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Securities Transaction Tax in France: Impact on Market Quality and Inter-Market Price Coordination

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1. Executive Summary

The concept of the securities transaction tax (STT) is one of the most controversial topics in financial markets regulation during the last decades. Politicians argue that this tax would dampen speculative trading activity, leading to increased financial market integrity (e.g. Summers and Summers, 1989; Stiglitz, 1989). Opponents posit that an STT would not only impair financial markets' quality but also unnecessarily burden the economy by biasing investors' capital allocation (e.g. Matheson, 2011; Habermeier and Kirilenko, 2001). Although theoretical research is widespread and supported by some empirical studies, no common understanding on how an STT affects market quality is established yet. These scarce empirical results are limited in their applicability to today's market settings as conditions in recent years have changed drastically. In Europe, the ongoing fragmentation process induced by the Markets in Financial Instruments Directive (MiFID) catalyzes competition among trading venues. New technologies (e.g. high frequency trading (HFT), as well as smart order routing) and innovative pricing regimes, like maker-taker pricing (Foucault et al., 2012), added even more layers of complexity. In the light of the still ongoing controversy, contradictory research results and the plans for an STT in many European countries, research is crucial in providing guidance for regulators, practitioners and academics alike.

In 2012, France decided to introduce an STT, providing a suitable and recent case to draw empirical conclusions on this subject. To follow the call of Schwert and Seguin (1993) to provide more empirical evidence, we obtain insights into market quality changes via a difference-in-differences analysis.

Firstly, by evaluating various dimensions of single-market quality parameters, e.g. price volatility, trading activity and order book depth, we will focus on STT-induced changes to liquidity demand

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and supply at NYSE Euronext Paris. We find trade executions (traded volumes) declining, on average, by 15 percent (19 percent) within 2 months (medium-term event window) after the adoption, which is in line with results of previous studies, like Pomeranets and Weaver (2012). Focusing on order book liquidity provision, we find an instantaneous decline in order book depth immediately after the introduction of the STT as well as a widening of the relative spread levels although professional liquidity provision is not taxed, leading to additional implicit transaction costs on top of the explicit tax. Although these effects are peaking in the short-term event window (10 days after implementation), results remain robust even 6 month after the implementation (long-term event window) and even after omitting the initial peak. Market volatility levels remain unchanged in the long-, medium- as well as in the short-term and therefore give no indication whether the lost order volume and trading activity was of distinct disorienting nature, as argued by Summers and Summers (1989) and Stiglitz (1989).

Secondly, in light of the fragmented nature of today's European market landscape, we add another dimension of market quality analysis. As French stocks are traded on multiple trading venues, we analyze whether the quality of inter-market price coordination among French stocks has changed after the STT introduction. Information transmission between dispersed markets is a major requirement for price coordination, thereby ensuring price homogeneity and investors' confidence among fragmented markets (Hasbrouck, 1995). By investigating information transmission between two taxed markets before and after the introduction of the STT, we give an insight how this coordination mechanism is affected by the STT following the methodology of Engle and Granger (1987). We find that price dispersion between venues deteriorates significantly. Further, as exogenous shocks to the long-term price equilibrium are reverted more slowly than before the introduction of the tax, price coordination deteriorates significantly.

2. Anatomy of the French Transaction Tax

In order to exhibit the analyzed regulatory event and to highlight its distinctions to former STT implementations, this subsection will describe the French STT concept. The proposed STT is subdivided into three separate taxation concepts, i.e. the taxation of the acquisition of equity securities, the taxation of HFT and the taxation of naked sovereign credit default swaps. Our assessment focuses on the effects on equity market transactions. Additionally, within the French Second Amended Finance Bill, European as well as American Depository Receipts fall under the scope of the tax if traded after December 1st, 2012, which will not be discussed in this paper.

