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The Impact of Financial Transaction Taxes on Stock Markets:

Short-run Effects, Long-run Effects, and Migration

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Abstract: We investigate the impact of the French 2012 financial transaction tax on trading volumes and volatility. We extend empirical research by analyzing announcement and short-run treatment effects, migration effects, and long-run volatility measures. We find a strong short-run impact on trading volume, but show that the long-run effect is small and only significant for low liquidity stocks. We also identify a reduction of long-term volatility measures after the effective date as evidence for a market-stabilizing effect, and an increase in the trading volume of substitute stocks as evidence for a migration of trading activity.

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

JEL Classification: G02; G12; H24; M4

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1. Introduction

Due to the financial crisis of 2008–2009, the sovereign debt crisis in European countries and 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., Hemmelgarn and Nicodème, 2010; Pomeranets and Weaver, 2013; Burman et al., 2016). There are two main arguments for the introduction of a FTT. First, legislators intend to generate tax revenue with only a low tax rate (Shackelford et al., 2010), low administrative costs, and minor distortion of the real economy (Hemmelgarn and Nicodème, 2010). Second, 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 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). A main argument is a high tax elasticity of financial investments. Therefore, introducing a FTT in one market would result in the migration of trading activity to untaxed assets and tax-free markets. Consequently, opponents expect a strong reduction in the trading volume of taxed assets. In spite of low tax rates, there might be a significant distortion of investment activities and the allocation of capital. Opponents claim further that a FTT might harm liquidity and the pricing mechanism leading to an increase in volatility.

Since there is no theoretical consensus on the impact of a FTT, the empirical analysis of FTT effects on stock markets is an important research topic. While a number of papers cover FTT regulations in Asian and European markets (e.g., Liu and Zhu, 2009; Deng et al., 2014; Capelle-Blancard, 2015; Capelle-Blancard, 2016), the majority of recent papers focus on the introduction of a FTT on August 1, 2012, for French-headquartered stocks with a market capitalization of more than €1 billion (e.g., AMF, 2014; Becchetti et al., 2014; Meyer et al.,

2015; Coelho, 2016; Gomber et al., 2016; Colliard and Hoffmann, 2018). While research regarding the impact of the French FTT on liquidity, volatility, and stock prices is not fully conclusive (see also Burman et al., 2016), a main finding is a strong reduction of trading volume. Estimates suggest a reduction of trading volumes after the FTT effective date ranging from 10% to 30%. Regarding FTT effects on volatility, research considers exclusively measures for short-run intraday volatility.

We address these issues empirically and contribute to the literature in four aspects. First, previous studies interpret the French FTT as a natural experiment and estimate its impact by difference-in-differences (DiD) estimation (e.g., Becchetti et al., 2014; Meyer et al., 2015; Coelho, 2016; Gomber et al., 2016; Colliard and Hoffmann, 2018). Thus, they compare trading volumes and other related observables in trading (daily returns, volatilities) of treated and control stocks before and after the FTT introduction deadline. We focus on a more dynamic pattern of the tax reform.[1] Since the French National Assembly passed the FTT legislation on March 14, 2012, investors had an incentive to antedate transactions of taxable stocks (French large-cap stocks) to avoid transaction costs in the form of FTT payments. Thus, we expect a positive FTT announcement effect that temporarily increased trading volumes in the FTT announcement period from March 14, 2012, to July 31, 2012. We further distinguish between short-run and long-run treatment effects. We expect a strong negative short-run treatment effect on trading volumes due to the antedating of trading activities (bring-forward effect). When we ignore announcement and short-run treatment effects, we are able to replicate findings of the existing literature suggesting a strong reduction in trading volume after the effective date of the FTT in August 2012. However, such evidence becomes largely insignificant if we control for

[1] We are not aware of any research interpreting the impact of FTT reforms in a dynamic setting as ours does. Colliard and Hoffmann (2018) discuss potential anticipation effects as part of their appendix but not find such evidence. They also account for market anomalies in August 2012 but do not interpret them as short-run treatment effects. Coelho (2016) discusses potential anticipation effects. However, due to the short observation window of three weeks before and after the French FTT's effective date, she is not able to identify announcement effects or short-run treatment effects empirically.

announcement and short-run treatment effects. Relying on a strong DiD identification strategy considering the common trends assumption and the stable unit of treatment assumption (SUTVA), we find strong positive announcement and negative short-run treatment effects on trading volume, but only a significant long-run reduction of trading volume for less liquid stocks not participating in the Supplemental Liquidity Provider program of NYSE Euronext (SLP). Thus, evidence of a strong long-run reduction in trading volume (e.g., AMF, 2014; Meyer et al., 2015; Colliard and Hoffmann, 2018) seems to be largely driven by temporary market reactions. Considering the heterogeneity of market reactions of SLP and non-SLP stocks, we estimate an average long-run reduction in trading volume of about 2.4% to 2.8%, which largely undercuts the official AMF estimate of a reduction of 10% (AMF, 2014).

Second, we pay more attention to the design of the French FTT, which encompasses a considerable number of regulations to avoid or at least mitigate a negative impact on liquidity. Thus, the tax is limited to the more liquid large-cap stocks (market capitalization of more than €1 billion) and a significant number of trading activities are exempt from taxation (e.g., market making, securities financing transactions). Due to the rules on intraday netting, pure day trading is not taxable. This has two important implications. 1) The French FTT provides an incentive for day trading (i.e., the opening and closing positions on the same day), which might even increase trading activity for investors with short-term trading strategies. 2) As day trading remains untaxed, the impact of the tax on intraday volatility measures might be small, while there could be a relevant effect on long-term volatility measures. Accounting for these aspects, we focus on long-term volatility and find a significant reduction in weekly (and monthly) volatility in the short-run and long-run. This fits well with the theories of Stiglitz (1989) and Summers and Summers (1989), who predict a stabilizing effect of FTTs on stock markets.

Third, existing studies on financial transaction taxes focus on changes of trading volumes, but do not identify "migrated" trading volume to substitute stocks or other stock markets (e.g., Umlauf, 1993; Becchetti et al., 2014; Meyer et al., 2015; Coelho, 2016; Gomber et al., 2016;

Colliard and Hoffmann, 2018; see also the reviews of Matheson, 2011 and Burman et al., 2016). In effect, migration results in a positive and indirect treatment effect on untaxed substitutes of taxed stocks. A challenge for the identification of such "migrated" trading volume is to find close substitutes of treated stocks absorbing the "migrated" trading volumes. Colliard and Hoffmann (2018) rely in their paper on a control group of large Dutch and Luxembourg stocks being similar in terms of market conditions and stock characteristics. The trading volume of these stocks largely undercuts the trading volume of the treated French stocks. In our view, these features make this group to a good candidate for substitute stocks. The similarity of stocks and market conditions ensures substitutability, while the relatively small trading volume suggests that a small migration of volumes from the treatment group is sufficient for a relevant impact on the substitute group. In DiD regressions, we find evidence that the French FTT increased trading volumes of Dutch and Luxembourg stocks traded at NYSE Euronext in the short-run and long-run. That holds especially for the short-run treatment period with the strongest treatment effect on French stocks.

Fourth, we add to the empirical research on the heterogeneity of FTT-driven market reactions considering market capitalization and liquidity of treated stocks, with liquidity being measured by participation in the Supplemental Liquidity Provision (SLP) program of NYSE Euronext (see also Colliard and Hoffmann, 2018). We find a significant long-run reduction of trading volume for the non-SLP stocks, but not for SLP stocks, as well as ambiguous results for the market capitalization of stocks. Adding to the evidence of Colliard and Hoffmann (2018), our findings suggest that market capitalization does not play a major role for FTT impact (and therefore liquidity), while SLP participation on average compensates FTT impact. From this perspective, SLP participation "protected" stocks from reductions of trading volume. In unreported additional tests, we also analyzed FTT impact on daily returns and bid-ask spreads without finding clear empirical evidence (confirming existing research).

Our findings have three important implications. First, our results suggest 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 effect on long-run volatility measures. However, the revenue of the French tax is quite small (€697 million to €917 million from 2013–2016) and our evidence suggests lower long-run trading volumes of less liquid stocks and a migration of trades to substitute stocks. Overall, our findings are consistent with the argument of Burman et al. (2016) that potential benefits and risks of financial taxes should not be overstated. Thus, financial transaction taxes are neither unworkable nor should they generate vast amounts of tax revenue without excess burden.

Second, our evidence implies that FTT design is important and should have implications for the stock market impact of such a tax, which is neglected in current empirical work. Consistent with the tax exemption for intra-day netting, we find significant treatment effects on long-run but not on short-run volatility measures. As suggested by the high relevance of the NYSE Euronext SLP program on FTT impact, market characteristics seem to matter as well and FTTs are less "harmful" for high-liquidity stocks. Third, we show that the assessment of the full dynamic structure of a tax reform can be relevant to identify its long-run impact. We find that small-cap stocks (violation of the common trends assumption) and close substitutes of stocks (violation of SUTVA) are no appropriate control groups in a DiD specification of observables in trading of large-cap stocks.

2. The 2012 French FTT

On January 29, 2012, the media informed the French public that President Sarkozy was planning the introduction of a FTT. In January and February, the media published further information on the FTT, reporting an intended tax 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. The

reform further included a tax on high-frequency trading and a tax 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 relevant for our analysis.

The first reading of Tax Bill No. 2012-354 was on February 16. The French National Assembly finally passed the bill on March 14. Therefore, since the middle of March 2012, the introduction of a tax on French large-cap stocks on August 1 was foreseeable. Market efficiency suggests an anticipation of that event 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. The National Assembly agreed to the doubling of the FTT rate on July 31, one day before the FTT effective date. While investment service providers (e.g., banks) are liable for the tax payment, the tax burden shall be on investors. The final guidelines of the FTT were released on August 2, 2012.

The French FTT has a number of characteristics that should prevent a decline in liquidity and a migration of transactions to other markets (PwC, 2012; Haferkorn and Zimmermann, 2013) and are important for understanding FTT impact. 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, European depositary receipts (EDRs) and American depositary receipts (ADRs) are also taxable. 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 effective date. Considering that the French FTT provided other ways of avoiding tax payments (e.g., day trading) 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 was limited to stocks with a minimum market capitalization of more than €1 billion, small-cap stocks were not directly affected.

A taxable transaction requires a change in the ownership of a security between two trading days. Pure day trading (intraday netting) is therefore not taxed by the French FTT. 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: 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 for liquidity provision (central securities depositories), 4) transactions performed under liquidity agreements, 5) exchangeable/convertible bonds, and 6) temporary transfers of securities.

