volatility measures. Thus, we focus on long-term volatility, which might be even more relevant to long-term stock market stability.

In preliminary tests ignoring announcement and short-run treatment effects, we are able to replicate findings suggesting a strong reduction in trading volume after the introduction date of the FTT in August 2012. However, corresponding evidence becomes widely insignificant or even disappears if we control for announcement effects and short-run treatment effects. While we find a strong positive FTT announcement effect and a negative short-run treatment effect on the trading volumes of treated stocks, there is almost no significant evidence of a long-run reduction in trading activity on regulated lit markets. Our findings suggest that evidence of a strong reduction in trading volumes resulting from the French FTT (e.g., Becchetti et al., 2014; Meyer et al., 2015; Colliard and Hoffmann, 2017) might (at least partially) have been driven by temporary market reactions (announcement effects and short-run treatment effects).

Regarding stock market volatility, we find an increase in intraday volatilities in the announcement period that might be due to higher trading activity of noise traders before the FTT introduction date. In addition and more relevant, we observe a reduction in weekly and monthly volatilities in the short-run and long-run treatment periods. These findings fit well with the theories of Stiglitz (1989) and Summers and Summers (1989), who predict a stabilizing effect of FTTs on stock markets. Our results further suggest a reduction in stock prices at the beginning of the announcement period that might be driven by an anticipation of the FTT as well as (weak) evidence of higher bid-ask spreads. The results on bid-ask spreads and daily returns are not fully consistent or robust (e.g., no pricing effects after the announcement of the tax rate increase on June 26, 2012) and should therefore be interpreted with caution.

Our findings provide three important implications for tax policy and tax research. First, we can show that the assessment of the full dynamic structure of an event might be relevant to identify the long-run impact of a tax reform or another event. Second, we can show that the

design of an FTT is important and should have strong implications for the stock market effects of such a tax. Therefore, comparisons of the empirical estimates of different FTT designs might be a wise but also challenging research strategy to assess the impact of FTTs. One should ask not only if an FTT might enhance financial stability but also what kind of FTT might be regarded as efficient or at least effective. Third, our results imply that the French FTT might be "better" than its reputation. We find only a small and barely significant long-run reduction in trading volume, while there is a positive and significant impact on long-run volatility measures.

The paper is organized as follows. Section 2 presents a brief overview of the French FTT regulations introduced in 2012. Section 3 discusses the theoretical background regarding the announcement effects, short-run treatment effects, and long-run treatment effects of the 2012 French FTT reform and develops our hypotheses. The identification strategy and data are described in Section 4. Section 5 provides the empirical results and Section 6 concludes the paper.

2. The 2012 French FTT

On January 29, 2012, the French public was informed that President Sarkozy was planning the introduction of an FTT. In January and February, the media published further information on the FTT, citing an intended rate of 0.1% for stock transactions. As announced by February 6, 2012, the FTT should only apply to the transactions of stocks of French-headquartered companies with a market capitalization of more than €1 billion on January 1, 2012. Thus, only the shares of the most liquid French stocks should be taxed by the French FTT. The reform further included an FTT on high-frequency trading and an FTT on the transactions of sovereign credit swaps (both with a much lower rate of 0.01%). These additional FTTs generated very little tax revenue and are not considered in the following, since they are of minor relevance to our analysis of stock market reactions.

The first reading of Tax Bill No. 2012-354 was on February 16. The French National Assembly finally passed the bill on March 14, 2012. Therefore, since the middle of March 2012, the introduction of an FTT on French large-capitalization stocks on the first of August was a foreseeable event. Market efficiency suggests that this event was anticipated by the market participants in the announcement period. Following the presidential elections in May, the new President Hollande announced an increase of the FTT rate on stock transactions from 0.1% to 0.2% on June 26, 2012. The National Assembly agreed to the doubling of the FTT rate on July 31, one day before the FTT introduction date. While investment service providers (e.g., banks) are liable for the tax payment, the tax burden shall be on institutional and private investors. The final guidelines of the FTT were released on August 2, 2012.

Compared to FTTs analyzed by previous research, the French FTT has a number of unique properties that should prevent a decline in liquidity and a migration of transactions to other markets (PriceWaterhouseCoopers, 2012; Haferkorn and Zimmermann, 2013). These characteristics are important for understanding the FTT impact on the French stock market. The French tax applies to the acquisition of securities that provide access to capital and voting rights in the issuing company. Since December 2012, cross-listings as well as European depositary receipts (EDRs) and American depositary receipts (ADRs) are also taxed by the French FTT. Therefore, a simple migration of stock trading to other markets was only a potential strategy to avoid FTT payments in the first four months after the introduction date. Considering that the French FTT provided other ways of avoiding tax payments (e.g., day trading, see below) as well as the costs of migration strategies (e.g., higher trading costs and lower liquidity of ADRs), migration was likewise not the best tax avoidance strategy. Since the French FTT has been limited to stocks with a minimum market capitalization of more than €1 billion, the stocks of smaller companies in terms of total capitalization should not have been affected directly by the tax.

Corresponding to the rules of the French FTT, a taxable transaction requires a change in the ownership of a security between two trading days. Therefore, pure day trading (the buying and selling of a stock on the same trading day) is not taxed by the French FTT (intraday netting). While this might mitigate the impact of the French FTT on liquidity provision and trading volume, it also provides a simple way of avoiding FTT payments by opening and closing positions on the same trading day. The bill further included a number of tax exemptions to avoid cascading effects and ensure liquidity provision, including 1) primary market transactions (e.g., mergers, IPOs), 2) intragroup transactions, restructuring transactions, and employee saving schemes, 3) market making, clearinghouses, and similar special trading activities relevant to liquidity provision (central securities depositories), 4) transactions performed under liquidity agreements, 5) exchangeable/convertible bonds, and 6) temporary transfers of securities.

Corresponding exemptions highlight the rigorous commitment of the French legislature to protect liquidity provision. In addition, this extensive list of tax exemptions leaves room for tax avoidance strategies. For example, the temporary transfer of securities provides a wide scope for short-term speculation actions (e.g., lending schemes, sale and repurchase agreements). Regarding the taxation of derivatives, the scope of the French FTT was and is clearly limited. Apart from default credit swaps on sovereign debt, derivatives are not taxed by the French FTT. Since derivatives can be used as substitutes of stocks for short-term speculation, this again highlights the wide range of tax avoidance opportunities of the French FTT. Figure 1 illustrates the process of the French FTT reform.

[Figure 1 about here]

The French government initially expected to raise €1.5 billion in tax revenue per year. The realized tax revenue, based on Organisation for Economic Co-operation and Development data, amounts to €700 million to €800 million (about 50% of the expected revenue). This

lower deviation might be driven by a reduction of trading volume (e.g., a migration to other markets), but also by tax avoidance practices resulting in tax-exempt trades. For example, extending tax-exempt day-trading activities would result in a loss of tax revenue and might even increase trading volume.

3. Theory, Evidence, and Hypotheses

For the derivation of hypotheses, we refer to the theoretical and empirical literature (for a review see Matheson, 2011). In line with standard economic theory (e.g., Stiglitz, 1989; Schwert and Seguin, 1993), a considerable number of studies provide empirical evidence of a negative effect of FTTs on the trading volume of stocks, since the expected return of short-time trading strategies will be reduced by the tax payments. As documented in Section 2, the French FTT was announced before its introduction 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 on the French stock market. We focus on March 14, 2012, as the official announcement date, when the French National Assembly passed the legislation in a second reading. Since that date, the French FTT regulation can be regarded as a foreseeable event for French and international investors.[2] Thus, we interpret the time span between March 14, 2012, and July 31, 2012, as the announcement period of the FTT.

The announcement of the FTT generated a strong tax incentive for investors to shift transactions of (taxable) large-capitalization stocks from the post-reform period to the tax-free pre-reform period to avoid FTT payments. Blouin et al. (2002) and Dhaliwal and Li (2016)

[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. Since 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 the French National Assembly passed the law. 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.

provide evidence that shareholders' personal tax incentives affect the timing of stock trades and trading volumes. Thus, the FTT should have resulted in a positive bring-forward effect, increasing trading volume in the announcement period and reducing trading volume in the period shortly after the introduction date (short-run treatment period). This suggests a positive announcement effect as well as a strong short-run treatment effect on trading volume.

Hypothesis 1a. *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.*

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

Regarding the long-run impact of FTTs, standard theory suggests a reduction in trading volumes. In the case of the French FTT, a confounding factor results from the effective tax exemption of day trading. Since day trading is not taxable, intensifying day trading activities (i.e., opening and closing positions on the same day) provides an effective strategy to avoid any French FTT payments. Thus, while the French FTT should reduce trading activities and increase holding periods for all trading activities between days, it could also lead to an increase of within-day trading activities. We focus on the average impact of the tax on aggregate trading activity (for heterogeneous effects, see Colliard and Hoffmann, 2017). Following the research (e.g., Meyer et al., 2015), we hypothesize a long-run reduction in trading volume. However, we expect the long-run impact of the tax to be considerably smaller than the short-run impact.

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

Regarding stock prices, Umlauf (1993) argues that the discounted value of foreseeable FTT payments will reduce the expected net present value of an asset. This should be most relevant for investors with a short-term investment horizon. A second argument stems from a potential mispricing of securities leading to an increase of transaction costs. If an FTT reduces trading activity and liquidity, it becomes harder to find a counterparty for trades, which may harm the pricing mechanism. Prices might therefore be temporarily too high or too low, which increases investor uncertainty. Hence, one should expect an increase in the cost of capital and a reduction in stock prices (Hu, 1998; Bond et al., 2005).

An argument against a strong pricing impact of the French FTT stems from arbitrage theory and the low French FTT rate of 0.2%. If the underlying value of an asset depends on the net present value of its after-tax cash flow stream, then a mispricing exceeding the FTT payment and other transaction costs will induce an adjustment of market prices to their fundamental level. Nevertheless, we hypothesize a negative effect of the French FTT reform on daily stock prices and returns. Market efficiency suggests that foreseeable events are captured by current prices (e.g., Fama, 1970). As stated by Brooks et al. (2003, p. 109), it "is only new – and especially new and unpredictable – information that moves prices." Therefore, we expect an early price adjustment shortly after the announcement of the French FTT reform.

