NYSE Closure and Global Equity Trading: The Case of Cross-listed and Domestic Stocks

OLGA DODD [a,*] and BART FRIJNS [a]

[a] Department of Finance, Auckland University of Technology, Auckland, New Zealand

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*Corresponding author. Department of Finance, Auckland University of Technology, Private Bag 92006, 1020 Auckland, New Zealand. Tel.: +64 9 921 9999 (ext. 5423); Fax: +64 9 921 9940; Email: olga.dodd@aut.ac.nz

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Abstract

This paper examines the impact of the New York stock exchange (NYSE) closure on trading of stocks in 36 countries, including stocks that cross-list on the NYSE and stocks that do not cross-list in the US (domestic stocks). We show that the NYSE is an important source of information and its closure significantly affects liquidity and information efficiency of stock prices around the globe, for both cross-listed and domestic stocks in our sample. Stocks that cross-list on the NYSE see a greater impact than their domestic counterparts, which could be attributed to a greater dependence of cross-listed stocks on information generated in the US market and a decrease in competition for order flow on the days when the NYSE is closed. The greater the NYSE liquidity and visibility of cross-listed stocks (measured respectively by trading volume and duration of listing on the NYSE) the more they are affected by NYSE closure. Furthermore, both domestic and cross-listed stocks are affected more when their home country and the US are more integrated financially (measured by equity market returns correlations) and informationally (measured by cross-border telephone traffic). Overall, our findings have important implications for understanding of the transmission of information across markets, the determinants of global equity trading activity, and add an extra dimension to the relation between spill-over effects, information transmission and cross-listed stocks.

Key Words: Stock liquidity, NYSE, stock market closure, cross-listing.

JEL Classifications: C24; G10.

1. Introduction

The New York stock exchange (NYSE) is the largest equity market in the world and as such is a major centre where information is released and priced into financial assets. Closure of this exchange has been shown to affect return variances of stocks in the US (See French and Roll, 1986), who suggest that on days when the US exchanges are closed, there is a reduction in the amount of information that arrives to the market and is incorporated into the market. In an international context, Cheung and Kwan (1992) show that the closure of the US markets reduces volatility and trading in the Canadian market. Surprisingly, there is no further evidence in the literature on the impact of US stock market closure on global market trading activity.

A second strand of literature has focused on the impact of cross-listings in the US and the improvements in the informational environment for these stocks (see e.g. Lang et al., 2003; and Fernandes and Ferreira, 2009; Dodd and Gilbert, 2016). These studies show that a listing on the US markets generally leads to an improvement in the information environment for cross-listed stocks, which has benefits for trading in the home market. Although the improvements in the informational environment have been documented, the impact of closure of the US market on these cross-listed firms has received little attention.[1]

The aim of this paper is to empirically investigate the effects of NYSE closures on trading in other markets, with a particular focus on the impact it has on cross-listed stocks. Based on the notion that the US market forms an important source of information for other market, and that information is shown to spill-over between markets, we expect that a closure of the US has a negative impact on the liquidity of stocks around the globe. In addition, we expect that stocks cross-listed in the US will be more affected by the US market closures, as the improvement in the informational environment they experience through cross-listing will make them more dependent on the US as a source of information.

[1]Tannous and Zhang (2008) is the only study that has examined the impact of US markets closure for a sample of Canadian stocks cross-listed in the US.

Using daily and intraday trading data for stocks cross-listed on the NYSE and matching domestic stocks from 36 countries, we examine the impact of NYSE closure on the home market trading activity. In our sample the NYSE is closed due to the US public holidays and also due to hurricane Sandy in October 2012. Our empirical results confirm our arguments, and we find that closure of the NYSE has a negative impact on liquidity and information efficiency of stock prices around the world. Cross-listed stocks are affected by NYSE closure more significantly that domestic stocks. Additional testing reveals that those cross-listed stocks that are normally traded more actively on the NYSE and those that are more visible in the US are more affected by NYSE closure. We find no evidence that foreign institutional ownership can explain the impact of NYSE closure. Furthermore, countries with stock market returns that correlate more strongly with the US market returns, observe a greater reduction in stock liquidity and information efficiency and cross-listed stocks from these countries are more affected. Finally, equity trading in countries with significant information links with the US (measured by international telephone traffic) are affected by NYSE closure to a greater degree.

