Geography and Time Patterns of Trading in the European Exchanges

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This draft 16 April 2018

This work provides a comprehensive analysis of stock turnover occurring in the public equity markets of the three largest Eurozone member countries, benchmarked with the US and the UK. Exploiting the turnover behavior on holidays, we show that stock trading responds to a time varying investors' attention capacity constraint and to a clientele effect due to the investors' bias toward trading local stocks. Country specific cultural and institutional features emerge as critical factors in defining the type of investors with a tighter attention capacity constraint. In terms of the mapping of the cross-country turnover interconnectedness, both the relevance of the market and the geographical proximity between markets matter. Finally, the positive unconditional correlations between turnover and returns suggested by trading models based on investor heterogeneity and short sale constraints applies only to small caps, the opposite being true for large caps being their turnover more sensitive to price drops than to price increases.

EFM code
350 - Market Efficiency and Anomalies
630 - International Market Integration and Efficiency

We acknowledge the financial support of Baffi Carefin Research Centre at Bocconi University

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1. Introduction

Challenges to mainstreams asset pricing models based on the representative agent assumption have grown over the years. Labelled as "anomalies", they relates to either time or spatial effects. As for the former, an extensive literature grown in the last half a century made us aware of a smorgasbord of seasonal, holiday, turn of the year and of the month effects in the equity markets (Rossi, 2015). As for the latter, the investors' preference for holding domestic and even local stocks has proved to be stubbornly resilient to the growing integration of financial markets (De Santis and Gèrard, 2006).

Such evidence of anomalies with respect to traditional mainstream asset pricing models has triggered a more recent wave of research on the dynamics of stock turnover. The existence of a local preferred investment habitat implies the exposure of both stock holdings and turnover to local clientele effects. They are rooted either in behavioral motives, such as a false perception of lesser risks and superior information induced by familiarity (Bailey et al., 2008; Grinblatt and Keloharju, 2001; Huberman, 2001), or in a true information advantage due to social proximity in a context of slow moving news dissemination (Baik et al. 2010; Bodnaruk, 2009; Coval and Moskowitz, 2001).

Traditional representative agent asset pricing models are mute on trading volumes. In their setting, trading is contained originating from random liquidity shocks that force investors to rebalance their portfolios. Prices adjust to news flows to clear the market in terms of the stock of equity available in the economy, with minimal need for trading. Not even asymmetries in information across traders, as in Kyle (1985), provide a reason for the huge volume transacted in the case of rational strategic interaction among them with full update of their beliefs based on the counterparties' decision to trade. To account for the massive equity market turnover, as well as for its patterns through time, there is a need of trading models based on the investor heterogeneity assumption. If supplemented with binding short sale constraints and investors' overconfidence in their own information (Hong and Stein, 2003) these models also imply positive co-movement, in terms of "level" variables, between overtrading and high valuation, and, in terms of "flow" variables, between stock returns and turnover fluctuation.

Return anomalies may thus translate in concurrent trading anomalies, as in the case of the window dressing motivated trading in which asset managers engage at the turn of their reporting periods (Carhart et al., 2002) or of the combination of subdued returns and trading volumes during the summer months (Hong and Yu, 2009).

Representative agent asset pricing models assume common priors and perfect rationality, consisting of investors able to process correctly the full set of public information at all times. Heterogeneity of beliefs (Harris and Raviv, 1993; Kandel and Pearson, 1995) and slow moving information flows (Hong and Stein, 2007) allow to part from the first assumption; the presence of noise traders (Shleifer and Summers, 1990) or of constraints on the investors' attention capacity from the second one. In this case of bounded rationality, investors deal with the information overload by actively allocating their limited time and skills to different stocks (Hirshleifer and Teoh, 2003; Peng and Xiong, 2006). As each investor is keen on choosing the stocks more visible to him, clientele effects arise.

Moreover, the investors' attention capacity is not time invariant, since they must continuously allocate their cognitive effort to a larger set of activities than just monitoring and evaluate stocks. If a common factor of distraction emerges, the stock turnover should then drop as many investors lose focus on promptly adjusting their portfolios to the news flows (Jacobs and Weber, 2012).

This work provides an integrated comprehensive analysis of the stocks turnover, aiming to uncover systematic patterns in the geography and timing of the trading flows that occur in the public equity markets of the three largest Eurozone member countries: Germany, France and Italy. We also include in our analysis the markets of the UK and the US with two goals in mind: to benchmark the Eurozone results and to assess the relevance of the two main world financial centers (Yeandle, 2017) on the trading activity in the Eurozone. Since we investigate the dynamics of the daily rate of change of turnover, our approach is best suitable to deal with high frequency, rather than low frequency, trends in transaction volumes.

To the best of our knowledge, our work is the first to investigate the relevance and the directions of the cross-country sources of trading activity among some of the main stock markets worldwide. It

also provides novel evidence confirming that stock trading is affected by a time varying investors' attention capacity constraint and is exposed to a clientele effect originating from an investors' bias toward local the stocks that they feel to be nearest to them.

As for the mapping of the cross-country interconnectedness of the trading activity, both the relevance of each market and the degree of economic proximity between markets matter. When markets in the US (large, but distant market) or in the UK (smaller, but closer market) stop their trading due to national holidays ("closed market holidays"), turnover significantly falls in the three Eurozone markets. A meaningful impact on the US market turnover, instead, emerges only when both the UK and at least two of the three Eurozone markets remain closed at the same time due to a common holiday.

The drop in turnover due to foreign closed market holidays is also greater among large caps than among small caps in almost all cases, in line with the investor recognition hypothesis proposed by Merton (1987): large caps enjoy a comparative advantage over small caps in making themselves visible and understandable to foreign investors.

As for the investors limited span of attention, and consequent clientele effects, our results show that turnover falls significantly on national bank holidays during which domestic exchanges run regular operating hours ("open market holidays"). We use these dates to proxy for an increasing investor distraction. The turnover drops more in the country on holiday than in any other countries, but some significant cross-country effects emerge, especially in the Eurozone. Open market holidays in anyone of the three Eurozone markets negatively weights also on the turnover of the neighboring markets. A similar effect also arises in the case of open market holidays in the US, but not for those in the UK.

Similarly to Hong and Yu (2009), our evidence is not conclusive about which type of investor, retail or institutional, gets more distracted worldwide by the occurrence of open market holidays. Yet, a geographical pattern appears: in the exchanges of the Eurozone, the drop in turnover seems stronger for small stocks, i.e. those catering mostly to retail investors, while the opposite holds true in the US. The distraction is more pervasive among professionals in the US and retail investors in the Eurozone.

If we pair this with the UK turnover being immune from the open market holiday effect, it emerges the distinctive role of country specific factors in defining who, and how much, gets distracted by it.

In terms of turnover behavior around both closed and open market holidays, our evidence further supports the hypothesis that investors may get distracted and be slow in resuming their investment decisions, when returning to pay full attention to the stock market.

A final novel finding of our work concerns the sensitivity of stock turnover to stocks' rate of returns. Reviewing the evidence on this issue then available, Karpoff (1987) shows that turnover increases with both the absolute size of the stock rate of return and the rate of return itself, implying that trading volumes are more sensitive to price increase than to price drops. Our work reveals that, for small caps this is indeed the case, but the opposite holds true for large caps, with mixed evidence for mid caps. Compared to the more recent wave of trading models based on investor heterogeneity and short sale constraints, for large stocks our finding questions the hypothesis of unconditional positive correlation between turnover and rate of returns, while are more supportive of the claim of a negative skewness of returns conditional on high trading volume (Hong and Stein, 2003).

The second section outlines the research design; the third sets up the models and describes variables and dataset. Sections four to six show the results. Section 7 summarizes and concludes.

2. **Research design**

Our analysis targets the Eurozone equity market. We consider the volume transacted on the exchanges of its three main economies: Germany, France and Italy. Even though we focus on three Eurozone countries, our analysis provides a comprehensive picture of the stock trading occurring in the Eurozone. France, Germany and Italy account for about two thirds of both the total equity markets capitalization and turnover in the Eurozone (65% and 67% respectively) as shown in Table 1.

Since the start of the Eurozone, the stocks listed on these exchanges share a common monetary policy and currency; respond to converging fiscal policies and economic cycles; trade, clear, settle through increasingly integrated processes, under a regulatory framework designed by European Directives.

