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Abstract

We analyse the impact of the introduction of the French Tobin tax on volumes, liquidity and volatility of affected stocks with parametric and non parametric tests on individual stocks, difference in difference tests and other robustness checks controlling for simultaneous month-of-the-year and size effects. Our findings document that the tax has a significant impact in terms of reduction in transaction volumes and intraday volatility. The reduction in volumes traded occurs in similar proportion in non taxed small cap stocks.

Keywords: Financial Transaction Tax; intraday volatility; liquidity, transaction volumes.

JEL Classification Numbers: G18; G12; G14.

1 Introduction

The global financial crisis, and the discussion on the reform of the financial system which followed, have recently revived the debate on the imposition of a financial transaction tax (henceforth also FTT). Times and financial market conditions are different from those who led James Tobin to formulate his "Tobin tax" proposal after the end of the Bretton Woods era with the intent of "throwing sands in the wheel of "speculators" on foreign exchange markets.[1] In these more recent years the alleged responsibility of the financial system for the global crisis and the demand for an equitable sharing of the costs of the crisis

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[1]Tobin observed about the tax that: "Most disappointing and surprising, critics seemed to miss what I regarded as the essential property of the transaction tax –the beauty part- that this simple, one-parameter tax would automatically penalize short-horizon round trips, while negligibly affecting the incentives for commodity trade and long-term capital investments. A 0.2 per cent tax on a round trip to another currency costs 48 per cent a year if transacted every business day, 10 per cent if every week, 2.4 per cent if every month. But it is a trivial charge on commodity trade or long-term foreign investments".

created bottom-up pressure for the adoption of the tax at the EU level.[2] After several favorable votes of the European parliament seven EU member states on October 2012 agreed to start the process of enhanced cooperation to introduce the tax at EU level.[3] In the meanwhile countries like France opted for an anticipated adoption of the tax at 1^{st} August 2012.

This paper aims to evaluate the effects of such adoption.

As is well known France is not the first single country which decided to introduce a Financial Transaction Tax without coordination with other countries. In his survey Matheson (2011) identifies 23 examples of sovereign states which have adopted in the past or are still adopting (15 of them) a financial transaction tax (including top financial centers such as Hong Kong, the United States and the United Kingdom).[4]

The pros and cons of the FTT have been hotly debated. Advocates of the tax today argue that it may serve the purpose of reducing "speculative" short term trading (Summers and Summers, 1988; Stiglitz, 1989 and Rubenstein 1992) and distributing more equitably the burden of the costs of the global financial crisis. Obviously, even if the two arguments were correct, there would be a trade-off between them, that is, between the revenue and the anti-speculative goals.

Opponents of the tax reply that it is undemonstrated that its adoption reduces speculation. They also affirm that, if not adopted worldwide, the tax will be paid by less speculative traders who generally have less elastic demand and are less able to relocate their activities on other financial markets. Moreover, they expect the tax to reduce liquidity and increase the cost of equity capital with recessionary effects on the real economy.[5]

Unfortunately, theoretical evidence is unable to distinguish between the two views. From a theoretical point of view, the impact of the tax on liquidity and volatility, as well as the nexus between the tax and "speculation", depends on market microstructure assumptions.[6] As is well known "speculators" are on one of the two sides in a transaction in which one part (the hedger) buys an insurance from another (the speculator). In this sense the speculator plays the important role of assuming risk by selling protection of risk to another agent who want to buy this "service". However, if we assume the existence of noise

[2]The idea of the adoption of the tax after the crisis gained consensus in the discipline and led 1,000 economists of 53 countries to sign a document supporting it in occasion of the G20 meeting held in Washington 14-15 April 2011. See the www.guardian.co.uk/business/2011/apr/13/robin-hood-tax-economists-letter.

[3]On May 23rd, 2012 the EU Parliament voted in favour of the FTT (487 out of 685 votes). At that time the Eurobarometer showed that 66 percent of the Europeans were in favour of the tax. Since not all EU members are favorable to it, on 12 October 2012 a subset of 11 member states started the so-called "enhanced cooperation" procedure (requiring a minimum of 9 member states) toward its enactment.

[4]The UK stamp duty tax charges 0.5% of the transaction value of stocks listed in the domestic stock exchange, while the US tax at NYSE and NASDAQ charges 0.003%. The highest reported tax revenue is in Korea (6.2 billion dollars) followed by United Kingdom (5.86 billion dollars).

[5]The EU has recently simulated with a stochastic dynamic general equilibrium model the real effects of the introduction of the tax identifying a .5 percent fall of the EU GDP in the long run (40 years in the model). The reduction falls to .21 percent if the share of investment financed via equity and bonds is reduced to 80 percent among model assumptions. The simulation also assumes that tax revenues are neutral on GDP.

[6]Mannaro et al. (2008) document that the tax reduces liquidity increasing volatility. Westerhof and Dieci (2006) argue on the contrary that the tax may reduce volatility if it produces a reduction of noise trading. Pellizzari and Westerhof (2009) generalize the problem by showing that in a double auction market (as it is the case for stock exchanges) the adoption of the tax does not stabilize the market due to a fall in liquidity. On the contrary, in a dealer market where liquidity is provided by specialists, the tax may reduce volatility if it reduces speculative orders.

traders à la De Long et al. (1990) (traders who amplify market movements basing their information on noise), speculation and risk-taking behaviour may be destabilizing and amplify asset price movements. In this respect, if the FTT induces noise traders or chartists to migrate, it may reduce market overreaction to news (Gammil and Perold, 1989; Gorton and Pennacchi, 1993; Kumar et al., 1996 Choi and Subrahmanyan, 1993; Becchetti and Ciciretti, 2011)

From an empirical point of view the existing evidence documents that the introduction of the tax definitely reduces transaction volumes even though this does not imply that its revenues are necessarily negligible (see footnote 3). On the other hand, the impact on volatility has been generally (but not always) proven to be positive. Umlauf (1993) reports an increase after the tax introduction in Sweden. Baltagi and Li (2006) find a similar result when the tax is raised from .3 to .5 in China. However Liu and Zhou (2004) find that commission deregulation in Japan increased (and not reduced) volatility. Phylpaktis and Aristidou (2012) qualify this impact by finding that the effect on volatility is positive for highly traded stocks in bull market, but not significant in bear markets.

If it is hard to dispute that an FTT would reduce efficiency, we must also take into account that efficiency is not the only criterion by which the introduction of such tax should be evaluated since equity and precaution are also important. Some authors argue in fact that the FTT could create incentives to address human capital and financial resources toward activities different from short term trading that can be more productive for the society (Persaud and Griffith-Jones, 2012). As well, the costs in terms of efficiency must be traded off with the potential gains in equity provided that the FTT is effectively progressive and not paid by low wealth investors with less elastic demand.

In the present paper we investigate the effects of the introduction of the Financial Transaction Tax on blue chips at the Paris stock exchange on volumes, liquidity and volatility. Differently from many papers in the literature we analyze what happened stock by stock also because the French law applies only to stocks with capitalization above $1bn$ euros. In this sense the French FTT creates two (a time and a size) thresholds which crucially discriminate among stocks subjects or not to the tax. For this reason we adopt different approaches to measure its effects and our overall empirical strategy is developed in three steps. In the first step we perform standard parametric and non parametric tests on the null hypothesis of no difference in our main target variables before and after the introduction of the tax (transaction volumes, bid-ask spread, intraday volatility).[7] The test is performed on single stocks. In the second step we perform aggregate difference in difference tests considering taxed stocks as treatment and non taxed stocks as control sample. In the third step we outline an econometric panel specification which follows an approach similar to a two-dimensional regression discontinuity design allowing us to control for small size and month-of-the-year effects which may occur simultaneously to the introduction of the tax.

[7] We focus on these variables since these are those more likely to be affected by the tax as documented in the literature. Inspection of our database also shows that daily stock returns and volatility calculated on daily returns are substantially unaffected by the tax after three months following its introduction. Results are omitted and available upon request.

The paper is divided into five sections (introduction and conclusions included). In the second section we illustrate in detail the event around which our we build our empirical analysis (introduction and characteristics of the French Tobin tax). In the third section we present and comment our difference in difference empirical findings and our parametric and non parametric tests on volumes, liquidity and intraday volatility on individual stocks. The fourth section illustrates our econometric findings. The fifth section concludes.

2 Event and data

Introduced by the article 235-ter of law $2012 - 958$ the financial transaction tax became operative in France on August 1, 2012. It imposes a 0.2 per cent tax on purchases of shares in any publicly traded company headquartered in France with a market cap above €1bn, and a 0.1 per cent tax on "naked" short sales of sovereign credit default swaps. The original project from the former prime minister Sarkozy was a 0.1 percent tax which was doubled by the new prime minister Hollande once in power. The tax is paid on end of the day net holdings. The French government estimated at the moment of the introduction a revenue of €500m in the following year. The exemption of market makers' transactions, small capitalisation stock transactions (with the intention to limit potential liquidity costs for them) and of trading positions opened and closed in the same day is an important difference with the Stamp Duty Tax in the UK which also has a higher tax rate (0.5 percent). The French tax is also different from the tax that the EU intends to adopt following the reinforced cooperation procedure (see footnote 3). The proposal activated in October 2012 establishes that a 0.1% tax would be imposed on the trading of shares and bonds, while a 0.01% rate would apply to other products. To mitigate the risk of relocation, the levy would be imposed on the financial institutions at their place of residence. The tax would apply to all member states joining the proposal from January 1, 2014.

Our sample period is from March 23, 2012, to December 4, 2012, that is 90 trading days before and after di event. All the data are collected from Bloomberg. We calculate that 108 stocks are eligible for the French Tobin tax (ie. they have stock market capitalization above $1bn$ euros when the tax is introduced) and use 106 of them as our treatment group, by excluding the only two for which it was not possible to retrieve information on prices and turnover along the sample period[8]. For the same reason, our control group comprehend 220 over 231 companies listed on the Paris stock exchange[9]. In the difference in difference tests which follow we will compare them with the other small cap (below €1bn capitalization) French stocks which are not taxed (which approximate our control sample). Heterogeneity between the "treatment" and "control" sample will be dealt with in the econometric analysis of section 4.

[8] Quartz & Silice, and Compagnie Cambodge are the names excluded from the analysis

[9] The names not inserted in the control group are: Augros, Compagnie de Marocaine, Soditech Ingenierie, Tonna Electronique, Cibox Inter@ctive, Courtois, Orchestra Kazibao, DBV Technologies, Fonciere Paris Nord, Theolia, Acanthe Developpement

3 Descriptive statistics and our empirical strategy

Our empirical analysis of the effects of the introduction of the Tobin tax in France follows three steps. In the first we look at each stock separately and test the null of no significant difference in transaction volumes (section 3.1), intraday volatility (section 3.2) and bid-ask spread (section 3.3) before and after the adoption of the tax for treated stocks. After that we evaluate the aggregate effect of the tax in two ways: i) difference in difference tests which look at changes on "treatment" and "control" stocks; ii) econometric panel estimates with specifications based on a two-dimensional regression discontinuity design approach.