This study contributes to the debate on the role of information in equity trading in international multi-market environment. The findings shed more light on inter-market connectedness in global equity markets and the role of information generated in the US equity markets. In addition, this paper contributes to the debate on the source of benefits from cross-listing on a foreign exchange. In particular, it provides a new evidence on the role of trading on a foreign market for stock liquidity and information efficiency of stock prices in the home market of cross-listed stocks.

The paper is structured as follows. In Section 2, we discuss literature on the impact of market closure and the consequences of cross-listing in the US. Section 3 discusses the data used in the empirical part of the study. Section 4 reports and discusses the results. Finally, Section 5 concludes.

2. Literature Review and Hypotheses

Several studies examined the impact of market closure on stock price dynamics and a number of studies have considered the impact on stock prices after cross-listing in the US. However, there is limited literature that has looked at the impact of foreign market closures on trading of cross-listed stocks. In this section, we will first discuss the evidence on the impact of stock market closures, and then discuss the effects of cross-listing on information environment and trading of cross-listed stocks.

The seminal study on the subject of the impact of stock market closures is by French and Roll (1986). Their study documents that stock returns are more volatile during trading hours than during times when the market is closed. They propose three possible explanations for this phenomenon. First, volatility can be lower during non-trading hours because the arrival of public information is lower. Second, the lower volatility can be explained through a lower arrival rate of private information (as private information is revealed through the trade process, this information cannot be incorporated during non-trading hours). Third, if the trading process itself introduces noise, then the closure of an exchange would result in lower volatility. Overall, their findings suggest that the difference in volatility between trading and non-trading hours is mostly driven by the difference in the arrival and incorporation of private information.

Cheung and Kwan (1992) extend the work of French and Roll (1986) into an international setting by examining the impact of an exchange closure on trading in foreign markets. In particular, they study the case of US and Canadian public holidays and the impact these closures have in the trading activities of domestic stocks. They note that during US public holidays, trading volume in Canada decreases significantly to about 60% of its normal levels, whereas a public holiday in Canada only has a marginal impact on the trading volume of stocks in the US. They conclude that the US constitutes an important source of macro-market/public information, and that the closure of the US, therefore, reduces the arrival rate of information in Canada. Hence, the effect of a market closure in the US not only affects the US market itself, but the effects spill-over into foreign markets as well.

Based on the above studies, we would expect that the closure of the US market has an impact on equity trading in other countries. There are several possible channels through which the closures of the US stock market can impact stock trading in foreign markets. First, the effects can occur through traditional spill-over channels. Numerous studies have documented the interconnectedness of stock markets and volatility spill-overs occurring between them (see for instance Hamoa et al., 1990 for an early reference or Diebold and Yilmaz, 2009 for a more recent reference). When the US market closes, the lack of information coming from the US may spill-over through its channels and as such have an impact on foreign markets. In this type of setting, we would expect that those countries that have the strongest relations with the US will see the greatest decrease in trading activity. Second, the effects of the US stock market closure on foreign markets can occur through the role that the US market plays as a major source of information. Rapach et al. (2013) show that US stock returns have important predictive power for the returns of many international markets. When the US markets are closed, an important source of information is removed, affecting trading activity in other markets. Overall, we would expect a negative effect of closure of the US stock market on global trading activity.

Another strand of literature has focused on cross-listing in the US and its implications for cross-listed stocks, in particular with regards to multi-market trading activity. In case of cross-listed stocks, on a normal day trading takes place in two markets, the home and foreign markets. If the foreign market, e.g. the US market, is closed, trading activity could migrate to the home market - in this case trading in the home market should not be affected or could even increase. On the other hand, if the foreign market is a source of information that is vital for trading and pricing of cross-listed stocks, then trading in the home market may decrease. Domowitz et al. (1998) propose a model for cross-listed assets to explain order flow migration from emerging markets. Their model demonstrates that if information linkages between the home and foreign markets are poor, liquidity in the home market will decrease after cross-listing. Depending on the level of integration/ segmentation, trading activity may also increase in the domestic market resulting in a decrease in spreads and an increase in trading volume. Lang et al. (2003) examine whether cross-listings in the US improve the information environment of cross-listed stocks and whether such an