The pillars of such framework are common transparency requirements, a "best execution policy" rule and the principle of open access and interoperability of market infrastructures. In short, after the launch of the Eurozone, the equity trading venues in its member states are part of an integrated equity market, even though stocks continue to trade mainly on their respective national exchange. Since this integration process is recent, an investors' bias for trading stocks listed in their own country persists, making such stocks their preferred trading habitats. In a world of heterogeneous investors, trading flows are quintessential to the pricing process that clears the stock market. These preferred local trading habitats have thus considerable implications for the liquidity and the quality of the price discovery process observed on the national trading venues operating in the Eurozone.

The major sources of potential stock order flows are located outside the Eurozone, namely in the US and the UK, home of two of the most important financial centers worldwide. France, Germany and Italy account for only 6.4% of the total market cap worldwide, slightly more than the UK alone (4.2%), but much less than the United States (39.1%). Similar proportions hold in terms of the trading activity, as they account for only 3.5% of the worldwide turnover, whilst the UK alone weights 1.9% and the US 32.8%. The assets in the equity funds established in these three Eurozone countries amounts to 3.7% of the world total that compares with 3.9% for the UK and 62% for the US. While the Eurozone countries account for more than 10% of the international equity portfolio investment, the UK is around 7% and the US stands at 28.5%.

Including the US and the UK equity markets in our analysis is thus necessary to provide a broader scope to the investigation in the geography of trading in terms of both direction and relevance of order flows across economies. The extent to which these two sources contribute to the activity of the each Eurozone market is of great consequence for its liquidity and the composition of its heterogeneous population of investors. Yet, there has been not much effort paid so far to gain comprehension of the geography of trading flows, a limited exception being Casado et al. (2013), with their analysis of the turnover in European markets when the US stock exchanges are closed.

To start filling this gap, we leverage on the different national holiday schedules to build an experiment aimed to test some hypothesis on the geography and time pattern of order flows in these markets.

The Eurozone exchanges have long agreed to run a similar annual calendar of trading days, operating on all weekdays of the year, with only six common exceptions: Good Friday, Easter Monday, May 1st, Christmas, the Second Day of Christmas and New Year's Day, here dubbed "closed market holidays" (CMHs). Italy adds to this list of CMHs August 15th, as well as December 24th and 31st. Germany only adds the two days in December that for the French exchange are, instead, only worth shorter trading hours (morning trading only).

On other nationally recognized bank holidays, no matter their relevance for the country (as July 14th in France or January 6th in Italy), trading takes place according to standard business hours. Hence, we refer to them as open market holidays (OMHs).

A similar partition between CMHs and OMHs also applies to both the UK and the US market. Like France, they both run shorter trading hours in selected days of the years. These half-trading days are December 24th and 31st in the UK, the day before Independence day, Black Friday and Christmas Eve in the US.

OMHs are of interest to us since they provide a proxy for investor distraction, as Jacobs and Weber (2012) suggest for the bank holidays observed in same States, but not all, of the Federal Republic of Germany. We leverage on it to test three hypothesis on the pattern of stock trading.

We start with the claim that, distracted by the festivity, attention capacity constrained investors spend less effort on their stock market activities, limiting their order flow and causing a drop in turnover.

Secondly, should the preference for trading local stocks hold, turnover would drop more on the domestic trading venues than on foreign ones, even in the integrated Eurozone market. The relevance of the impact felt on foreign venues should depend positively both on their international visibility to the equity investors of the country on holiday and on the size of the security industry in such country.

The third testable hypothesis concerns an issue left unresolved in Hong and Yu (2009) about the type of investors that gets more distracted by outside engagements, in their case the summer activities:

retail or professional investors? Since the large cap clientele consists of a relatively higher share of professionals compared to the small cap clientele, detecting the type of stocks suffering the largest drop in turnover during a domestic OMH should answer the question.

Leveraging on the CMHs, we can appreciate the contribution provided by the US and UK to the Eurozone markets' turnover. The investor recognition hypothesis claims that the greater the visibility of a market, the larger the drop in turnover that it should suffer during a CMH in the US or in the UK. By segmenting the turnover by stock size, we can also test a variation of the recognition hypothesis: as large caps are more visible to foreign investors than small caps, the turnover should drop more for the former than for the latter during a CMH in a foreign country relevant enough to matter.

The investigation of the turnover dynamics on the day pre and post-holiday allows us to provide further insights through the assessment of competing hypothesis. If random liquidity shocks were the main driver of trading activity, as representative agent models imply, turnover should rise on the day after a CMH since investors catch up on their liquidity plans. A higher turnover may also be possible on the day preceding the CMH to the extent that investors retain some flexibility about the timing of their liquidity induced portfolio rebalancing and decide to anticipate, rather than delay, it. A similarly motivated surge, possibly of smaller intensity, in turnover would also occur around an OMH. Having a choice, investors would rather avoid trading on a day with a scarce liquidity.

If, on the other hand, investors get distracted preparing for the holiday, turnover should drop on the eve of it as well, in line with the Dellavigna and Pollet (2009) finding of a weaker investors' reaction to the earning announcements that are disclosed on Friday. Such drop may continue on the day after the holiday, if the investors need time to recover focus on the stock market. On the other hand, in investigating return behavior, Meneu and Pardo (2004) find no difference in the pre-holiday pattern of trading volumes.

We also perform a similar test of these competing hypotheses by analyzing the turnover behavior on Monday and Friday, since, weekends may closely resemble CMHs with respect to them.

As for the methodology, the standard approach in the literature used to detect abnormal trading on a specific date is based on the event study approach which compares the turnover on the relevant date to a normal turnover estimated over an appropriate sample period, close enough in time (Chae, 2005). Unfortunately, this approach is not suitable in our case due to the comprehensiveness of our experiment. Since we combine several event days for five different markets, there are just too many relevant dates for our investigation to build event free sample periods for each one of them.

Therefore, we cast our experiment in a linear regression setting, aimed to explain daily turnover changes as a function of dummy variables that identify all relevant dates, avoiding the problem of having to provide unreliable and logically inconsistent estimates of the normal trading volume.

Our approach requires great care in interpreting the estimates when dealing with dummies related to back-to-back trading days. If both parameters are significant and similar in size, in their sign reversal we must read a reliable indication of an abnormal volume on the first day, but not on the subsequent day. The significance of the latter would signal that trading reverts to a normal level, while its statistical insignificance would, instead, signify persistence of the previous day abnormal volume.

To detect clientele effects due to varying degrees of stock visibility to different types of investors, or arising from investors catering to different stocks, we run three separate models for each country concerning large, medium and small caps.

Our research accommodates additional dummy variables meant to capture abnormal daily change in turnover induced both by some exchanges running a shorter (morning only) daily trading session and by the window dressing motivated trading in which professional investment managers indulge at the turn of the reporting cycles (Lakonishok et al., 1991). We use three pairs of dummies to single out respectively the days with only a morning trading session and their subsequent days; the first and the last trading day of the year; the first and last trading days of the remaining months.

Lastly, our experiment must control for the relation existing between turnover and rate of returns. The turnover should positively correlate with the size of price changes, regardless of their sign since a more intense news flow amplifies the implications of the heterogeneity of investors' beliefs on the

trading volume. Theoretical models of trading with some combinations of heterogeneous investors, short sales constraints and investors' overconfidence in their own beliefs (Epps, 1975; Karpoff, 1986; Hong and Stein, 2003) deliver the hypothesis of a positive unconditional correlation between turnover and realized returns, as turnover is more sensitive to increases than to decreases in prices. Since, as reported by Karpoff (1987), empirical evidence appears consistent with these implications, we add both the positive and the negative contemporaneous daily return variables on the right hand side of our regression models. By doing so, we gain some empirical evidence on the opposite hypothesis that returns are more negatively skewed conditional on high trading volume, as delivered by a model with heterogeneous investors and endogenous revelation of private information (Hong and Stein, 2003). To allow for lagged effects, we add the same pair of return series, with a one-day lead.

3. The Model

In order to test the hypothesis concerning the dynamics of trading on the OMHs and CMHs, as well as to gain a comprehensive understanding of the trading pattern at the international level, we run linear regression models of the daily percentage changes in stock turnover over the period 17 Dec 2007 - 5 March 2015. For each of the countries considered, we run separate regressions for large, medium and small caps. Given the complexity and length of outputs, to facilitate the reading of the results and an immediate comparison among countries and classes of shares vis-à-vis each of the different research questions, we report the regression findings in an innovative format. We use multiple tables, each encompassing all 15 regressions, but displaying only the subset of the explanatory variables required for testing the hypothesis to which the table is related.