In Table 1 we provide summary statistics for the main variables considered in our analysis. The bid-ask spread is calculated as the daily closing bid-ask spread in the limit order book. The amortized spread is equal to bid-ask spread times the ratio of daily shares traded to shares outstanding. For stock price volatility we use the intraday high-low price dispersion measure calculated as the difference between the daily highest price and the daily lowest price scaled by the daily mean price. This is a less volume sensitive measure of volatility than the generally used standard deviation.

Descriptive findings tell us that average market capitalisation in the sample is around 10.3m euros and gets larger after the event. The average bid-ask spread which proxies liquidity is .007 euros and remains remarkably stable in terms of sample average before and after the event date. The amortized bid-ask spread is however on average lower after the event (4.954 against 5.442). Intraday volatility (measured as the difference between the highest and the lowest daily price divided by the average day price) also falls after the event from 3 to 2.3 basis points.

3.0.1 Methodology for the tests on volumes, bid-ask spread and intraday volatility

In order to evaluate the impact of the introduction of the French FTT, we test whether trading volumes, intraday volatility, the bid-ask spread and the amortized bid-ask spread of each of the 109 taxed (above 1m market cap) stocks have changed after the 1st August 2012 . More specifically, we want to test whether taxed stock means before and after the event are different by using a bootstrap difference-in-mean hypothesis testing approach designed by [10]. Hence, by referring to the trading volumes n days before and m days after the event respectively as to z and y, we calculate:

$$t(x) = \frac{\bar{z} - \bar{y}}{\sqrt{\frac{\bar{\sigma}_1^2}{n} + \frac{\bar{\sigma}_2^2}{m}}}$$

where $\bar{\sigma}_1^2 = \frac{\sum_1^n (z_i - \bar{z})^2}{(n-1)}$ and $\bar{\sigma}_2^2 = \frac{\sum_1^m (y_i - \bar{y})^2}{(m-1)}$. The key idea is to re-center the two sub-samples on the mean $\bar{x}$ of the combined sample in order to obtain the bootstrap distribution of the test statistic $t(x)$ by

[10] See Efron (1982) and Efron and Tibshirani (1993).

resampling each sub-sample separately. Thus, the sub-samples are rescaled so to have $\tilde{z}_i = z_i - \bar{z} + \bar{x}$, $i = 1, 2, ..., n$, and $\tilde{y}_i = y_i - \bar{y} + \bar{x}$, $i = 1, 2, ..., m$.

By resampling with replacement from $\tilde{\mathbf{z}}_i$ $\tilde{\mathbf{y}}_i$, it is possible to form a number of $\mathbf{B}$ bootstrap datasets $(\mathbf{z}^{*b}, \mathbf{y}^{*b})$, and finally evaluate

$$t(\mathbf{x}^{*b}) = \frac{\bar{z}^{*b} - \bar{y}^{*b}}{\sqrt{\frac{\bar{\sigma}_1^{2*b}}{n} + \frac{\bar{\sigma}_2^{2*b}}{m}}}$$

with $b = 1, 2, ..., B$. In this way, we can deal with eventual data non-normality and do not need to assume equal variance between the ex ante (z) and ex-post (y) trading periods. While the assumption of independently distributed observations is plausible with randomly sampled cross-sectional datasets allowing to resample observations from the dataset to generate bootstrap samples, the same assumption is too restrictive for time-series data. In our case, treating z_i and y_i as a completely random observations in a bootstrap resampling scheme is inappropriate, because the resulting bootstrap sample would not reflect the fact that z_i depends on z_{i-1}. As a consequence, in order to take into account time dependence of observations and their potential autocorrelation, we bootstrap the sample with block resampling[11]. In addition to it, in order to reduce arbitrariness in sample length, we pose $n = m$ and implement the equal mean test for 15, 30, 45, 60 and 90 trading days before and after the event.

With the above outlined procedure, it is possible to recover the entire empirical bootstrap distribution of the $t(\cdot)$ statistic and then assess its achieved significance level under the null hypothesis that the two means are equal. Following Efron and Tibshirani (1993), we compute and define the $Prob_{H_0}\{t(x^*) \geq t(x)\}$ as the approximated ASL_{boot}:

$$\widehat{ASL}_{boot} = \#\{t(\mathbf{x}^{*b}) \geq t_{obs}\}/B$$

where $t_{obs} = t(x)$ the observed value of the statistic.

3.0.2 Findings on individual tests on volumes

With the above explained methodology we first look at the ratio between average daily transaction volumes for all the affected stocks before and after the tax introduction. The considered intervals are 15, 30, 45, 60 and 90 days. Our null hypothesis of no impact of the FTT introduction implies that average daily transaction volumes are not significantly different when measured at equal intervals before and after the introduction of the tax. We test the hypothesis separately on each of the 109 stocks subject to the tax with the approach indicated in the previous section. We report the synthesis of our results in Table 2, while detailed findings for each taxed stock in Table A1 in the Appendix. Table 2 shows that

[11] Notice that the bootstrap hypothesis test, differently from the permutation test, does not require any special symmetry and can therefore be applied under more general assumptions. In our two samples, for instance, the bootstrap can test equal means and equal variances, or equal means with possibly unequal variances.

the null is rejected at 1 percent significance level for 44.3 percent of stocks in the 15-day interval and for a very close share in the 45-day interval. After 90 days the share however rises to around 72 percent, while only 19 percent of the taxed stocks do not reject the null.[12] Overall, the introduction of the tax seems to have generated a significant reduction in transaction volumes for most of the treated stocks after this first empirical check.

3.0.3 Individual tests on Liquidity (bid-ask spread)

The impact of the tax introduction on liquidity appears to be moderate and slightly decreasing as far as the distance from the event date grows. The null is rejected in both sides only for a small share of taxed stocks (Tables 2 and A2 in the Appendix). In the 15-day interval the null is not rejected for around 74 percent of the taxed stocks. In the 90-day interval the share remains at 73 percent while rejection at 1 percent occurs only for around 8 percent of the taxed stocks. The situation is not much different when we consider the amortized bid-ask where the share of stocks not rejecting the null moves from around 75 percent to 61 percent when we move from the shortest (15-day) to the longest (90-day) considered interval.

3.0.4 Individual tests on Intraday Volatility

The effect of the Tobin tax on intraday volatility becomes stronger when we consider larger time intervals around the event date. In the 15-day interval the null of no difference before and after the tax is rejected at 1 percent only by 9 percent of the taxed stocks (Tables 2 and A3 in the Appendix). The share rises to 30 percent in the 30-day interval and up to 73 percent in the 90-day interval. In almost all of these cases the direction of the change indicates a reduction in the difference between the maximum and the minimum price (see Table A3 in the Appendix).[13] It is reasonable to believe that this effect is driven by the reduction of high frequency trading whose cost is definitely risen by the tax (even though the tax affects only transactions which are not closed in the same day).

3.0.5 Difference-in-difference findings

In the empirical analysis presented above we focused only on taxed stocks. Since we cannot exclude concurring effects on non-taxed stocks in the same period (ie. due to common summer trading effects) we perform difference in difference tests where we consider non taxed stocks as our control sample.

By performing this test we find that transaction volumes in the treatment group fall by 22 percent (in the 90 day interval) but fall as well, even though in a smaller proportion, in the control group (Table

[12] Note that in the 90 day interval only 10 stocks register a slight increase in transaction volumes while all other stocks experience a reduction (see Table A1).

[13] Note that in the 90-day interval only 6 stocks register a mild increase in intraday volatility, while for all other stocks the change is in the other direction.

3). Since the treatment group fall is larger, the difference between treatment and control group narrows significantly, thereby determining a significant difference in difference in volumes.

The liquidity effect is interesting. Liquidity measured in terms of bid-ask spread is unchanged in the treatment group, while it improves by slightly less than 17 percent in the control group. The significant difference in difference is therefore generated by a change entirely determined in the control group. When we weight the bid-ask with firm size (amortized bid-ask) we register however a slight improvement in liquidity in both the treatment and control group (9 percent and 4 percent respectively) and an insignificant difference in difference effect in the 90-day interval. The short term effect is however far different, with a 27 percent liquidity reduction in the treatment group in the 15-day interval which is completely reabsorbed already in the 30 and 45-day intervals (5 percent reduction and 5 percent improvement respectively). Seasonal factors may have played a role in these differences between the 15 and the 90-day interval and the econometric analysis which follows will control for them.

Results on intraday volatility are more clear cut. If we exclude results on the 15-day interval all other intervals provide evidence going in the same direction. The treatment group registers a fall between 17 (30-day interval) and 23 percent (90-day interval), while intraday volatility in the control group is unchanged. As a consequence the difference in difference test is strongly significant. As already mentioned, evidence from our difference in difference tests still has some limits since it is subject to two potential biases. First, participation to the two (treatment and control) groups is non random and discriminated on the base of size by definition. Second, substitution effects of trading from taxed to non taxed stocks may contribute to alter the "experiment". Third, the concurring August effect, especially on shorter time intervals, may affect our results as well. This is the reason why our final check consists in panel econometric estimates where we build our specification following a "quasi" two-dimensional regression discontinuity design.

4 Econometric robustness check

In order to devise our econometric check we consider that, as is well known, in impact studies the first best is never achievable since the comparison of the treatment effect with the counterfactual (in our case what has happened to the taxed stocks with the tax/treatment and what would have happened to the same stocks without the tax/treatment) cannot be performed. The second best is a randomized experiment with a control group having characteristics not significantly different from those of the treatment group since placement in one of the two groups is randomized ex ante. We may therefore wonder whether our exercise corresponds or not to a difference-in-difference test in a randomized experiment (that is, a test on the significance of the difference between changes in the treatment and in the control group after the introduction of the treatment). Unfortunately this is not our case since our placement is non random,

that is, the French legislator did not randomly created two (treatment and control) groups with similar characteristics ex ante, but de facto discriminated between large capitalization and small capitalization stocks (the second being exempt from the tax).

Hence, our parametric and non parametric tests on the significance of changes for stocks paying the tax (presented and commented in sections 3.1-3.4) may correspond to a difference-in-difference test in randomized experiments only under the maintained assumption that the difference effect for a hypothetical control group is nil in the same period. However we cannot be sure of it since there may be for instance some simultaneity effects related to the timing of tax adoption (such as a seasonal August effect) which can be indistinguishable from the effect of tax introduction. Imagine that the eventually observed reduction in volumes of taxed stocks is in reality due to a physiological reduction of transactions due to summer holiday effect. The presence of a control group of non taxed stocks with characteristics similar to those of the treated stocks and a similar negative effect in volumes would have signaled the problem. The diff-in-diff tests discussed in section 3.4 and presented in Table 3 can overcome the problem of the simultaneous timing effect (and indeed show that the reduction in transaction volumes occurs also for the control group of non taxed stocks) but not that of the size effect (the control sample is significantly different from the treatment sample in terms of size). The best way to tackle jointly the two potential (size and month-of-the-year) effects simultaneous to the introduction of the tax is the adoption of an approach similar to a two-dimensional regression discontinuity design (Lee and Lemieux, 2010). The introduction of the FTT has some of the properties required for a discontinuity design. A first one is that the two cutoffs cannot be arbitrarily manipulated and are fixed by law (and we observe no price manipulations with stocks moving across the threshold around the introduction date to avoid the tax). However, in spite of these similarities with the standard regression discontinuity design some important caveats need to be taken into account. Differently from the standard approach which is cross-sectional, in our case observations are repeated in time and therefore definitely not independent from each other. In addition to it, market capitalization varies daily, while the forcing variable which is used to delimit treatment from control observations should be fixed or measured before the event. Note however that, even in our case, the capitalization value which applies for defining eligibility to the tax is that at 1st August 2012 and no stock after that has a market value capitalization which passes the threshold in any of the two directions. Furthermore, our size variables evolve smoothly in the target variables and the assumption that omitted variables also evolve smoothly without jumps around the two thresholds is reasonable.