These exemptions highlight the rigorous commitment of the French legislature to protect liquidity provision. In addition, the extensive list of tax exemptions leaves room for tax avoidance strategies. For example, the temporary transfer of securities provides a wide scope for tax avoidance (e.g., lending schemes, sale and repurchase agreements). Apart from credit default swaps on sovereign debt, derivatives are not taxable for 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 OECD data, amounts to €697 million to €917 million in the years 2013 to 2016 (about 46% to 61% of the expected revenue). This shortfall of revenue 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, if a high number of investors increased (tax-exempt) day trading, this would reduce realized FTT revenue.

3. Theory and Hypotheses

In line with standard economic theory (e.g., Stiglitz, 1989; Schwert and Seguin, 1993), a considerable number of studies provide evidence of a negative effect of FTTs on trading

volumes, as additional trading costs reduce the expected return of short-term trading strategies. Since the French FTT was announced several months before its introduction on August 1, 2012, we expect an impact of the FTT announcement on treated stocks through anticipation (Fama, 1970). We focus on March 14 as the official announcement date, when the French National Assembly passed the legislation in a second reading and interpret the time span between March 14 and July 31 as FTT announcement period. Since that date, the French FTT was a foreseeable event for French and international investors.[2]

Blouin et al. (2002) and Dhaliwal and Li (2016) provide evidence that shareholders' personal tax incentives affect the timing of stock trades and trading volumes. In addition, economic research in a variety of settings suggests that taxpayers adjust the timing of real transactions as a reaction to tax burdens and investment tax incentives (e.g., House and Shapiro, 2008). As the FTT increased transaction costs, it generated an incentive to antedate transactions from the period after the announcement date to avoid FTT payments. Consistent with market efficiency considerations,[3] we expect a shifting of trading volume from the period shortly after the introduction of the FTT (short-run treatment period) into the announcement period resulting in a positive announcement effect and a negative short-run treatment effect on trading volume.

H1a. *The announcement of the French FTT resulted in a temporary increase of trading volumes in the announcement period and a (strong) short-run decrease of trading volumes shortly after the effective date for taxable stocks.*

[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. 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). Thus, we decided to focus on the date the French National Assembly passed the law. 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 to July 31, 2012).

[3] Market efficiency suggests that investors consider foreseeable events in their trading behavior. Thus, if future FTT payments become foreseeable and can be avoided, it seems a wise strategy to antedate transactions. Note that FTT payments depend on shareholder activities and not directly on the value of the firm. Thus, FTT payments cannot be fully "priced in" as they depend on (heterogeneous) trading behavior. For example, FTT costs are smaller for buy-and-hold investors compared to investors with a higher trading frequency and zero for day traders. Confirming the literature, we find no significant FTT impact on asset prices (Eichfelder et al., 2017).

Regarding the long-run impact, economic theory suggests a reduction in trading volume (e.g., Schwert and Seguin, 1993). In case of the French FTT, a confounding factor stems from the effective tax exemption of day trading. Since pure day trading is not regarded as taxable, intensifying day trading activities provides an effective strategy to avoid FTT payments if such a behavior is consistent with the overall investment strategy. In addition, the French FTT provided a number of additional tax exemptions (e.g., market making) and alternative ways for tax avoidance. As we focus on the average impact on trading activity, we nevertheless follow the literature (e.g., Matheson, 2014; Meyer et al., 2015) and hypothesize a (moderate) long-run reduction of trading volume.

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

Regarding FTT impact on volatility, the theoretical literature considers two opposing effects. As argued by Stiglitz (1989) and Summers and Summers (1989), a FTT reduces the incentive for destabilizing short-term speculation based on investor's beliefs instead of fundamental market information (noise trading; Dávila, 2016). This change in the composition between noise traders and fundamental traders reduces volatility (composition effect). In contrast, Schwert and Seguin (1993) or Jones and Seguin (1997) bring forward the argument that risk-seeking noise traders might be an important counterparty for hedging strategies and thus provide valuable liquidity to the market. In addition, FTTs may also affect fundamental traders. If a FTT drives out noise traders as well as fundamental traders, it becomes harder to find a counterparty for risky transactions, which decreases liquidity and increases volatility (liquidity effect; e.g., Schwert and Seguin, 1993; Hau, 2006).

Theoretically, the impact of a FTT on volatility depends on the relative strength of both effects. If the composition effect dominates the liquidity effect, a FTT will reduce volatility and vice versa (Song and Zhang, 2005; Deng et al., 2014). As discussed in Section 2, the French FTT incorporates a significant number of characteristics to avoid distortion of liquidity and the

pricing mechanism. In line with that argument, there is a only weak empirical evidence for an impact of the French FTT on liquidity measures like bid-ask spread and quoted depth (e.g., Becchetti et al., 2014; Meyer et al., 2015; Gomber et al., 2016; Colliard and Hoffmann, 2018). We therefore expect a dominating composition effect and hypothesize a negative impact on volatility. 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. However, since pure day trading is not a taxable event for the French FTT, the appropriateness of such intraday measures for the identification of FTT effects on volatility is questionable. Therefore, we consider intraday volatility as well as weekly volatility (and in a robustness test monthly volatility) as a long-term volatility measure for our empirical analyses.

H2. *The introduction of the French FTT resulted in a short-run and long-run reduction of the volatility of taxable stocks.*

We further address the heterogeneity of FTT impact. The design of the French FTT intends to protect liquidity by a concentration on French stocks with a minimum market capitalization of €1 billion with a weak expected liquidity effect. We test if and how the impact of the French FTT on trading volumes and liquidity is related to market capitalization. Following the intentions of the French legislator, we expect that trading volumes of large-cap stocks (with a potentially high liquidity) are more robust to FTT effects, while stocks with a smaller market capitalization are more strongly affected.

H3a. *The effect of the French FTT on treated French stocks decreases in the market capitalization of stocks.*

Extending the work of Colliard and Hoffmann (2018), we further test the relevance of the Supplemental Liquidity Provider programme on European blue chips (SLP) of NYSE Euronext on FTT impact. On April 1, 2011 NYSE Euronext launched a program to incentivize supplemental liquidity providers with a financial rebate when they post liquidity that executes

against incoming orders (i.e., passive trades) (NYSE Euronext, 2012). Thus, in addition to regular market marking activities the program intended to increase liquidity and to reduce transaction costs for grouped baskets of shares. Colliard and Hoffmann (2018) provide evidence for stronger FTT impact on stocks that did not participate in the SLP program. However, as SLP stocks are typically blue chips and therefore larger than non-SLP stocks, this might be due to market capitalization. Thus, accounting for H3a, we further test H3b.

H3b. *The effect of the French FTT on treated French stocks is smaller for stocks participating in the SLP program.*

Theory suggests a migration of trading volume from treated stocks to untreated substitutes. However, identification of such migration effects is difficult as it remains unclear what relevant substitutes are and therefore empirical evidence is scarce (Matheson, 2011; Burman et al., 2016). We deal with that issue by considering existing research of Colliard and Hoffmann (2018). The authors argue that especially non-French large-cap stocks traded at NYSE Euronext form a natural control group, as the microstructural environment, including trading protocol, the tick size regime, and the fee structure of this group are most similar to the group of treated stocks. They rely on 32 Dutch and Luxembourg large-cap stocks traded at NYSE Euronext and Euronext's Universal Trading Platform (UTP) as main control group.[4]

The high degree of similarity between treatment group and control group as well as the low cost of transferring trading volumes within a given market place makes Dutch and Luxembourg large-cap stocks to a good candidate for substitute stocks being subject to a migration of trading activity. In this alternative view, the close link between treated stocks and non-treated substitute stocks promotes an above-average migration of trading volumes that allows for an identification of "migrated" trading volume. In other words, there is an indirect treatment effect of the French

[4] In additional tests (e.g., heterogeneity tests), they further use 30 French and 17 non-French small-cap stocks as part of their control group. However, our graphical analyses in Section 5.1. suggest that French small-cap stocks are not well-suited as a control group for trading volumes of French large-cap stocks as we do not find a common trend in the pre-announcement period or in any other period.

FTT on substitute stocks resulting in a positive shock of trading volume in any period after FTT announcement.

We test the hypothesis if the announcement of the French FTT in March 2012 and its introduction in August 2012 resulted in an increase of the trading volume of Dutch and Luxembourg large-cap stocks that we regard as close substitutes to the treated French stocks. An important aspect is that the number of treated French stocks (in our sample 105) is large compared to the number of control stocks (32). Therefore, migration effects for substitute stocks might be larger in magnitude than for the treated stocks.

H4. *The announcement and the introduction of the French FTT resulted in an increase in trading volume of substitute stocks (Dutch and Luxembourg large-cap stocks traded at NYSE Euronext Paris).*

4. Identification Strategy and Data

4.1. Identification Strategy

The most relevant identification strategy of the literature on the market impact of FTTs (and especially for the French FTT) is the interpretation of tax reforms as natural experiments (e.g., Capelle-Blancard and Havrylchyk, 2013; Becchetti et al., 2014; Meyer et al., 2015). Note that the French FTT refers exclusively to French-based stocks with a minimum market capitalization of €1 billion. The literature relies on two types of control groups: a) large-cap stocks of European control markets (e.g., the German DAX) and b) nontaxable French small-cap stocks (market capitalization < €1 billion). For our study, we rely on a control group of UK and German stocks listed on the London Stock Exchange or the German CDAX with a minimum market capitalization of €1 billion on January 1, 2012. For both stock markets, there were no major tax reforms during the relevant period.

Important requirements for a DiD strategy are the common trends assumption and the stable unit of treatments assumption (SUTVA). The common trends assumption demands that the underlying trend of trading volumes and other market indicators of the treatment group should

be very close to that of the control group. Taking into account that the French stock market is one of the biggest in Europe, we select stocks of the two other largest Western European trade centers London and Frankfurt as control group. Note that especially London is a leading trading place affecting other European markets. More relevant, testing co-movements between both groups in the pre-announcement period graphically (see Section 5.1), we find strong co-movement with the treatment group for our control group of German and UK large-cap stocks, but not for French small-cap stocks. Thus, we regard French small-cap stocks not as a well-suited control group for our analysis.

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). This is a benefit because it limits the risk of our control group being affected by the French FTT regulation. 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 a violation of SUTVA and inconsistent DiD estimates. Such concerns also hold for the substitute stocks that we use to test H4 suggesting a migration of trading volumes (Luxembourg and Dutch stocks traded at NYSE Euronext).

The selection of a well-suited control group is not sufficient to ensure the identification of long-run treatment effects in our setting. As mentioned before, stock trading of the French market before August 1, 2012 (pre-reform period) may have been affected by the announcement of the French FTT on March 14, 2012. Since corresponding announcement effects imply an increase in trading volumes (H1a), 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). Thus, short-run market reactions do not seem to be a good indicator for the long-run impact of the French FTT and can lead to inconsistent estimates.