Equation 1 below summarizes the general model that we apply to each country and class of stock:

$$\Delta V_{t,k}^{i,j} = \alpha + \beta_1 OMH_t^j + \beta_2 CMH_t^j + \beta_3 OMH_{t-1}^j + \beta_4 OMH_{t+1}^j + \beta_5 CMH_{t-1}^j + \beta_6 CMH_{t+1}^j + \beta_7 Dmon + \beta_8 Dfri + \beta_9 Dtue + \beta_{10} Dthu + \beta_{11} DHDT_t^j + \beta_{12} DHDT_{t+1}^j + \beta_{13} DSY + \beta_{14} DEY + \beta_{15} DSM + \beta_{16} DEM + \beta_{17} R_t^{+j} + \beta_{18} R_t^{-j} + \beta_{19} R_{t+1}^{+j} + \beta_{20} R_{t+1}^{-j} + \varepsilon \quad (1)$$

Our dependent variable is the daily percentage change in turnover defined as $\Delta V_{t,k}^{i,j} = (T_t - T_{t-1}) / T_{t-1}$, with T being the turnover of stocks included in the headline equity market index on day *"t"*, in the country *"j"* (France, Germany, Italy, UK and US), for the stocks of class size *"k"* (large, mid, and small caps). Table 2 provides the complete list of such indices.

We partition our explanatory variables in four groups according to the content of the tables where we show the parameters estimates of our regressions and their related p-values.

The first group consists of series of dummies that identify the open (OMH^j) and the closed (CMH^j) market holidays in each country "j".

The OMH^j dummies can appear in all regressions, causing both a "same country" effect (i = j) and a "cross-country" effects (i ≠ j). There is very little, or no overlap, in OMHs among countries since, even in Europe, they identify festivities that do not deserve a common trading suspension precisely because they are country specific.

At the opposite, CMH^j dummies can only be part of the regression models explaining other countries' turnover (i ≠ j) and be responsible of cross-country effects. The massive overlap in the CMHs among Eurozone countries caused by their closely aligned yearly schedule of trading sessions forces us to use only three dummy variables to identify the CMHs (US, UK and Eurozone at large). We define as CMH for the Eurozone at large (CMH^{EZ}) any bank holiday with no trading session in the venues of at least two of its three member countries considered.

In the case of the US regressions, some slight changes to this general model are appropriate since the European domestic stock markets, if taken separately, are too small to bear any effect on the US market. Therefore, we drop their OMH dummies from the set of the explanatory variables, being they almost entirely idiosyncratic to each different country, and we structure the CMH dummies according to a pyramidal approach. By doing so, we aim to detect at which level of aggregation the European markets reach enough critical mass to affect significantly the turnover on the US trading venues. We set CMH^{EZ} to identify the holidays shared by at least two Eurozone countries, but not by the UK, and CMH^{UK} to perform the same function for the UK. Hence, we can introduce the $CMH^{UK\&EZ}$ dummy

to single out when exchanges are closed in both the UK and in at least two of three Eurozone countries.

Since OMH^j is a proxy for distraction for country *j* investors, its parameter should be negative if the investors' attention capacity is constrained. Under the local stock preferred habitat hypothesis, the OMH^j own country effect ($j = i$) should dominate the corresponding cross-country effects ($j \neq i$). Moreover, these should be weaker, the narrower the international reach of country *j* equity investors is, and the scarcer the international visibility of the country *i* stocks to country *j* investors is.

Instead, no a priori hypothesis is currently available in the literature, either theoretical or empirical, regarding the type of investors who gets distracted the most by OMHs. Should it be the professional (retail) component, in the regressions concerning the local market turnover (i=j), the OMH parameters should be significantly more relevant in the case of large (small) caps.

As for CMH^j, their parameters should be more negative and significant in the large cap regressions. Both the investor recognition hypothesis and to the higher propensity to invest abroad shown by professional over retail investors would weight in, combined with the first type being more focused on large caps and the second type on small caps.

The geographical pattern of the CMH^j estimated regressions' parameters shed light on the relevance and the direction of cross-country order flows. Keeping stock size constant, the CMH^j parameters should be stronger and more significant, the larger the size of the international equity investment of country "j"; the stronger the international appeal of the investable market "i"; the higher the visibility of the stock listed in country "i" to the investors of country "j". Because of the size factor, the US CMHs should affect the turnover in other markets the most. Because of the visibility factor, the opposite might hold true, should the effect of economic proximity dominate.

We introduce the second group of explanatory variables to check for competing hypothesis about potential pre and post-holiday trading anomalies. It consists of four series of dummies variables that identify, for each country "*i*", both the trading day preceding and the trading day following an open

(OMH^{j}_{t-1} and OMH^{j}_{t+1}) and a closed (CMH^{j}_{t-1} and CMH^{j}_{t+1}) market holiday. These variables only appears when $i = j$, that is in the regressions aimed to explain the same country stock turnover.

If trading occur in response to random liquidity shocks, the parameter for CMH^{j}_{t+1} should be positive, as investors catch up with their portfolio rebalancing plan after a full day of trading halt. If the news flows hit the market with a constant intensity through time, the expectation for a positive sign of the CMH^{j}_{t+1} parameter will be even more justified since investors would have to adjust their portfolio in response to the richer update of their information taking place over a 48 hour period.

To a lesser extent, similar implications applies to the OMH^{j}_{t+1} variables. Investors may prefer to avoid adjusting their portfolio to a liquidity shock on such days, being either distracted or afraid of trading risks due to a less liquid market. If they retain discretion about the timing of their response to liquidity shocks, they may bring forward their response and trade on the day preceding the holiday. The same fate might occur to the timing of the release of price sensitive news, generating extra turnover. Under either of these conditions, coefficients for OMH^{j}_{t-1} and, even more, CMH^{j}_{t-1} might then turn positive. If, on the other hand, investors start to lose their focus on the day preceding the holiday and need time to refocus on market activities once the festivity is over, both pre and post-holiday dummies should all show a negative parameter, signaling a drop in turnover.

We also include in this second group of explanatory variables four dummies that identify the day of the week effects, of which Monday and Friday are of primary importance, keeping Wednesday as our baseline case. There are two reasons for this. First, Monday and Friday occur around weekends, when trading venues are shut, mirroring the case of CMH_{t-1} and CMH_{t+1} just discussed, net of a few differences: their routine occurrence makes the risk of distraction less disruptive; the trading halt lasts a couple of days and occurs at the same time to all main exchanges worldwide. Second, in some countries, bank holidays tend to cluster on a specific day of the week, noticeably Monday in the US and the UK, forcing us to control for any potential day of the week effect.

The third group of the right hand-side variable consists of dummies that serve to control for additional calendar anomalies. We introduce the dummies $DHDT^{j}_{t}$ and $DHDT^{j}_{t+1}$ to identify respectively the

dates when the market of country "j" operates a shorter trading session (morning only) and their next day, when it resume its standard session. We expect the former to be negative and the latter positive. These variables do not appear in the regression for Germany and Italy, as their public equity markets have no shorter trading session.

We also introduce dummies to identify the first and the last trading day of the year (DSY and DEY), as well as the start and the end of trading in the remaining eleven months (DSM and DEM). Since they mark the turning point for different reporting cycles in the asset management industry, they may provide professional investors with an incentive for window dressing motivated trading, causing a surge in turnover. DSY and DEY do not appear in the regression for France and the UK since their markets run a morning only trading session on the last day of the year, making impossible to disentangle the turn of the year effect from the half trading day effect. We chose to give priority to the DHDT variable, dropping the end and the start of the year dummies from the model.

The fourth and last group of explanatory variables consists of the same day and of the previous day stock returns. We build the return series from the official closing prices of the total return indices shown in Table 2, as retrieved from Bloomberg. Karpoff's 1987 work motivates the inclusion of the same day returns, even though, in our case, the relation is between stocks returns and percentage change in the daily turnover level, rather than between returns and the turnover level.

Since turnover positively correlates with the contemporaneous returns size, no matter its sign, we introduce two explanatory variables, R_t^{+j} and R_t^{-j}. We define them as the absolute value of the daily return in country *j* whenever it happens to be respectively positive or negative, and zero otherwise. By doing so, we admit relations of different strength in the case of upward rather than downward price moves, as existing empirical and theoretical works suggest.