Hence, even though several factors make our case quite different from a "local randomized treatment", the regression discontinuity approach remains a good benchmark to build a robustness check of our findings based on panel econometrics and gives us good suggestions with regard to the proper regressors to be used as controls in such estimate. In essence, by testing the sensitivity of our findings to restrictions

of the sample to observations closer to the two (time and size) thresholds, we may have an idea on whether the event introduces a sharp change among observations which are close to such thresholds on both sides.

More specifically, we may conveniently model the following four different model regimes in the (size, time, performance variable) three-dimensional space, thati is:

$$Y_{it} = i_1 + f_1|Size_{it} - c_{size}| + g_1|Day_{it} - c_{day}| + \varepsilon, \quad if \quad X_{it} < c_{size} \quad and \quad Day_{it} < c_{day}$$
$$Y_{it} = i_2 + f_2|Size_{it} - c_{size}| + g_2|Day_{it} - c_{day}| + \varepsilon, \quad if \quad X_{it} < c_{size} \quad and \quad Day_{it} > c_{day}$$
$$Y_{it} = i_3 + f_3|Size_{it} - c_{size}| + g_3|Day_{it} - c_{day}| + \varepsilon, \quad if \quad X_{it} > c_{size} \quad and \quad Day_{it} < c_{day}$$
$$Y_{it} = i_4 + f_4|Size_{it} - c_{size}| + g_4|Day_{it} - c_{day}| + \varepsilon, \quad if \quad X_{it} > c_{size} \quad and \quad Day_{it} > c_{day}$$

where Y is our target variable (daily transaction volumes, bid-ask, amortized bid-ask, intraday volatility), *Size* is stock market capitalisation, $c_{size} = 1bn$ euros and $c_{day} = 1st$ August. Based on this specification our approach therefore evaluates the impact of the event controlling for a function of the distance from the threshold of the "forcing" variable (market capitalization in our case) in which the cutoff is calculated. Our null hypothesis is $i_1 = i_2 = i_3 = i_4$ against the alternative of $i_4 \neq i_1 = i_2 = i_3$.

Given that calculation of the optimal bandwidth defining the interval of observations which are close to the two thresholds is not univocal in the literature, we prefer to perform our test by considering different intervals in order to evaluate the robustness of our results to changes in the bandwidth. If we start with the linearity assumption on the distance-from-cutoff function we get the following unrestricted model:

$$\begin{aligned} Y_{it} = {} & a_0 + a_1 * D + a_2(Size_{it} - c_{size}) + a_3 Di * (Size_{it} - c_{size}) + a_4 Di * T \\ & + a_5 D * T * (Size_{it} - c_{size}) + a_6 T + a_7 T * (Size_{it} - c_{size}) + a_8(Day_{it} - c_{day}) \\ & + a_9 Di * (Day_{it} - c_{day}) + a_{10} D * T * (Day_{it} - c_{day}) + a_{11} T * (Day_{it} - c_{day}) + \varepsilon \end{aligned}$$

where D is a (0/1) dummy with unit value when market capitalisation is above $1m$ and T is a (0/1) dummy taking value one when observations are after July the $31st$. We estimate the model by giving the following labels to our regressors.

$$\begin{aligned} Y_{it} = {} & a_0 + a_1 TDummy + a_2 SizeDist + a_3 TDummySizeDist + a_4 TDummyTreated + \\ & + a_5 TDummyTreatedSizeDist + a_6 Treated + a_7 TreatedSizeDist + a_8 DayDist + a_9 \\ & + TDummyDayDist + a_{10} TDummmyTreatedDayDist + a_{11} TreatedDayDist + \varepsilon \end{aligned} \tag{1}$$

Note as well that it is possible to retrieve original parameters from a-parameters by considering that $a_4 = i_4$, $a_1 = i_3 + i_4$, $a_6 = i_2 + i_4$, $a_2 = f_1 + f_2 + f_3 + f_4$, $a_3 = f_3 + f_4$, $a_5 = f_4$, $a_7 = f_2 + f_4$,

$a_8 = g_1 + g_2 + g_3 + g_4$, $a_9 = g_3 + g_4$, $a_{10} = g_4$, $a_{11} = g_2 + g_4$

Note as well that a convenient restriction may be that of considering the functions of distances from the two thresholds identical in the four areas of our two-dimensional space. This implies that $f_1 = f_2 = f_3 = f_4$ and $g_1 = g_2 = g_3 = g_4$, leading to a simplified specification where distance from threshold variables are not interacted with the dummies.

$$Y_{it} = a_0 + a_1 TDummy + a_2 SizeDist + a_4 TDummyTreated + a_5 TDummyTreatedSizeDist + \\ + a_6 Treated + a_8 DayDist + \varepsilon \quad (2)$$

We call this the restricted model.

As is well known, in regression discontinuity design it is common to control for more complex polynomial distance functions which weight differently observations according to their distance from the cutoffs. In the section which follows we will first illustrate results from the base specification described here and then move to a robustness check in which we will consider polynomial specifications up to the quartic level and variation in the bandwidth to check whether our findings are robust to these changes.

5 Results

We perform the regression discontinuity design under different specifications. Our benchmark is the specification (2) of the unrestricted model in the previous section with a bandwidth excluding top and bottom 10 percent stocks in terms of the dependent variable distribution. We then check the robustness of our findings from this estimate with more complex (quartic) polynomials, fixed effects and different bandwidth cut-offs.

In the benchmark specification with transaction volumes as dependent variable we find that the time dummy variable *TDummy* is negative and significant (Table 4). This identifies a post August negative effect (probably driven by a physiological summer effect), while the treatment dummy is positive but not significant per se. The interaction dummy between size and time *TDummyTreated* is negative but not significant. The direction of these three effects is consistent with what we found in previous tests. In Table 3 we in fact found that treated large size firms have higher volumes before and after the event, while both treated and control stocks register a significant reduction in volumes after the event. The insignificance of the *TDummyTreated* variable however tells us that, differently from our difference in difference results, there is not a significant difference in the reduction in volumes between treatment and control stocks after controlling for the distance from the two thresholds with the contiguity design approach. In essence this tells us that, if we isolate stocks which are closer to the size threshold, the difference in volumes traded after the event and around the event is not significant. Note however

that part of the effect of the event on transaction volumes is captured by the *TDummyTreatedSizeDist* variable which tells us that strong departures from the size threshold for treated stocks after the event are associated with a significant reduction in volumes when interacted with the two (size and time) dummies. This may still be considered an effect of the Tobin tax introduction which produces more consistent effects in terms of reduction of volumes for stocks which have higher capitalisation and are further from the threshold.

When looking at other variables the combination of the size distance effect and side distance interacted with size dummy effect (*SizeDist* and *TreatedSizeDist*) tells us that volumes get smaller(higher) when we depart from the size threshold from the left (right) side, which is again consistent with the positive effect of market capitalization on volumes.

The final interpretation of our findings is that the Tobin tax introduction produces a significant negative effect only when we consider longer distances from the size threshold but not when we consider small distances. This is consistent with the assumption that the effect is more marked on larger size and more heavily traded stocks.

Results from the unrestricted specification in the intraday volatility estimate document a significant negative effect of the *TDummyTreated* variable consistently with our previous findings in Tables 2 and 3 where the significant fall in intraday volatility for treated stocks was not accompanied by a parallel fall in "control" (non taxed stocks). The *TDummyTreatedSizeDist* variable is instead positive but the effect is much smaller in magnitude and negligible. The treatment variable (*Treated*) is positive and significant, consistently with the higher intraday volatility of large cap stocks. The post event dummy *TDummy* is positive and significant indicating an increase in volatility for both stocks.

When looking at other variables the combination of the size distance effect and side distance interacted with size dummy effects *Sizedist* and *TreatedSizedist* tells us that volatility get smaller(higher) when we depart from the size threshold from the left (right) side.

The bid-ask estimate of the unrestricted specification documents an insignificant effect of the *TDummyTreated* interaction dummy measuring the impact of the Tobin tax effect. However the *TDummyTreatedSizeDist* variable is positive and significant indicating a reduction in liquidity which is higher for more capitalized stocks. However, if we look at the amortized bid-ask spread our two main variables of interest (*TDummyTreated* and *TDummyTreatedSizedist*) are never significant neither in the pooled nor in the fixed effect estimates.

The synthesis of results on robustness checks on our base specification is provided in Tables 5 and 6. In these tables we use a quartic polynomial specification for our distance from the threshold (size and day) variables taking as a reference the best practice in the literature (see Oreopulos, 2006 among others). Other checks consist on varying the bandwidth by cutting symmetrically at the $10th$, $20th$, $30th$ percentiles the two variables (and up to $40th$ percentile for the day variable), controlling or not for fixed

effects and by introducing or not interaction effects between the two thresholds and our dummies (which implies reference to the unrestricted model in (1) or to the restricted model in (2)). Last but not least, we estimate our specification with time varying or time invariant size variables.

The findings we obtain are extremely robust when we consider the impact of the tax introduction on intraday volatility (the effect being always negative and significant with remarkably similar magnitudes across all different specifications), while slightly less so when we consider transaction volumes. We give three interpretations for this last finding. First, August effects may determine a reduction in volumes for both treatment and control stocks making part of the effect on treatment stocks not depending on the tax introduction. Second, trading complementarities among stocks listed in the same stock exchange may transfer part of the effect of the tax on treatment stocks on control stocks as well. Third, the effect of the reduction in transaction volumes generated by the tax grows in stock market capitalization. Hence, it is stronger for stocks at a higher distance from the size threshold and this explains why the observed effect is weaker when we use the regression discontinuity design approach which compares observations of treatment and control stocks around the thresholds. Note that, in terms of policy conclusions, the second and third interpretation (differently from the first) imply that the effect of the tax introduction on volumes is relevant in spite of the mixed findings presented in Tables 5 and 6.

Overall, econometric results confirm and qualify our previous findings. The Tobin tax introduction produces a significant effect in terms of traded volumes reduction. The effect however is significant not in terms of intercept but in terms of slope, that is, the reduction of volumes becomes more significant as far as the stock capitalization gets larger and more distant from the size threshold. The Tobin tax introduction also generates a significant reduction in intraday volatility, while an insignificant reduction in liquidity (especially when we consider the amortized bid-ask spread).

6 Conclusions

Our empirical work provides an original approach to the evaluation of the effects of the adoption of the FTT in France. Differently from most of the previous literature we do not focus our analysis on market indexes but look at the impact of the tax introduction on liquidity, intraday volatility and volumes of individual stocks. In addition to it, we perform difference in difference tests in order to evaluate the aggregate effect on taxed stocks compared to what occurs on non taxed stocks in the same period in order to control for spurious concurring factors. Last, by exploiting the two (time and size) cut-offs implicitly created by the tax introduction (which applies from August the 1st, 2012 on to stocks above 1b capitalization) we provide an econometric robustness check with an approach similar to a two-dimensional regression discontinuity design in order to make our impact analysis akin to a randomized experiment and in order to control for potential size and month-of-the-year effects.