Hypothesis 2a. *The announcement of the French FTT on March 14, 2012, resulted in a reduction of the daily returns of taxable stocks.*

In the case of an efficient pricing mechanism of the French stock market, we should not observe additional pricing reactions in the short-run or long-run treatment periods resulting from the French FTT. Since information on the French FTT was already available in the announcement period, an additional negative reaction would suggest a significant delay in the dissemination of that information into stock prices (Hirshleifer et al., 2009). On the other hand, a positive abnormal return of French treated stocks in the treatment period would be an

indicator of a return reversal, suggesting overreaction of the French stock market in the announcement period (e.g., Tetlock, 2011). Since both alternatives are possible, we test for a positive or negative abnormal return in the short-run and long-run treatment periods.

Hypothesis 2b. *The introduction of the French FTT on August 1, 2012, resulted in positive or negative daily returns for taxable stocks in the short-run treatment period.*

Hypothesis 2c. *The introduction of the French FTT on August 1, 2012, resulted in positive or negative daily returns for taxable stocks in the long-run treatment period.*

The theoretical as well as the empirical literature suggests a negative impact of FTTs on liquidity. Habermeier and Kirilenko (2003) and Song and Zhang (2005) point out that even speculators and noise traders are relevant for the provision of liquidity. Increased transaction costs should reduce the incentives of short-term trading strategies. Consequently, noise traders are distracted from the market and liquidity will be reduced. Pellizari and Westerhoff (2009) argue that the relation described 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 in market liquidity. This argument might be relevant in our case, since the French FTT exempts market making activities and other transactions that are relevant for liquidity provision.

Empirical studies typically use the bid-ask spread to measure liquidity (e.g., Becchetti et al., 2014; Meyer et al., 2015), with a spread increase indicating a reduction in liquidity. In line with the research, we hypothesize that the French FTT led to a short-run and a long-run increase in the bid-ask spread. Furthermore, since Hypothesis 1a suggests an increase in trading activity in the announcement period to avoid later FTT payments, we hypothesize the opposite effect in the announcement period.

Hypothesis 3a. *The announcement of the French FTT on March 14, 2012, resulted in a temporary decrease in the bid-ask spreads of taxable stocks until the FTT introduction date on August 1, 2012.*

Hypothesis 3b. *The introduction of the French FTT on August 1, 2012, resulted in a short-run increase of the bid-ask spreads for taxable stocks.*

Hypothesis 3c. *The introduction of the French FTT on August 1, 2012, resulted in a long-run increase of the bid-ask spreads for taxable stocks.*

An important argument for the introduction of FTTs is their hypothesized positive influence on market stability (e.g., Stiglitz, 1989; Summers and Summers, 1989). Corresponding to the composition effect, the introduction of an 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 view, there are also contradicting perspectives in the literature considering the negative impact of FTTs on liquidity as a reason for the destabilizing nature of FTTs on volatility (liquidity effect).

Schwert and Seguin (1993) argue that risk-seeking noise traders might be an important counterparty for hedging strategies and thus provide valuable liquidity to the market. If an FTT drives out noise traders, it becomes harder to find a counterparty for risky transactions. Therefore, the liquidity of the treated stocks might decrease and the volatility of stock prices might increase (Schwert and Seguin, 1993; Hau, 2006; Becchetti et al., 2014). This holds especially for stock markets with a high share of noise traders (Song and Zhang, 2005; Deng et al., 2014). Higher transaction costs might further induce mispricing, since trades will only take place if transaction costs are lower than the difference of the current price and the true value of an asset. It might therefore take longer until prices reflect fundamental information, leading to more noise in price discovery and higher volatility (Baltagi et al., 2006; Parwada et al., 2014).

As documented in Section 2, the French FTT incorporates a significant number of characteristics to avoid distortion of liquidity and the pricing mechanism. Therefore, we follow standard theory and hypothesize a negative impact of the French FTT on market volatility. Considering the hypothesized positive bring-forward effect (Hypothesis 1a), we expect an increase in volatility during the announcement period. Since Hypothesis 1a suggests an activation of noise traders and short-term trading during the announcement period, this is the most reasonable assumption, from our perspective.

Hypothesis 4a. *The announcement of the French FTT on March 14, 2012, resulted in a temporary increase in the volatility of taxable stocks until the FTT introduction date on August 1, 2012.*

Hypothesis 4b. *The introduction of the French FTT on August 1, 2012, resulted in a short-run reduction of the volatility of taxable stocks.*

Hypothesis 4c. *The introduction of the French FTT on August 1, 2012, resulted in a long-run reduction of the volatility of taxable stocks.*

While intraday volatility measures have been widely used in FTT research (e.g., Capelle-Blancard and Havrylchyk, 2013; Becchetti et al., 2014; Gomber et al., 2016), they do not account for the volatility of prices between trading days. Since pure day trading is not taxed by the French FTT, the appropriateness of intraday measures for the identification of the French FTT's impact on volatility seems questionable. Furthermore, it seems questionable that intraday volatility measures should be most relevant with regard to the overall financial stability of a capital market. Therefore, we consider intraday volatility as well as two long-term volatility measures (weekly volatility and monthly volatility) for our empirical analyses. Definitions of the corresponding variables are provided in Section 4.

4. Identification Strategy and Data

4.1. IDENTIFICATION STRATEGY

An important identification strategy of the literature on the market impact of FTTs is the interpretation of tax reforms as natural experiments. This holds especially for the recent introduction of the French FTT in 2012 (e.g., Capelle-Blancard and Havrylchyk, 2013; Becchetti et al., 2014; Coelho, 2016; Colliard and Hoffmann, 2017; Gomber et al., 2016). Note that the French FTT refers exclusively to French-based (headquartered in France) stocks with a minimum market capitalization of €1 billion.

The literature on the French FTT almost exclusively relies on DiD comparisons of the treatment group (French large-capitalization stocks) and two types of control groups: a) the large-capitalization stocks of European control markets (e.g., the German DAX) and 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 an 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 that of 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 (listed on the German CDAX and the London Stock Exchange, with a minimum market capitalization of €1 billion in January 1, 2012), but not for French small-capitalization stocks. This holds for measures of stock market volumes, prices, liquidity, and volatility. Hence, our analysis is based on comparisons between the treatment group and a panel of German and UK large-capitalization stocks that can be regarded as an appropriate control group with a common trend in the pre-announcement period.

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) may have been affected by the announcement of the new French FTT on March 14, 2012. Since corresponding announcement effects imply an increase in trading volumes (Hypothesis 1a), the common trends assumption will be violated in this case and DiD estimation will lead to an overestimation of the FTT effect on trading volume. The same consideration holds for strong short-run market reactions resulting from an antedating of trades from the post-reform period to the pre-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 do not seem to be a good indicator for the long-run impact of the French FTT and might lead to inconsistent estimates.

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 to replicate the result of the literature suggesting a strong reduction in trading volume (e.g., Becchetti et al., 2014). Within this estimation, we consider evaluation periods of two, four, and eight months before and after the FTT introduction date, August 1, 2012. Our control group for the treated French stocks consists of large-capitalization stocks in the United Kingdom and Germany. This preliminary model, using the logarithm of the daily trading volume (measured in thousands of units of traded stocks) as the dependent variable, can be written as

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

where $TPeriod_t$ is a dummy variable with a value of one for observations of stock i at time t after July 31, 2012 (treatment period) and DiD_{it} is an interaction term of $TPeriod_t$ and a dummy variable for French large-capitalization stocks subject to the 2012 FTT. Since we

consider stock fixed effects υ_i, there is no need to account for a dummy variable for treated French stocks. The term 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 millions of euros (*Market capitalization*), and the logarithm of the current year earnings before interest, taxes, depreciation, and amortization (EBITDA) in thousands of euros (*EBITDA*). We further include month fixed effects ψ_t to control for stock market seasonality and an error term u_{it}.

We assume that the results of Equation (1) might be distorted by announcement effects and short-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 the study of Colliard and Hoffmann (2017), who observe an abnormal 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 (the last two, four, or eight months before March 14, 2012) with the period after initial short-run market reactions (the next two, four, or 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 a dummy variable for stock-day observations after August 31, 2012, and $LDiD_{it}$ (an interaction term of $LTPeriod_t$ with a dummy for treated stocks) as a measure for the long-run FTT effect.

A disadvantage of Equation (2) is that it provides an estimate for neither short-run treatment effects nor announcement effects. Equation (2) is thus 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. Since observations before the announcement of the French FTT can be regarded as undistorted, we use the pre-announcement period as a 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}, where $APeriod_t$ is a dummy variable with a value of one in the announcement period, $ADiD_{it}$ is an interaction term of $APeriod_t$ and a dummy variable for treated stocks that identifies the announcement effect, and $STPeriod_t$ is a dummy variable for observations in the short-run treatment period (August 1 to August 31, 2012) and $LTPeriod_t$ is a dummy variable for observations in the long-run treatment period (two, four, and eight months after August 31, 2012), with $SDiD_{it}$ and $LDiD_{it}$ the corresponding DiD interaction terms.

We use measures for trading volume, stock prices, liquidity, and volatility as the dependent variables Y_{it}. The variable *Trading volume* is defined the same way as in Equations (1) and (2) (the logarithm of 1,000 traded stock units per day and stock). As measure for price effects we use the daily return, respectively the difference of closing prices between two trading days $\left(=\left(Price_{it} - Price_{it-1}\right)/Price_{it-1}\right)$. Liquidity is measured by the relative bid-ask spread, defined as the difference between the average ask and the average bid price of a day, divided by the daily closing 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 the daily measure we use the relative intraday volatility, defined as the difference between the highest and the lowest execution price per day, divided

by the closing price $\left(=\left(Highest\ price_{it}-Lowest\ price_{it}\right)/Price_{it}\right)$. As the long-term weekly (monthly) volatility measure, we use the standard deviation of the closing prices in euros over one week (month) divided by the average of closing prices 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., Becchetti et al., 2014; Meyer et al., 2015; Colliard and Hoffmann, 2017; Gomber et al., 2016), our analysis is based on data from regulated lit markets. Colliard and Hoffmann (2013) and to some extent Coelho (2016, only over the counter, or OTC) also consider data from OTC, dark pools, and other non-regulated trading venues. Taking into account that the analyzed French stock market (the Paris Stock Exchange, part of NYSE Euronext) is one of the biggest in Europe, we select the two other largest Western European stock markets as the control group, namely, those of the United Kingdom (the London Stock Exchange) and Germany (the Frankfurt Stock Exchange). This can be justified as follows: 1) London and Frankfurt are geographically close to the French trade center, Paris, and are economically and politically closely related to France. The United Kingdom, Germany, and France are similar countries in terms of population size, land area, and economic development. 2) The London Stock Exchange can be considered a leading trading place affecting other European stock markets. 3) No major tax reforms were implemented in the control group during the relevant evaluation period. 4) While prices and trading volumes in London and Frankfurt are related to those in Paris, the stocks of our control group are no perfect substitutes for French stocks (e.g., cross-listings, ADRs, or EDRs). From our perspective, this is a benefit because it limits the risk of our control group being affected by the French FTT regulation (e.g., by a migration of trading volumes). For example, considering the typically low trading volumes of ADRs, the French FTT might largely increase trading in ADRs in relative terms, which would lead to biased or inconsistent

DiD estimates. In our case, this is very unlikely, since the aggregate trading volume of our control group (London and Frankfurt) is much higher than that in Paris. 5) Most relevant, our graphical and empirical analysis provides strong evidence of a common trend for our most relevant dependent variables (i.e., trading volumes, daily returns, volatilities) between our treatment and control groups in the period before the FTT announcement (e.g., Table XIII).