We also include the previous day returns, R_{t-1}^{+j} and R_{t-1}^{-j} to allow for a negative lagged effect, as the turnover might go back to normal level once the information content behind the previous day return has been incorporated in the market prices and the portfolio rebalancing decisions executed.

Spanning the period from 17 December 2007 to 5 March 2015, our analysis covers 1865 maximum potential trading days (equivalent to calendar days net of Saturdays, Sundays and closed market holidays common to all 5 countries here considered). As shown in Table 3, the precise number of observations varies among countries because of different CMH schedules. It also varies among classes of shares because we filter the data to avoid unreliable outliers by dropping observations with exceptional changes in daily trading volumes (greater than +200%; lower than -67%), whenever they occur in an otherwise ordinary date. Such outliers always appear in the small cap return series. Their number is trivial, ranging from a minimum of one for the UK and Germany, to a maximum of 14 for the US. They account for far less than 1% of the entire sample, whose number of useful observation thus ranges from 1796, in the case of the US small caps, to 1844, for French large caps.

We build the holiday schedules for each country and separate the OMHs from the CMHs starting from the stock exchanges' trading calendars and the calendars of national festivities retrieved from public sources (www.timeandate.com).

Table 4 details the OMH and CMH dummies. OMHs are more frequent in France, followed by Italy and Germany; the US and the UK have a higher frequency of CMH. The number of half day sessions is 18 in the US (Christmas Eve, the day preceding Independence Day, Black Friday), 14 in the UK and France (24^{th} and 31^{st} of December) and zero in Germany and Italy.

A pre-emptive analysis of the data reveals the presence of heteroscedasticity, but no problem of autocorrelation. Consequently, we apply a robust standard errors procedure in the estimation.

Table 5 shows the overall significance of the regression models. The R^2s of the regressions for the large caps ranges from 0.27 in the US to 0.60 in France. They are lower for mid caps (from 0.22 in Italy and US to 0.47 in France), and even more so for small caps (from 0.12 in Italy to 0.23 in Germany).

4. Holiday effects

If OMHs are a source of distraction for investors with attention capacity constraints, on those days trading volume should drop. Since retail investors enjoy a comparative advantage in catering to small caps compared to professional ones, a significantly greater fall in turnover for small caps rather than for large caps would signal that the retail side is suffering the holiday distraction more than the professional side. Moreover, if investors prefer trading locally listed stocks, the drop should especially hit the exchange of the country experiencing the OMH.

Table 6 provides supporting evidence on the first two accounts, with mixed results for the third one. It shows OMHs and CMHs dummies' estimates. Panels A, B and C refer respectively to large, mid and small caps.

Reading through the main diagonal of the part of each panel marked as "Open Market Holidays", the OMH induced drop in turnover on the domestic exchange is significant, mostly at less than the 1% significance level, for all stock size and in all countries, with the exception of the UK where is never significant. The estimated fall in turnover goes from -12.1% (Italian large caps) to -41.3% (German small caps), with huge differences across countries and stock sizes. Germany is where distraction is the highest for all stock sizes; the US is where it is generally the lowest, apart from the UK, where OMHs carry no weight on both domestic and foreign trading, refusing the distraction hypothesis.

Overall, the OMH effect matters more in the Eurozone than in Anglo-Saxon countries, making it a function of country specific work habits and cultural traditions, as well as of the different structure of the domestic financial systems.

The pattern of the turnover drops by stock size is also markedly different across countries, further supporting the relevance of country specific institutional factors and traditions. In Italy, it is much more sizable for small than for large caps (-32.6% vs. –12.1%), while the opposite holds true for the US (-9.8% vs. -14.6%). France and Germany sit in between, with a drop in turnover only slightly greater for small than for large caps: -25.2% vs. –16.7% in France; -41.3% vs. -35.1% in Germany. Hence, the US set itself apart in the sense of being the only country where distraction appear to prevail

among professional investors rather than among retail investors, as it seems to be the case in the three Eurozone markets, but especially in Italy.

The inspection of the off-diagonal terms reveals that OMHs often bite even across countries. These cross-countries effects are less relevant than the corresponding home country ones in terms of both their frequency of statistical significance and of their strength, as measured by their point estimates. When read by columns, the panels of Table 6 show a persistent strong preference for trading stocks listed on the domestic exchange even in the Eurozone, despite all trading venues in this area being now part of an integrated secondary equity market. Among them, the home country OMH effects are at least twice as large as the corresponding cross-country effects.

Figure 1, Panel A provides a graphical representation of the intensity and the direction of the cross border effects of the OMH for stocks of different size, when statistically significant. It let appreciate the relevance of the "visibility" factor, as suggested by the Merton recognition hypothesis.

Among Eurozone countries, the drop in turnover for large caps is not significant only in the case of French OMHs on the Italian market, arguably the one with the least international appeal. For small caps, instead, only the German venue suffers of a significant drop in turnover due to other Eurozone countries OMHs. Similarly, OMHs in the US cause the turnover to slow down for large caps in all Eurozone venue but only in Germany and Italy for mid caps and it loses any influence in the case of small caps. The size of the stock is thus also important for making it recognizable by foreign investors and attract them to trading.

There are two others factors that appear to matter in shaping the direction and the intensity of the cross-country OMH effect: the investors' total equity investment capacity in the country experiencing the holiday and the overall importance of the investable stock market. As for the former, please note that an OMH in Germany is associated to a drop in the turnover of large and medium stocks in France and Italy that is significantly larger than the drop in turnover observed among German large and medium caps when a similar OMH takes place in Italy and France. As for the latter, instead, please

note how OMHs in Italy and France significantly affect small cap trading in Germany, while there is no significant reverse effect.

The interplay between the visibility ensured by the stocks' size, the equity investment capacity of the investors experiencing the holiday and the attractiveness of the investable market is also at the core of the patterns of the CMH effects across countries, whose representation is in Figure 1, Panel B. CMHs in the US, the country with the greatest investment capacity, strongly depress turnover in all the other markets despite the different time zone and the reduced overlap of trading time. The drop is much greater for large and mid than for small caps, whose scarce visibility makes them less enthusing for US investors. The international appeal of the investable market also matter as trading falls the most for UK large caps (-23.6%), while there is no consequence for Italian small caps.

CMHs either in the UK market alone, or in any possible pair of the three Eurozone markets alone, are not enough to cause a significant drop in the US turnover. Only if in both the UK and the Eurozone markets shut down at the same time, the US trading significantly drops for stocks of any size.

A CMH in either the UK or the US makes turnover in large and mid caps drop similarly across the Eurozone markets. The higher recognition due to the geographical proximity and the common time zone offset the differential equity investment capacity between the UK and the US. For small stocks, instead, the turnover slowdown induced on the Eurozone markets by the UK CMHs is once again significant only in Germany, the most visible markets for investors outside the Eurozone.

Lastly, the effect of a CMH occurring in a single Eurozone market lack the strength to depress the trading activity on the UK market. However, when at least two out of the three Eurozone markets here considered close due to a common holiday, the UK markets turnover clearly drops (-20% for small caps and -30% for medium and large caps), showing a slowdown that exceeds the one detected the other way around.

5. Pre and post holiday effects and other calendar anomalies

The investigation of turnover behavior on the day before and after a holiday provides further insights in discriminating between competing hypotheses.

Should trading occur due to random liquidity shock, a surge in turnover should occur after a day with no trading as investors catch up with their optimizing portfolio rebalancing process. The greater flow of price sensitive news revealed to the market during the trading suspension period may magnify this effect. The surge in turnover may also occur on the eve of the holiday, should investors be able to choose between anticipating and postponing their portfolio adjustments to liquidity shocks.

Alternatively, the holiday distraction may spill over to the preceding and the following day, as investors lose their focus on the stock market in anticipation of the holiday or are slow to refocusing on it after the holiday. The same competing hypothesis apply to Fridays and Mondays.

Test results on these issues are in Table 7.

There is no evidence of systematic turnover anomalies on the eve of the OMHs in any market and for stocks of any size. Neither a distraction, nor a timing factor plays a systematic role or, if they do, they cancel each other out.