To account announcement and short-run treatment 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. Within this analysis, we consider a pre-announcement period of four months and treatment periods of two, four, and eight months. We define the dependent variable *Trading Volume* as the logarithm of the number of share trades per day (measured in thousand units of traded stocks). In a robustness test (Table 7), we also test price-adjusted trading volume as an alternative volume measure. The preliminary "naïve" DiD model is

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

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-cap stocks subject to the 2012 FTT. Since stock fixed effects υ_i capture all time-invariant stock characteristics, there is no need to account for country dummies or 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 ($PTB\ Ratio_{it}$), the logarithm of daily market capitalization in millions of euros (measured on a daily basis) (MC_{it}), and the logarithm of the current year earnings before interest, taxes, depreciation, and amortization in thousands of euros ($EBITDA_{it}$). 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 effective 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. Therefore, we compare a pre-announcement period of four

months (November 14, 2011 until March 14, 2012) with a long-run treatment period after August 31, 2012 of two, four or eight months

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

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

A disadvantage of Equation (2) is that it does not provide an estimate for short-run treatment or announcement effects. Therefore, we extend 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. 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

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

$APeriod_t$, $STPeriod_t$, and $LTPeriod_t$ are dummy variables for the announcement period (March 14 to July 31, 2012), the short-run treatment period (August 1 to 31, 2012) and long-run treatment periods of two, four, or eight months after August 31, 2012. $ADiD_{it}$, $SDiD_{it}$ and $LDiD_{it}$ are the DiD interaction terms of $APeriod_t$, $STPeriod_t$, and $LTPeriod_t$ with a dummy variable for treated firms and identify the corresponding announcement and treatment effects.

We use measures for trading volume and volatility as the dependent variables Y_{it}. In additional tests (see Eichfelder et al., 2017), we also analyze measures for stock prices and liquidity (daily return, bid-ask spread). Again, we define *Trading volume*$_{it}$ as the logarithm of 1,000 traded stock units per day and stock (for a robustness test for a price-adjusted trading volume see Table 7). We use two simple measures for the daily and weekly volatility of each stock. We define the daily measure (relative intraday volatility) 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 volatility measure, we use the standard deviation of the closing prices in euros over one week divided by the average of closing prices of that week $\left(Relative\ weekly\ volatility=STD\left(Price_{it}\right)/Mean\left(Price_{it}\right)\right)$.

For our tests of H3a and H3b, we further add indicators on stock heterogeneity. We consider a dummy variable for stocks being part of the SLP program in 2012 (SLP_i) and the logarithm of daily market capitalization in millions of euros (MC_{it}). We interact these variables with our DiD indicators in order to identify heterogeneous announcement effects, short-run treatment effects and long-run treatment effects for different types of stocks. Considering the heterogeneity indicators H_{it} (either SLP_i and/or MC_{it}), we can rewrite the generalized model as

$$\begin{aligned} Y_{it} = {} & \alpha + \beta_1 \cdot ADiD \times H_{it} + \beta_2 \cdot SDiD \times H_{it} + \beta_3 \cdot LDiD \times H_{it} \\ & + \beta_4 \cdot ADiD_{it} + \beta_5 \cdot SDiD_{it} + \beta_6 \cdot LDiD_{it} \\ & + \beta_7 \cdot APeriod_t + \beta_8 \cdot STPeriod_t + \beta_9 \cdot LTPeriod_t \\ & + \beta_{10} \cdot APeriod \times H_{it} + \beta_{11} \cdot STPeriod \times H_{it} + \beta_{12} \cdot LTPeriod \times H_{it} \\ & + \gamma_k \cdot C_{kit} + \psi_t + \upsilon_i + u_{it}. \end{aligned} \tag{4}$$

We may abstain from controlling for the heterogeneity measure H_{it} as such. MC_{it} is already included in the control vector C_{kit} and SLP_i is captured by our stock fixed effects. Nevertheless, we account for interaction terms of both variables with our treatment period variables $APeriod_t$, $STPeriod_t$, and $LTPeriod_t$. We identify the heterogeneity of the causal impact of the FTT reform by the interaction terms $ADiD \times H_{it}$, $SDiD \times H_{it}$ and $LDiD \times H_{it}$.

To identify migrated trading volume to substitute stocks, we re-estimate Equation (3) with UK and German large-cap stocks as control group (as in the previous regressions) and the substitute stocks as treatment group. Thus, to identify migration effects claimed by H4, we rely on a group of stocks that the existing literature regards as very similar to the treatment group (Colliard and Hoffmann, 2018), and which therefore might be a good candidate for substitute stocks. A benefit for our analysis is that the aggregate trading volume of these substitute stocks is much

smaller than the aggregate trading volume of the treated French stocks. As a result, a relatively small withdrawal of trades from the French treated stocks might induce large exogenous variation in trading volumes of substitute stocks.

4.2. Data

We collect stock market and financial statement information on French (NYSE Euronext Paris), UK (London Stock Exchange), and German (Frankfurt Stock Exchange) stocks with a minimum market capitalization of €1 billion from the Datastream database of Thomson Reuters. For our tests of a migration of trading volumes to substitute stocks (H4), we further consider a panel of Luxembourg and Dutch stocks with a minimum market capitalization of €1 billion treated at NYSE Euronext that we regard as substitutes to the treated French stocks. Following the literature (e.g., Gomber et al., 2016; Colliard and Hoffmann, 2018), we rely on data from regulated lit markets.[5]

We collect stock market and financial statement information using the Datastream database of Thomson Reuters. While information on trading volumes and stock prices (including closing prices, highest and lowest prices) are available on a daily basis, financial statement data are available at an annual level. We use information on all relevant stocks for four periods: 1) The pre-announcement period considers the four months before the announcement of FTT (from November 14, 2011 until March 14, 2012). 2) The announcement period ranges from 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 of two, four, or eight months beginning at September 1, 2012. Adjusting our raw data, we exclude all observations with missing information on trading volumes, prices, or control variables and we do not consider observations with a negative book value.[6] Our final sample is a panel ranging from November 14, 2011 to either October 31, 2012

[5] Colliard and Hoffmann (2013) (an early version of Colliard and Hoffmann, 2018) and to some extent Coelho (2016) also consider data from OTC, dark pools, and other non-regulated trading venues and do not find fundamentally different results for these alternative market venues.

[6] 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.

(long-run treatment period of two months), December 31, 2012 (long-run treatment period of four months), or April 30, 2013 (long-run treatment period of eight months).

In Table 1, we provide descriptive statistics for long-run treatment periods of two months (eight months) with 25,165 (37,779) observations of 105 French stocks, 69,429 (102,876) observations of 291 German and UK control stocks, and 7,189 (10,730) observations of 32 Luxembourg and Dutch substitute stocks. Thus, for each observation of a treated French stock, we have about 2.7 observations in the control group and about 0.3 observations in the substitute group. Considering SUTVA, exogenous shocks resulting from a migration of trading volumes should be much stronger for the small substitute group compared to the large control group.

[Table 1 about here]

Compared to the treatment group, average trading volumes (i.e., the number of traded shares per day) are higher in the control group and the substitute group. In case of the control group, this is due to the high trading volumes in London. Regarding the substitute group, the relatively lower share prices suggest a higher number of traded shares. We find no relevant differences of daily returns between the control group and the treatment group, while there are higher average returns and a higher standard deviation of returns for the substitute stocks. In general terms, differences in means (e.g. different average trading volumes), are no problem for our analysis, since we capture time-invariant differences by stock fixed effects. Graphical evidence in the pre-announcement period suggests a strong co-movement of trading volumes between treatment and control group as well as between substitute group and control group (Section 5.1.).

Descriptive statistics of the relative intraday volatility, the relative weekly volatility, and market capitalization of the three groups are very close to each other. Compared to the treatment group, average EBITDA values are significantly higher for the substitute stocks. While the median price-to-book ratio is similar for all three groups, we find a very high mean price-to-book ratio

for the control group. This is due to a small number of UK stocks with very high price-to-book ratios. Again, we control for such differences in means by stock fixed effects.

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 volatility measures for each stock 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 the treatment group of French large-cap stocks and the control group of German and UK large-cap stocks. We also provide graphical evidence for French small-cap 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. For example, we subtract the mean of *Trading volume* for each stock 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 means are captured by the stock fixed effects of our regression models and do not affect our results.

Figures 2 and 3 show graphical evidence for 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) and in comparison to French small-cap 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-cap stocks do not seem to be appropriate as an alternative control group with regard to the

common trends assumption. The graphical evidence of Figure 2 supports H1a and H1b. Thus, we observe abnormally high trading volumes of the treated stocks in the announcement period and abnormally low trading volumes of treated stocks in the short-run treatment period. In the longer perspective (after week 4), we do not observe clear differences in trading volumes for the treatment group and the control group.

[Figure 2 about here]

[Figure 3 about here]

Figure 4 documents graphical evidence for the relative intraday volatility and the relative weekly volatility. We abstain from providing evidence for the non-appropriate French small-cap stocks. 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 should be a well-suited control group for our analysis. In line with H2, graphical evidence suggests abnormally low volatilities of the treatment group in the treatment period.

[Figure 4 about here]

Figure 5 reports graphical evidence for trading volumes of the group of substitute stocks compared to the group of control stocks. While we find a strong co-movement of trading volumes of both groups in the pre-announcement period (before March 14, 2012), there is graphical evidence for a significant increase in average trading volumes of the substitute stocks in the announcement period, the long-run treatment period and especially shortly before and after the effective date of the French FTT. Such graphical evidence is consistent with the expectation that a migration of trading activities from the French stocks to the Dutch and Luxembourg substitute stocks resulted in an exogenous shock in trading volumes of these stocks. Thus, graphical evidence supports H4.

[Figure 5 about here]

5.2. Short-run and Long-run Effects on Trading Volume and Volatility

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 the impact of the French FTT on trading volume (e.g., Capelle-Blancard and Havrylchyk, 2013; Becchetti et al., 2014).

We execute regressions by OLS and 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^2 considering the explanatory power of the stock fixed effects. Regression coefficients for trading volumes can be interpreted as semi-elasticities. Thus, we recalculate coefficients for our DiD dummy variables to determine the relative effect on trading volume by $\exp\left(\hat{\beta}_i - \frac{1}{2} \cdot Var\left(\hat{\beta}_i\right)\right) - 1$. The estimated regression coefficient is $\hat{\beta}_i$ and the variance $Var\left(\hat{\beta}_i\right)$ is the squared estimated standard error of $\hat{\beta}_i$ (see also Kennedy, 1981).

[Table 2 about here]

As a preliminary step, we estimate Equation (1) for treatment periods of two, four, and eight months after the FTT effective date to replicate the literature and provide results in the Models 1 to 3 of Table 2. These "naïve" models do not account for announcement and short-run treatment effects and suggest a strong and significant reduction in trading volume resulting from the introduction of the French FTT. FTT impact is larger for shorter treatment periods and ranges from a reduction of 11.8% (Model 3 for a treatment period of eight months after August 1, 2012) to a reduction of 16.9% (Model 1 for a corresponding period of two months). This is

somewhat smaller than most estimates (e.g., Becchetti et al., 2014; Meyer et al., 2015; Gomber et al., 2016). Thus, we are able to replicate the findings of the literature if we do not account for announcement and short-run treatment effects.