We rely on stock market and financial statement information using the Datastream database of Thomson Reuters. While information on stock prices (including closing prices, daily average bid and ask prices, highest and lowest prices) and the trading volumes for each stock are available on a daily basis, financial statement data are available at an annual level. We use information on all relevant stocks for our 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 (with start days January 14, 2012; November 14, 2011, and July 14, 2011, respectively). 2) The announcement period ranges from March 14, 2012, to July 31, 2012. The period after FTT introduction is divided into 3) a short-run treatment period (from August 1, to August 31, 2012) and 4) a long-run treatment period (that begins on September 1, 2012). Similar to the pre-announcement period, we account for three alternative long-run treatment periods of two months, four months, and eight months (with the final days October 31, 2012, December 31, 2012, and April 30, 2013, respectively).

We adjust the raw data in two ways: 1) We exclude all observations with missing information on trading volumes, prices, or control variables and 2) we do not consider observations with a negative book value.[3] Our final data are an unbalanced panel ranging from either January 14, to October 31, 2012 (two-month evaluation period, 78,499 stock-day observations), from

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

November 14, 2011, to December 31, 2012 (four-month period, 110,597 observations), or from July 14, 2011, to April 30, 2013 (eight-month period, 174,215 observations).

In Table I, we provide descriptive statistics for evaluation periods of two months (eight months) with 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 observation of a treated French stock, 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, since time-invariant differences in means are captured by stock fixed effects. Graphical evidence suggests a strong degree of co-movement of trading volumes between 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), and market capitalization are very close to each other in all three markets. The mean daily returns 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 the average French EBITDA and average French relative bid-ask spreads quite well. The average stock prices are similar in the French and German markets 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 very high price-to-book ratios.

[Table I about here]

5. Results

5.1. GRAPHICAL EVIDENCE

For our graphical analysis, we calculate the weekly mean values of the logarithm of trading volumes (in thousands of units of traded stocks) and our other dependent variables for the treatment group and the control group. A main target of this analysis is to determine if our data meet the common trends assumption for both groups (French large-capitalization stocks with a minimum market capitalization of at least €1 billion on January 1, 2012; German and UK large-capitalization stocks). Our observation period includes a pre-announcement period of four months, the announcement period (March 14, 2012, to 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 the average levels of trading volume and other market indicators differ between stocks and markets, we de-mean all variables with their average value over the whole observation period for each stock (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 to address whether trends (and not means) differ between the control group and the 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 our regression approach well.

Figures 2 and 3 show graphical evidence for the de-meaned *Trading volume* (the logarithm of thousands of 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). We center the observation period and define the reference point (week 0) as the week when the French FTT was introduced. Boundaries between 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 0 and the short-run treatment period from week 1 to week 4.

While we find strong co-movement between French stocks and the control group, French small-capitalization stocks do not seem to be well-suited as an alternative control group with regard to the common trends assumption. The graphical evidence of Figure 2 supports Hypotheses 1a and 1b. Thus, we observe abnormally high trading volumes of the treated stocks in the announcement period (Hypothesis 1a) and abnormally low trading volumes of treated stocks in the short-run treatment period (Hypothesis 1b). In the longer perspective (after week 4), we do not observe 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 the corresponding de-meaned values for relative changes in stock prices (*Daily return*). Again, we observe a stronger correlation between the treatment group with foreign large-capitalization stocks. It follows that French small-capitalization stocks cannot be regarded as an appropriate alternative control group for our analysis. Our graphical evidence further suggests that the daily returns of the treatment group at the beginning of the announcement period are smaller than those in the control group. This would be consistent with a negative FTT announcement effect on daily returns (Hypothesis 2a).

[Figure 4 about here]

[Figure 5 about here]

Figure 6 further documents graphical evidence for the 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 French small-capitalization stocks as well as

for monthly volatilities, which do not fit a weekly illustration well. We mostly observe strong co-movement 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. Confirming our expectations, graphical evidence suggests abnormally high volatilities of the treatment group in the announcement period and abnormally low volatilities in the treatment period. Co-movement of the treatment and control groups is less pronounced for bid-ask spreads and corresponding graphical evidence is not clear, which fits the literature (e.g., Colliard and Hoffmann, 2017) well.

[Figure 6 about here]

5.2. EFFECTS ON TRADING VOLUME

We present the regression results for distorted and non-distorted long-run treatment effects (Equations (1) and (2), respectively) on trading volume as well as for long-run treatment effects, short-run treatment effects, and announcement effects (Equation (3)). Note that the literature provides by far the strongest empirical evidence for trading volume as the dependent variable (e.g., Capelle-Blancard and Havrylchyk, 2013; Becchetti et al., 2014; Coelho, 2016).

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 values considering the explanatory power of the stock fixed effects. The results for trading volumes can be interpreted as semi-elasticities. Thus, the estimated dummy variable coefficients must 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 $Var\left(\hat{\beta}_i\right)$ being defined as the squared estimated standard error of $\hat{\beta}_i$.

[Table II about here]

As a preliminary step, we estimate Equation (1) for evaluation periods of two, four, and eight months before and after the FTT introduction date to replicate the results of the literature. The results are provided by Models 1 to 3 of Table II. In these models, we do not account for announcement and short-run treatment effects. In line with the literature, these "naïve" models suggest a strong and significant reduction in trading volume resulting from the introduction of the French FTT. The FTT impact is larger for short evaluation periods and ranges from a reduction of 8.3% (Model 3 for an evaluation period of eight months before and after August 1, 2012) to a reduction of 16.8% (Model 1 for a corresponding period of two months). This is somewhat smaller than most estimates (e.g., Becchetti et al., 2014; Parwada et al., 2014; Meyer et al., 2015; Gomber et al., 2016) but fits well with the fact that most papers focus on shorter evaluation periods of one to six months, which are more strongly affected by short-term treatment effects (for corresponding evidence, see Table III). 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 II, we estimate Equation (2) excluding observations of the announcement period and the short-run treatment period. Thus, our estimates for *LDiD* (long-run treatment effect) are based on a comparison of observations before March 14, 2012, and after August 31, 2012. The results change dramatically. As expected, we obtain negative coefficients. However, the estimated FTT impact is very small and not significant in most specifications. Thus, accounting for announcement effects and for short-run treatment effects, we do not find clear empirical evidence that the French FTT significantly reduced the trading

volumes of treated stocks. Table II supports our expectation that the estimates of long-run treatment effects are driven by temporary announcement and short-run treatment effects.

We further derive regression results corresponding to Equation (3). In these models, we explicitly measure the announcement effect and the short-run treatment effect with additional DiD interaction terms, *ADiD* and *SDiD,* respectively. Thus, we isolate the announcement, short-run, and long-run treatment effects of the French FTT by considering observations from 1) the pre-announcement period as the reference period (two, four, or eight months before March 14, 2012), 2) the announcement period (March 14 to July 31, 2012), 3) the short-run treatment period (August 1 to August 31, 2012), and 4) 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 II. We abstain from reporting the regression results for our controls (*Price-to-book ratio*, *Market capitalization*, *EBITDA*) for brevity.

Bertrand et al. (2004) argue and provide evidence that the standard errors of DiD estimates could be severely understated for serially correlated data. This holds especially for data with a high number of repeated observations, as in our case. Thus, significance might be due to the number of observations and not to the economic relevance of FTT effects. Thus, we re-estimate Equation (3) with collapsed data in Models 4 to 6 of Table III. As suggested by Bertrand et al. (2004), we calculate the collapsed average values for four periods: the pre-announcement period, the announcement period, the short-run treatment period, and a long-run treatment period. 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 III about here]

In Table III, we find a positive FTT announcement effect, which is typically significant at the 10% level. Note however, that we also find highly significant announcement effects (at the 5% and 1% levels) if we consider stock market seasonality (see Section 5.5) or small adjustments of the regression model (e.g., defining the trading volume as the logarithm of trades in local currency instead of the logarithm of the number of traded shares). The effect is greater for short evaluation periods as well as for collapsed models (Bertrand et al., 2004). The estimated impact ranges from 5.7% to 9.3%, with higher announcement effects in the collapsed models. Overall, Table III provides evidence of a temporary increase in trading volumes after the announcement of the French FTT legislation.

We further observe a strong and highly significant reduction in trading volume shortly after the FTT introduction deadline, captured by *SDiD*. The effect is greater for long evaluation periods and smaller for collapsed DiD models. Depending on the specification, the estimated reduction in trading volume ranges from 15.2% to 19.2%. In contrast to the literature, we cannot provide clear empirical evidence for a statistically significant long-term reduction in trading volumes resulting from the French FTT. While the regression coefficients are generally negative, there is only one significant regression coefficient in Model 3.

Table III supports Hypotheses 1a and 1b of a positive FTT announcement effect and a negative short-term FTT effect on trading volumes. However, we find only very weak (mostly insignificant) support for Hypothesis 1c, suggesting a negative long-term impact on the volumes of treated stocks. The results also confirm the estimates in Models 4 to 6 of Table II. 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 of long-run market reaction. In part, this might be due to tax avoidance strategies that could even increase trading activities for some taxpayers (e.g., day trading).

Our results suggest that the findings of a strong reduction in trading volumes by up to 30% are mainly driven by short-term market reactions around the introduction date of the French FTT. Note that the aggregate impact of the announcement effect (upward by up to 9.3%) and the short-run treatment effect (downward by up to 19.2%) would suggest a reduction in trading volume of up to 26% if one ignores 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 statistically significant.