Instead, with the exception of France, the turnover in small caps significantly drops in all countries on the eve of a CMH: from –17.8% in the UK, to -6.6% in the US. A similar, even if not so striking, evidence holds true for medium and large caps: the sign of CMH_{t-1} dummies is always negative and statistically significant for Italy and the UK; it is also confirmed for large companies in France and medium caps in the US. Overall, in anticipation of CMHs, retail investors reduce their trading more than professionals do.

Friday turnover shows a pattern similar to the CMHs' eve, but with a muter tone and a noticeable exception. For small and medium caps, the sign of the dummy is negative for all countries but the US, even though only for Italy is always significant at the 1% level (in France only for medium caps). For large caps, Italy retains a significant negative sign, but Germany and the US show a noticeable turnover increase. The muter results for Friday are consistent with the idea that the routine makes

easier for investors to deal with the risk of distraction, being weekends a routine. As for the US and German large cap exceptions, it must be noticed that these countries are home to the most active exchange equity derivatives markets whose contracts always expire on Friday, inducing a spike in trading on the underlying as derivatives positions have to be settled.

As for the post-holiday, OMH_{t+1} often shows a significant positive sign, not to be interpreted, however, as evidence of an abnormal positive turnover due to investors catch up with liquidity shocks. The estimated size of the turnover increase is such to allow only a partial recover from the OMH trading slump, the exception being the case of Germany and Italy for small caps. Only where the holiday distraction is most severe, and related to retail trading, the post-holiday turnover rebound is strong enough to offset entirely the previous drop.

The trading on the day following a CMH makes an even clearer case about the absence of any rebound in turnover due to the investors' desire to catch up with the cumulated liquidity shocks. The sign of CMH_{t+1} is generally negative, and often significant, providing further evidence of a turnover drop, with the exception of the UK given its significant pick up in trading. This matches the even stronger evidence of a generalized turnover slowdown after a weekend. Monday dummies are always deeply negative, failing to reach significance only for small caps in Italy and France.

In short, in spite of the 24 or 48 extra hours of potential news flows worth of a portfolio rebalancing after a holiday or a weekend, investors are universally slow to refocus on their trading activity. This general result matches the Jain and Joh (1988) specific findings about a weak start in the S&P500 stocks' turnover in the first hour of the Monday session.

As for the remaining calendar anomalies, Table 8 shows a strong surge in turnover on the last trading day of the month. This effect is consistent with the window dressing motivated trading by institutional investors and appears particularly stronger in the US and in the UK, that is the countries with the most developed asset management industry.

Table 8 also shows that the higher turnover level persists on the following day marking the first trading session of the calendar month and the beginning of a new reporting cycle. The DSM dummy

is either not significant or, when negatively significant, it is of an order size smaller in absolute value than the corresponding DEM positive estimate signaling that the turnover remains on the higher level recorded on the last trading day of the previous month, or on only slightly below it.

The strong increase in turnover at the turn of the month is consistent with a portfolio rebalancing process through which investors download losers at the end of the month, reinvesting the proceeds, together with the new money inflow received from clients, at the beginning of the new month.

For Germany, Italy and the US, we use separate dummies to single out the last and the first trading day of the year for two reasons. First, the calendar year reporting cycle is of a superior order of importance than any other monthly cycle. Second, the turn of the year occurs during a season of festivities that may cause other sorts of distortions in the trading activity. Investors may dilute their portfolio rebalancing over a longer period, front loading their window dressing motivated trading in earlier in December, to anticipate the distraction of the holiday season. Our research design, meant to catch systematic pattern of sudden turnover change on well pre-specified dates, is not well suited to account for such slow moving turnover changes occurring over fuzzily defined time horizon.

In the US regressions, the results for DEY and DSY magnify those obtained for the turn of the month effects: in the first trading day of the year, the stock turnover further strengthen the significant surge of the last trading day of the previous year. On the contrary, in Germany, the turnover significantly slows at the year's end, paving the way for a huge rebound in the trading volume in the first session of the new year. Volumes more than doubles for large caps, the most likely target for professional investors, while increasing by less than 50% for small stocks, whose clientele consists of a greater share of retail investors, less prone to indulge in a window dressing motivated trading. Italy stands in between. It shows no turnover change in the last trading day of the year, as if the effects of the holiday season distraction and of the window dressing motive cancel each other out, but it shares with both the US and Germany the strong turnover surge on the first trading session of the year.

The dummies aimed to control for the half day trading sessions behave as expected. In the US, where there is no interference with the end of the year effect, the turnover about halves on these days and

almost fully recover the normal level in the next trading session. Instead, for the UK and France, the DHDT also captures the end of year anomaly. The significant role of the UK asset management industry contains the end of the year drop in the turnover for large and medium caps to roughly -25%, while the small caps volume halves, as stocks of all size do in France, consistently with the halved trading hours. Both in the UK and in France, and for stocks of all size, the turnover rebound after the half day session far exceeds the simple recovery of the standard level of turnover, being fueled by both a resumption of the standard trading schedule and the start of the year effect.

6. Return effect

The same day return must enter our regression models separately for positive and negative value as necessary control variables, given the extensive theoretical and empirical literature suggesting a positive correlation between turnover volume and both the rate of returns and their absolute value.

However, our results, shown in Table 9, provides some novel insights on this issue since they only partially support previous literature evidence and claims.

In line with them, for all countries and stock sizes, we find a strong positive co-variation of trading volumes changes with both positive and negative same day returns.

Differently from them, we find that turnover is more sensitive to positive rather than to negative returns only for small caps (Table 9, Panel C). For large caps the opposite holds true, as their turnover grows more in response to a price decrease than to a price increase (Table 9, Panel A). For mid caps, results are country dependent (Table 9, Panel B).

Short sales constraints thus continue to bite only on small stocks, while proving ineffective on large stocks. This is consistent with the advances in the stock lending technology and practices, as well as with the growth of the market for equity derivatives products, especially for stocks included in the headline blue chip exchange indices. Both factors have sensibly lowered, if not nullified, the cost differential between taking short and long positions on large caps.

But our results shows more than this: without binding short sale constraints, the response of trading volumes to price changes does not become symmetrical, but tilts in the opposite direction proving stronger in the case of market downturns in all countries.

Two factors may be at work. First, convex investment strategies dictated by the investors' decreasing risk aversion in wealth may prevail more during downtrends than uptrends. Asset managers, the main clientele for the large caps, are more consistent than retail investors are in implementing stop loss policies when prices drop, while being less keen on increasing risk exposures when prices increases. Second, correlations among stocks increase during down-markets, as negative pieces of news tend to be more systematic than positive ones, fostering more widespread portfolio rebalancing waves.

This finding for the large caps is aligned with the Hong and Stein (2003) hypothesis of a negatively skewed return distribution conditional on high trading volume implied by a process of endogenous revelation of latent private information held by pessimistic investors facing short sale constraints in a setting also populated by optimistic investors and fully rationale arbitrageurs.

The nuances in the results obtained for mid-caps are also informative. Short sale constraints appear to remain the prevailing factor in dictating turnover sensitivities to stock returns in the countries where exchange equity derivatives market are less developed. In Italy, France and the UK, turnover is more responsive to upswing than to downswing in stock prices. Instead, in Germany and the US, home to the most developed equity derivative exchange markets, the turnover sensitivities to positive and negative returns are roughly symmetrical.

The preceding day return variables both show a strong negative covariation with the change in turnover volume for all stocks, and in all countries. Their negative sign does not mean that larger returns today, both positive and negative, are associated to lower turnover levels tomorrow, but rather that the contemporaneous turnover surge associated to a large price change fades on the next day, with trading volumes reverting to a standard level. Indeed, Table 9 shows that the estimated parameters for the prior day positive and return variables to be of opposite sign, but usually close in value, to the estimate of the corresponding same day return.

This is generally the case for large caps: investors neither systemically over-trade nor under-trade them, conditional on the price sensitive news that moved prices on the day before. The same always holds for small caps if the previous day return is negative, and only for Italy and the US if negative. For the other countries, in the case of positive returns, the estimates are much smaller for the previous day than for the current day positive returns, meaning that part of the turnover surge associated to the today positive price change survives into the next trading session. These investors need an extra day to complete portfolio adjustments induced by the information impounded in today positive returns.