In Models 4 to 6 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) rely on a comparison of observations before March 14, 2012, and after August 31, 2012. Results change dramatically. As expected, we obtain negative coefficients. However, the estimated FTT impact is very small and not significantly different from zero in any specification. This supports our expectation that existing estimates of long-run treatment effects depend largely on temporary announcement and short-run treatment effects.

In Models 7 to 9 of Table 2 we estimate the impact of the French FTT by Equation (3) for long-run treatment periods of two, four and eight months. Thus, we explicitly identify the announcement effect and the short-run treatment effect on trading volume with the additional DiD interaction terms *ADiD* and *SDiD* for the announcement period and the short-run treatment period. Confirming H1a, we find positive and significant announcement effects and negative and significant short-run treatment effects. Similar to our Models 4 to 6, coefficients of long-run treatment effects *LDiD* are negative but not significantly different from zero. Estimates for announcement effects range from an increase of trading volume of 5.2% to 6.3%, while estimates for short-run treatment effects suggest a reduction of trading volume in August 2012 by 16.4% to 17.3%. Overall, our findings provide evidence that the French FTT resulted in strong short-run stock market reactions anticipating the introduction of the FTT, while estimates for average long-run treatment effects are not statistically different from zero. Our results suggest that previous findings of a strong reduction in trading volumes by up to 30% result from short-run market reactions around the effective date of the French FTT.

In Table 3, we estimate Equation (3) considering announcement effects and short-run treatment effects with intraday volatility and weekly volatility as dependent variables. As discussed

before, we expect a stronger impact on weekly volatility, as day-trading is not taxed by the French FTT. In the Models 1 to 3 (4 to 6) we report regression results for our DiD interaction terms *ADiD*, *SDiD*, and *LDiD* with relative intraday (weekly) volatility as dependent variable.

[Table 3 about here]

Confirming the literature (e.g., Meyer et al., 2015; Gomber et al., 2016; Colliard and Hoffmann, 2018), we find no significant evidence for a long-run reduction of intraday volatility. Results for announcement effects and short-run treatment effects for intraday volatility are contradictory with positive announcement effects and negative short-run treatment effects. A potential explanation is that the FTT resulted in a positive shock in trading volume in the announcement period (higher volatility) and a negative shock in the short-run treatment period (lower volatility). Thus, effects on intraday volatility could result from changes in trading volumes, while the direct impact of the French FTT on intraday volatility can be small or even non-existent considering the tax-exemption for day trading.

Regression results for long-term volatility measures provide a different picture. In these regressions, we observe consistently negative and statistically significant coefficient estimates for short-run and long-run-treatment effects. Regression coefficients can be interpreted as reduction of the volatility measure in percentage points. Considering average values of relative weekly volatilities in the treatment group (Table 1), we are able to calculate an estimate for the average reduction of volatility resulting from the French FTT. For weekly volatility, we find causal evidence for a long-run (short-run) average reduction ranging from 7.7% to 13.1% (15.5% to 15.9%). Confirming H2, we find an economically and statistically significant reduction of weekly volatility measures of treated stocks after the introduction of the French FTT in comparison to our control group.

5.3. Heterogeneity of FTT Effects

Addressing the heterogeneity of stock market reactions for different types of stocks, we estimate Equation (4) with participation in the SLP program (*SLP*) and market capitalization (*MC*) as

stock attributes. We identify heterogeneous reactions by the triple difference interaction terms (e.g., *ADiD* × *SLP*). In Models 1 to 3 (4 to 6) of Table 4, we focus on SLP participation (market capitalization), while Models 7 to 9 consider both aspects. We observe stronger announcement effects for SLP stocks (Models 1 to 3) and large-cap stocks (Models 4 to 6). However, controlling for both aspects, coefficients for heterogeneous announcement effects are neither significant for market capitalization nor for SLP participation. Thus, one should interpret those findings with caution.

[Table 4 about here]

We find much weaker short-run and long-run treatment effects for SLP stocks. In Models 1 to 3, we observe a statistically significant short-run and long-run reduction of trading volumes for non-SLP stocks (identified by *SDiD* and *LDID*) and the opposed effect for SLP stocks (identified by *SDiD* × *SLP* and *LDID* × *SLP*). This finding confirms H3b and suggests that participation in the SLP program seems to have "immunized" the participating stocks. Hence, trading volumes of participating SLP stocks remained widely unaffected by the French FTT and trading volumes of non-SLP stocks decreased by 25.9% to 26.9% in the short-run and by 9.8% to 12.0% in the long-run. Thus, while we do not find a significant average reduction in trading volume in Table 2, Table 4 reveals that only SLP stocks remained virtually unaffected by the French FTT. These heterogeneous reactions of SLP stocks remain significant in the Models 7 to 9. Considering the heterogeneity of market responses of SLP stocks (no relevant reaction) and non-SLP stocks, we can extrapolate an overall average long-run reduction of trading volume ranging from 2.4% to 2.8%. Thus, our findings suggest a much smaller reduction of trading volume of the French stock market as reported by the official AMF estimate of about 10% (AMF, 2014).

Considering the market capitalization of stocks, we find ambiguous evidence. In Models 4 to 6, we find weaker short-run treatment effects for large-cap stocks (positive coefficient estimates of *SDiD* × *MC*). However, if we also account for SLP participation (Models 7 to 9), there is

some (weak) evidence for stronger long-run effects of the French FTT on trading volumes of large-cap stocks, which is not statistically significant for a long-run treatment period of eight months. Hence, we cannot confirm H3a suggesting a weaker impact of the French FTT on trading volumes of large-cap stocks.

In Table 5, we report regression results for Equation (4) with volatility measures as dependent variables. Allover, the evidence in these regressions is weak and we do not find large significant heterogeneity in the impact of the French FTT on volatility. Announcement effects seem to be somewhat stronger for SLP stocks (especially for weekly volatilities). For short-run and especially long-run effects, we find almost no significant regression coefficients.

[Table 5 about here]

5.4. Migration of Trading Volume

To test H4 hypothesizing a migration of trading volumes to substitute stocks, we re-estimate Equations (2) and (3) with Dutch and Luxembourg large-cap stocks as treatment group and UK and German large-cap stocks as control group. Thus, we test if we find an exogenous shock in trading volumes of substitute stocks in comparison to our standard control group in the announcement period (after FTT announcement) and especially the short-run and long-run treatment periods (after the FTT effective date). We document regression results in Table 6.

In the first three rows (Models 1 to 3), we estimate the long-run treatment effect by a comparison of the long-run treatment period with observations in the pre-treatment period as specified by Equation (2). In Models 4 to 6, we estimate Equation (3) to identify announcement effects, short-run treatment effects and long-run treatment effects. We abstain from reporting "naïve" models not accounting for announcement and short-run treatment effects (see Table 2).

[Table 6 about here]

We find evidence for a significant exogenous increase in trading volumes of the Dutch and Luxembourg substitute stocks after the effective date of the French FTT 2012. Estimates for the long-run effect range from an increase of trading volume of 10.0% to about 18.1%. This is

a similar magnitude as our long-run estimate for the decrease in trading volumes of French non-SLP stocks (see Subsection 5.3). We find positive and statistically significant short-run market reactions ranging from 7.0% to 7,3% (announcement effects), respectively 21.9% to 22.7% (short-run treatment effects). Overall evidence is consistent with our hypothesis that the French FTT 2012 resulted in an increase of trading activities of substitute stocks traded at the same market as the treated French large-cap stocks.

5.5. Robustness Checks and Further Analyses

We estimate an extensive number of robustness checks and additional analyses. We only report a limited number of robustness tests to keep the paper concise. An earlier draft of this paper (Eichfelder et al., 2017) contains more information on robustness checks and alternative specifications. As a first set of checks, we test alternative dependent variables for trading volume (price-adjusted trading volume) and long-run volatility (monthly volatility). Price-adjusted trading volume is the logarithm of the number of traded shares (in thousands) multiplied with the daily closing price in euro. Corresponding to weekly volatility, monthly volatility is the standard deviation of closing prices of a stock over one month, divided by the average closing price of that month. The results in Table 7 confirm our findings. Compared to our baseline results in Tables 2 and 3, we find stronger announcement effects for price-adjusted trading volumes and stronger long-run treatment effects for monthly volatility. The announcement effect (short-run treatment effect) for price-adjusted trading volume ranges from an increase of 7.6% to 8.5% (a reduction of 13.2% to 14.0%). Again, the long-run treatment effect is not significantly different from zero. For monthly volatility, we estimate a long-run (short-run) reduction of 12.7% to 17.1% (24.6% to 24.8%).

[Table 7 about here]

In a second set of tests, we account for a potential impact of the French presidential and parliamentary elections in 2012 on trading volumes and volatilities of the treated French stocks that might lead to inconsistent results. To ensure that announcement effects are unbiased by

elections, we exclude all observations in the announcement period until the parliamentary elections on June 17, 2012 (the final bullot of the presidential elections was on May 6, 2012). Thus, we exclude all observations from March 14, 2012 until June 17, 2012. The results in Table 8 fully confirm our baseline results of Tables 2 and 3.

[Table 8 about here]

Bertrand et al. (2004) argue and provide evidence that the standard errors of DiD estimates can 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. As a third set of tests (reported by Eichfelder et al., 2017), we re-estimate our models with collapsed data. The results of these tests are fully in line with our main findings. In a fourth set of tests (reported by Eichfelder et al., 2017), 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. Using pre-matched samples does not change our baseline estimates significantly. In a fifth set of tests (reported by Eichfelder et al., 2017), we use a triple difference specification to account for seasonality effects. In these tests, we find somewhat weaker but still significant short-run treatment effects for trading volume. In additional analyses (see also Eichfelder et al., 2017), we also check other market indicators as dependent variables (e.g., daily returns and bid-ask spreads). In line with the literature, these additional specifications do not provide clear evidence that the French FTT affected bid-ask spreads or asset prices to a significant extent.

6. Conclusion

We analyze the impact of the 2012 French FTT on trading volumes and volatility. We contribute to the literature in four ways. First, while existing research compares observations of treated and untreated stocks directly before and after the FTT's effective date (August 1, 2012), we

find evidence of temporary market reactions surrounding the FTT effective date (FTT announcement effects, short-run treatment effects). Our findings suggest an antedating of trades, which means abnormally high trades in the announcement period and abnormally low trades in the short-run treatment period. Under these conditions, simple naïve DiD estimates are inconsistent due to a violation of the common trends assumption. Methodologically, our results suggest further that short-run market reactions surrounding the effective date might not provide a consistent estimate for long-run effects if investors anticipate such events. In addition, trends of small-cap stocks may largely differ from large-cap stocks (violation of common trends assumption) and market reactions of treated stocks may affect potential substitute stocks (violation of SUTVA) leading to inconsistent estimates.