5.3. EFFECTS ON STOCK PRICES

We analyze the pricing effects of the French FTT with the daily return (i.e., the relative change in the closing price compared to the closing price of the last trading day) as the dependent variable. We use the same model specifications as for the trading volume in Table III. Table IV documents the baseline estimates of the announcement effects, short-run treatment effects, and long-run treatment effects for the different 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 III and abstain from reporting the results for the regression controls. Note that the dependent variable is the unadjusted daily return. Thus, the regression coefficients can be easily interpreted as changes in average daily returns in percentage points.

[Table IV about here]

For the regular Models 1 to 3, we find significant evidence of a negative FTT announcement effect supporting Hypothesis 2a. The impact is stronger for the short evaluation period and suggests an abnormal negative average daily return in the announcement period. Regarding short-run and long-run treatment effects, we also observe negative and significant abnormal returns, but only for short-term evaluation periods. In Models 2 and 3, the corresponding coefficients are now positive but not significant. Thus, Hypotheses 2b and 2c are not supported in most specifications. For the collapsed Models 4 to 6, the evidence of 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 significant evidence of short-run treatment effects. Overall, Table IV suggests a reduction in the prices of treated stocks during the announcement period but does not provide evidence for the short-run and long-run treatment periods.

To achieve a better understanding of the dynamic structure of abnormal pricing effects in the announcement period, we re-estimate model (3) with a more detailed structure of the time dummy variables and DiD interaction terms. Thus, instead of one dummy variable for the announcement period (*APeriod*), we consider dummy variables for each month within this period (*March*, *April*, *May*, *June*, and *July*). The corresponding DiD variables (*March DiD*, *April DiD*, *May DiD*, *June DiD*, *July DiD*) are defined as an interaction term of a time dummy (e.g., observation in April 2012) and a dummy variable for treated French stocks. Apart from *March DiD* (observations from the beginning of the announcement period on March 14, 2012), we always consider full months. The regression results are reported in Table V. For brevity, we abstain from reporting the estimates of the periodical time dummies (*March*, *April*, *May*, *June*, *July*, *STPeriod*, *LTPeriod*).

Apart from the models with short evaluation periods (Models 1 and 4), we only find significant abnormal daily returns for the French stock market in April 2012. Thus, the whole pricing reaction of the French capital market to the 2012 FTT seems to have taken place in April. Since the models with short evaluation periods seem to be relatively unstable for the daily return as the dependent variable, we focus on the models with longer evaluation periods (Models 2, 3, 5, and 6) for quantitative interpretation. Considering 16 trading days in April 2012, our findings suggest a cumulative and negative abnormal return of about four percentage points in the French stock market (our estimates range from -3.6% to -4.7%).

[Table V about here]

This result suggests a large abnormal pricing reaction of the French stock market in April 2012. Nevertheless, not all of our findings are consistent with Hypothesis 2a, suggesting an immediate pricing reaction to the 2012 French FTT reform. First, we cannot observe significant pricing effects in March 2012. Thus, the market seems to have "waited" for about two weeks before reacting to the FTT announcement. Potential explanations might be legal uncertainty and a delayed dissemination of FTT information in French stock prices (e.g., Hirshleifer et al., 2009). Second, in spite of the announcement of a higher FTT rate by the end of June 26, 2012 (0.2% instead of 0.1%), there is no evidence of an additional reduction in stock prices and the French market seems to have ignored information about a higher tax burden in the following months (July and August 2012). In additional cross checks (unreported), we focused more on that event and explicitly identified abnormal returns of treated French stocks since June 26, 2012. Again, we do not find evidence of a negative abnormal return during this period.

Combining the evidence of Tables IV and V, there is some empirical support for Hypothesis 2a (pricing effect in the announcement period), while evidence on Hypotheses 2b and 2c (pricing effects in the treatment period) is inconclusive. Thus, our evidence is consistent with the hypothesis that the announcement of the French FTT reduced prices of treated French stocks.

5.4. EFFECTS ON LIQUIDITY AND VOLATILITY

In Table VI, we analyze the relative bid-ask spread (the bid-ask spread divided by the daily closing price) as a measure of liquidity using the same specifications as in Tables III and IV. We find negative coefficients in the announcement period and positive coefficients in the short-run and long-run treatment periods. However, we only find positive and significant effects in Model 6. While this fits well with our expectations, the evidence is not sufficient for significant support of Hypotheses 3a to 3c. This result is in line with the literature, which also

does not find convincing evidence of an impact of the French FTT on bid-ask spreads (e.g., Capelle-Blancard and Havrylchyk, 2013; Becchetti et al., 2014; Colliard and Hoffmann, 2017). This could be due to the relatively low degree of co-movement between the control group and the treatment group for bid-ask spreads. In addition, the French FTT includes a significant number of regulations to ensure stock market liquidity (e.g., non-taxability of day trading, tax exemptions for market makers; see Section 2).

[Table VI about here]

In Tables VII to IX, we address the impact of the French FTT on relative intraday volatilities (the difference between the highest and smallest daily stock prices, divided by the closing price) and weekly (monthly) volatilities, that is, the standard deviation of the daily closing price in euros over one week (one month) divided by the average closing price of that week (month). Thus, Table VII is based on stock-day observations, Table VIII relies on stock-week observations, and Table IX relies on stock-month observations, using the same specifications as before.

Supporting Hypothesis 4a, we find a positive and significant announcement effect in almost all specifications on intraday volatility. Thus, intraday volatilities are extraordinarily high in a period with higher average demand (see Table III), 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, the regression coefficients for *SDiD* and *LDiD* are typically negative, as expected (Hypotheses 4b and 4c, respectively) but not significant in most specifications.

[Table VII about here]

For weekly volatilities, we find no conclusive evidence of positive announcement effects. However, we observe negative and significant treatment effects in the short run and in the long run in most specifications. Only for models with a short evaluation period of two months

(Model 1) do we not find a significant long-run treatment effect. Thus, Table VIII provides empirical support for Hypotheses 4b and 4c, but not for Hypothesis 4a. The results for monthly volatilities (Table IX) are very close to the results in Table VIII.

[Table VIII about here]

[Table IX about here]

Given the properties of the French FTT, the results of Tables VII to IX are not surprising. Since 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 periods. 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 are in line with our hypotheses that the French FTT resulted in a reduction in long-term volatility measures. Thus, the results of Tables VIII and IX are consistent with the theoretical considerations of Stiglitz (1989) and Summers and Summers (1989), who suggest a stabilizing power of FTTs on stock markets.

5.5. ACCOUNTING FOR SEASONALITY

A potential problem for our analysis could be differences in seasonal effects between the treatment group and the control group. For example, there might be abnormally high trading volumes in the French stock market in the spring, which would lead to a distorted estimate for the announcement effect of the FTT reform. As preliminary evidence, Figures 7 and 8 provide the de-meaned values of the logarithm of trading volume in the same way as in Figure 2 for the years 2011 and 2013. Thus, we test graphically if similar effects on trading volumes can be observed in the following or previous year that could be driven by seasonality. While we find no evidence of a strong increase in French trading volumes in the announcement period (from week -20 to week 0), the trading volumes of the French stock market seem to be

abnormally low in weeks 1 to 4 (August) in the case of 2013. This result fits well with that of Colliard and Hoffmann (2017), who also find evidence of seasonality effects in August. Thus, our results for short-run treatment effects might be (partially) driven by seasonality.

[Figure 7 about here]

[Figure 8 about here]

To account for that aspect, we use an alternative triple difference specification. Thus, we not only compare developments of the treatment group and the control group but also developments in treated years (2012) with control years (2010, 2011, 2013, and 2014). The regression model can be described as follows:

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

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. 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. The variables $APeriodS\ 2012_t$, $STPeriodS\ 2012_t$, and $LTPeriodS\ 2012_t$ are the 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 2012 that are relevant to the treatment group and the control group.

The variables $APeriodS\ France_{it}$, $STPeriodS\ France_{it}$, and $LTPeriodS\ France_{it}$ are the 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 are observed not only in 2012 but also in the control years. 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 $LDiDiD_{it}$, respectively. These are the 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, since we only consider observations from the year 2012 and do not account for control periods and the 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, second specification) or from 2010 to 2014 (four control years, third specification). The regressions are estimated by OLS. The 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 the results for brevity. For the same reason, we abstain from reporting the regression results for the standard controls or triple difference control dummy variables.

Table X documents the regression results for *Trading volume* (Models 1 to 3) and *Daily return* (Models 4 to 6). Similar to our baseline models (Table III), we find evidence of a highly significant and positive announcement effect on trading volume, ranging from 7.2% (Model 3) to 14.4% (Model 2). Thus, controlling for seasonality, we still find significant evidence for Hypothesis 1a. The short-run treatment 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 III might be partially (but not fully) driven by seasonality. Regarding daily returns, we obtain similar results as in

Table IV. We conclude that the estimated impact on *Daily return* is not affected by seasonality.

[Table X about here]

Table XI provides the corresponding estimates for the relative bid-ask spread (Models 1 to 3) and relative intraday volatility. The results fit the evidence in Tables VII and VIII very well. Thus, apart from one significant and slightly negative coefficient for the announcement period, there is no empirical evidence of a significant impact of the French FTT on bid-ask spreads. For intraday volatilities, we find a positive announcement effect supporting Hypothesis 4a, but no significant effects in the short-run or long-run treatment period.

[Table XI about here]

Table XII documents the triple difference results for the relative weekly volatility (Models 1 to 3) and relative monthly volatility. Again, the results are in line with our previous findings. Thus, the triple difference estimates support Hypothesis 4b as well as Hypothesis 4c and we can provide evidence that the introduction of the French FTT is significantly linked to a reduction in long-run volatility measures in the short run (measured by $SDiDiD_{it}$) and in the long run (measured by $LDiDiD_{it}$).

[Table XII 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 formally tested (especially not for the treatment period), 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-movement before the announcement of the FTT, one might consider if the suitability of the control group could be enhanced by matching strategies.

Addressing this aspect, we use propensity score matching to increase the correlation between the treatment and the control group in the pre-announcement period. We define a matched control group (i.e., a subgroup of the full control sample) with especially strong co-movement in the pre-announcement period. Our matching approach is as follows. In a first step, we estimate a probit model for each stock using treatment status as the dependent variable (treated = 1, untreated = 0). The right-hand-side variables are the de-meaned weekly average values of *Trading volume*, *Daily return*, *Bid-ask spread*, *intraday volatility,* and *weekly volatility* (e.g., the weekly average of the logarithm of the trading volume) over a pre-announcement period of four months. We de-mean the values 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. The basic idea of the probit model is to use weekly trends as explanatory variables of treatment status. In a second step, we interpret the fitted values of the probit model as a propensity score to derive an optimized matched sample with stronger co-movement of the dependent variables in the pre-announcement period. For each treated firm, we match one control firm, considering the firms with the highest propensity scores.