The first French STT concept is applied only to the acquisition (one-sided) of securities that give, or may give, access to capital or voting rights in the issuing company. The condition for taxation is clarified under the definition of the "Eligible Instruments" as well as the "Eligible Markets" (PriceWaterhouseCoopers, 2012). The respective security has to be issued by a company with a registered office in France and exhibit a market capitalization larger than €1 billion, evaluated by January 1st of the preceding year of taxation. In contrast to comparable taxes, the French STT is therefore limited to the most liquid French equity instruments. In addition, the security or

instrument has to be admitted to trading on a French, European or foreign trading venue (French Government, 2013). If these criteria are met, the asset is considered eligible for taxation, irrespective of where the transaction was negotiated or settled in order to avoid regulatory arbitrage.

To avoid cascading effects on market liquidity or on public offerings, various exemptions from the STT are existent. Most notably, the commitment to protect liquidity provision as market making and also contractual liquidity provision are excluded.

3. The Effect of the French STT on Market Quality

In this section we present the results on the effect of the French STT on the various market quality parameters. In selecting the market parameters we follow the guidance of the related literature. Firstly, by analyzing the demand for liquidity, we focus on the number of executed trades and the log of traded volume (number of shares) on a daily basis. Secondly, as proposed by various studies before (e.g. Baltagi et al., 2006; Pomeranets and Weaver, 2012; Umlauf, 1993), we also analyze price volatility. Thirdly, while most empirical studies concentrate only on liquidity demand, volatility and price changes, we also focus on liquidity supply, i.e., order book liquidity characteristics. To prevent the influence of the price level on our measure, we choose the quoted relative spread. The relative spread represents the market's cost for immediacy, i.e. compensation for professional market participants for continuously providing liquidity to the market and is considered crucial in the assessment of a security's market quality. To capture the liquidity within the order book, we also use the depth measure as proposed by Degryse et al. (2011) – the Depth(X). It quantifies the order volume available X basis points (bps) around the midpoint, measured in €.

We rely on the constituents of the French blue chip index CAC 40 for our data sample. The CAC 40 represents the 40 largest industry-wide, capitalization-weighted enterprises of NYSE Euronext Paris. Due to their location outside France, three of these constituents do not fall into the scope of the STT, leaving 37 constituents to the analysis. We choose the constituents of the German blue chip index DAX 30 as control group. DAX 30 and CAC 40 share strong similarities concerning market price levels (2 months pre-event correlation of 0.94) and volume development (2 months pre-event correlation of 0.69), industry coverage and the European macroeconomic dependency due to the close geographic proximity. Our data source is the Thomson Reuters Datascope Tick History service.

Table 1 aggregates the overview results of the regression for all analyzed time ranges separated for volatility, liquidity demand and liquidity supply. We list the STT coefficients with respective levels of significance (coeff.). Based upon the pre-STT level, relative changes (rel.) are calculated for each case.

Table 1
Overall Effects - Fixed Effects Regression

Aggregated fixed-effects regression results for the STT indicator and relative changes compared to pre-event averages on various market quality parameters 10 trading days, 2 months and 6 months before and after August 1st, 2012. Dependent variables are daily averages of standard deviation of prices (Std. Dev.), high-to-low measure (High Low), number of executed trades (Executed Trades), the log of daily traded volume (Traded Volume), daily average relative spread level (Relative Spread) as well as daily average Depth measure as proposed by Degryse et al. (2011), i.e. the Euro volume available 10 basis points around the midpoint (Depth(10)). Difference-in-Differences methodology is performed on the French treatment sample (no_contr) and together with the German control sample (contr). We further control for weekday effects, price levels and tick size changes. As spread levels are incorporated into the Depth measure, we additionally control for changes in spread level within Depth(10) regression. Standard errors are clustered by entity. ***, ** and * denote significance at the 1, 5 and 10 % levels, respectively.