Second, the French FTT might have been more effective than its reputation and empirical studies (ignoring short-run market reactions) suggest. Estimates of the long-run impact on trading volume are negative but economically small and statistically not significant. By contrast, we find a relevant long-run reduction in the weekly (and in robustness tests monthly) volatility of stock prices of about 8% to 13% (13% to 17%), in line with the theoretical considerations of Tobin (1978), Stiglitz (1989) and Summers and Summers (1989). Thus, the French FTT might provide pathways for a reduction in volatility without severely affecting trading volumes or liquidity.

Third, we contribute to the literature on the migration of trading volume (e.g., Umlauf, 1993). Interpreting Luxembourg and Dutch stocks traded on NYSE Euronext as substitute stocks, we can identify "migrated" trading volume. Therefore, the liquidity of untaxed securities on the same market (and other untaxed substitutes) could benefit from financial transaction taxes on treated stocks. Thus, our evidence implies a positive fiscal externality of raising financial taxes.

Fourth, we contribute to the small literature on the heterogeneity of FTT impact. We confirm the finding of Colliard and Hoffmann (2018) of a smaller impact of the French FTT on stocks participating in the Supplementary Liquidity Provider programme (SLP stocks). Different from

Colliard and Hoffmann (2018), our evidence suggests no relevant short-run or long-run FTT effects on trading volumes of SLP stocks. From this view, the SLP program "protected" treated stocks from a reduction of trading volumes resulting from the French FTT.

Note that our research relies on lit market data from NYSE Euronext Paris compared to London and Frankfurt stock exchange. Thus, we do not consider alternative trading facilities such as OTC or dark pools, which have been analyzed by Colliard and Hoffmann (2013) and Coelho (2016). For future empirical research, it might be an interesting question to determine if the identified FTT announcement effects, short-run treatment effects, and long-run treatment effects on trading volume, intraday volatility and long-run volatility can also be identified in other marketplaces (especially OTC) and for similar FTT regulations (like the Italian FTT 2013).

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Figure 1: FTT introduction process in France

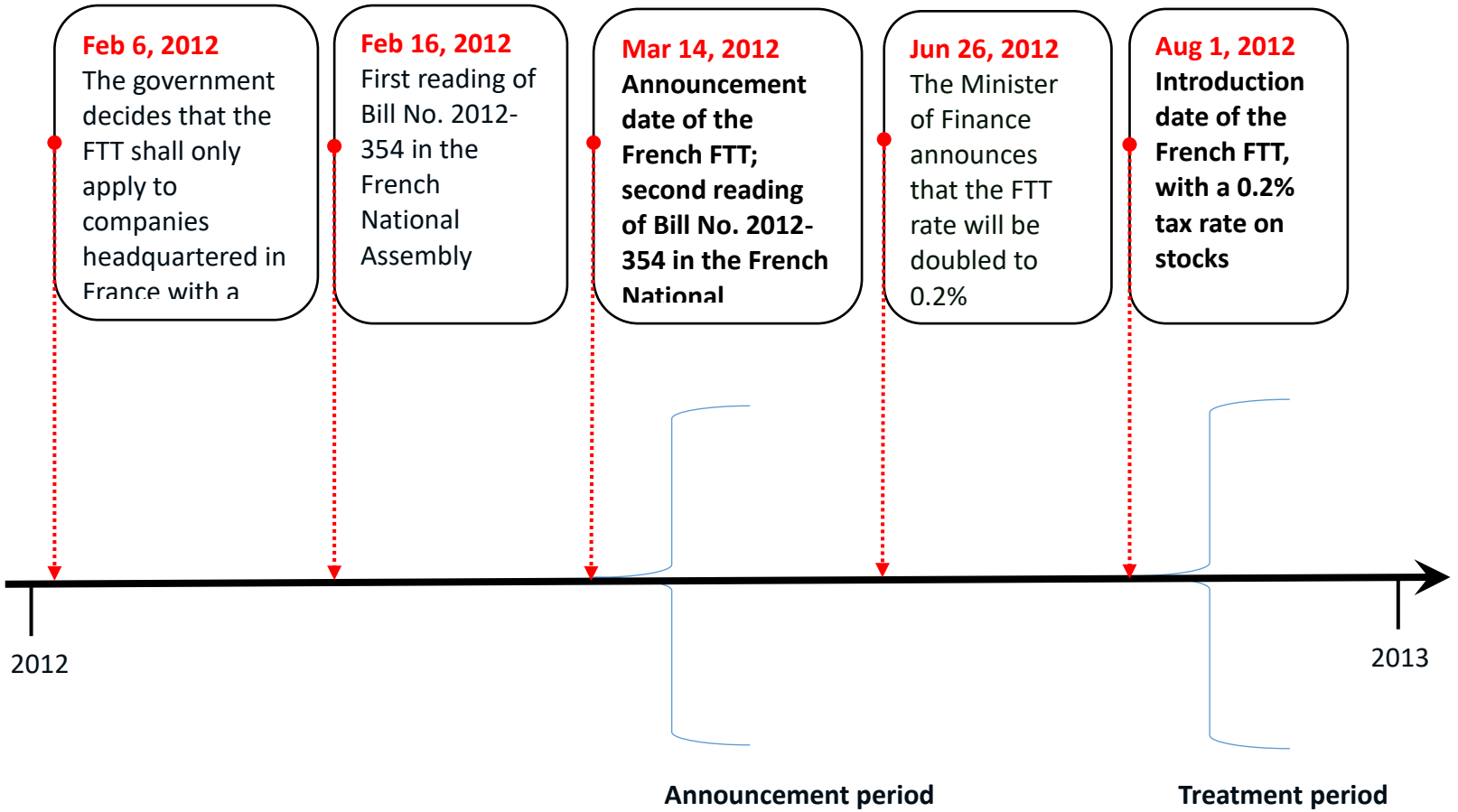
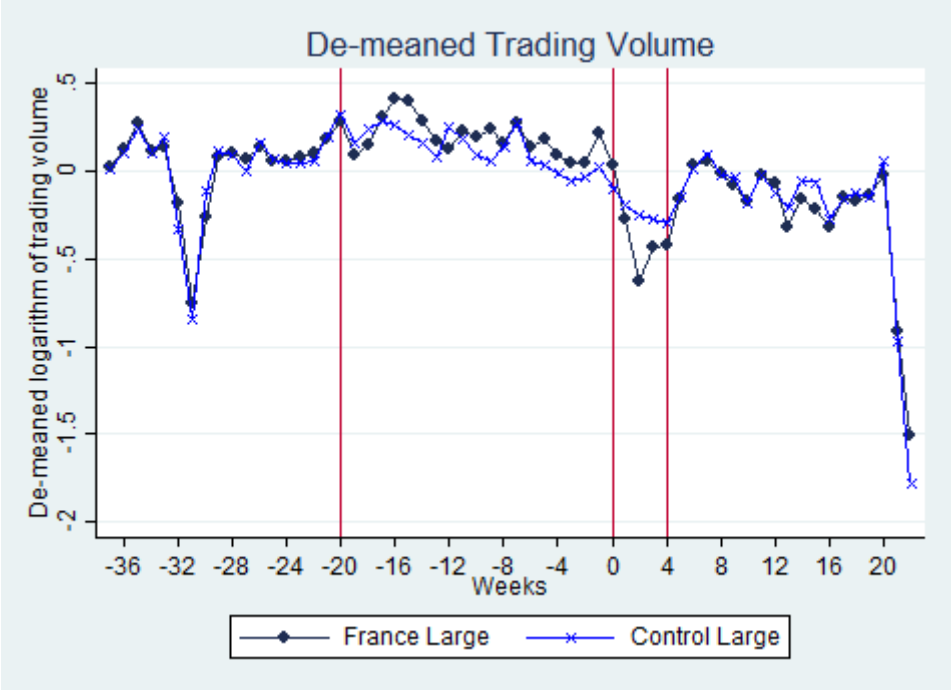
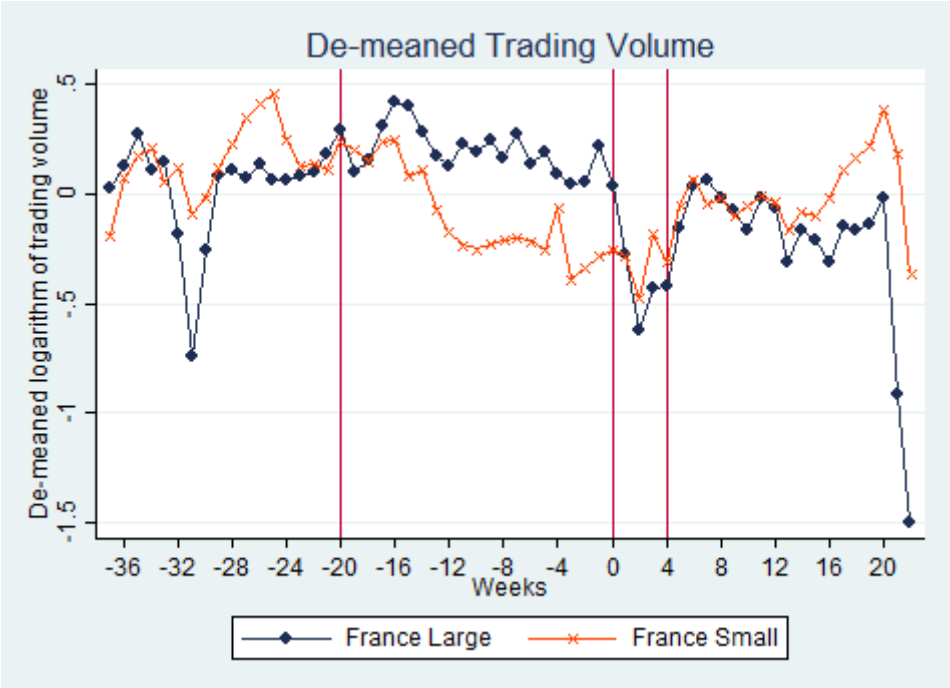