7. Conclusion

Our investigation of turnover patterns in occasion of open and closed market holidays shows that stock trading responds both to time varying investors' attention capacity constraints and to clientele effects originating from the investors' bias toward trading locally listed stocks. Such bias persists even in the integrated Eurozone equity market. Country specific cultural and institutional features emerge as critical factors in defining the type of investors with a tighter attention capacity constraint. While in the US, the holiday distraction hits institutional investors more than retail investors, the opposite holds true in Continental Europe. The dynamics of stocks turnover when holidays occur shows that both the size of the market and the geographical proximity between markets matter for the cross-country turnover interconnectedness.

Finally, as of recent, short sale constraints have become too weak to remain a factor for positive unconditional correlations between turnover and same day stock returns in the case of large caps.

Table 1: Dimensions of equity markets, international relevance and type of asset owners in the countries under analysis (as of Dec 2016, mil USD)

	Germany	France	Italy	UK	US	World total
Market capitalization of equity markets[1]	1,718,032	2,160,071	553,455	2,913,979	27,352,201	70,015,536
% of Eurozone total	25.3%	31.8%	8.2%			
% of world total	2.5%	3.1%	0.8%	4.2%	39.1%	100.0%
Turnover (EOB)[2]	1,310,417	1,064,825	658,102	1,624,878	28,388,830	86,620,013
% of the Eurozone total	29.2%	23.7%	14.7%			
% of the world total	1.5%	1.2%	0.8%	1.9%	32.8%	100.0%
Assets under management in equity funds[3]	283,202	321,963	20,824	674,701	10,606,920	17,113,364
% of world total	1.7%	1.9%	0.1%	3.9%	62.0%	100.0%
Assets held in foreign equity and investment funds (CPIS data[4])	1,009,045	739,777	739,067	1,692,304	7,005,010	24,555,298
as a % of world total	4.1%	3.0%	3.0%	6.9%	28.5%	100.0%

**Total value for all asset owners in the economy, including financial corporations and households*
Data source: [1,2] World Federation of Exchanges, Euronext and Borsa Italiana;
[3]International Iinvestment Funds Association;
[4]International Monetary Fund;

Table 2: Total return stock indices used in the analysis
Closing price values and daily turnover retrieved from Bloomberg: 17 Dec 2007 - 5 March 2015

Country	*Large caps*	*Medium caps*	*Small caps*
Germany	DAX 30	MDAX Index	SDAX Index
France	CAC40	CAC Mid 60	CAC Small
Italy	FTSE MIB	FTSE IT Mid Cap	FTSE IT Small Cap
UK	FTSE 100	FTSE 250	FTSE Small Cap
US	S&P 500	S&P 400	S&P 600

Table 3: Descriptive statistics of percentage daily changes in turnover
Trading volume daily change was calculated as the percentage variation between total trading volumes at the end of the day and the same data for the previous regular trading day. Outliers (i.e. variations larger than 200% or lower than -67%) were cleaned up, provided they did not occur in proximity of holiday or special dates.

Market Index	Number of observations	Mean	Std. Dev.	Min	Max
GER Large	1,831	4.59%	35.20%	-183.95%	303.08%
GER Medium	1,830	3.75%	29.76%	-76.34%	338.67%
GER Small	1,831	3.40%	28.70%	-70.91%	370.21%
FRA Large	1,844	4.97%	37.73%	-92.48%	404.94%
FRA Medium	1,836	3.27%	30.01%	-85.97%	385.51%
FRA Small	1,833	4.80%	34.73%	-73.37%	247.96%
ITA Large	1,826	3.17%	26.75%	-63.70%	165.21%
ITA Medium	1,827	3.27%	27.04%	-64.52%	190.99%
ITA Small	1,817	3.07%	26.84%	-61.06%	147.95%
UK Large	1,816	3.80%	32.20%	-89.76%	339.79%
UK Medium	1,815	3.57%	32.30%	-91.28%	438.26%
UK Small	1,815	4.82%	34.02%	-94.34%	270.84%
US Large	1,810	2.91%	25.67%	-78.07%	191.19%
US Medium	1,801	2.92%	26.42%	-79.73%	190.17%
US Small	1,796	3.38%	28.79%	-81.51%	195.78%

Table 4: Bank holidays and half day trading sessions

Number of days in which: i) exchange is open for trading despite a national bank holiday (OMH); ii) exchange is closed because of a national bank holiday (CMH); iii) exchange operates a shorter daily trading session (DHDT)

Country or Economic Area involved	Local market open holiday ($OMH^{j=i}$)	Local market closed holiday ($CMH^{j=i}$)	Half day of trading in local market ($DHDT^{j=i}$)
Germany	17	33	
France	38	18	14
Italy	24	37	
US	14	48	18
UK	12	42	14
CMH^{EZ}: Closed market holiday only in Eurozone (at least 2 countries out of 3 and not overlapping with UK)		18	
CMH^{UK}: Closed market holiday only in UK (not overlapping with Eurozone)		29	
$CMH^{UK\&EZ}$: Closed market holiday overlapping in UK and Eurozone		13	

Table 5: Regressions' significance

Explanatory power and constant term (with p-value) of the regression explaining the dynamics of the change in the daily turnover of the constituents of the equity indices referred to different countries and stock sizes (sample: 17 Dec 2007 - 5 March 2015)

		LARGE CAPS	MEDIUM CAPS	SMALL CAPS
Germany	R^2	31.50%	26.30%	23.20%
	Constant	0.030^^	0.048^^^	0.035^^
		0.013	0.000	0.020
France	R^2	60.30%	47.50%	18.00%
	Constant	0.035^^^	0.038^^^	0.002
		0.003	0.001	0.918
Italy	R^2	28.10%	22.10%	12.20%
	Constant	0.023^	0.029^^	0.026^
		0.074	0.048	0.079
UK	R^2	41.80%	38.00%	17.10%
	Constant	0.033^^^	0.032^^	0.037^^
		0.005	0.016	0.042
US	R^2	27.40%	22.60%	22.10%
	Constant	0.018^^	0.014	-0.006
		0.037	0.159	0.666

Table 6: Impact of holidays on trading volumes

Estimated impact (with p-value) of Open (OMH) and Closed (CMH) Market Holiday dummies on the turnover daily change in five countries (17 Dec 2007 - 5 March 2015). Subscripts refer to the country, or wider geographical area, of reference (EZ: CMH in at least 2 out of 3 Eurozone countries; UK&EZ: CMH in the UK and in the EZ). ^^^, ^^, ^ are for significance at the 1%, 5% and 10% level.

PANEL A – LARGE CAPS

	OPEN MARKET HOLIDAYS					CLOSED MARKET HOLIDAYS			
	OMH^{GER}	OMH^{FRA}	OMH^{ITA}	OMH^{UK}	OMH^{US}	CMH^{US}	CMH^{UK*}	CMH^{EZ**}	$CMH^{UK\&EZ}$
Germany	-0.351^^^	-0.076^^	-0.122^^^	0.044	-0.097^^	-0.153^^^	-0.150^^^		
	0.000	0.029	0.000	0.529	0.032	0.000	0.001		
France	-0.159^^^	-0.167^^^	-0.064^	0.036	-0.081^	-0.195^^^	-0.212^^^		
	0.000	0.000	0.084	0.580	0.061	0.000	0.000		
Italy	-0.147^^	0.009	-0.121^^	0.036	-0.133^^	-0.159^^^	-0.170^^^		
	0.017	0.819	0.013	0.526	0.012	0.000	0.000		
UK	-0.069	-0.060^	-0.031	0.030	-0.058	-0.236^^^		-0.294^^^	
	0.106	0.074	0.345	0.594	0.149	0.000		0.001	
US				0.047	-0.146^^^		0.024	-0.071	-0.205^^^
				0.533	0.001		0.632	0.148	0.004

PANEL B – MEDIUM CAPS

	OMH^{GER}	OMH^{FRA}	OMH^{ITA}	OMH^{UK}	OMH^{US}	CMH^{US}	CMH^{UK*}	CMH^{EZ**}	$CMH^{UK\&EZ}$
Germany	-0.336^^^	-0.093^^^	-0.087^^^	0.114^	-0.085^^	-0.158^^^	-0.209^^^		
	0.000	0.001	0.009	0.082	0.012	0.000	0.000		
France	-0.152^^^	-0.203^^^	-0.034	0.097	-0.045	-0.157^^^	-0.255^^^		
	0.000	0.000	0.389	0.341	0.229	0.000	0.000		
Italy	-0.150^^^	-0.034	-0.133^^^	0.016	-0.156^^^	-0.172^^^	-0.145^^^		
	0.002	0.401	0.004	0.824	0.003	0.000	0.002		
UK	-0.100^^^	-0.058^^	-0.038	0.038	-0.017	-0.170^^^		-0.298^^^	
	0.005	0.049	0.169	0.576	0.607	0.000		0.000	
US				-0.037	-0.151^^^		-0.038	-0.093	-0.247^^
				0.269	0.001		0.507	0.106	0.013