		10 Days		2 Months		6 Months	
		no_contr	contr	no_contr	contr	no_contr	contr
Volatility							
Std. Dev.	coeff.	-0.018	0.005	-0.019 ***	0.010	-0.046***	0.013
	rel.	-7 %	2 %	-8 %	4 %	-20 %	5 %
High Low	coeff.	-0.003	0.001	-0.005 ***	0.000	-0.003	0.002
	rel.	-0 %	0 %	-0 %	0 %	-0 %	0 %
Liquidity Demand							
Executed Trades	coeff.	-2,412***	-1,900***	-2,329 ***	-1,310***	-2,472***	-1,347***
	rel.	-26 %	-20 %	-26 %	-15 %	-28 %	-15 %
Traded Volume	coeff.	-0.358***	-0.225***	-0.354 ***	-0.193***	-0.350***	-0.168***
	rel.	-36%	-23%	-35%	-19%	-35%	-17%
Liquidity Supply							
Relative Spread	coeff.	0.0001***	0.0001***	0.0001 **	0.0001 ***	0.0000	0.0001***
	rel.	11 %	10 %	10 %	14 %	-2 %	12 %
Depth(10)	coeff.	-80,700***	-81,582***	-29,739 *	-127,206 ***	63,359***	-88,578***
	rel.	-17 %	-17 %	-6 %	-26 %	12 %	-17 %

We start with the analysis of the results for volatility. In related literature, price volatility is found to be highly affected by the STT due to changes in transaction costs and a possible change in the structure of trader types. Increased variability of asset prices indicates an increased level of uncertainty about the true underlying value of the respective asset. High volatility biases an investor's evaluation and potentially results in incorrect investment decisions (Harris, 2003). The differences between our two measures (standard deviation and high to low ratio) are reflected in the fact that the high to low ratio is only affected by the daily maximum and minimum values, whereas these values are underweighted within the standard deviation, which focuses primarily on deviations from the mean. Within 10 days after August 1st, 2012, French stocks show a slight tendency towards lower intra-day standard deviation and high to low ratio (no_contr), which however is not significantly different from zero. Within the two and six month windows, this tendency further intensifies as intra-day standard deviation is significantly reduced by 8 percent (2 months) and 20 percent (6 months) respectively. However, as German blue chips mirror this tendency (contr), significance in differences vanishes, leading to the conclusion that these effects could be considered to represent a more general trend within the European blue chip indices.

Focusing on the developments in liquidity demand, captured by the number of executed trades and traded volumes, we observe a more significant impact. Within 10 days after introduction, the

number of trades (traded volumes) in French stocks decline initially by 26 (36) percent. This level remains stable at 2 and 6 months after the STT introduction as compared to the respective pre-event window. By controlling for German DAX 30 developments, results indicate a similar but much more lenient decline in liquidity demand as the coefficient on the STT dummy is reduced to a decline of 20 percent (23 percent for traded volumes) after ten days. Within the following 2 and 6 months, the coefficient within the controlled regression (contr) is reduced to 15 percent for executed trades (19 percent for traded volumes) after 2 months and again 15 percent for executed trades (17 percent for traded volume) after 6 months. Decline in liquidity demand (controlled) bottoms out in early August, followed by a slight period of recovery resulting in a stable and statistically significant deterioration after 6 months.

Empirical studies on the effects of STTs mostly focus on the impact on trading activity as well as price volatility, especially as trade executions seem to be the most relevant activity influenced by the STT. However, an increase in transaction costs may additionally affect traders' willingness to quote and stay in the market and therefore directly influences liquidity supply in the order book. We therefore raise the question, whether the decline in execution activity is also accompanied by a deterioration of liquidity supply. Within 10 days, relative spread levels are significantly higher by 11 percent in comparison to the pre-event situation. As German benchmark spread levels do not change within the short-term period, this effect is almost completely attributable to the STT implementation (10 percent in comparison to the German benchmark). Results remain constant for the 2 month window as the German spread experiences further narrowing, leading to an increased STT coefficient of about 14 percent. After six months, results show that this spread narrowing is also shared by the French stocks as pre-event spread levels are largely restored. However, in comparison to the development of the German benchmark, relative spread levels still remain widened by 12 percent. A similar development can be observed for the order book depth levels as the initial and statistically significant drop of 17 percent is not shared by our control group. A period of recovery in the French stocks is observable within the next 2 and 6 months. As recovery of German stocks is much stronger in these periods, the STT effect is further expanding. After 6 months, order book depth levels declined by about 17 percent in comparison to German stocks but increased by 12 percent in comparison to the French pre-event period. All together, we find that the French STT implementation immediately curbs liquidity demand and supply in French stocks. Although liquidity demand has recovered slightly, the effect is still significant 6 months after the event as the recovery is also observable in the benchmark group. While liquidity supply deterioration is peaking in the mid-term window, after 6 months the decline remains at the same level as it was 10 days after the implementation. The French STT has increased the cost of trading and therefore might reduce incentives to trade or even to quote. Especially those traders relying on high execution rates and small profit margins, e.g. HFTs and arbitrageurs, will find trade or quote opportunities to be unfavorable. On the other hand, intra-day volatility was not affected by the STT.