In Table XIII, we document the daily and 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 the estimated correlations are already high for the unmatched control group and increase even more for the matched control groups. The only exception is *Bid-ask spread,* with a relatively small correlation of the control and treatment groups. This result fits the literature (e.g., Colliard and Hoffmann, 2017) well and somewhat limits the explanatory power of our models for *Bid-ask spread*.

[Table XIII 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 expected, the number of observations and stocks decreases. The results are provided in Tables XIV to XVI and are fairly in line with our previous findings. Most relevant, we find 1) evidence of a positive and (weakly) significant announcement effect on *Trading volume*, 2) a significant and negative short-run treatment effect on *Trading volume*, 3) no significant evidence of a negative long-run treatment effect on *Trading volume*, and 4) evidence of a short-run and a long-run treatment effect on *Weekly volatility* and *Monthly volatility*. Moreover, we also find evidence of a significant and positive impact of the French FTT on bid-ask spreads in the short-run and long-run treatment periods. Thus, our results from matched samples fit well with Hypotheses 3b and 3c. In sum, our robustness checks using matched samples provide additional support for our primary specification, with two exceptions. First, we find no significant evidence of pricing effects. Second, we obtain significant evidence of bid-ask spreads fitting well with our theoretical expectations.

[Table XIV about here]

[Table XV about here]

[Table XVI about here]

6. Conclusion

We analyze the impact of the 2012 French FTT on trading volumes, prices, liquidity, and volatility. We contribute to the research in three ways. First, while the literature typically compares observations of treated and untreated stocks directly before and after the FTT's introduction date (August 1, 2012), we find evidence of temporary market reactions surrounding the FTT introduction date (FTT announcement effects, short-run treatment effects). Our findings suggest an antedating of trades that means abnormally high trades in the announcement period and abnormally low trades in the short-run treatment period. Simple

DiD estimates ignoring such temporary effects may be biased due to a violation of the common trends assumption.

Second, we focus more on the legal design of the French FTT and especially the tax exemption of day trading via intraday netting. We argue that a simple tax avoidance strategy would be an extension of day trading, which might even increase trading activities for some taxpayers. Considering the wide range of tax avoidance opportunities of the French FTT, we therefore do not expect that the French FTT largely reduced trading volumes in the French stock market. This is confirmed by our empirical findings on the long-run FTT impact. An important implication of tax-free day trading is that intraday volatility may not be an appropriate empirical measure for assessing the impact of the French FTT on stock market stability. Therefore, we additionally consider long-term volatility measures (weekly and monthly volatility).

Third, corresponding to our empirical findings, the French FTT might have been more effective than its reputation and empirical studies (largely ignoring short-term market reactions) suggest. Estimates of the long-run impact on trading volume are typically negative but economically small and empirically insignificant. By contrast, we find robust empirical evidence of a long-run reduction in the weekly and monthly volatilities of stock prices, which fits well with the theoretical considerations of Stiglitz (1989) and Summers and Summers (1989). Thus, the French FTT might provide pathways for a reduction in volatility without severely affecting market efficiency and liquidity. Nevertheless, some of our findings (although not fully robust and consistent) also suggest that the French FTT might have reduced stock prices and the liquidity of the French market.

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 such as OTC or dark pools, which have been addressed by Colliard and

Hoffmann (2013) and Coelho (2016). For further research, it might be an interesting to determine if the FTT announcement effects and short-run treatment effects on trading volume as well as the short-run and long-run treatment effects on long-term volatility measures identified are also relevant in other marketplaces (especially OTC) and for similar FTT regulations, such as the 2013 Italian FTT.

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Figure 1: FTT introduction process in France

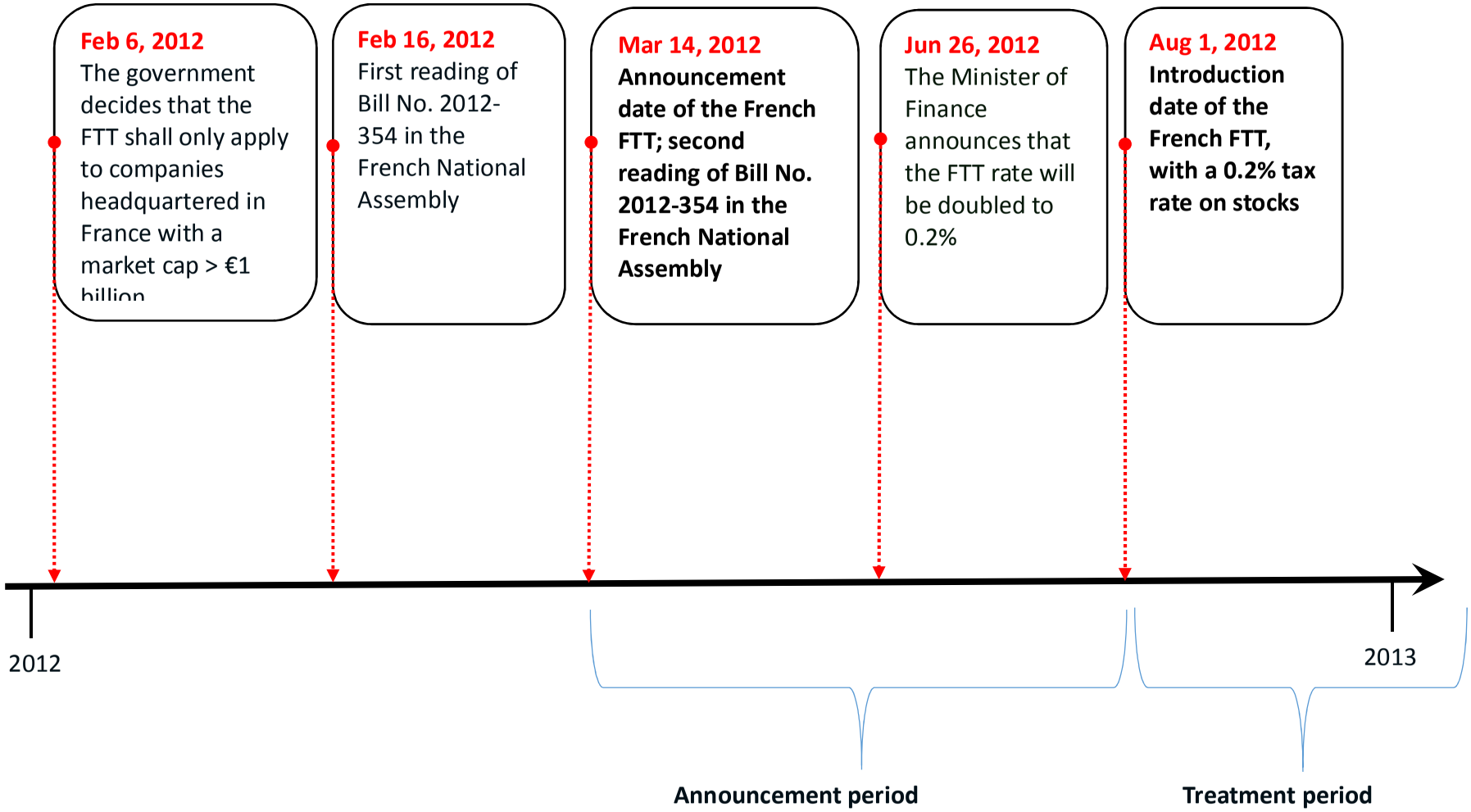
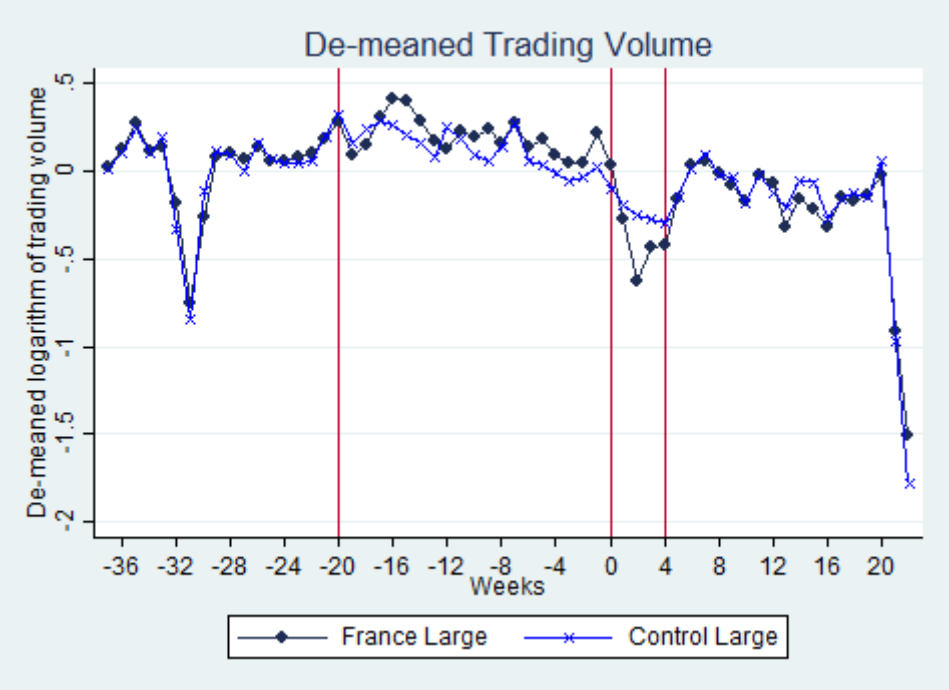
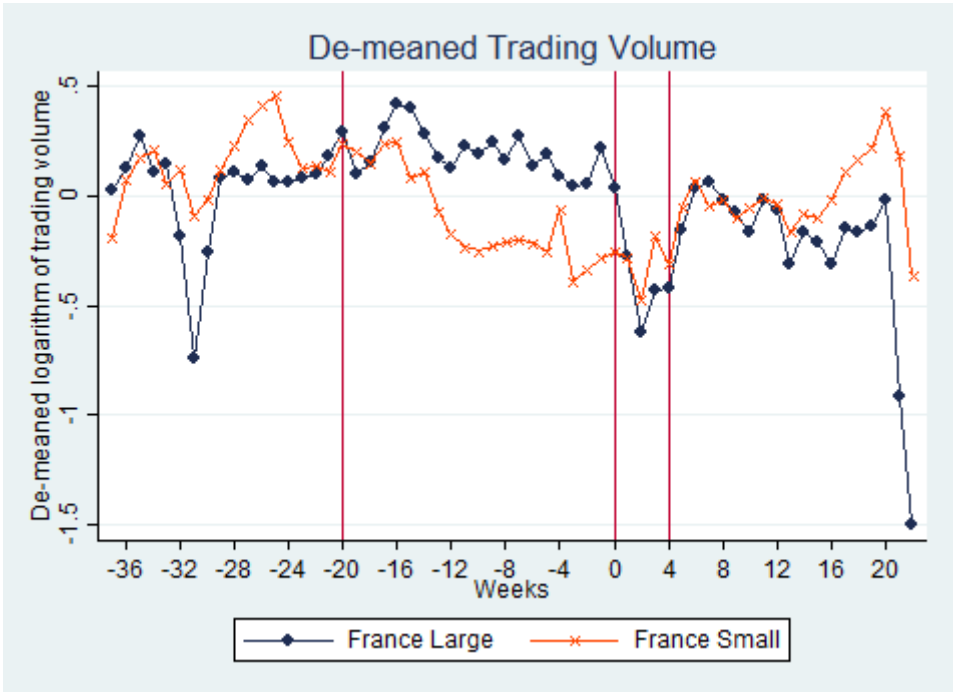