Our empirical findings clearly document that the two significant findings arising from the introduction of the French FTT are the reduction in transaction volumes and intraday volatility. The findings are significant in parametric tests on individual stocks, in aggregate difference in difference tests and confirmed when we control for simultaneous potential size and month-of-the-year effects with our econometric panel estimates. Our two results are not at odds with the hypothesis of noise traders' migration discussed in the introduction and considered as one of the potential outcomes of the introduction of an FTT in the literature. Beyond the literature, it is undisputable that a tax of this kind cuts returns of high frequency traders much more than those of buy-and-hold traders (even though high frequency trading need not to coincide with noise trading). If both high frequency and noise trading raise intraday volatility this justifies our findings.

We also document that the intraday volatility result appears however more robust to this final check. This is due to the fact that a sharp reduction in intraday volatility occurs only in the treatment, while not in the control sample after the event date. On the contrary, as shown in our difference in difference tests, the reduction in volumes after the event date occurs both in the treatment and in the control sample. The reason why should be further investigated but a likely explanation is a partial spillover effect which reduced volume also on non taxed stocks of the same market. From a normative point of view our findings therefore clearly document that what we should expect from the introduction of a FTT of the French style (see section 2) is a significant reduction in volumes and intraday volatility while an insignificant effect on liquidity.

Several caveats exist to the generalisation of our results. As clearly documented in the introduction and in the section describing French FTT characteristics there is not a standard unique FTT and the heterogeneity of results on the impact of its adoption in different countries and time periods is highly likely to depend on the different FTT characteristics (mainly related to class of exemptions, tax rates, etc.). It may be argued for instance that the documented absence of a negative liquidity effect may be due to the three exemptions of the French tax (market makers, small caps and intraday transactions) and that results might be different in case such exemption would not be in place. Hence it might be argued that a FTT of the French type reduces noise (or high frequency) trading avoiding negative effects on liquidity and the increase in volatility which may arise when market makers are also subject to the tax. Further research on events related to the introduction of different types of FTTs might allow to test this working hypothesis helping as well to evaluate whether our findings are sensitive to such crucial characteristics of the French tax or can be further generalised.

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Tables

Table 1 - Descriptive findings

	Transaction volumes	Market Capitalization	Bid-Ask Spread	Amortized Bid-Ask	Intraday Volatility
Whole Sample					
Mean	159.49	10.26	0.72	519.81	2.65
St.Dev.	476.31	15.4	4.59	3615.74	2.76
Min	0.0001	0.799	−5.37	−91224.11	0
Max	16900.81	98.96	64.96	326975.2	37.07
Pre-event					
Mean	179.24	9.84	0.74	544.23	3.00
St.Dev.	476.35	14.63	4.74	3012.12	2.79
Min	0.0001	0.799	−5.37	−91224.11	0
Max	13766.75	96.93	64.96	63430.56	37.07
Post-event					
Mean	139.72	10.68	0.71	495.36	2.31
St.Dev.	475.48	16.14	4.43	4132.52	2.67
Min	0.0001	0.92	0	0	0
Max	16900.81	98.95	56.67	326975.2	32.77

This table presents summary statistics for French stocks eligible to the FTT.
Market Capitalization: stock market capitalization (in billions of euros). Transaction volumes: daily transaction volumes (in 10,000 euros). Bid-ask spread: daily closing bid-ask spread in the limit order book (in basis points). Amortized bid-ask spread: bid-ask spread times the ratio of daily shares traded to shares outstanding. Intraday Volatility: difference between the daily highest price and the daily lowest price scaled by the daily mean price (in basis points).

Table 2 - Synthesis of bootstrap nonparametric tests on the impact of Tobin Tax introduction

Transaction volumes - % change (before-after)

Interval	Significant change*** (%)	Significant change** (%)	Significant change* (%)	Not signif. change (%)
15 days	41.51	17.92	7.55	33.02
30 days	49.06	14.15	11.32	25.47
45 days	48.11	14.15	10.38	24.53
60 days	57.55	12.26	8.49	21.70
90 days	71.70	8.49	0.94	18.87

Bid-Ask Spread - % change (before/after)

Interval	Significant change*** (%)	Significant change** (%)	Significant change* (%)	Not signif. change (%)
15 days	2.83	13.21	11.32	73.58
30 days	10.38	7.55	14.15	67.92
45 days	6.60	9.43	10.38	73.58
60 days	10.38	6.60	15.09	67.92
90 days	8.49	15.09	3.77	72.64

Amortized Bid-Ask - % change (before-after)

Interval	Significant change*** (%)	Significant change** (%)	Significant change* (%)	Not signif. change (%)
15 days	5.66	6.60	13.21	74.53
30 days	13.21	15.09	16.04	55.66
45 days	17.92	14.15	12.26	55.66
60 days	18.87	21.70	8.49	50.94
90 days	22.64	8.49	4.72	60.52

Intraday Volatility - % change (before/after)

Interval	Significant change*** (%)	Significant change** (%)	Significant change* (%)	Not signif. change (%)
15 days	9.43	14.15	12.26	64.15
30 days	30.19	16.04	5.66	48.11
45 days	43.40	16.98	6.60	33.02
60 days	53.77	15.09	7.55	23.58
90 days	72.64	5.66	2.83	18.87

Total Transaction Volumes (> 1bn)

		k = 15	**k = 30**	**k = 45**	**k = 60**	**k = 90**
Mean Volumes before		190.85	180.02	190.68	188.64	189.98
Mean Volumes after		134.42	133.02	144.42	147.60	147.97
Ratio		1.42^{***}	1.35^{***}	1.32^{***}	1.28^{***}	1.28^{***}
	t-statistic	3.40	4.11	4.91	5.19	6.93

Table 3 - Diff-in-Diff tests on the impact of Tobin Tax introduction

	BASE LINE			FOLLOW UP			
15-day interval	**Control**	**Treated**	**Diff. (BL)**	**Control**	**Treated**	**Diff. (FU)**	**Diff in diff**
Transaction volumes	0.065	1.8	1.736^{***}	0.059	1.272	1.213^{***}	-0.522^{***}
std.error	(0.006)	(0.152)	(0.152)	(0.004)	(0.093)	(0.093)	(0.178)
Bid-ask	0.018	0.006	-0.013^{***}	0.017	0.006	-0.011^{***}	0.002
std.error	(0.00)	(0.001)	(0.001)	(0.00)	(0.001)	(0.001)	(0.001)
Amort. Bid-ask	19.986	5.089	-14.897^{***}	19.014	6.474	-12.54^{***}	2.357
std.error	(2.596)	(0.471)	(2.638)	(2.398)	(2.169)	(3.234)	(4.173)
Intraday Volatility	0.004	0.03	0.026^{***}	0.003	0.024	0.021^{***}	-0.005^{***}
std.error	(0.00)	(0.001)	(0.001)	(0.00)	(0.001)	(0.001)	(0.001)
30-day interval							
Transaction volumes	0.081	1.698	1.617^{***}	0.06	1.257	1.196^{***}	-0.421^{***}
std.error	(0.01)	(0.089)	(0.09)	(0.003)	(0.063)	(0.063)	(0.11)
Bid-ask	0.018	0.006	-0.012^{***}	0.017	0.006	-0.01^{***}	0.002^{*}
std.error	(0.00)	(0.001)	(0.001)	(0.00)	(0.001)	(0.001)	(0.001)
Amort. Bid-ask	20.452	5.079	-15.373^{***}	20.808	5.341	-15.467^{***}	-0.094
std.error	(1.653)	(0.360)	(1.691)	(1.877)	(1.111)	(2.181)	(2.76)
Intraday Volatility	0.004	0.029	0.025^{***}	0.004	0.024	0.02^{***}	-0.005^{***}
std.error	(0.00)	(0.001)	(0.001)	(0.00)	(0.001)	(0.001)	(0.001)
45-day interval							
Transaction volumes	0.077	1.799	1.727^{***}	0.06	1.364	1.304^{***}	-0.418^{***}
std.error	(0.007)	(0.071)	(0.071)	(0.002)	(0.054)	(0.054)	(0.089)
Bid-ask	0.019	0.007	-0.012^{***}	0.016	0.007	-0.009^{***}	0.003^{***}
std.error	(0.00)	(0.001)	(0.001)	(0.00)	(0.001)	(0.001)	(0.001)
Amort. Bid-ask	20.147	5.382	-14.765^{***}	19.633	5.119	-14.514^{***}	0.25
std.error	(1.202)	(0.305)	(1.24)	(1.296)	(0.754)	(1.499)	(1.946)
Intraday Volatility	0.004	0.03	0.026^{***}	0.004	0.024	0.02^{***}	-0.005^{***}
std.error	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.001)

(Table 3 follows)

	BASE LINE			FOLLOW UP			
60-day interval	**Control**	**Treated**	**Diff. (BL)**	**Control**	**Treated**	**Diff. (FU)**	**Diff in diff**
Transaction volumes	0.75	1.78	1.705^{***}	0.058	1.394	1.336^{***}	-0.369^{***}
std.error	(0.005)	(0.059)	(0.06)	(0.002)	(0.052)	(0.052)	(0.079)
Bid-ask	0.019	0.007	-0.012^{***}	0.016	0.007	-0.009^{***}	0.003^{***}
std.error	(0.00)	(0.001)	(0.001)	(0.00)	(0.001)	(0.001)	(0.001)
Amort. Bid-ask	21.32	5.623	-15.697^{***}	19.493	5.203	-14.29^{***}	1.407
std.error	(1.293)	(0.298)	(1.327)	(1.067)	(0.609)	(1.228)	(1.808)
Intraday Volatility	0.004	0.03	0.026^{***}	0.004	0.024	0.02^{***}	-0.006^{***}
std.error	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.001)
90-day interval							
Transaction volumes	0.085	1.792	1.707^{***}	0.067	1.397	1.33^{***}	-0.378^{***}
std.error	(0.004)	(0.049)	(0.049)	(0.003)	(0.049)	(0.049)	(0.069)
Bid-ask	0.018	0.007	-0.011^{***}	0.015	0.007	-0.008^{***}	0.003^{***}
std.error	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.001)
Amort. Bid-ask	22.509	5.442	-17.066^{***}	21.553	4.954	-16.6^{***}	0.467
std.error	(1.046)	(0.308)	(1.091)	(0.857)	(0.423)	(0.956)	(1.45)
Intraday Volatility	0.004	0.03	0.026^{***}	0.004	0.023	0.019^{***}	-0.006^{***}
std.error	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

Table 4 - Econometric robustness check on the impact of Tobin tax introduction: Baseline estimates