4. The Effect on Inter-Market Price Coordination

As per Harris (2003), prices in securities markets contain valuable signals supporting the direction of resources and cash flows into most efficient projects and companies. Within the European securities markets system, the fragmentation of order flow enables us to study the effect of STTs on inter-market information transmission as price dispersion is an important indicator of market quality in fragmented markets. French blue chips can be traded on the main Regulated Market (NYSE Euronext Paris), several Multilateral Trading Facilities, Systematic Internalisers or on Over-the-Counter markets. Derived from the law of one price, "frictionless" markets will price homogeneous goods uniformly, i.e. show zero price dispersion. However, asymmetric information diffusion as well as differences in search costs may result in temporal price dispersion (Lamont and Thaler, 2003). Due to the existence of fully automated and low-latency trading strategies, price homogeneity has increased as news are incorporated more accurate and market monitoring and subsequent arbitrage opportunities become more apparent (Martinez and Rosu, 2011; Hendershott and Riordan, 2011).

This development has increased price integrity and investor's certainty to trade on efficient prices. However, the introduction of an STT may reverse this development as with a certain amount of price-adjusting, low-revenue trades will become unprofitable and therefore disappear, as suggested by Culp (2010). As such, STTs may discourage financial transactions and reduce a market's informational efficiency due to higher transaction costs. Hence, temporal price dispersion between markets may increase for these transactions in order to become profitable again. We show that this phenomenon occurs to a significant and verifiable amount due to the introduction of the French STT. We observe that the price equilibrium adjustment mechanism, that is the rate of reversion towards the equilibrium relationship after price shocks, has been significantly weakened due to the introduction of the French STT.

In order to empirically analyze this process, we again rely on stock market data of the French blue chip index CAC 40. Due to the fragmentation of the European securities market system initiated by MiFID in 2007, French stocks, among others, are traded simultaneously on various venues. According to Fidessa (2012), a significant portion of the CAC 40 trading volume is executed on NYSE Euronext Paris as well as on Chi-X's CXE MTF. Together, both account for about 85 percent of traded volume in the open limit order books. We analyze price co-movement on these two dominant venues using an event-based approach. Further, we investigate the impact on the equilibrium correction mechanism using the co-integration framework suggested by Engle and Granger (1987). Again, we rely on tick by tick data provided by Thomson Reuters Datascope Tick History service. Theoretically, comparing stock prices among venues requires event synchronicity as well as homogeneity in liquidity and transaction costs. Since trades as well as order book updates may occur asynchronously on both markets, we rely on a form of aggregation. In order to achieve event synchronicity, this analysis is based on the one minute average price on both trading venues. We rely on 37 of the CAC 40 stocks. Due to data unavailability on Chi-X we have to dismiss two instruments, so the analysis incorporates 35 instruments. The minute-wise aggregation leads to an immense amount of observations per instrument. We therefore focus on

the medium-term event window of 2 months and apply stock-wise time series regressions to account for the long time series.

Our results show that before the introduction of the tax, any form of price disequilibrium between NYSE and Chi-X is reverted by 73 percent, on average, within the following minute. This result is not surprising, as co-integration within securities prices could empirically be shown by various studies like Harris et al. (1995) and Harris et al. (2002). However, 22 out of 35 CAC40 stocks experienced a significant deterioration in the speed of adjustment after the introduction of the tax. Henceforth, these findings suggest that the introduction of the French STT has deteriorated the speed of adjustment towards the long-term price equilibrium relationship leading to extended price dispersion between co-listed stocks. Again, as we so far have focused on French instruments alone, such effects could also be the result of the macro-economic development of the European trading system. Therefore, we applied the same model to the German DAX30 instruments to check whether the results are similar or not.