Figure 2: Trading volume, large German and UK stocks



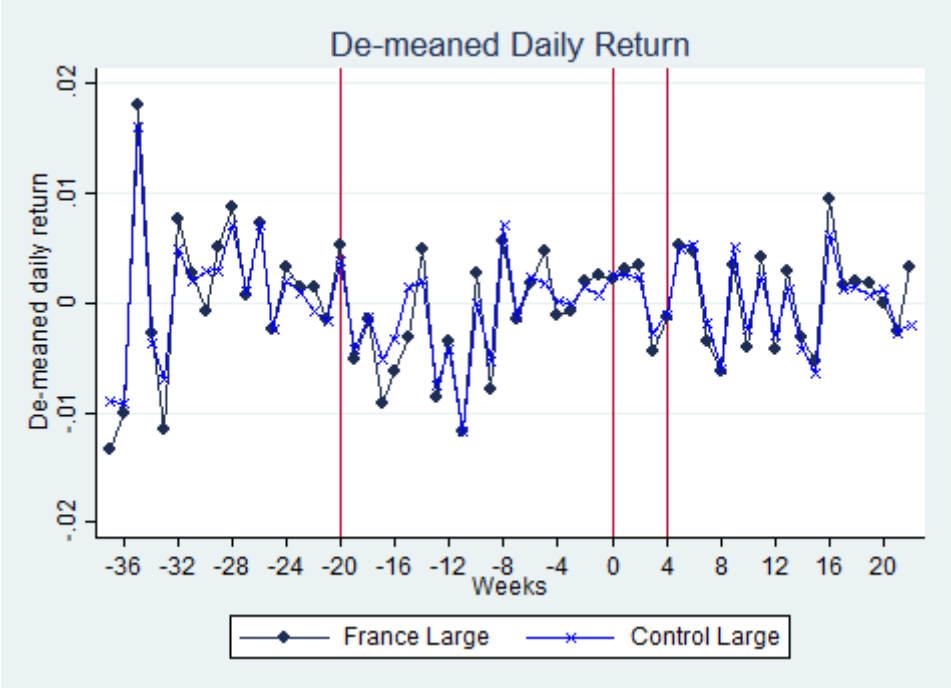
Note: Week -20 indicates the announcement date (March 14, 2012) and week 0 the introduction date (August 1, 2012). The period between these dates is the announcement period. The period from week 0 to week 4 is the short-run treatment period and the time span from week 4 onward is the long-run treatment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

Figure 3: Trading volume, small French stocks



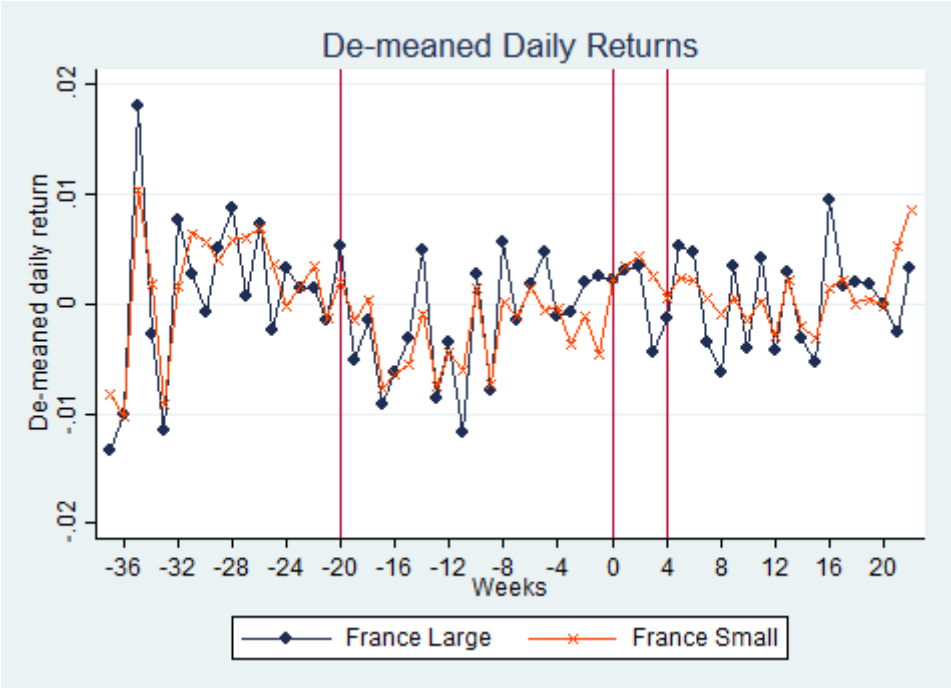
Note: Week -20 indicates the announcement date (March 14, 2012) and week 0 the introduction date (August 1, 2012). The period between these dates is the announcement period. The period from week 0 to week 4 is the short-run treatment period and the time span from week 4 onward is the long-run treatment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

Figure 4: Daily returns, large German and UK stocks



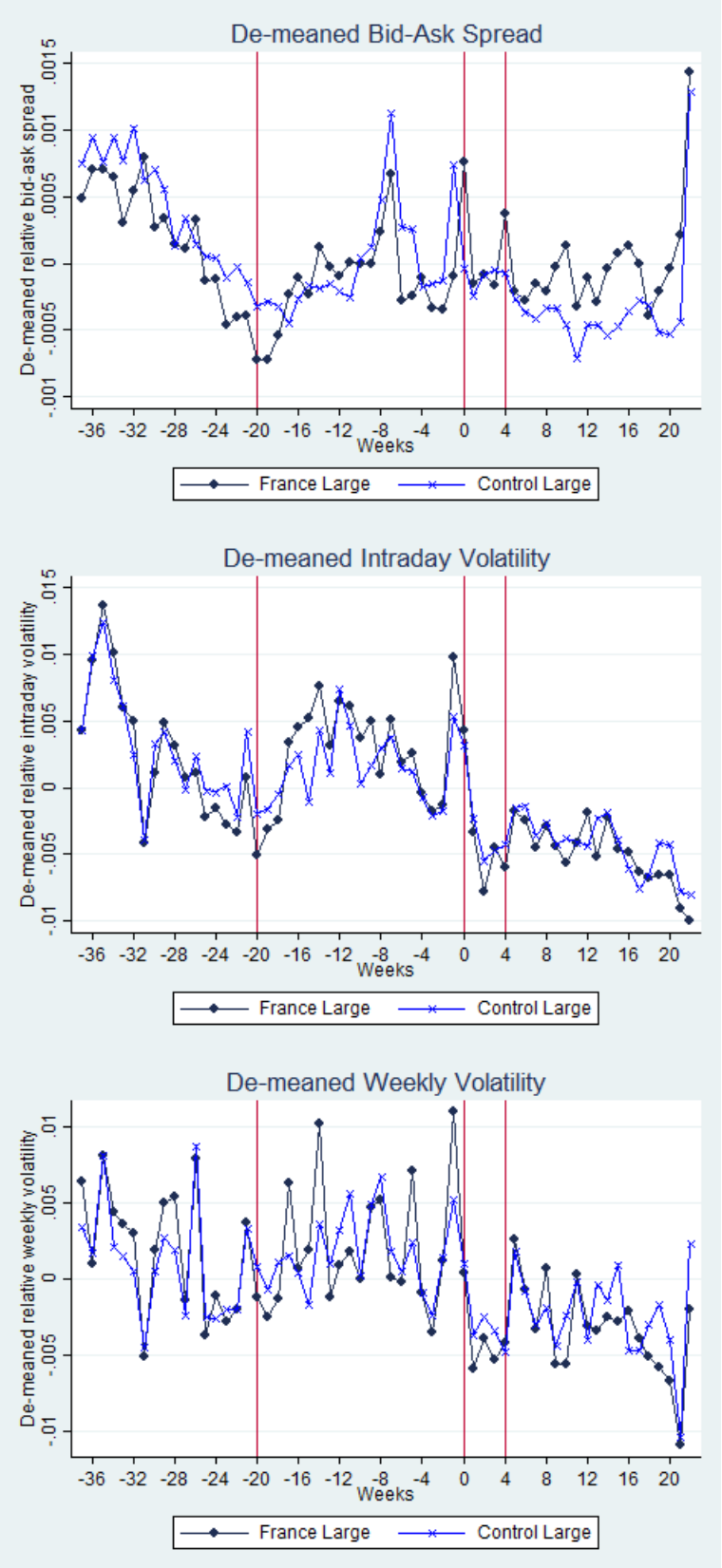
Note: Week -20 indicates the announcement date (March 14, 2012) and week 0 the introduction date (August 1, 2012). The period between these dates is the announcement period. The period from week 0 to week 4 is the short-run treatment period and the time span from week 4 onward is the long-run treatment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