Bandwith 10%-90-%	**Transaction volumes**	**Bid-Ask spread**	**Amortized Bid-Ask**	**Intraday Volatility**
TDummy	-11.8^{**}	0.423^{***}	139.7	0.176^{***}
	(5.38)	(0.0737)	(331.2)	(0.0297)
Treated	3.12	2.14^{***}	2285^{***}	3.01^{***}
	(19.4)	(0.169)	(272.5)	(0.0621)
TDummyTreated	20.1	-0.367	95.8	-0.683^{***}
	(22.8)	(0.237)	(474.4)	(0.0783)
DayDist	-0.003	0.0002	4.20^{*}	0.0009^{***}
	(0.0167)	(0.0004)	(2.46)	(0.0002)
SizeDist	-0.0504^{***}	0.002^{***}	3.33^{***}	0.0009^{***}
	(0.005)	(0.00007)	(0.362)	(0.00003)
TDummySizeDist	0.0121^{**}	-0.0006^{***}	-0.241	-0.0002^{***}
	(0.005)	(0.00009)	(0.436)	(0.0004)
TreatedSizeDist	0.0673^{***}	-0.003^{***}	-3.49^{***}	-0.0009^{***}
	(0.005)	(0.00008)	(0.363)	(0.00003)
TreatedDayDist	-0.018	0.003	-1.8	0.005^{***}
	(0.373)	(0.003)	(4.21)	(0.0012)
TDummyTreatedSizeDist	-0.0378^{***}	0.0006^{***}	0.228	0.02^{***}
	(0.007)	(0.0001)	(0.439)	(0.00004)
TDummyTreatedDayDist	0.582	0.00388	-5.05	-0.0046^{***}
	(0.474)	(0.0047)	(7.39)	(0.0015)
Materials	-4.41^{***}	0.0292	-55.8	0.317^{***}
	(1.41)	(0.0331)	(109.3)	(0.0329)
Communications	95.6^{***}	0.203^{***}	684.7^{***}	-0.029^{*}
	(9.98)	(0.0258)	(210.3)	(0.0155)
Diversified	-64.1^{***}	-0.285^{***}	-295.0^{***}	-0.113^{**}
	(3.48)	(0.0386)	(86.1)	(0.0539)
Energy	-29.8^{***}	-0.00383^{***}	-368.7^{***}	0.553^{***}
	(3.00)	(0.0396)	(63.4)	(0.0462)
Financial	-0.223	0.240^{***}	-528.6^{***}	-2.04^{***}
	(3.61)	(0.0315)	(77.1)	(0.0191)
Industrial	-19.4^{***}	0.913^{***}	-231.5^{**}	0.0215
	(1.24)	(0.0807)	(97.5)	(0.0159)
Tech	1.27	-0.109^{***}	-359.5^{***}	-0.122^{***}
	(1.03)	(0.0222)	(90.4)	(0.0117)
Utilities	86.5^{***}	-0.564^{***}	-320.5^{***}	0.179^{**}
	(10.1)	(0.0464)	(75.6)	(0.07)
Day	-0.009	-0.003^{***}	-0.878	-0.0012^{***}
	(0.0167)	(0.0004)	(2.46)	(0.0002)
Constant	43.0^{***}	-0.398^{***}	-1090^{***}	-0.342^{***}
	(4.26)	(0.0596)	(280.6)	(0.0239)
R^2	0.054	0.043	0.012	0.502

Table 5.1 - Econometric robustness check on the impact of Tobin tax introduction: Sensitivity analysis

Bandwidth	**20%-80%**	**30%-70%**	**40%-60% day 30%-70% size**	**20%-30%**	**30%-70%**	**40%-60% (day) 30%-70% (size)**
	TDummy-Treated	***TDummy-Treated***	***TDummy-Treated***	***TDummy-Treated***	***TDummy-Treated***	***TDummy-Treated***
dependent variable						
Transaction volumes	-21.8	-29.5***	-28.6**	-21.8***	-29.6***	-28.6***
	(14.9)	(9.04)	(13.5)	(8.29)	(6.74)	(6.45)
Bid-Ask	0.022	0.358**	0.441	0.023	0.357***	0.439***
	(0.19)	(0.155)	(0.276)	(0.106)	(0.0913)	(0.136)
Amort. Bid-Ask	-129.9	-196.0**	-52.2	-130.3	-196.3	-51.7
	(189.4)	(96.7)	(113.6)	(178.8)	(297.2)	(276.1)
Intraday volatility	-0.718***	-0.721***	-0.632***	-0.717***	-0.72***	-0.632***
	(0.045)	(0.146)	(0.23)	(0.0271)	(0.0501)	(0.072)
Size Polynomial	*quartic*	*quartic*	*quartic*	*quartic*	*quartic*	*quartic*
Time Polynomial	*quartic*	*quartic*	*quartic*	*quartic*	*quartic*	*quartic*
Industry Control	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*
Fixed Effects	*no*	*no*	*no*	*yes*	*yes*	*yes*

Table 5.2 - Econometric robustness check on the impact of Tobin tax introduction: Sensitivity analysis

Bandwidth	**20%-30%**		**30%-70%**		**40%-60% day 30%-70% size**	
	TDummy-Treated	*TDummyTreated-SizeDist*	*TDummy-Treated*	*TDummyTreated-SizeDist*	*TDummy-Treated*	*TDummyTreated-SizeDist*
dependent variable						
Transaction volumes	11.6	-0.0899***	-8.61	0.0833	10.2	-0.0961
	(36.8)	(0.0138)	(18.0)	(0.108)	(32.5)	(0.178)
Bid-Ask	-0.528	0.0008 * **	1.12*	−0.0035 * *	0.941	−0.0004
	(0.395)	(0.0002)	(0.603)	(0.0014)	(1.04)	(0.002)
Amort. Bid-Ask	992.5	-0.662*	1278***	-4.05***	5735	-2.47**
	(675.8)	(0.365)	(370.9)	(1.09)	(385.6)	(1.19)
Price Stock vol.	-0.442***	−0.0001 * *	1.87***	−0.001	2.39***	0.0003
	(0.119)	(0.00006)	(0.326)	(0.0017)	(0.521)	(0.003)
Size Polynomial	*quartic*	*quartic*	*quartic*	*quartic*	*quartic*	*quartic*
Time Polynomial	*quartic*	*quartic*	*quartic*	*quartic*	*quartic*	*quartic*
Industry Control	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*
Fixed Effects	*no*	*no*	*no*	*no*	*no*	*no*

Table 5.3 - Econometric robustness check on the impact of Tobin tax introduction: Sensitivity analysis

Bandwidth	**20%-30%**		**30%-70%**		**40%-60% day 30%-70% size**	
	TDummy-Treated	*TDummyTreated-SizeDist*	*TDummy-Treated*	*TDummyTreated-SizeDist*	*TDummy-Treated*	*TDummyTreated-SizeDist*
dependent variable						
Volume	11.3	-0.0898***	-9.07	0.0869	10	-0.0962
	(24.9)	(0.0224)	(19.5)	(0.0801)	(18.4)	(0.0790)
Bid-Ask	-0.531*	0.0008 * **	1.11***	−0.0035 * **	0.941**	−0.0004
	(0.322)	(0.0003)	(0.64)	(0.0011)	(0.388)	(0.0017)
Amort. Bid-Ask	982.8*	-0.651	1269	-3.91	577	-2.55
	(542.5)	(0.488)	(859.6)	(3.54)	(790.6)	(3.39)
Price Stock vol.	-0.442***	−0.0001*	-0.356**	−0.001*	-1.02***	0.0003
	(0.082)	(0.00007)	(0.145)	(0.0006)	(0.206)	(0.0009)
Size Polynomial	*quartic*	*quartic*	*quartic*	*quartic*	*quartic*	*quartic*
Time Polynomial	*quartic*	*quartic*	*quartic*	*quartic*	*quartic*	*quartic*
Industry Control	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*
Fixed Effects	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*

Appendix

Table A1 - Transaction Volumes Bootstrap

	k = 15 days			k = 30 days			k = 45 days			k = 60 days			k = 90 days		
Name	**Before**	**After**	**Ratio**	**Before**	**After**	**Ratio**	**Before**	**After**	**Ratio**	**Before**	**After**	**Ratio**	**Before**	**After**	**Ratio**
Accor	74.99	52.09	0.69***	74.95	65.10	0.87	98.27	67.44	0.69**	103.30	68.80	0.67***	117.02	64.88	0.55***
Adp	5.95	3.60	0.60***	7.20	4.50	0.63***	8.94	5.43	0.61***	10.11	5.24	0.52***	10.06	5.57	0.55***
Air France-Klm	436.95	265.17	0.61	454.00	285.79	0.63***	455.00	347.82	0.76**	411.35	374.39	0.91	402.65	424.54	1.05
Air Liquide	94.43	68.17	0.72**	96.83	70.75	0.73***	100.70	75.07	0.75***	102.50	75.33	0.73***	100.36	71.68	0.71***
Alcatel-Lucent	4797.61	2700.0	0.56*	3552.24	2427.48	0.68*	3347.15	2427.19	0.73**	3254.13	2967.07	0.91	3386.62	3483.48	1.03
Alstom	170.9	100.31	0.59***	167.57	101.83	0.61***	175.58	125.78	0.72**	179.18	130.36	0.73**	190.61	135.41	0.71***
Altarea	0.13	0.13	1.01	0.11	0.10	0.91	0.11	0.13	1.14	0.10	0.11	1.13	0.14	0.11	0.75
Autoroutes Paris	0.05	0.04	0.94	0.05	0.05	0.91	0.05	0.06	1.05	0.05	0.06	1.11	0.07	0.12	1.71
Areva	12.72	5.48	0.43*	10.70	4.55	0.43**	10.19	5.67	0.56***	11.55	5.63	0.49***	11.70	5.38	0.46***
Arkema	41.85	34.72	0.83	49.06	31.07	0.63**	52.01	31.77	0.61**	50.33	31.79	0.63***	45.24	29.68	0.66***
Atos	38.33	18.46	0.48**	34.96	18.80	0.54***	36.62	23.80	0.65***	33.42	25.56	0.76***	34.80	25.49	0.73***
Axa	1103.48	1000.03	0.91	1089.58	923.55	0.85	1205.58	923.92	0.77***	1188.84	896.34	0.75***	1192.35	808.77	0.68***
Societe Bic.	6.43	5.36	0.83	7.98	4.88	0.61***	8.28	6.34	0.77**	8.90	6.52	0.73**	9.22	6.59	0.71***
Biomerieux	4.04	1.31	0.32*	3.30	1.63	0.49**	4.06	2.31	0.57**	4.03	2.32	0.58***	4.36	2.36	0.54***
Bnp Paribas	679.32	581.48	0.86	722.61	553.36	0.77**	833.69	573.90	0.69***	833.42	533.33	0.64***	838.57	492.10	0.59***
Bollore	1.41	0.23	0.16	0.95	0.34	0.36	0.75	0.40	0.53	0.63	0.38	0.60	0.65	0.45	0.70
Bourbon	11.01	6.48	0.59**	11.74	8.48	0.72**	12.10	8.33	0.69***	12.70	7.99	0.63***	13.70	8.75	0.64***
Bouygues	121.70	68.98	0.57***	127.63	103.20	0.81	137.23	106.72	0.78*	138.68	107.56	0.78**	144.60	116.39	0.80**
Bureau Veritas	15.93	8.06	0.51***	17.18	10.30	0.60***	20.50	12.61	0.62***	18.87	12.82	0.68***	18.97	13.07	0.69***
Cap Gemini	122.54	65.90	0.54***	102.64	68.12	0.66***	114.11	76.24	0.67***	108.95	76.14	0.70***	107.36	76.95	0.72***
Carrefour	473.95	288.87	0.61**	396.63	307.92	0.78*	405.42	301.29	0.74***	386.07	318.35	0.82*	366.30	304.62	0.83**
Casino G.P.	29.74	14.62	0.49***	30.08	15.49	0.51***	32.42	18.72	0.58***	32.49	21.39	0.66***	31.97	21.45	0.67***
Cfao	11.66	3.17	0.27*	11.00	12.70	1.15	9.58	12.69	1.33	8.78	21.78	2.48**	8.75	18.92	2.16***
Cie G.G.	125.40	63.33	0.50***	122.75	60.80	0.50***	135.84	86.93	0.64***	133.64	91.78	0.69***	131.63	89.41	0.68***
Christian Dior	8.84	5.80	0.66***	8.58	5.52	0.64***	9.69	7.94	0.82**	9.44	8.56	0.91	11.28	9.36	0.83**
Cic	0.02	0.05	2.26**	0.02	0.08	3.23	0.03	0.10	3.32***	0.03	0.09	2.97***	0.04	0.07	1.78***
Ciments Francais	0.54	0.32	0.59***	0.64	0.33	0.51***	0.80	0.41	0.51***	1.02	0.51	0.50***	1.04	0.50	0.48***
Cnp Assurances	61.66	35.05	0.57***	68.49	32.73	0.48***	65.16	33.24	0.51***	59.94	31.23	0.52***	55.29	30.36	0.55***
Colas	0.03	0.05	1.68*	0.03	0.05	1.55*	0.03	0.04	1.39	0.04	0.08	1.78*	0.09	0.07	0.78
Credit Agricole	1476.38	1577.61	1.07	1675.97	1730.35	1.03	1894.29	1906.25	1.01	1972.77	1796.60	0.91	1918.42	1538.70	0.80***
Danone	208.64	157.39	0.75*	236.16	158.29	0.67***	242.83	175.90	0.72**	239.84	181.26	0.76**	238.05	179.88	0.76***
Dassault Aviation	0.00	0.00	0.90	0.01	0.00	0.77	0.01	0.00	0.53***	0.01	0.00	0.56***	0.01	0.01	0.65**
Dassault Systemes	24.30	14.46	0.59***	28.50	16.07	0.56*	29.72	18.77	0.63***	31.27	17.69	0.57***	32.35	17.93	0.55***
Edenred	35.18	15.95	0.45***	38.95	19.94	0.51***	51.07	22.28	0.44**	49.20	23.14	0.47**	49.91	24.43	0.49***
Edf	216.47	136.87	0.63**	208.23	147.72	0.71***	240.61	140.82	0.59**	231.88	130.63	0.56***	246.87	147.99	0.60***
Eiffage	19.18	8.27	0.43***	19.63	13.29	0.68**	26.17	20.74	0.79	29.76	18.08	0.61**	31.82	16.61	0.52***
Eramet	2.65	2.32	0.87	2.66	2.34	0.88	3.35	2.30	0.69***	4.18	2.19	0.52***	4.74	1.96	0.41***
Essilor Int.	69.13	51.73	0.75**	69.64	58.49	0.84*	90.77	59.15	0.65	83.80	58.39	0.70	71.25	54.57	0.77
Euler Hermes	2.39	1.41	0.59	2.86	1.21	0.42**	3.17	1.54	0.49***	3.22	1.45	0.45***	3.06	1.66	0.54***
Eurazeo	6.41	3.69	0.57***	8.25	4.37	0.53***	9.21	5.38	0.58***	9.94	5.21	0.52***	11.15	4.65	0.42***
Eutelsat Comm.	43.85	29.31	0.67**	54.93	35.07	0.64***	68.86	36.33	0.53***	71.35	37.25	0.52***	63.86	39.97	0.63***