PANEL C – SMALL CAPS

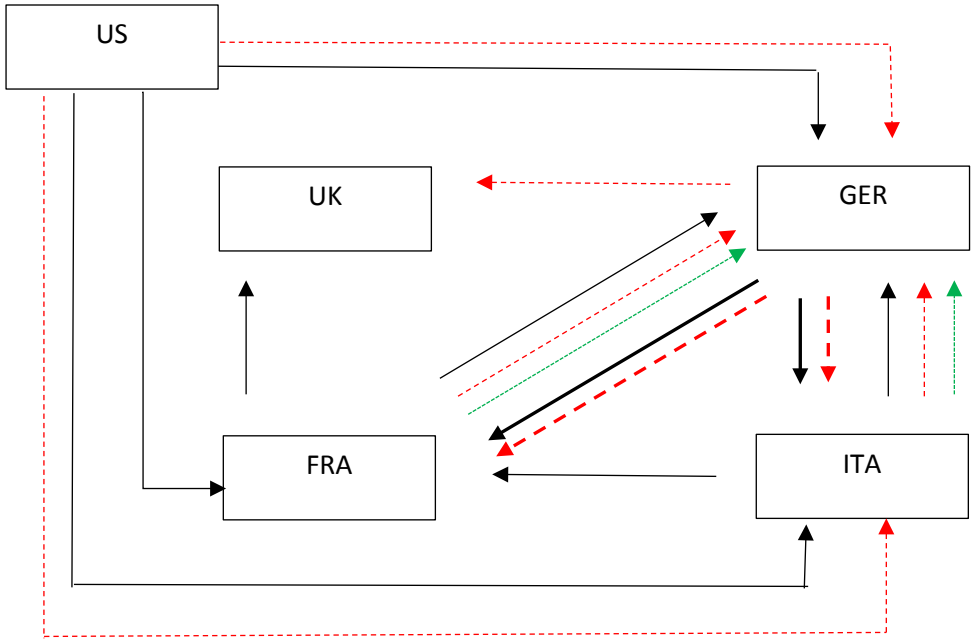
	OMH^{GER}	OMH^{FRA}	OMH^{ITA}	OMH^{UK}	OMH^{US}	CMH^{US}	CMH^{UK*}	CMH^{EZ**}	$CMH^{UK\&EZ}$
Germany	-0.413^^^	-0.086^^	-0.157^^^	0.098^^	-0.094	-0.084^^^	-0.165^^^		
	0.000	0.044	0.000	0.049	0.117	0.006	0.000		
France	-0.068	-0.252^^^	-0.068	-0.065	-0.026	-0.134^^^	0.023		
	0.341	0.003	0.397	0.424	0.850	0.003	0.780		
Italy	-0.038	-0.049	-0.326^^^	0.093	0.029	0.005	-0.021		
	0.571	0.321	0.000	0.145	0.696	0.854	0.679		
UK	-0.088	0.003	0.012	0.137	-0.038	-0.071		0.199^^	
	0.157	0.950	0.851	0.170	0.118	0.118		0.026	
US				0.015	-0.098^		-0.061	0.035	-0.242^^
				0.829	0.072		0.264	0.582	0.026

* In the regressions on the US volume, the dummy CMH^{UK} includes only UK closed holidays not overlapping with the Eurozone

** In the regressions on the US volumes, the dummy CMH^{EZ} includes only the Eurozone closed holidays (defined as closed holidays in at least 2 of the three countries considered) not overlapping with UK

Figure 1: Cross-country effects of bank holidays
Lines represent a negative and significant impact of a country's OMH on the turnover of the country indicated by the arrow. Continuous, dash and dotted lines are for large, medium and small caps.

Panel A: Open Market Holidays



Panel B: Closed market holidays (CMH)

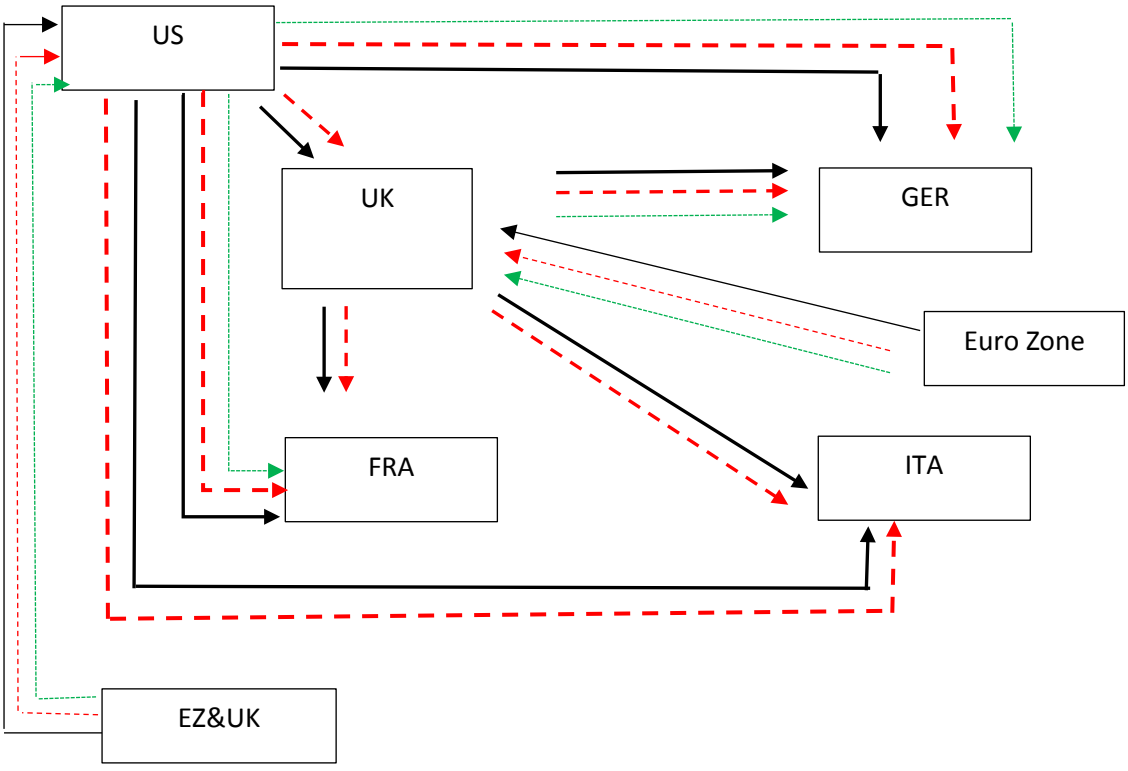


Table 7: Trading behavior around local bank holidays and day of the week effect

Estimated impact (with p-value) on the turnover daily change in five countries (17 Dec 2007 - 5 March 2015) *for stocks of different size of dummies variables signaling local Open (OMH) and Closed Market Holiday (CMH) occurring on the day preceding ($_{t-1}$) or following ($_{t+1}$) the holiday. The table also shows the impact of days of the week dummies. ^^^, ^^, ^ are for significance at the 1%, 5% and 10% level.*

PANEL A - LARGE CAPS

	OMH_{t-1}	OMH_{t+1}	CMH_{t-1}	CMH_{t+1}	Dmon	Dfri	Dtue	Dthu
Germany	0.003	0.415^^^	-0.031	-0.069	-0.224^^^	0.070^^^	0.149^^^	0.061^^^
	0.971	0.000	0.823	0.695	0.000	0.004	0.000	0.000
France	-0.017	0.214^^^	-0.110^^^	-0.147	-0.200^^^	0.001	0.134^^^	0.025^
	0.731	0.000	0.001	0.251	0.000	0.957	0.000	0.077
Italy	0.035	0.098^^	-0.106^^	-0.095	-0.176^^^	-0.044^^^	0.140^^^	0.018
	0.655	0.023	0.024	0.171	0.000	0.005	0.000	0.247
UK	0.031	0.116^^^	-0.080^^	0.333^^	-0.179^^^	-0.005	0.134^^^	-0.000
	0.620	0.009	0.045	0.030	0.000	0.812	0.000	0.990
US	-0.056	0.163^^^	-0.058	-0.041	-0.131^^^	0.117^^^	0.043^^^	-0.001
	0.226	0.005	0.163	0.386	0.000	0.000	0.000	0.915