Figure 2: Trading volume, German and UK large-cap stocks as control



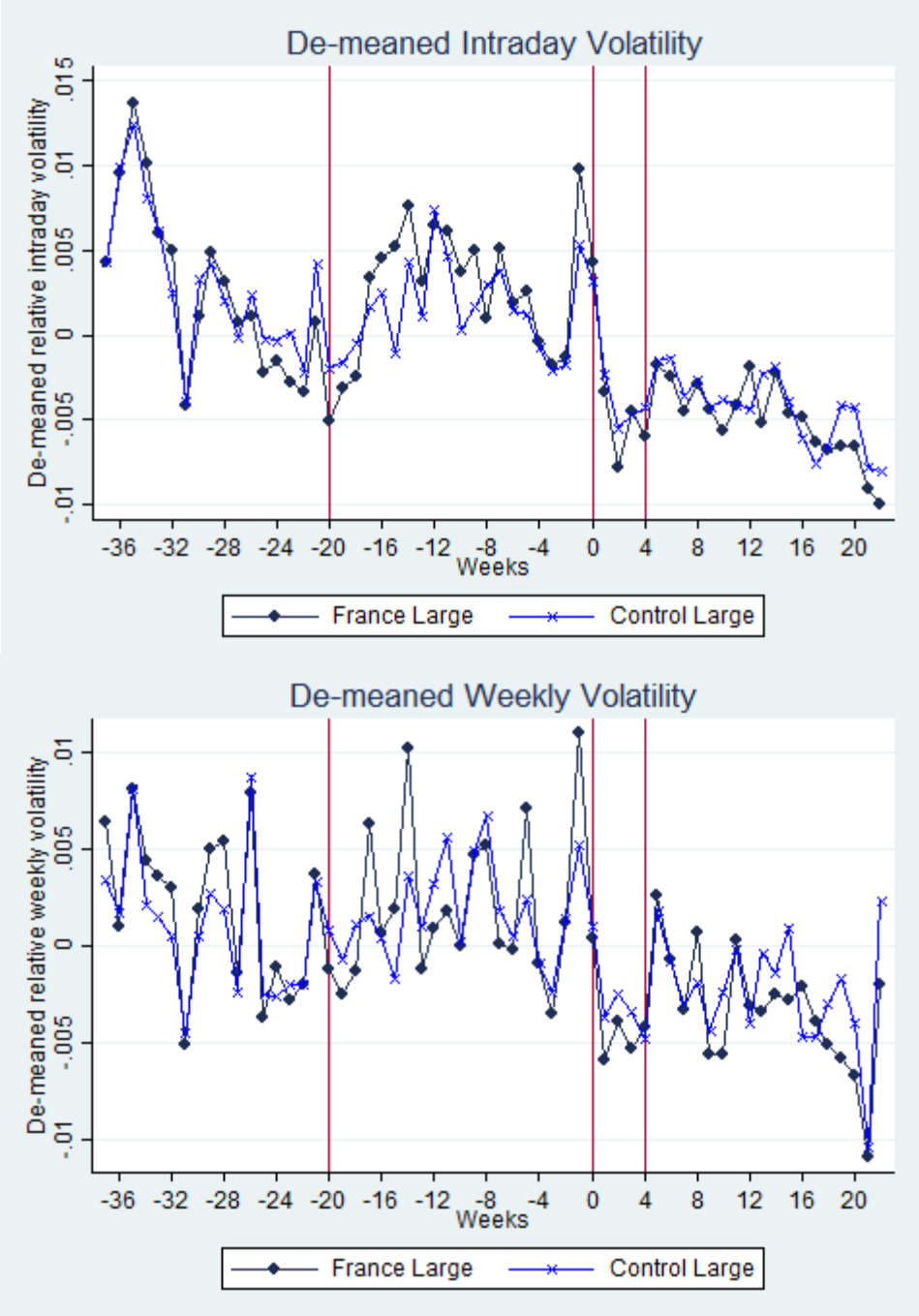
Note: Week -20 indicates the announcement date (March 14, 2012) and week 0 the introduction date (August 1, 2012). The period between these dates is the announcement period. The period from week 0 to week 4 is the short-run treatment period and the time span from week 4 onward is the long-run treatment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

Figure 3: Trading volume, French small-cap stocks as control



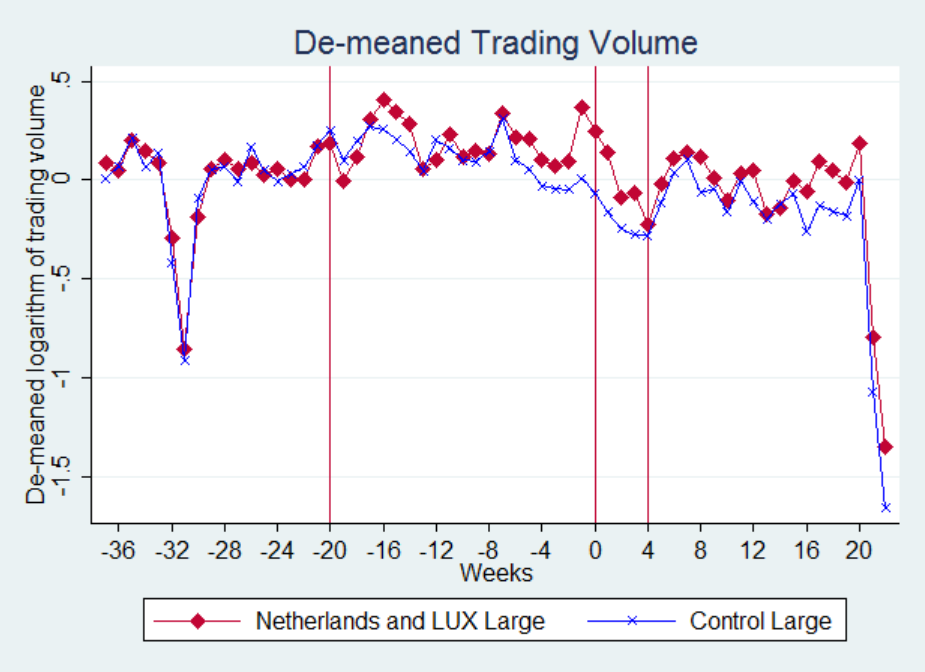
Note: Week -20 indicates the announcement date (March 14, 2012) and week 0 the introduction date (August 1, 2012). The period between these dates is the announcement period. The period from week 0 to week 4 is the short-run treatment period and the time span from week 4 onward is the long-run treatment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

Figure 4: Volatility measures, German and UK large-cap stocks as control



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 5: Migration of trading volume to Dutch and LUX 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.

Table 1: Descriptive statistics

Treatment period: 2 months	French stocks			Control stocks			Substitute stocks		
Observations	25,165			69,429			7,189		
Variable	Mean	Median	Standard deviation	Mean	Median	Standard deviation	Mean	Median	Standard deviation
Trading volume (1000s)	1,636.65	326.50	4,556.68	3,548.07	940.60	13,917.33	3,058.66	814.80	6,126.71
Daily return (%)	0.04	0.00	2.13	0.07	0.05	1.96	0.64	0.03	44.20
Share price (€)	52.31	34.21	66.91	700.90	359.38	951.52	29.85	26.20	29.29
Relative intraday volatility (%)	2.64	2.29	1.54	2.44	2.08	1.64	2.46	2.14	1.36
Relative weekly volatility (%)	1.76	1.48	1.18	1.58	1.32	1.11	1.74	1.45	1.92
Market capitalization (million €)	10,246.86	4,407.98	15,408.72	9,911.96	3,084.00	17,569.48	12,026.89	4,923.39	18,994.47
Price-to-book ratio (%)	1.53	1.25	1.47	264.65	1.70	4,450.79	2.01	1.69	1.31
EBITDA (1000s €)	2,420.77	892.17	4,398.64	2,356.63	483.00	5,719.66	3,280.74	565.88	9,137.27
Treatment period: 8 months	French stocks			Control stocks			Substitute stocks		
Observations	37,779			102,876			10,730		
Variable	Mean	Median	Standard deviation	Mean	Median	Standard deviation	Mean	Median	Standard deviation
Trading volume (1000s)	1,572.55	305.20	4,846.69	3,275.20	901.90	12,397.29	3,117.52	840.30	6,373.64
Daily return (%)	0.07	0.01	1.97	0.08	0.06	1.88	0.50	0.05	36.24
Share price (€)	52.31	34.21	66.91	726.23	366.94	978.76	29.92	26.65	27.31
Relative intraday volatility (%)	2.64	2.29	1.54	2.33	1.95	1.59	2.34	2.00	1.42
Relative weekly volatility (%)	1.76	1.48	1.18	1.51	1.25	1.10	1.69	1.37	1.97
Market capitalization (millions €)	10,246.86	4,407.98	15,408.72	10,225.97	3,249.93	17,908.52	12,472.37	5,232.09	19,152.92
Price-to-book ratio (%)	1.53	1.25	1.47	312.14	1.78	5,294.29	2.06	1.70	1.43
EBITDA (1000s €)	2,420.77	892.17	4,398.64	2,318.39	483.00	5,591.19	3,266.84	726.40	8,737.40

The number of observations is smaller for relative weekly volatilities.

Table 2: Trading volume, baseline tests

Model	1	2	3	4	5	6	7	8	9
Reference period	APeriod	APeriod	APeriod	Pre-APeriod	Pre-Aperiod	Pre-APeriod	Pre-APeriod	Pre-Aperiod	Pre-APeriod
Long-run treatment period	2 months	4 months	8 months	2 months	4 months	8 months	2 months	4 months	8 months
DiD	**-0.185*** **	**-0.155*** **	**-0.125*** **						
	(0.0300)	**(0.0286)**	**(0.0318)**						
TPeriod	-0.101***	-0.102***	-0.106***						
	(0.0160)	(0.0154)	(0.0154)						
ADiD							**0.0612** **	**0.0579** **	**0.0507* **
							(0.0282)	**(0.0281)**	**(0.0281)**
SDiD							**-0.178*** **	**-0.182*** **	**-0.189*** **
							(0.0421)	**(0.0420)**	**(0.0422)**
LDiD				**-0.00617**	**-0.0246**	**-0.0384**	**-0.0145**	**-0.0279**	**-0.0382**
				(0.0412)	**(0.0386)**	**(0.0374)**	**(0.0404)**	**(0.0380)**	**(0.0373)**
APeriod							0.0662***	0.0683***	0.0714***
							(0.0169)	(0.0168)	(0.0167)
STPeriod							-0.133***	-0.128***	-0.122***
							(0.0234)	(0.0230)	(0.0229)
LTPeriod				0.130***	0.157***	0.174***	0.0680**	0.0768***	0.0846***
				(0.0334)	(0.0323)	(0.0307)	(0.0263)	(0.0256)	(0.0250)
MC	0.116	-0.0289	-0.117	0.175	0.0482	-0.0675	0.0709	0.000718	-0.0734
	(0.198)	(0.150)	(0.106)	(0.142)	(0.134)	(0.113)	(0.138)	(0.129)	(0.109)
PTB Ratio	3.10e-06	3.59e-07	-1.05e-06	1.12e-06	-6.87e-06***	-4.71e-06***	-1.32e-06	-6.83e-06***	-3.71e-06***
	(2.38e-06)	(1.65e-06)	(7.03e-07)	(1.72e-06)	(1.50e-06)	(9.12e-07)	(1.76e-06)	(1.50e-06)	(8.82e-07)
EBITDA			1.95e-05	-0.000127***	-0.000122**	-4.11e-05	-0.000103	-0.000105	-3.21e-05
			(3.83e-05)	(4.63e-05)	(5.50e-05)	(2.75e-05)	(6.81e-05)	(6.80e-05)	(2.69e-05)
Stock fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES
Month fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES
Number of observations	48,447	65,808	95,755	49,340	65,031	95,464	95,094	110,785	141,218
Number of stocks	393	393	397	393	396	397	393	396	397
Adjusted R^2	0.948	0.946	0.940	0.935	0.930	0.933	0.941	0.937	0.937

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. *APeriod* is a dummy variable with a value of one in the announcement period from March 14, 2012 until 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 until August 31, 2012). *DiD, ADiD, SDiD,* and *LDiD* are the interaction terms of *TPeriod, APeriod, STPeriod,* and *LTPeriod*, respectively, with a dummy variable for treated French stocks. We consider the logarithm of market capitalization in millions of euros (*MC*), the price-to-book ratio (*PTB Ratio*), and the ratio of EBITDA to market capitalization (*EBITDA*) as additional stock controls.