(Appendix 1 follows)

Faurecia	63.04	30.49	0.48***	63.82	30.58	0.48***	63.17	33.98	0.54***	61.57	35.09	0.57***	68.50	35.81	0.52***
Financ.de L'Odet	0.06	0.02	0.39	0.07	0.14	1.84	0.10	0.10	0.96	0.09	0.09	1.02	0.08	0.08	1.03
Fdl	0.00	0.01	1.98	0.01	0.01	0.96	0.01	0.01	1.23	0.01	0.01	1.37	0.01	0.01	0.98
Fonciere des Regions	7.98	4.58	0.57***	8.54	4.87	0.57***	9.03	6.09	0.67***	9.35	6.81	0.73***	9.89	6.07	0.61***
Fonciere Lyonnaise	0.37	0.11	0.31	0.25	0.18	0.73*	0.26	0.13	0.50*	0.20	0.25	1.25	0.14	0.24	1.75
France Telecom	1037.19	708.49	0.68***	969.14	803.67	0.83*	1161.30	956.53	0.82*	1128.28	937.58	0.83**	1084.69	929.12	0.86**
Fromageries Bel.	0.01	0.01	0.90	0.01	0.01	0.63	0.01	0.01	1.04	0.01	0.02	2.54	0.01	0.02	2.19
Gdf Suez	474.34	442.98	0.93	538.93	432.47	0.80*	547.05	502.92	0.92	538.59	477.58	0.89*	548.06	474.17	0.87***
Gecina	4.96	2.27	0.46***	6.02	2.70	0.45***	5.87	4.21	0.72	5.95	4.40	0.74	6.91	6.33	0.92
Groupe Eurotunnel	90.67	63.51	0.70	92.43	65.62	0.71*	90.90	77.54	0.85	100.78	80.08	0.79*	100.56	80.84	0.80**
Havas	51.67	23.22	0.45**	64.09	29.65	0.46***	61.91	31.92	0.52***	70.70	33.37	0.47***	79.87	32.90	0.41***
Hermes Int.	4.13	3.46	0.84	3.94	3.12	0.79*	4.39	3.52	0.80	4.14	3.39	0.82	4.43	3.21	0.73***
Icade	8.94	4.20	0.47***	9.59	5.22	0.54***	9.38	5.29	0.56***	9.10	4.84	0.53***	8.83	4.49	0.51***
Iliad	10.35	6.12	0.59***	11.36	9.29	0.82	13.17	9.81	0.75***	13.60	9.88	0.73***	13.39	10.26	0.77***
Imerys	6.13	5.80	0.95	6.83	6.18	0.91	7.26	6.83	0.94	8.82	6.76	0.77**	10.25	6.18	0.60***
Ingenico	17.18	15.79	0.92	16.00	15.60	0.97	15.83	16.21	1.02	15.99	16.77	1.05	16.35	16.73	1.02
Ipsen	5.03	1.60	0.32**	6.89	3.21	0.47**	9.49	3.68	0.39**	8.80	3.46	0.39**	8.93	3.70	0.41***
Jc Decaux	18.95	20.33	1.07	15.04	18.09	1.20	17.90	18.69	1.04	19.62	17.74	0.90**	18.64	17.81	0.96
Klepierre	19.21	14.08	0.73**	21.80	16.12	0.74***	28.63	18.36	0.64***	31.04	17.42	0.56***	33.53	17.52	0.52***
Lafarge	127.31	76.00	0.60***	124.51	75.99	0.61***	139.37	89.57	0.64***	134.25	89.34	0.67***	145.77	89.02	0.61***
Lagardere	35.69	24.19	0.68***	39.48	25.27	0.64***	43.07	33.17	0.77**	46.62	32.11	0.69***	48.15	29.91	0.62***
Legrand	84.51	93.17	1.10	81.58	81.13	0.99	97.98	88.72	0.91	95.25	84.80	0.89	96.64	77.41	0.80***
L'Oreal	84.04	54.88	0.65**	80.91	69.31	0.86*	84.16	73.80	0.88*	83.19	72.58	0.87**	94.29	67.15	0.71***
LVMH	105.56	76.66	0.73**	94.41	72.55	0.77**	100.50	87.15	0.87*	98.78	87.20	0.88*	104.49	82.41	0.79***
Maurel et Prom	45.81	24.55	0.54**	43.22	27.56	0.64***	58.57	26.70	0.46*	56.93	25.05	0.44***	52.77	33.26	0.63***
Mercialys	8.72	4.84	0.55***	8.32	5.10	0.61***	8.78	6.62	0.75*	8.82	6.86	0.78**	14.10	8.46	0.60***
M6	23.71	12.92	0.54***	25.65	11.76	0.46***	26.09	14.04	0.54***	28.99	13.92	0.48***	27.91	13.68	0.49***
Michelin (CGDE)	104.20	69.00	0.66**	94.71	68.87	0.73***	101.67	78.74	0.77***	100.06	81.57	0.82***	100.07	75.71	0.76***
Natixis	489.81	415.67	0.85	552.18	415.55	0.75**	609.25	494.36	0.81**	618.17	473.40	0.77***	657.39	453.35	0.69***
Neopost	14.66	7.17	0.49***	14.86	9.08	0.61**	19.20	10.21	0.53	19.46	9.42	0.48***	18.65	8.85	0.47***
Nexans	27.69	15.57	0.56**	28.08	17.85	0.64***	28.02	18.95	0.68***	31.24	19.58	0.63***	30.08	18.81	0.63***
Orpea	10.10	3.75	0.37***	8.38	4.03	0.48***	7.56	4.62	0.61***	7.16	5.23	0.73***	7.68	5.30	0.69***
Pernod-Ricard	63.48	38.58	0.61***	63.05	44.94	0.71***	70.55	50.52	0.72***	67.60	52.71	0.78***	67.41	52.00	0.77***
Peugeot	1041.57	380.66	0.37***	865.52	409.74	0.47***	783.24	495.86	0.63***	696.79	478.84	0.69***	653.20	487.52	0.75***
Ppr	46.51	22.09	0.47**	40.60	21.20	0.52***	41.04	25.72	0.63***	38.49	29.43	0.76***	44.09	28.17	0.64***
Publicis Groupe	99.76	62.37	0.63**	96.45	64.79	0.67***	96.31	76.73	0.80**	92.31	71.22	0.77***	89.07	65.98	0.74***
Rallye	5.14	3.57	0.69*	5.68	3.60	0.63**	6.36	4.33	0.68***	5.88	4.83	0.82*	5.82	4.76	0.82**
Remy Cointreau	9.09	5.74	0.63***	8.17	5.16	0.63***	11.97	6.13	0.51	11.64	7.25	0.62	10.92	7.73	0.71
Renault	210.06	122.83	0.58***	202.13	123.11	0.61***	210.24	133.18	0.63***	210.69	141.66	0.67***	207.45	142.13	0.69***
Rexel	57.01	33.97	0.60***	55.86	34.08	0.61***	79.75	36.39	0.46	83.13	33.01	0.40*	82.33	37.05	0.45***
Rubis	5.51	3.86	0.70*	5.49	4.35	0.79	5.03	4.58	0.91	4.76	4.35	0.91	4.98	4.57	0.92
Safran	120.63	64.93	0.54***	116.69	72.12	0.62***	153.51	78.76	0.51***	144.45	85.59	0.59***	142.85	79.35	0.56***
Comp.de S.Gobain	304.62	203.28	0.67	248.65	196.57	0.79	292.10	211.24	0.72***	279.93	205.42	0.73***	278.84	203.80	0.73***

(Appendix 1 follows)