PANEL B - MEDIUM CAPS

	OMH_{t-1}	OMH_{t+1}	CMH_{t-1}	CMH_{t+1}	Dmon	Dfri	Dtue	Dthu
Germany	-0.022	0.536^^^	-0.001	-0.151^^^	-0.165^^^	-0.025	0.140^^^	-0.008
	0.592	0.000	0.990	0.008	0.000	0.207	0.000	0.605
France	-0.048	0.212^^^	-0.038	-0.232^^^	-0.132^^^	-0.044^^^	0.116^^^	-0.017
	0.310	0.000	0.402	0.005	0.000	0.006	0.000	0.195
Italy	0.031	0.111^^	-0.115^^	-0.122^	-0.130^^^	-0.052^^^	0.127^^^	0.006
	0.709	0.022	0.012	0.072	0.000	0.002	0.000	0.723
UK	0.044	0.049	-0.120^^^	0.409^^	-0.163^^^	-0.029	0.113^^^	-0.007
	0.448	0.182	0.002	0.019	0.000	0.150	0.000	0.623
US	-0.049	0.130^^	-0.101^^^	0.057	-0.077^^^	0.028	0.055^^^	0.011
	0.308	0.023	0.002	0.352	0.000	0.215	0.000	0.375

PANEL C - SMALL CAPS

	OMH_{t-1}	OMH_{t+1}	CMH_{t-1}	CMH_{t+1}	Dmon	Dfri	Dtue	Dthu
Germany	-0.028	0.888^^^	-0.111^^^	-0.082	-0.077^^^	-0.026	0.054^^^	-0.007
	0.372	0.000	0.005	0.127	0.000	0.190	0.006	0.660
France	0.007	0.152^^^	-0.049	-0.191^^	-0.031	-0.005	0.092^^^	-0.001
	0.887	0.003	0.356	0.016	0.206	0.824	0.000	0.975
Italy	-0.046	0.617^^^	-0.131^^^	-0.022	-0.006	-0.050^^^	0.074^^^	0.024
	0.355	0.000	0.004	0.677	0.768	0.005	0.000	0.217
UK	-0.075	-0.022	-0.178^^^	0.081	-0.138^^^	-0.005	0.141^^^	-0.020
	0.205	0.806	0.000	0.444	0.000	0.815	0.000	0.344
US	-0.051	0.025	-0.066^	0.006	-0.084^^^	0.106^^^	0.065^^^	0.002
	0.290	0.639	0.063	0.932	0.000	0.000	0.000	0.895

Table 8: Turn of the month, turn of the year and half trading day effects on volumes
Estimated impacts (with p-value) on the trading volumes daily change in five countries of the first (DSM) and the last trading day of the month (DEM); the first and the last trading day of the year (DSY and DEY); a local half day of trading ($DHDT_t$) and its day after ($DHDT_{t+1}$). ^^^, ^^, ^ are for significance at the 1%, 5% and 10% level (17 Dec 2007 - 5 March 2015).

PANEL A - LARGE CAPS

	DSM	DEM	DSY	DEY	$DHDT_t$	$DHDT_{t+1}$
Germany	-0.019	0.052^	1.175^^^	-0.307^^		
	0.541	0.097	0.000	0.032		
France	-0.038	0.139^^^			-0.628^^^	2.762^^^
	0.227	0.000			0.000	0.000
Italy	-0.014	0.093^^^	0.552^^^	0.067		
	0.640	0.002	0.000	0.561		
UK	-0.137^^^	0.227^^^			-0.284^^	2.519^^^
	0.000	0.000			0.015	0.000
US	-0.155^^^	0.220^^^	0.315^^	0.293^^^	-0.464^^^	0.772^^^
	0.000	0.000	0.012	0.011	0.000	0.000

PANEL B - MEDIUM CAPS

	DSM	DEM	DSY	DEY	$DHDT_t$	$DHDT_{t+1}$
Germany	0.000	0.154^^^	0.870^^^	-0.270^^^		
	0.991	0.000	0.000	0.006		
France	-0.084^^^	0.194^^^			-0.634^^^	2.031^^^
	0.005	0.000			0.000	0.000
Italy	-0.051^	0.105^^^	0.648^^^	0.012		
	0.061	0.000	0.001	0.895		
UK	-0.110^^^	0.168^^^			-0.267^^^	2.459^^^
	0.000	0.000			0.006	0.000
US	-0.083^^^	0.267^^^	0.183^	0.450^^^	-0.496^^^	0.981^^^
	0.001	0.000	0.090	0.000	0.000	0.000

PANEL C - SMALL CAPS

	DSM	DEM	DSY	DEY	$DHDT_t$	$DHDT_{t+1}$
Germany	-0.030	0.089^^^	0.458^^^	-0.133^^		
	0.243	0.003	0.001	0.020		
France	-0.042	0.029			-0.499^^^	0.897^^^
	0.223	0.354			0.000	0.000
Italy	-0.004	0.035	0.080	0.027		
	0.896	0.248	0.300	0.781		
UK	-0.093^^^	0.115^^^			-0.587^^^	1.241^^^
	0.007	0.004			0.000	0.000
US	-0.090^^^	0.230^^^	0.148	0.313^^^	-0.568^^^	0.985^^^
	0.000	0.000	0.202	0.000	0.000	0.000

Table 9: Impact of market returns on trading volumes

Impacts (and related p-values) on the trading volumes daily changes in five countries of the daily market returns calculated on closing prices (17 Dec 2007 - 5 March 2015). *R_t^+ and R_t^- are the absolute value of the daily returns, respectively positive and negative, of the same trading day. The same applies for R_{t-1}^+ and R_{t-1}^- with respect to the previous trading day. ^^^, ^^, ^ are for significance at the 1%, 5% and 10% level.*

PANEL A - LARGE CAPS

	R_t^+	R_t^-	R_{t-1}^+	R_{t-1}^-
Germany	6.348^^^	7.992^^^	-6.176^^^	-6.431^^^
	0.000	0.000	0.000	0.000
France	6.332^^^	8.076^^^	-5.496^^^	-6.171^^^
	0.000	0.000	0.000	0.000
Italy	5.204^^^	5.818^^^	-3.114^^^	-4.024^^^
	0.000	0.000	0.000	0.000
UK	3.365^^^	5.194^^^	-3.200^^^	-3.553^^^
	0.000	0.000	0.001	0.000
US	2.897^^^	4.030^^^	-4.099^^^	-2.697^^^
	0.000	0.000	0.000	0.000

PANEL B - MEDIUM CAPS

	R_t^+	R_t^-	R_{t-1}^+	R_{t-1}^-
Germany	3.168^^^	3.423^^^	-2.634^^^	-3.643^^^
	0.000	0.000	0.000	0.000
France	6.820^^^	4.540^^^	-4.801^^^	-4.510^^^
	0.000	0.000	0.000	0.000
Italy	6.269^^^	4.819^^^	-3.342^^^	-4.315^^^
	0.000	0.000	0.000	0.000
UK	5.108^^^	3.684^^^	-2.638^^^	-3.265^^^
	0.000	0.000	0.001	0.000
US	1.930^^^	1.664^^^	-2.403^^^	-0.947^
	0.004	0.005	0.000	0.097

PANEL C - SMALL CAPS

	R_t^+	R_t^-	R_{t-1}^+	R_{t-1}^-
Germany	7.442^^^	6.381^^^	-4.538^^^	-6.206^^^
	0.000	0.000	0.000	0.000
France	20.982^^^	8.878^^^	-9.871^^^	-7.521^^^
	0.000	0.000	0.000	0.001
Italy	2.186^^^	0.302	-2.566^^^	-1.381^
	0.007	0.694	0.001	0.066
UK	9.986^^^	3.296^^	-5.050^^^	-3.204^^
	0.000	0.012	0.002	0.014
US	2.660^^^	3.602^^^	-2.332^^	-1.580^^^
	0.000	0.000	0.018	0.009

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