Comparable to the French subsample, results indicate that shocks to the equilibrium relationships are reverted by 78 percent, on average, within the following minute before August 1st, 2012. However, unlike the French results, only 5 out of 30 instruments show a significant deterioration in the speed of adjustment after August 1st, 2012. Due to the strong divergence between the German and French results, we can conclude that this effect is at least partly initiated by the implementation of the STT.

5. Summary

The introduction of the French STT is an extraordinary event in the regulation of the financial system and must be seen in the context of the recent financial crisis. Great effort has been spent to protect market efficiency, hinder regulatory arbitrage and dampen predatory trading activities. Still, the applicability of the French regulation, as well as the general concept of an STT, is controversial among academics and politicians. While theoretical research is quite advanced, the empirical guidance is still scarce. Possible negative effects for market liquidity and market efficiency are theoretically predicted but have not been empirically tested yet. In light of the agreement of eleven European member states to implement an STT, empirical evidence is desirable, especially in a fragmented and technology-driven European market system. This study aims to give a comprehensive overview of the effects of the STT on market quality by measuring the impact of the STT on price volatility, liquidity demand, liquidity supply, as well as on inter-market information transmission.

In line with the related literature (Baltagi et al., 2006; Pomeranets and Weaver, 2012; Umlauf, 1993), we find that liquidity demand deteriorates after the implementation. However, the exact amount of the decline is hard to test, which is why we provide results for French stocks as well as results benchmarked against German stocks. We find that the number of trades within the French CAC 40 decline by about 15 percent (2 months and 6 months after the adoption) compared to the benchmark, and by about 20 percent within 10 days. The effect of the STT is peaking immediately

after its introduction. Trading volumes decline similarly. In addition to this decline in liquidity demand (as predicted in theoretical studies like Palley (1999)), we also observe a detrimental effect on liquidity supply as evidenced by 12 percent higher spreads and 17 percent lower depth within 10 bps of the mid-quote (as measured 6 months after the adoption). In line with Hub (1998) and Chou and Wang (2006), price volatility seems not to be affected by the STT.

Finally, we find that the STT negatively influences the inter-market information transmission efficiency. A fragmented market system, like in Europe, is bound by information transmission between markets and liquidity sources through a constantly maintained and renewed price equilibrium, as shown by Harris et al. (1995). Price homogeneity within a fragmented market system is essential for the integrity and efficiency of the market. However, since the introduction of the French STT, we find that price coordination between NYSE Euronext Paris and Chi-X Europe has significantly decreased. We find that the equilibrium correction mechanism (reversion to the long-term price equilibrium) has weakened persistently. Hence, one-sided information shocks last longer and consume additional time in order to be reversed.

Our results are robust across various market quality parameters, time periods and price/market capitalization levels as well as after excluding the initial August effect. However, there are limitations that have to be discussed: As the presented analysis relies on the comparison of the CAC 40 and the German DAX 30 index, a potential bias due to the French instruments' idiosyncrasy cannot be entirely ruled out. However, in light of the inter-market information efficiency approach, a comparable level of fragmentation is required. Regarding the success in dampening speculative activity and excessive order transmission activity induced by HFT's, further research is required. To generalize our results, other trading venues and instruments need to be taken into account.

Overall, our results indicate that market participants are not only burdened by the tax itself, but additionally by an increase in implicit transaction costs, as argued by Habermeier and Kirilenko (2001). Interestingly, the various exemptions for professional liquidity providers do not prevent the detrimental effect on liquidity provision. Regulators should take different measures if they want to protect liquidity. Policy makers must be aware of the effects of STTs on inter-market information transmission, since a major motivation of the French and likewise of the European STT is to preserve market integrity. Within a system of fragmented liquidity, according to our results, STTs prevent a homogeneous price determination and therefore lead to fragmented pricing.