Sanofi	327.76	285.84	0.87	309.49	278.95	0.90	340.40	276.45	0.81^{**}	368.45	266.36	0.72^{***}	345.52	258.26	0.75^{***}
Scor	38.24	33.04	0.86	40.31	33.37	0.83^{**}	42.80	36.24	0.85^{*}	53.41	33.70	0.63^{***}	55.56	33.42	0.60^{***}
Schneider Electric	183.06	170.97	0.93	185.15	156.23	0.84^{*}	222.97	172.87	0.78^{***}	230.73	165.64	0.72^{***}	223.81	156.44	0.70^{***}
Seb	9.75	3.39	0.35^{***}	8.95	3.80	0.42^{***}	9.69	4.36	0.45^{***}	10.77	4.70	0.44^{***}	11.22	5.43	0.48^{***}
Societe Generale	754.66	682.94	0.90	802.06	678.18	0.85	847.96	675.17	0.80	831.35	649.28	0.78^{***}	870.00	579.14	0.67^{***}
Sodexo	26.12	14.33	0.55^{***}	30.52	16.37	0.54^{***}	34.99	23.37	0.67^{***}	33.05	23.87	0.72^{***}	31.24	24.33	0.78^{***}
Somfy	0.02	0.03	1.19	0.02	0.03	1.20	0.02	0.02	0.82	0.09	0.02	0.19	0.10	0.02	0.22
Suez Env.	165.04	116.41	0.71^{***}	206.97	113.99	0.55^{***}	210.37	135.84	0.65^{***}	207.47	135.34	0.65^{***}	183.47	135.07	0.74^{***}
Technip	54.90	31.08	0.57^{***}	55.94	31.75	0.57^{***}	58.51	35.34	0.60^{***}	60.78	37.28	0.61^{***}	60.69	36.74	0.61^{***}
Thales	21.00	15.14	0.72^{***}	23.90	14.74	0.62^{***}	26.25	16.06	0.61^{**}	29.57	16.12	0.55^{***}	31.12	15.50	0.50^{***}
Total	623.63	455.61	0.73^{***}	601.06	451.83	0.75^{***}	665.44	497.60	0.75^{***}	654.52	480.01	0.73^{***}	705.80	463.25	0.66^{***}
Unibail-Rodamco	36.33	30.11	0.83^{*}	34.75	29.56	0.85	37.37	31.93	0.85^{*}	36.48	33.46	0.92	39.67	32.08	0.81^{**}
Valeo	46.73	32.69	0.70^{***}	57.64	30.98	0.54^{*}	55.17	34.88	0.63^{**}	53.10	39.33	0.74^{***}	52.91	39.51	0.75^{***}
Vallourec	96.34	53.19	0.55^{**}	110.77	55.67	0.50^{***}	118.73	64.24	0.54^{***}	132.54	64.43	0.49^{***}	116.86	69.89	0.60^{***}
Veolia Env	382.22	413.74	1.08	411.86	336.36	0.82	415.84	330.89	0.80^{*}	415.62	346.25	0.83^{**}	406.01	370.27	0.91
Vicat	2.18	6.15	2.83	1.91	4.13	2.16	1.85	3.29	1.78	1.96	3.03	1.54	1.91	2.51	1.32
Vilmorin & Cie	0.64	0.68	1.06	0.63	0.56	0.89	0.57	0.62	1.10	0.58	0.57	0.98	0.54	0.49	0.91
Vinci	242.04	170.04	0.70^{***}	246.66	159.80	0.65^{***}	253.46	182.69	0.72^{***}	260.64	179.26	0.69^{***}	250.58	175.16	0.70^{***}
Virbac	0.59	0.24	0.41^{***}	0.53	0.23	0.42^{***}	0.51	0.38	0.76	0.48	0.36	0.74^{*}	0.51	0.39	0.76^{***}
Vivendi	545.43	346.52	0.64^{***}	599.31	363.49	0.61^{***}	629.97	380.53	0.60^{***}	626.21	395.08	0.63^{***}	682.27	402.90	0.59^{***}
Wendel	11.33	6.06	0.53^{***}	13.01	6.62	0.51^{***}	14.53	7.35	0.51^{***}	15.23	7.71	0.51^{***}	17.92	7.56	0.42^{***}
Zodiac Aerospace	15.45	10.08	0.65^{***}	14.30	10.15	0.71^{***}	21.03	14.35	0.68	19.86	13.57	0.68	19.66	13.16	0.67^{*}

Table A2 - Bid-Ask Spread Bootstrap

	k = 15 days			k = 30 days			k = 45 days			k = 60 days			k = 90 days		
Name	**Before**	**After**	**Ratio**	**Before**	**After**	**Ratio**	**Before**	**After**	**Ratio**	**Before**	**After**	**Ratio**	**Before**	**After**	**Ratio**
Accor	0.097	0.097	1	0.089	0.089	1	0.083	0.087	1.051	0.083	0.090	1.085	0.063	0.095	1.506
Adp	0.253	0.221	0.873	0.227	0.212	0.931	0.216	0.232	1.073	0.210	0.222	1.060	0.206	0.216	1.050
Air France-Klm	0.159	0.102	0.639	0.125	0.090	0.721	0.112	0.099	0.879	0.118	0.097	0.823	0.048	0.103	2.130
Air Liquide	0.094	0.037	0.396*	0.068	0.044	0.651	0.062	0.057	0.920	0.037	0.059	1.590	0.051	0.055	1.071
Alcatel-Lucent	0.157	0.140	0.891	0.136	0.150	1.096	0.134	0.149	1.107	0.131	0.148	1.125	0.159	0.150	0.947
Alstom	0.048	0.070	1.470	0.059	0.067	1.137	0.058	0.058	1.004	0.058	0.063	1.094	0.025	0.067	2.713*
Altarea	1.007	0.829	0.823	1.133	0.724	0.639**	1.088	0.842	0.774*	1.047	0.795	0.759**	0.959	0.764	0.797**
Autoroutes Paris	0.814	1.619	1.989***	0.846	1.245	1.473***	0.952	1.298	1.364***	0.994	1.243	1.250**	1.033	1.189	1.151
Areva	0.616	0.302	0.491**	0.537	0.371	0.691*	0.519	0.393	0.757*	0.494	0.403	0.816*	0.439	0.393	0.894
Arkema	0.168	0.136	0.814	0.150	0.129	0.858	0.168	0.154	0.916	0.169	0.161	0.952	0.127	0.188	1.484**
Atos	0.110	0.184	1.680*	0.147	0.155	1.052	0.133	0.150	1.127	0.137	0.151	1.105	0.132	0.156	1.177
Axa	0.045	0.058	1.288	0.047	0.055	1.154	0.043	0.062	1.444**	0.040	0.062	1.553***	0.074	0.061	0.833
Societe Bic.	0.129	0.200	1.545*	0.139	0.217	1.557**	0.126	0.189	1.502**	0.138	0.192	1.396**	0.134	0.178	1.329**
Biomerieux	0.128	0.311	2.434***	0.155	0.279	1.800***	0.148	0.229	1.542***	0.141	0.211	1.494***	0.145	0.188	1.297**
Bnp Paribas	0.043	0.041	0.947	0.048	0.033	0.701*	0.048	0.043	0.890	0.046	0.042	0.929	0.020	0.041	2.040
Bollore	0.183	0.339	1.855**	0.263	0.345	1.311	0.280	0.330	1.176	0.339	0.338	0.996	0.430	0.382	0.889
Bourbon	0.222	0.346	1.557*	0.290	0.272	0.937	0.315	0.209	0.665**	0.296	0.177	0.596***	0.322	0.149	0.464***
Bouygues	0.092	0.074	0.803	0.128	0.067	0.523**	0.108	0.070	0.647**	0.103	0.074	0.717*	0.134	0.077	0.575
Bureau Veritas	0.140	0.146	1.039	0.129	0.138	1.065	0.128	0.145	1.128	0.130	0.138	1.066	0.150	0.145	0.968
Cap Gemini	0.072	0.094	1.305	0.087	0.092	1.058	0.083	0.086	1.046	0.080	0.094	1.181	0.091	0.081	0.894
Carrefour	0.067	0.097	1.450	0.059	0.097	1.634**	0.063	0.088	1.383*	0.063	0.080	1.276	0.051	0.074	1.448
Casino G.P.	0.106	0.059	0.556***	0.110	0.089	0.809***	0.099	0.083	0.836***	0.091	0.093	1.024	0.104	0.114	1.088***
Cfao	0.192	0.235	1.226	0.180	0.155	0.859	0.199	0.140	0.703	0.187	0.120	0.642***	0.210	0.136	0.648***
Cie G.G.	0.163	0.131	0.806	0.149	0.133	0.892	0.137	0.128	0.939	0.131	0.135	1.026	0.117	0.127	1.088
Christian Dior	0.147	0.163	1.111	0.157	0.167	1.058	0.196	0.195	0.999	0.223	0.193	0.864	0.213	0.166	0.777*
Cic	1.151	0.529	0.459*	1.037	0.491	0.473***	1.156	0.601	0.520***	1.120	0.623	0.557***	1.034	0.606	0.587***
Ciments Francais	0.570	1.082	1.897**	0.461	0.985	2.138***	0.500	0.993	1.985	0.491	0.879	1.789***	0.476	0.802	1.684***
Cnp Assurances	0.272	0.209	0.769	0.222	0.226	1.021	0.243	0.215	0.885	0.248	0.234	0.946	0.236	0.265	1.122
Colas	1.218	1.648	1.352	1.380	1.467	1.063	1.727	1.469	0.850	1.762	1.576	0.895	1.588	1.576	0.993
Credit Agricole	0.077	0.134	1.738**	0.085	0.096	1.131	0.084	0.080	0.954	0.080	0.077	0.960	0.102	0.070	0.688
Danone	0.048	0.041	0.852	0.048	0.054	1.125	0.046	0.060	1.300	0.047	0.056	1.184	0.020	0.056	2.799
Dassault Aviation	1.163	1.182	1.016	1.337	1.386	1.036	1.295	1.398	1.080	1.432	1.362	0.952	1.364	1.378	1.010
Dassault Systemes	0.053	0.060	1.118	0.055	0.075	1.361	0.080	0.064	0.808	0.074	0.071	0.961	0.071	0.076	1.076
Edenred	0.159	0.128	0.803	0.159	0.162	1.019	0.151	0.150	0.989	0.155	0.158	1.025	0.177	0.158	0.893
Edf	0.081	0.076	0.949	0.093	0.093	0.995	0.102	0.098	0.964	0.095	0.113	1.182	0.080	0.110	1.372**
Eiffage	0.158	0.174	1.100	0.175	0.161	0.920	0.233	0.165	0.708*	0.221	0.205	0.926	0.212	0.233	1.095
Eramet	0.141	0.269	1.903*	0.172	0.254	1.481*	0.194	0.238	1.226	0.194	0.235	1.214	0.177	0.236	1.332***
Essilor Int.	0.138	0.097	0.705	0.103	0.083	0.804	0.090	0.080	0.894	0.082	0.078	0.955	0.093	0.075	0.807
Euler Hermes	0.277	0.345	1.246	0.288	0.314	1.091	0.298	0.338	1.134	0.325	0.342	1.052	0.319	0.336	1.054
Eurazeo	0.130	0.238	1.835**	0.205	0.224	1.093	0.242	0.227	0.940	0.276	0.246	0.892	0.270	0.275	1.019
Eutelsat Comm.	0.143	0.185	1.295	0.124	0.171	1.377*	0.123	0.141	1.149	0.142	0.139	0.978	0.130	0.135	1.042