Figure 5: Daily returns, small French stocks



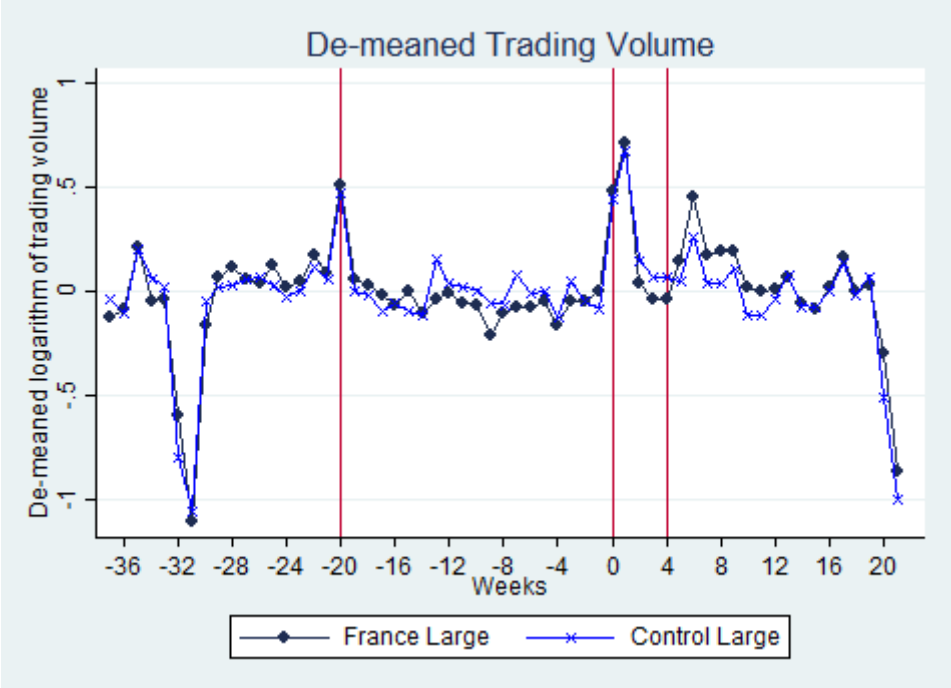
Note: Week -20 indicates the announcement date (March 14, 2012) and week 0 the introduction date (August 1, 2012). The period between these dates is the announcement period. The period from week 0 to week 4 is the short-run treatment period and the time span from week 4 onward the long-run treatment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

Figure 6: De-meaned bid-ask spread and volatility, large stocks



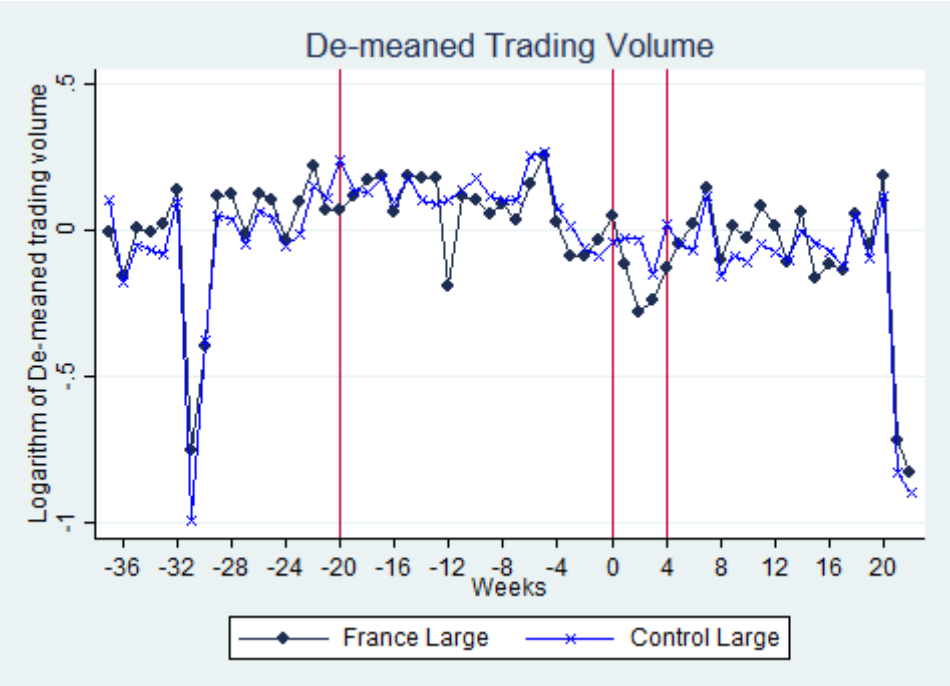
Note: Week -20 indicates the announcement date (March 14, 2012) and week 0 the introduction date (August 1, 2012). The period between these dates is the announcement period. The period from week 0 to week 4 is the short-run treatment period and the time span from week 4 onward is the long-run treatment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

Figure 7: De-meaned trading volume, 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 these 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 onward is the placebo long-run treatment period.

Figure 8: De-meaned trading volume, 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 these 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 onward is the placebo long-run treatment period.

Table I: 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 (1000s)	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 (millions €)	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 (1000s €)	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 (1000s)	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 (millions €)	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 (1000s €)	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 II: 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	**-0.184*** **	**-0.156*** **	**-0.0855*** **			
	(0.0288)	**(0.0285)**	**(0.0304)**			
TPeriod	-0.0999***	-0.101***	-0.120***			
	(0.0152)	(0.0154)	(0.0156)			
LDiD				**-0.00547**	**-0.0300**	**-0.0633***
				(0.0401)	**(0.0387)**	**(0.0370)**
LTPeriod				-0.155***	0.159***	0.185***
				(0.0254)	(0.0323)	(0.0296)
Market capitalization	0.0851	-0.0251	-0.0270	0.258	0.0474	-0.0906
	(0.173)	(0.151)	(0.114)	(0.163)	(0.134)	(0.0904)
Price-to-book ratio	1.41e-05***	3.40e-07	-1.54e-06	1.16e-05***	-6.92e-06***	-3.18e-06***
	(1.78e-06)	(1.65e-06)	(9.51e-07)	(2.22e-06)	(1.51e-06)	(8.42e-07)
EBITDA			-1.01e-05		-0.000121**	-1.07e-05
			(2.74e-05)		(5.55e-05)	(3.89e-05)
Controls	YES	YES	YES	YES	YES	YES
Stock fixed effects	YES	YES	YES	YES	YES	YES
Month fixed effects	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	0.948	0.946	0.936	0.941	0.930	0.934

The dependent variable is the logarithm of the number of traded shares (in thousands). We calculate estimates by OLS with stock and month 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. The variable *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; and *DiD* and *LDiD* are the interaction terms of *TPeriod* and *LTPeriod*, respectively, with a dummy variable for treated French stocks. We consider *Price-to-book ratio*, the logarithm of market capitalization in millions of euros (*Market capitalization*) and the ratio of EBITDA to market capitalization (*EBITDA*) as controls.

Table III: 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****	**0.0268**	**0.0862***	**0.0861***	**0.0901***
	(0.0294)	**(0.0282)**	**(0.0278)**	**(0.0453)**	**(0.0449)**	**(0.0461)**
SDiD	**-0.179*** **	**-0.182*** **	**-0.212*** **	**-0.164*** **	**-0.171*** **	**-0.170*** **
	(0.0424)	**(0.0416)**	**(0.0403)**	**(0.0498)**	**(0.0491)**	**(0.0498)**
LDiD	**-0.0188**	**-0.0332**	**-0.0625***	**-0.00253**	**-0.0263**	**-0.0414**
	(0.0391)	**(0.0381)**	**(0.0369)**	**(0.0463)**	**(0.0461)**	**(0.0471)**
APeriod	0.0690***	0.0711***	0.0804***	-3.483	-5.023	-7.318*
	(0.0170)	(0.0168)	(0.0166)	(2.250)	(3.312)	(4.148)
STPeriod	-0.131***	-0.125***	-0.113***	-6.147**	-8.212**	-9.849**
	(0.0233)	(0.0228)	(0.0223)	(2.891)	(3.663)	(4.163)
LTPeriod	0.0692***	0.0806***	0.0947***	-5.580*	-8.370**	-9.098*
	(0.0261)	(0.0253)	(0.0242)	(2.864)	(3.795)	(5.246)
Controls	YES	YES	YES	YES	YES	YES
Stock fixed effects	YES	YES	YES	YES	YES	YES
Month 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
Adjusted R-squared	0.945	0.937	0.937	0.990	0.991	0.990

The dependent variable is the logarithm of the number of traded shares (in thousands). We calculate estimates by OLS with stock fixed effects and month 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. The variable *APeriod* is a dummy variable with a value of one in the announcement period (March 14, 2012, to July 31, 2012); *LTPeriod* (*STPeriod*) is a dummy variable with a value of one in the long-run (short-run) treatment periods after August 31, 2012 (August 1, 2012, to August 31, 2012); and *ADiD*, *LDiD*, and *SDiD* are the interaction terms of *APeriod*, *LTPeriod*, and *STPeriod*, respectively, with a dummy variable for treated French stocks. As control variables, we consider *Price-to-book ratio*, the logarithm of market capitalization measured in millions of euros (*Market capitalization*), and the ratio of EBITDA to market capitalization (*EBITDA*).

Table IV: 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 fixed effects	YES	YES	YES	YES	YES	YES
Month 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
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. We calculate estimates by OLS with stock fixed effects and month 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. The variable *APeriod* is a dummy variable with a value of one in the announcement period (March 14, 2012, to July 31, 2012); *LTPeriod* (*STPeriod*) is a dummy variable with a value of one in the long-run (short-run) treatment period after August 31, 2012 (August 1, 2012, to August 31, 2012); and *ADiD*, *LDiD*, and *SDiD* are, respectively, the 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 millions of euros (*Market capitalization*), and the ratio of EBITDA to market capitalization (*EBITDA*).