Bibliography

Baltagi, B. H., Li, D., and Li, Q., 'Transaction tax and stock market behavior: evidence from an emerging market', *Empirical Economics,* Vol. 3, 2006, pp. 393-408.

Chou, R. K., and Wang, G. H. K., 'Transaction tax and market quality of the taiwan stock index futures', *Journal of Futures Markets*, Vol. 26, 2006, pp.1195-1216*.*

Culp, C. L., 'Financial transaction taxes: Benefits and cost', *Working Paper* (2010).

Degryse, H., Jong, F. de, and van Kervel, V., 'Equity market fragmentation and liquidity: the impact of mifid', *Working Paper* (2011).

Engle, R. F., and Granger, C. W. J., 'Co-integration and error correction: Representation, estimation, and testing', *Econometrica,* Vol. 55*,* 1987, pp. 251-76.

Fidessa, 'Fidessa Fragmentation Index', *(2012),* Retrieved January 07, 2013, from *http://fragmentation.fidessa.com/.*

Foucault, T., Karan, O., and Kindle, E., 'Liquidity Cycles and Make/Take Fees in Electronic Markets', *Forthcoming in The Journal of Finance* (2012).

French Government, 'French Tax Law', *(2013),* Retrieved January 14, 2013, from *http://www.legifrance.gouv.fr/.*

Habermeier, K., and Kirilenko, A., 'Securities transaction taxes and financial markets', *IMF Working Papers* (2001).

Harris, F. D., McInish, T., Shoesmith, G., and Wood, R., 'Cointegration, error correction and price discovery on informationally-linked security markets', *Journal of Financial and Quantitative Analysis,* Vol. 30, 1995, pp. 563-579.

Harris, F., McInish, T., and Wood, R., 'Security price adjustment across exchanges: an investigation of common factor components for dow stocks', *Journal of Financial Markets,* Vol. 5*,* 2002, pp. 277-308.

Harris, L., 'Trading and exchanges: Market microstructure for practitioners', *(Oxford University Press, 2003).*

Hasbrouck, J., 'One security, many markets: Determining the contributions to price discovery', *Journal of Finance,* Vol. 50, 1995, pp. 1175-99.

Hendershott, T., and Riordan, R., 'Algorithmic trading and information', *Working Paper* (2011).

Hub, S.-Y., 'The effects of the stock transaction tax on the stock market – experiences from asian markets', *Pacific-Basin Finance Journal*, Vol. 6, 1998, pp. 347-364.

Lamont, O., and Thaler, R., 'The law of one price in financial markets', *The Journal of Economic Perspectives*, Vol. 17, 2003, pp. 191-202.

Martinez, V. H., and Rosu, I., 'High frequency traders, news and volatility', *Working Paper* (2011).

Matheson, T., 'Taxing financial transactions: Issues and evidence', *IMF Working Papers*, 11/54 (2011).

Palley, T. I., 'Speculation and tobin taxes: Why sand in the wheels can increase economic efficiency', *Journal of Economics,* Vol. 69, 1999, pp. 113-126.

Pomeranets, A., and Weaver, D., 'Security transaction taxes and market quality', *Working Paper* (2012).

PriceWaterhouseCoopers, 'French financial transaction tax on equity securities', *(2012),* Retrieved January 14, 2013, from *http://www.pwc.be/en/financial-services-newsalert/2012/landwell-fftt-pdf-aug-2012.pdf.*

Schwert, W., and Seguin, P. J., 'Securities transaction taxes: An overview of costs, benefits and unresolved questions', *Financial Analysts Journal,* Vol. 49, 1993, pp. 27-35.

Stiglitz, J. E., 'Using tax policy to curb speculative short-term trading', *Journal of Financial Services Research,* Vol. 3, 1989, pp. 101-115.

Summers, L. H., and Summers, V. P., 'When financial markets work too well: A cautious case for a securities transactions tax', *Journal of Financial Services Research,* Vol. 3, 1989, pp. 261-286.

Umlauf, S. R., 'Transaction taxes and the behavior of the swedish stock market', *Journal of Financial Economics,* Vol. 33, 1993, pp. 227-240.