Table 3: Volatility, baseline tests

Model	1	2	3	4	5	6
Volatility measure	Intraday volatility			Weekly volatility		
Long-run treatment period	2 months	4 months	8 months	2 months	4 months	8 months
ADiD	**0.00106****	**0.00104****	**0.00108****	**-0.000532**	**-0.000544**	**-0.000503**
	(0.000423)	**(0.000429)**	**(0.000435)**	**(0.000488)**	**(0.000491)**	**(0.000495)**
SDiD	**-0.00139****	**-0.00141****	**-0.00136****	**-0.00278*****	**-0.00279*****	**-0.00273*****
	(0.000665)	**(0.000667)**	**(0.000659)**	**(0.000676)**	**(0.000675)**	**(0.000665)**
LDiD	**-0.000899**	**-0.000896**	**-0.00109**	**-0.00135****	**-0.00170*****	**-0.00230*****
	(0.000684)	**(0.000709)**	**(0.000677)**	**(0.000604)**	**(0.000585)**	**(0.000572)**
APeriod	-0.00237***	-0.00235***	-0.00238***	-0.00187***	-0.00186***	-0.00189***
	(0.000350)	(0.000352)	(0.000349)	(0.000537)	(0.000536)	(0.000535)
STPeriod	-0.00456***	-0.00453***	-0.00461***	-0.00492***	-0.00490***	-0.00499***
	(0.000460)	(0.000464)	(0.000458)	(0.000664)	(0.000665)	(0.000662)
LTPeriod	-0.00376***	-0.00373***	-0.00377***	-0.00276***	-0.00265***	-0.00257***
	(0.000478)	(0.000501)	(0.000483)	(0.000694)	(0.000694)	(0.000683)
MC	-0.00908***	-0.00948***	-0.00814***	-0.00567***	-0.00588***	-0.00474***
	(0.00125)	(0.00165)	(0.00137)	(0.00115)	(0.00123)	(0.00101)
PTB Ratio	4.29e-07***	3.39e-07***	6.15e-08***	2.05e-07***	1.57e-07***	3.53e-08***
	(1.51e-08)	(1.46e-08)	(9.11e-09)	(1.39e-08)	(1.18e-08)	(7.33e-09)
EBITDA	-1.19e-06	-1.25e-06	-4.43e-07	8.26e-09	-7.52e-08	2.11e-07
	(1.46e-06)	(1.38e-06)	(4.15e-07)	(9.49e-07)	(9.56e-07)	(3.35e-07)
Stock fixed effects	YES	YES	YES	YES	YES	YES
Month fixed effects	YES	YES	YES	YES	YES	YES
Number of observations	95,094	110,785	141,218	19,988	23,433	29,825
Number of stocks	393	393	397	393	396	397
Adjusted R^2	0.299	0.302	0.296	0.261	0.258	0.248

The dependent variables are either the relative interday volatility (difference of the highest and the lowest price of one day divided by the closing price) or the relative weekly volatility (standard deviation of closing prices over one week divided by the average closing price of that week). 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. *APeriod* is a dummy variable with a value of one in the announcement period from March 14, 2012 until 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 until August 31, 2012). *ADiD*, *SDiD*, and *LDiD* are the interaction terms of *APeriod*, *STPeriod*, and *LTPeriod*, respectively, with a dummy variable for treated French stocks. We consider the logarithm of market capitalization in millions of euros (*MC*), the price-to-book ratio (*PTB Ratio*), and the ratio of EBITDA to market capitalization (*EBITDA*) as additional stock controls.

Table 4: Volume, heterogeneity tests

Model	1	2	3	4	5	6	7	8	9
Long-run treatment period	2 months	4 months	8 months	2 months	4 months	8 months	2 months	4 months	8 months
ADiD × SLP	**0.0922****	**0.0915****	**0.0982****				**0.0743**	**0.0741**	**0.0804**
	(0.0466)	**(0.0462)**	**(0.0463)**				**(0.0580)**	**(0.0572)**	**(0.0569)**
SDiD × SLP	**0.240*****	**0.240*****	**0.247*****				**0.165****	**0.163****	**0.168****
	(0.0698)	**(0.0695)**	**(0.0694)**				**(0.0742)**	**(0.0732)**	**(0.0725)**
LDiD × SLP	**0.226*****	**0.158*****	**0.131****				**0.245*****	**0.191*****	**0.170*****
	(0.0629)	**(0.0594)**	**(0.0576)**				**(0.0604)**	**(0.0599)**	**(0.0563)**
ADiD × MC				**0.0441***	**0.0450****	**0.0478****	**0.0241**	**0.0250**	**0.0260**
				(0.0228)	**(0.0227)**	**(0.0227)**	**(0.0269)**	**(0.0266)**	**(0.0264)**
SDiD × MC				**0.0738****	**0.0756****	**0.0795****	**0.0296**	**0.0318**	**0.0342**
				(0.0357)	**(0.0356)**	**(0.0356)**	**(0.0373)**	**(0.0369)**	**(0.0367)**
LDiD × MC				**0.0143**	**-0.00602**	**0.00409**	**-0.0517***	**-0.0575****	**-0.0418**
				(0.0338)	**(0.0305)**	**(0.0310)**	**(0.0311)**	**(0.0287)**	**(0.0293)**
ADiD	0.0155	0.0126	0.00268	-0.323	-0.333	-0.365*	-0.185	-0.196	-0.214
	(0.0438)	(0.0437)	(0.0438)	(0.209)	(0.209)	(0.209)	(0.225)	(0.223)	(0.222)
SDiD	-0.297***	-0.300***	-0.311***	-0.831**	-0.851**	-0.892***	-0.527	-0.549*	-0.580*
	(0.0654)	(0.0654)	(0.0656)	(0.332)	(0.332)	(0.332)	(0.328)	(0.326)	(0.325)
LDiD	-0.126**	-0.106*	-0.102*	-0.154	0.0113	-0.0788	0.300	0.367	0.238
	(0.0612)	(0.0579)	(0.0564)	(0.316)	(0.284)	(0.289)	(0.285)	(0.259)	(0.266)
APeriod	0.0665***	0.0685***	0.0714***	0.155*	0.167**	0.176**	0.155*	0.167**	0.176**
	(0.0170)	(0.0168)	(0.0168)	(0.0833)	(0.0831)	(0.0840)	(0.0833)	(0.0831)	(0.0841)
STPeriod	-0.132***	-0.128***	-0.122***	-0.414***	-0.399***	-0.388***	-0.415***	-0.399***	-0.388***
	(0.0234)	(0.0231)	(0.0229)	(0.121)	(0.120)	(0.120)	(0.121)	(0.120)	(0.120)
LTPeriod	0.0685***	0.0771***	0.0847***	-0.266**	-0.208*	-0.0164	-0.266**	-0.208*	-0.0166
	(0.0264)	(0.0256)	(0.0250)	(0.127)	(0.124)	(0.126)	(0.127)	(0.124)	(0.126)
Stock controls	YES	YES	YES	YES	YES	YES	YES	YES	YES
DiD controls	YES	YES	YES	YES	YES	YES	YES	YES	YES
Stock fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES
Month fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES
Number of observations	95,094	110,785	141,218	94,170	109,713	139,782	94,170	109,713	139,782
Number of stocks	393	393	397	393	396	397	393	396	397
Adjusted R^2	0.941	0.937	0.937	0.938	0.935	0.934	0.938	0.935	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. *APeriod* is a dummy variable with a value of one in the announcement period from March 14, 2012 until 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 to 31, 2012). A*DiD*, *SDiD*, and *LDiD* are the interaction terms of *APeriod*, *STPeriod*, and *LTPeriod*, respectively, with a dummy variable for treated French stocks. *ADiD × MC* (*ADiD × SLP)* denote interaction terms of *ADiD* with the logarithm of market capitalization in millions of euros *MC* (a dummy variable for SLP stocks *SLP*). The same holds for corresponding interaction terms for the long-run and short-run treatment periods (*SDiD × SLP*; *LDiD × SLP*; *SDiD × MC*; *LDiD × MC*). Stock controls include the logarithm of market capitalization in millions of euros (*MC*), the price-to-book ratio (*PTB Ratio*), and the ratio of EBITDA to market capitalization (*EBITDA*). DiD controls consider interaction terms of *APeriod*, *STPeriod*, and *LTPeriod* with the logarithm of market capitalization in millions of euros *MC*. Corresponding interaction terms with *SLP* are omitted by reason of multi-collinearity.