(Appendix 2 follows)

Faurecia	0.175	0.170	0.973	0.162	0.164	1.012	0.170	0.145	0.851	0.185	0.153	0.825	0.174	0.169	0.969
Financ.de L'Odet	1.411	0.879	0.623**	1.653	1.182	0.715**	1.487	1.231	0.828	1.421	1.315	0.925	1.379	1.340	0.972
Fdl	1.939	3.481	1.795	1.253	2.559	2.043	1.011	2.097	2.074	0.962	1.956	2.033	1.069	1.746	1.632
Fonciere des Regions	0.244	0.238	0.979	0.241	0.185	0.769	0.230	0.187	0.811	0.229	0.185	0.808*	0.223	0.211	0.942
Fonciere Lyonnaise	1.541	2.643	1.715**	1.856	2.899	1.562***	2.285	2.732	1.196	2.479	2.690	1.085	2.606	2.670	1.025
France Telecom	0.104	0.059	0.566*	0.099	0.071	0.723	0.083	0.063	0.759*	0.077	0.065	0.838	0.093	0.059	0.634
Fromageries Bel.	1.663	2.893	1.740**	2.088	2.567	1.229	1.947	2.162	1.111	1.974	1.862	0.943	2.198	1.695	0.771**
Gdf Suez	0.044	0.101	2.315*	0.050	0.091	1.811	0.048	0.082	1.710***	0.046	0.078	1.692***	0.038	0.072	1.889
Gecina	0.158	0.335	2.119**	0.182	0.308	1.692***	0.229	0.293	1.281*	0.220	0.276	1.255*	0.218	0.277	1.271**
Groupe Eurotunnel	0.181	0.262	1.452	0.192	0.213	1.110	0.177	0.207	1.172	0.177	0.192	1.088	0.181	0.190	1.052
Havas	0.319	0.407	1.276	0.365	0.328	0.897	0.535	0.298	0.556**	0.459	0.275	0.599*	0.395	0.259	0.655**
Hermes Int.	0.231	0.296	1.283	0.248	0.294	1.186	0.257	0.272	1.056	0.264	0.268	1.013	0.250	0.246	0.983
Icade	0.236	0.202	0.853	0.226	0.195	0.864	0.221	0.184	0.833	0.232	0.176	0.760**	0.227	0.195	0.857
Iliad	0.163	0.209	1.280	0.168	0.199	1.183	0.182	0.196	1.079	0.178	0.189	1.060	0.161	0.207	1.290**
Imerys	0.189	0.200	1.057	0.189	0.234	1.241	0.217	0.229	1.056	0.222	0.253	1.138	0.193	0.256	1.329**
Ingenico	0.123	0.195	1.585	0.129	0.192	1.495*	0.143	0.190	1.332*	0.160	0.204	1.275*	0.157	0.195	1.240**
Ipsen	0.195	0.358	1.834**	0.168	0.332	1.978***	0.232	0.306	1.321**	0.226	0.292	1.289**	0.226	0.320	1.415***
Jc Decaux	0.159	0.211	1.328	0.157	0.250	1.595**	0.211	0.261	1.236	0.173	0.276	1.591	0.183	0.275	1.502**
Klepierre	0.078	0.225	2.876**	0.110	0.169	1.540*	0.115	0.148	1.283	0.116	0.152	1.310*	0.125	0.142	1.135
Lafarge	0.068	0.073	1.073	0.072	0.080	1.109*	0.068	0.073	1.083	0.066	0.070	1.050	0.095	0.076	0.801
Lagardere	0.131	0.124	0.944	0.127	0.148	1.164	0.133	0.131	0.985	0.143	0.138	0.968	0.149	0.152	1.020
Legrande	0.173	0.155	0.898	0.163	0.149	0.917	0.145	0.127	0.880	0.138	0.138	0.996	0.109	0.128	1.172
L'Oreal	0.072	0.081	1.130	0.059	0.071	1.199	0.062	0.069	1.105	0.056	0.065	1.157	0.023	0.064	2.795
LVMH	0.069	0.077	1.107	0.091	0.068	0.744	0.089	0.065	0.731**	0.080	0.070	0.867	0.081	0.070	0.864
Maurel et Prom	0.167	0.244	1.464*	0.180	0.202	1.118	0.198	0.188	0.952	0.185	0.193	1.040	0.188	0.203	1.076
Mercialys	0.313	0.285	0.912	0.289	0.322	1.115	0.317	0.354	1.114	0.280	0.337	1.206	0.225	0.322	1.430**
M6	0.208	0.200	0.962	0.254	0.216	0.849	0.236	0.216	0.913	0.219	0.223	1.018	0.221	0.246	1.110
Michelin (CGDE)	0.094	0.075	0.804	0.080	0.073	0.907	0.074	0.081	1.096	0.067	0.088	1.309	0.086	0.091	1.053
Natixis	0.190	0.208	1.094	0.176	0.258	1.468*	0.177	0.229	1.297*	0.181	0.205	1.132	0.180	0.184	1.019
Neopost	0.106	0.130	1.225	0.122	0.127	1.038	0.157	0.126	0.803	0.164	0.145	0.881	0.185	0.152	0.824
Nexans	0.148	0.240	1.619**	0.157	0.238	1.511**	0.157	0.246	1.567***	0.154	0.252	1.638***	0.153	0.246	1.605***
Orpea	0.159	0.135	0.846	0.165	0.149	0.900	0.175	0.138	0.787	0.181	0.142	0.787*	0.181	0.139	0.768**
Pernod-Ricard	0.075	0.060	0.804	0.065	0.057	0.873	0.068	0.057	0.837	0.063	0.053	0.833	0.030	0.057	1.908
Peugeot	0.048	0.072	1.494	0.043	0.064	1.505*	0.043	0.066	1.549**	0.050	0.069	1.362*	−0.016	0.080	−4.935
Ppr	0.081	0.082	1.012	0.076	0.073	0.957	0.078	0.071	0.910	0.075	0.077	1.017	0.077	0.085	1.105
Publicis Groupe	0.086	0.070	0.817	0.092	0.060	0.652*	0.092	0.072	0.779	0.098	0.072	0.735*	0.073	0.090	1.226
Rallye	0.323	0.302	0.935	0.298	0.352	1.180	0.306	0.328	1.073	0.323	0.306	0.947	0.289	0.311	1.076
Remy Cointreau	0.163	0.208	1.275	0.182	0.202	1.114	0.195	0.189	0.968	0.142	0.205	1.446	0.144	0.220	1.521*
Renault	0.120	0.057	0.473*	0.089	0.057	0.640*	0.076	0.065	0.860	0.085	0.060	0.706**	−0.010	0.066	−6.705
Rexel	0.171	0.151	0.884	0.197	0.164	0.829	0.189	0.179	0.951	0.182	0.190	1.048	0.175	0.205	1.169*
Rubis	0.202	0.187	0.926	0.190	0.197	1.038	0.183	0.180	0.984	0.176	0.178	1.014	0.185	0.199	1.075
Safran	0.120	0.105	0.873	0.118	0.099	0.843	0.106	0.095	0.901	0.104	0.106	1.014**	0.098	0.098	0.999
Comp.de S.Gobain	0.046	0.076	1.635*	0.045	0.066	1.458*	0.040	0.057	1.443**	0.039	0.058	1.473	0.013	0.053	4.175

(Appendix 2 follows)

Sanofi	0.048	0.057	1.190	0.053	0.062	1.171	0.052	0.068	1.317	0.049	0.064	1.313	0.048	0.062	1.280
Scor	0.134	0.119	0.886	0.137	0.126	0.921	0.139	0.130	0.933	0.137	0.127	0.926	0.149	0.119	0.799
Schneider Electric	0.064	0.063	0.986	0.067	0.067	0.996	0.062	0.060	0.967	0.047	0.053	1.113	0.005	0.049	10.707
Seb	0.115	0.188	1.626	0.123	0.178	1.446*	0.139	0.154	1.106	0.139	0.184	1.319*	0.185	0.194	1.046
Societe General	0.054	0.066	1.222	0.057	0.063	1.095	0.061	0.054	0.879	0.061	0.059	0.974	0.050	0.054	1.084
Sodexo	0.125	0.206	1.649**	0.118	0.194	1.640***	0.134	0.175	1.301*	0.126	0.172	1.363***	0.103	0.151	1.471**
Somfy	1.497	0.962	0.643	1.145	1.273	1.111	1.997	1.455	0.729	2.457	1.395	0.568***	2.629	1.544	0.587***
Suez Env.	0.130	0.176	1.356	0.131	0.250	1.905**	0.152	0.203	1.336	0.159	0.182	1.144	0.150	0.158	1.055
Technip	0.057	0.076	1.324	0.090	0.077	0.856	0.091	0.081	0.881	0.089	0.085	0.957	0.070	0.089	1.278
Thales	0.194	0.251	1.297	0.212	0.220	1.041	0.190	0.206	1.081	0.177	0.210	1.188	0.176	0.197	1.115
Total	0.052	0.049	0.943	0.045	0.049	1.085	0.041	0.050	1.223	0.038	0.044	1.154	0.036	0.044	1.230
Unibail-Rodamco	0.105	0.076	0.722	0.090	0.074	0.819	0.088	0.083	0.938	0.086	0.079	0.911	0.055	0.078	1.410
Valeo	0.154	0.149	0.963	0.141	0.154	1.098	0.148	0.153	1.038	0.142	0.170	1.201	0.119	0.169	1.422
Vallourec	0.051	0.044	0.866	0.048	0.069	1.424	0.054	0.068	1.275	0.057	0.068	1.205	0.076	0.062	0.816
Veolia Env	0.059	0.070	1.191	0.068	0.063	0.923	0.063	0.069	1.095	0.060	0.082	1.365*	0.087	0.085	0.972
Vicat	30.994	32.282	1.042	36.861	36.964	1.003	41.579	38.924	0.936*	44.188	41.582	0.941*	47.930	45.104	0.941**
Vilmorin & Cie	0.575	0.464	0.808	0.520	0.447	0.859	0.551	0.436	0.793	0.554	0.453	0.817*	0.546	0.479	0.877
Vinci	0.047	0.055	1.176	0.054	0.046	0.852	0.049	0.048	0.981	0.049	0.046	0.940	0.083	0.046	0.558
Virbac	0.276	0.522	1.891**	0.324	0.526	1.623**	0.378	0.495	1.309**	0.384	0.479	1.248*	0.427	0.470	1.101
Vivendi	0.069	0.072	1.043	0.077	0.067	0.868	0.074	0.063	0.845	0.076	0.072	0.947	0.109	0.074	0.674
Wendel	0.159	0.157	0.983	0.143	0.160	1.120	0.127	0.146	1.146	0.133	0.134	1.002	0.117	0.132	1.127
Zodiac Aerospace	0.179	0.137	0.767	0.125	0.173	1.381*	0.123	0.163	1.325*	0.131	0.175	1.329*	0.139	0.164	1.180