Table V: Daily return, monthly estimates in the 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
March DiD	**-0.000858**	**-0.000350**	**0.000119**	**-0.000801**	**3.41e-05**	**0.000266**
	(0.000543)	**(0.000482)**	**(0.000445)**	**(0.000593)**	**(0.000544)**	**(0.000495)**
April DiD	**-0.00343*** **	**-0.00293*** **	**-0.00246*** **	**-0.00334*** **	**-0.00250*** **	**-0.00227*** **
	(0.000627)	**(0.000553)**	**(0.000477)**	**(0.000671)**	**(0.000564)**	**(0.000521)**
May DiD	**-0.00134** **	**-0.000842**	**-0.000365**	**-0.00131** **	**-0.000476**	**-0.000244**
	(0.000556)	**(0.000520)**	**(0.000456)**	**(0.000596)**	**(0.000543)**	**(0.000483)**
June DiD	**-0.000672**	**-0.000169**	**0.000308**	**-0.000815**	**1.96e-05**	**0.000252**
	(0.000492)	**(0.000434)**	**(0.000403)**	**(0.000558)**	**(0.000507)**	**(0.000470)**
July DiD	**-0.000623**	**-0.000125**	**0.000344**	**-0.000570**	**0.000265**	**0.000497**
	(0.000530)	**(0.000463)**	**(0.000410)**	**(0.000575)**	**(0.000494)**	**(0.000452)**
SDiD	**-0.000671***	**-0.000175**	**0.000295**	**-0.000514**	**0.000322**	**0.000553**
	(0.000394)	**(0.000338)**	**(0.000325)**	**(0.000449)**	**(0.000417)**	**(0.000396)**
LDiD	**-0.00141*** **	**-0.000272**	**0.000101**	**-0.00137*** **	**7.64e-05**	**0.000215**
	(0.000380)	**(0.000217)**	**(0.000165)**	**(0.000416)**	**(0.000286)**	**(0.000229)**
Controls	YES	YES	YES	YES	YES	YES
Stock fixed effects	YES	YES	YES	YES	YES	YES
Month fixed effects	YES	YES	YES	YES	YES	YES
Number of observations	78,499	110,597	174,215	3,144	3,147	3,150
Number of stocks	393	396	397	393	396	397
Adjusted R-squared	0.00798	0.00704	0.00975	0.248	0.227	0.244

The dependent variable is the daily return measured as the relative change in the stock price compared to the last trading day. We calculate estimates by OLS with stock fixed effects and month 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. The variable *March DiD* is an interaction term of a dummy variable for March 2012 (included in the regression model but not reported in Table VI) and a dummy variable for treated French stocks; *April DiD*, *May DiD*, *June DiD*, and *July DiD* are defined correspondingly; and *LDiD* and *SDiD* are the interaction terms of *LTPeriod* (dummy variable for the period after August 2012) and *STPeriod* (dummy variable for August 2012), respectively, with a dummy variable for treated French stocks. As control variables, we consider *Price-to-book ratio*, the logarithm of market capitalization measured in millions of euros (*Market capitalization*), and the ratio of EBITDA to market capitalization (*EBITDA*).

Table VI: 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 fixed effects	YES	YES	YES	YES	YES	YES
Month 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
Adjusted R-squared	0.645	0.311	0.387	0.919	0.910	0.940

The dependent variable is the relative bid-ask spread (the difference between the average bid and the average ask price, divided by the closing price). We calculate estimates by OLS with stock fixed effects and month 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. The variable APeriod is a dummy variable with a value of one in the announcement period (March 14, 2012, to July 31, 2012); *LTPeriod* (*STPeriod*) is a dummy variable with a value of one in the long-run (short-run) treatment period after August 31, 2012 (August 1, 2012, to August 31, 2012); and *ADiD*, *LDiD*, and *SDiD* are the interaction terms of *APeriod*, *LTPeriod*, and *STPeriod*, respectively, with a dummy variable for treated French stocks. As control variables, we consider *Price-to-book ratio*, the logarithm of market capitalization measured in millions of euros (*Market capitalization*), and the ratio of EBITDA to market capitalization (*EBITDA*).

Table VII: 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 fixed effects	YES	YES	YES	YES	YES	YES
Month 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
Adjusted R-squared	0.289	0.301	0.359	0.846	0.852	0.865

The dependent variable is the relative intraday volatility (the difference between the highest and lowest stock prices, divided by the closing price). We calculate estimates by OLS with stock fixed effects and month 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. The variable *APeriod* is a dummy variable with a value of one in the announcement period (March 14, 2012, to July 31, 2012); *LTPeriod* (*STPeriod*) is a dummy variable with a value of one in the long-run (short-run) treatment period after August 31, 2012 (August 1, 2012, to August 31, 2012); and *ADiD*, *LDiD*, and *SDiD* are the interaction terms of *APeriod*, *LTPeriod*, and *STPeriod*, respectively, with a dummy variable for treated French stocks. As control variables, we consider *Price-to-book ratio*, the logarithm of market capitalization measured in millions of euros (*Market capitalization*), and the ratio of EBITDA to market capitalization (*EBITDA*).

Table VIII: 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 fixed effects	YES	YES	YES	YES	YES	YES
Month fixed effects	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 (the standard deviation of the stock price over one week divided by the average stock price that week). We calculate estimates by OLS with stock fixed effects and month 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. The variable *APeriod* is a dummy variable with a value of one in the announcement period (March 14, 2012, to July 31, 2012); *LTPeriod* (*STPeriod*) is a dummy variable with a value of one in the long-run (short-run) treatment period after August 31, 2012 (August 1, 2012, to August 31, 2012); and *ADiD*, *LDiD*, and *SDiD* are the interaction terms of *APeriod*, *LTPeriod*, and *STPeriod*, respectively, with a dummy variable for treated French stocks. As control variables, we consider *Price-to-book ratio*, the logarithm of market capitalization measured in millions of euros (*Market capitalization*), and the ratio of EBITDA to market capitalization (*EBITDA*).

Table IX: 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 fixed effects	YES	YES	YES	YES	YES	YES
Month fixed effects	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 (the standard deviation of the stock price over one month divided by the average stock price that month). We calculate estimates by OLS with stock and month 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. The variable *APeriod* is a dummy variable with a value of one in the announcement period (March 14, 2012, to July 31, 2012); *LTPeriod* (*STPeriod*) is a dummy variable with a value of one in the long-run (short-run) treatment period after August 31, 2012 (August 1, 2012, to August 31, 2012); and *ADiD*, *LDiD*, and *SDiD* are the interaction terms of *APeriod*, *LTPeriod*, and *STPeriod*, respectively, with a dummy variable for treated French stocks. As control variables, we consider *Price-to-book ratio*, the logarithm of market capitalization measured in millions of euros (*Market capitalization*), and the ratio of EBITDA to market capitalization (*EBITDA*).

Table X: Trading volume and daily returns, 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
Month 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 (the relative change in stock prices compared to the previous trading day). We calculate estimates by OLS with stock fixed effects and month 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 millions of euros (*Market capitalization*), and the ratio of EBITDA to market capitalization (*EBITDA*). In addition, we consider (triple) difference dummy variables as controls. In Models 1 and 4, we only include *APeriodS* (a dummy for the period March 14 to July 31 in any year), *STPeriodS* (a dummy for the period August 1 to August 31 in any year), and *LTPeriodS* (a dummy for the 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*, and *LTPeriodS 2012* (the interaction terms of the corresponding period dummies with a dummy for the year 2012) and *APeriodS France*, *STPeriodS France*, and *LTPeriodS France* (the interaction terms of the corresponding period dummies and a dummy variable for French stocks.

Table XI: Bid-ask spreads 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
Month 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 (the difference between the average bid and the average ask price, divided by the closing price) or the relative intraday volatility (the difference between the highest and lowest stock prices, divided by the closing price). We calculate estimates by OLS with stock fixed effects and month 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 millions of euros (*Market capitalization*), and the ratio of EBITDA to market capitalization (*EBITDA*). In addition, we consider (triple) difference dummy variables as controls. In Models 1 and 4, we only include *APeriodS* (a dummy for the period March 14 to July 31 in any year), *STPeriodS* (a dummy for the period August 1 to August 31 in any year), and *LTPeriodS* (a dummy for the 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*, and *LTPeriodS 2012* (the interaction terms of the corresponding period dummies with a dummy for the year 2012) and *APeriodS France*, *STPeriodS France*, and *LTPeriodS France* (the interaction terms of the corresponding period dummies and a dummy variable for French stocks.

Table XII: 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
Month 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 (the standard deviation of the stock price over one week, divided by the weekly average closing price) or the relative monthly volatility (the standard deviation of the stock price over one month, divided by the monthly average closing price). We calculate estimates by OLS with stock fixed effects and month 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 millions of euros (*Market capitalization*), and the ratio of EBITDA to market capitalization (*EBITDA*). In addition, we consider (triple) difference dummy variables as controls. In Models 1 and 4, we only include *APeriodS* (a dummy for the period March 14 to July 31 in any year), *STPeriodS* (a dummy for the period August 1 to August 31 in any year), and *LTPeriodS* (a dummy for the 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*, and *LTPeriodS 2012* (the interaction terms of the corresponding period dummies with a dummy for the year 2012) and *APeriodS France*, *STPeriodS France*, and *LTPeriodS France* (the interaction terms of the corresponding period dummies and a dummy variable for French stocks.

Table XIII: 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 the treatment group and					
Unmatched control group	.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 the 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 XIV: 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
Month 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 (the relative change in stock prices compared to the previous trading day). We calculate estimates by OLS with stock fixed effects and month 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 millions of euros (*Market capitalization*), and the ratio of EBITDA to market capitalization (*EBITDA*). In addition, we consider DiD dummy variables as controls. We include *APeriodS* (a dummy for the period March 14 to July 31 in any year), *STPeriodS* (a dummy for the period August 1 to August 31 in any year), and *LTPeriodS* (a dummy for the period after July 31 in any year).

Table XV: 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
Month 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 (the difference between the average bid and the average ask price, divided by the closing price) or the relative intraday volatility (the difference between the highest and lowest stock prices, divided by the closing price). We calculate estimates by OLS with stock fixed effects and month 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 millions of euros (*Market capitalization*), and the ratio of EBITDA to market capitalization (*EBITDA*). In addition, we consider DiD dummy variables as controls. We include *APeriodS* (a dummy for the period March 14 to July 31 in any year), *STPeriodS* (a dummy for the period August 1 to August 31 in any year), and *LTPeriodS* (a dummy for the period after July 31 in any year).

Table XVI: 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
Month 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 (the standard deviation of the stock price over one week, divided by the weekly average closing price) or the relative monthly volatility (the standard deviation of the stock price over one month, divided by the monthly average closing price). We calculate estimates by OLS with stock fixed effects and month 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 millions of euros (*Market capitalization*), and the ratio of EBITDA to market capitalization (*EBITDA*). In addition, we consider DiD dummy variables as controls. We include *APeriodS* (a dummy for the period March 14 to July 31 in any year), *STPeriodS* (a dummy for the period August 1 to August 31 in any year), and *LTPeriodS* (a dummy for the period after July 31 in any year).

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