Table 5: Volatility, heterogeneity tests

Model	1	2	3	4	5	6
Volatility measure	Intraday volatility			Weekly volatility		
Long-run treatment period	2 months	4 months	8 months	2 months	4 months	8 months
ADiD × SLP	**0.00163***	**0.00162***	**0.00163***	**0.00285****	**0.00285****	**0.00286****
	(0.000941)	**(0.000940)**	**(0.000957)**	**(0.00114)**	**(0.00114)**	**(0.00115)**
SDiD × SLP	**0.000790**	**0.000763**	**0.000782**	**0.00202**	**0.00201**	**0.00200**
	(0.00135)	**(0.00135)**	**(0.00134)**	**(0.00150)**	**(0.00150)**	**(0.00149)**
LDiD × SLP	**0.00222**	**0.00100**	**0.00155**	**0.00113**	**0.000948**	**0.00129**
	(0.00147)	**(0.00162)**	**(0.00156)**	**(0.00127)**	**(0.00135)**	**(0.00137)**
ADiD × MC	**-0.000745****	**-0.000745****	**-0.000755****	**-0.000730**	**-0.000730**	**-0.000734**
	(0.000371)	**(0.000370)**	**(0.000370)**	**(0.000486)**	**(0.000485)**	**(0.000483)**
SDiD × MC	**0.00114***	**0.00115***	**0.00113***	**0.000124**	**0.000132**	**0.000120**
	(0.000632)	**(0.000632)**	**(0.000629)**	**(0.000745)**	**(0.000744)**	**(0.000740)**
LDiD × MC	**-0.000192**	**-0.000150**	**-0.000160**	**-0.000254**	**-0.000373**	**-0.000176**
	(0.000753)	**(0.000835)**	**(0.000789)**	**(0.000620)**	**(0.000666)**	**(0.000670)**
ADiD	0.00669**	0.00666**	0.00679**	0.00448	0.00447	0.00454
	(0.00296)	(0.00296)	(0.00294)	(0.00381)	(0.00381)	(0.00379)
SDiD	-0.0117**	-0.0118**	-0.0115**	-0.00491	-0.00498	-0.00480
	(0.00527)	(0.00527)	(0.00524)	(0.00602)	(0.00601)	(0.00598)
LDiD	-0.000335	-2.12e-05	-0.000380	0.000250	0.00106	-0.00136
	(0.00622)	(0.00676)	(0.00641)	(0.00511)	(0.00537)	(0.00541)
APeriod	-0.00465***	-0.00462***	-0.00476***	-1.02e-05	1.19e-05	-9.70e-05
	(0.00141)	(0.00142)	(0.00141)	(0.00145)	(0.00145)	(0.00145)
STPeriod	-0.00317	-0.00311	-0.00324	-0.00379*	-0.00375*	-0.00388*
	(0.00247)	(0.00247)	(0.00248)	(0.00218)	(0.00217)	(0.00218)
LTPeriod	-0.00379*	-0.00169	-0.00124	-0.00428**	-0.00251	-0.000740
	(0.00222)	(0.00255)	(0.00224)	(0.00200)	(0.00206)	(0.00183)
Stock controls	YES	YES	YES	YES	YES	YES
DiD 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	94,170	109,713	139,782	19,697	23,092	29,378
Number of stocks	393	393	397	393	396	397
Adjusted R^2	0.299	0.302	0.297	0.263	0.260	0.249

The dependent variables are either the relative interday volatility (difference of the highest and the lowest price of one day divided by the closing price) or the relative weekly volatility (standard deviation of closing price over one week divided by the average closing price of that week). 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. *APeriod* is a dummy variable with a value of one in the announcement period from March 14, 2012 until 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 to 31, 2012); and A*DiD*, *SDiD*, and *LDiD* are the interaction terms of *APeriod*, *STPeriod*, and *LTPeriod*, respectively, with a dummy variable for treated French stocks. *ADiD × MC* (*ADiD × SLP)* denote interaction terms of *ADiD* with the logarithm of market capitalization in millions of euros *MC* (a dummy variable for SLP stocks *SLP*). The same holds for corresponding interaction terms for the long-run and short-run treatment periods (*SDiD × SLP*; *LDiD × SLP*; *SDiD × MC*; *LDiD × MC*). Stock controls include the logarithm of market capitalization in millions of euros (*MC*), the price-to-book ratio (*PTB Ratio*), and the ratio of EBITDA to market capitalization (*EBITDA*). DiD controls consider interaction terms of *APeriod*, *STPeriod*, and *LTPeriod* with the logarithm of market capitalization in millions of euros *MC*. Corresponding interaction terms with *SLP* are omitted by reason of multi-collinearity.

Table 6: Migration of Trading Volume

Model	1	2	3	4	5	6
Long-run treatment period	2 months	4 months	8 months	2 months	4 months	8 months
ADiD				**0.0711****	**0.0679****	**0.0678****
				(0.0316)	**(0.0313)**	**(0.0319)**
SDiD				**0.206*****	**0.202*****	**0.200*****
				(0.0559)	**(0.0558)**	**(0.0563)**
LDiD	**0.105***	**0.131****	**0.168*****	**0.0971***	**0.125****	**0.165*****
	(0.0542)	**(0.0604)**	**(0.0607)**	**(0.0535)**	**(0.0591)**	**(0.0599)**
APeriod				0.0815***	0.0827***	0.0842***
				(0.0169)	(0.0168)	(0.0168)
STPeriod				-0.112***	-0.107***	-0.102***
				(0.0230)	(0.0226)	(0.0222)
LTPeriod	-0.0667	-0.0827	-0.107	0.0923***	0.0973***	0.102***
	(0.114)	(0.111)	(0.104)	(0.0260)	(0.0260)	(0.0256)
Stock 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	40,303	53,157	77,641	77,726	90,580	115,064
Number of stocks	321	322	323	321	322	323
Adjusted^2	0.914	0.907	0.911	0.922	0.917	0.917

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. *APeriod* is a dummy variable with a value of one in the announcement period from March 14, 2012 until 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 until August 31, 2012). *ADiD*, *SDiD*, and *LDiD* are the interaction terms of *APeriod*, *STPeriod*, and *LTPeriod*, respectively, with a dummy variable for treated French stocks. We consider the logarithm of market capitalization in millions of euros (*MC*), the price-to-book ratio (*PTB Ratio*), and the ratio of EBITDA to market capitalization (*EBITDA*) as additional stock controls.

Table 7: Alternative dependent variables

Model	1	2	3	4	5	6
Volatility measure	Price-adjusted volume			Monthly volatility		
Long-run treatment period	2 months	4 months	8 months	2 months	4 months	8 months
ADiD	**0.0819*** **	**0.0794*** **	**0.0734*** **	**-0.00296** **	**-0.00302** **	**-0.00302** **
	(0.0271)	**(0.0270)**	**(0.0270)**	**(0.00142)**	**(0.00141)**	**(0.00141)**
SDiD	**-0.141*** **	**-0.144*** **	**-0.150*** **	**-0.00803*** **	**-0.00810*** **	**-0.00810*** **
	(0.0401)	**(0.0399)**	**(0.0401)**	**(0.00172)**	**(0.00171)**	**(0.00169)**
LDiD	**0.00831**	**-0.00550**	**-0.0310**	**-0.00415*** **	**-0.00513*** **	**-0.00559*** **
	(0.0387)	**(0.0361)**	**(0.0351)**	**(0.00154)**	**(0.00148)**	**(0.00143)**
APeriod	0.0616***	0.0632***	0.0657***	-0.0168	-0.0129	-0.00868
	(0.0167)	(0.0166)	(0.0166)	(0.0220)	(0.0217)	(0.0230)
STPeriod	-0.137***	-0.133***	-0.129***	-0.0205	-0.0166	-0.0124
	(0.0229)	(0.0226)	(0.0226)	(0.0221)	(0.0218)	(0.0231)
LTPeriod	0.0762***	0.0837***	0.0944***	-0.0190	-0.0148	-0.0105
	(0.0254)	(0.0248)	(0.0244)	(0.0221)	(0.0217)	(0.0231)
Stock 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	4,708	5,494	6,979	4,708	5,494	6,979
Number of stocks	393	396	397	393	396	397
Adjusted R^2	0.441	0.433	0.420	0.441	0.433	0.420

The dependent variable is either the logarithm of the number of traded shares (in thousands) multiplied with the shares' daily closing price (Models 1 to 3) or the standard deviation of stock prices over one month divided by the average closing price over that month (Models 4 to 6). 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. *APeriod* is a dummy variable with a value of one in the announcement period from March 14, 2012 until 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 to 31, 2012); and A*DiD*, *SDiD*, and *LDiD* are the interaction terms of *APeriod*, *STPeriod*, and *LTPeriod*, respectively, with a dummy variable for treated French stocks. Stock controls include the logarithm of market capitalization in millions of euros (*MC*), the price-to-book ratio (*PTB Ratio*), and the ratio of EBITDA to market capitalization (*EBITDA*).

Table 8: French election tests

Model	1	2	3	4	5	6	7	8	9
Dependent variable	Trading volume			Daily volatility			Weekly volatility		
Long-run treatment period	2 months	4 months	8 months	2 months	4 months	8 months	2 months	4 months	8 months
ADiD	0.139***	0.130***	0.119***	0.00142**	0.00136**	0.00141**	0.000609	0.000554	0.000608
	(0.0394)	(0.0392)	(0.0392)	(0.000577)	(0.000592)	(0.000588)	(0.000672)	(0.000670)	(0.000662)
SDiD	-0.171***	-0.178***	-0.188***	-0.00131**	-0.00136**	-0.00134**	-0.00270***	-0.00275***	-0.00271***
	(0.0428)	(0.0424)	(0.0425)	(0.000662)	(0.000666)	(0.000657)	(0.000657)	(0.000660)	(0.000650)
LDiD	-0.00903	-0.0254	-0.0380	-0.000830	-0.000862	-0.00108	-0.00106*	-0.00159***	-0.00223***
	(0.0408)	(0.0384)	(0.0374)	(0.000685)	(0.000715)	(0.000677)	(0.000588)	(0.000598)	(0.000575)
APeriod	0.121***	0.135***	0.143***	-0.00283***	-0.00272***	-0.00291***	0.000113	0.000195	2.81e-05
	(0.0276)	(0.0266)	(0.0255)	(0.000364)	(0.000408)	(0.000369)	(0.000367)	(0.000363)	(0.000343)
STPeriod	-0.0628**	-0.0448	-0.0330	-0.00496***	-0.00484***	-0.00507***	-0.00230***	-0.00220***	-0.00240***
	(0.0308)	(0.0292)	(0.0273)	(0.000430)	(0.000478)	(0.000430)	(0.000381)	(0.000390)	(0.000368)
LTPeriod	0.137***	0.159***	0.174***	-0.00418***	-0.00404***	-0.00422***	-0.000376	-0.000132	-0.000174
	(0.0338)	(0.0320)	(0.0300)	(0.000450)	(0.000542)	(0.000466)	(0.000411)	(0.000441)	(0.000397)
Stock controls	YES	YES	YES	YES	YES	YES	YES	YES	YES
Stock fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES
Month fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES
Number of observations	66,514	82,205	112,638	66,514	82,205	112,638	66,514	82,205	112,638
Number of stocks	393	393	397	393	396	397	393	396	397
Adjusted R^2	0.937	0.933	0.935	0.290	0.294	0.289	0.273	0.262	0.245

The dependent variables are the logarithm of the number of traded shares (in thousands) (Models 1 to 3), the difference of the highest and lowest share price on a trading day divided by the closing price (Models 4 to 6, or the weekly standard deviation of the daily closing prices divided by the average daily closing price (Models 7 to 9). 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. *APeriod* is a dummy variable with a value of one in the announcement period from March 14, 2012 until 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 until August 31, 2012). *ADiD*, *SDiD*, and *LDiD* are the interaction terms of *APeriod*, *STPeriod*, and *LTPeriod*, respectively, with a dummy variable for treated French stocks. We consider the logarithm of market capitalization in millions of euros (*MC*), the price-to-book ratio (*PTB Ratio*), and the ratio of EBITDA to market capitalization (*EBITDA*) as additional stock controls.

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