improvement leads to an increase in market value. They document that firms that cross-list in the US see an improvement in analyst following and that there is an improvement in forecast accuracy, and that this subsequently leads to higher valuations. Likewise, Fernandes and Ferreira (2008) investigate how international cross-listing affects the information environment after cross-listing in the US. They find that the quality of information environment, proxied by firm-specific return variation, increases after cross-listing for firms from developed markets but decreases for firms from emerging markets. This supports the argument that cross-listing in the US has significant positive information effects and also that lower costs of information acquisition after cross-listing in the US results in an increase in informed trading. Dodd and Gilbert (2016) examine the changes in the information asymmetry and informational efficiency of prices of cross-listed stocks in their home market around cross-listing in the US, using market microstructure measures of information asymmetry (the effective spread, information asymmetry components of the spread, price impact) and intraday stock return autocorrelation as a measure of informational price efficiency. They find that cross-listing in the US is associated with a significant improvement in the quality of the stock's information environment and stock price efficiency in the home market. Baruch et al. (2007) propose a theoretical model of multimarket trading that can explain the differences in the foreign share of trading volume of cross-listed stocks. This model shows that the liquidity of the stock in the foreign market is proportional to the correlation of the asset with other stocks in that foreign market. Empirically, Baruch et al. (2007) confirm this relation for a sample of firms cross-listed in the US, by showing that trading volume in the US market is higher for stocks that show higher correlations with the US market.

These studies demonstrate that a cross-listing in the US generally leads to an improvement in the information environment that can lead to a reduction in asymmetric information (as in Domowitz et al., 1998; Dodd and Gilbert., 2016), which in turn reduces the bid-ask spread and improves liquidity and trading activity in the home market. An additional argument for increased trading activity in the home market is put forward by Tannous and Zhang (2008), who suggest that cross-listing increases competition for order flow and therefore leads to more aggressive quote setting, resulting in lower spreads. Again, these lower spreads would lead to an increase in liquidity and trading activity. Therefore, the closure of the NYSE would then have an additional impact on

cross-listed firms (beyond the impact of US closure on non-cross-listed firms), resulting in a greater reduction in trading activity.

3. Data

3.1 Sample Selection

To evaluate the role of the NYSE in global equity trading, we obtain a sample of non-US stocks that we cross-listed on the NYSE during the period from 2009 - 2014 and a matching sample of non-US stocks that are listed only in their home market during the same time period (domestic stocks). The lists of non-US stocks cross-listed on the NYSE (including a company's name, home country and industry and cross-listing date) are obtained from the NYSE's website. Matching stocks are those that are not listed on US exchanges (the NYSE, AMEX or Nasdaq) during the sample period and are matched based on a stock's home country, industry, firm size (market capitalization) and price-to-book ratio. These data are obtained from Datastream.

After eliminating stocks with missing data for the liquidity measures (described below), we obtain a sample of 728 stocks from 36 countries, including 303 stocks cross-listed on the NYSE and 425 domestic stocks. Table 1 reports the sample description by home country. Canadian cross-listed stocks constitute a significant proportion of the sample (90 stocks or 29.7% of the cross-listed sample). Other countries that contribute a significant number of cross-listed stocks to the sample include United Kingdom (8.3%), Brazil (7.6% of the sample), Japan (5.9%), Mexico (5.6%) and China (4.6%).

INSERT TABLE 1 HERE

We analyze daily trading of the sample stocks in the home market over the period 1 January 2009 to 31 December 2014. Over this time period, we identify days when NYSE is closed. In addition to the US public holidays[2], NYSE is closed on 29 and 30 October 2012 due to hurricane Sandy.[3]

[2] NYSE closes on the following public holidays: George Washington Day, Independence Day, Labor Day, Martin Luther King Day, Memorial Day, Thanksgiving, Veterans' Day, Christmas and New Year.
[3] Note that during these days only the NYSE was closed, other US exchanges were open.

Because Christmas and New Year are celebrated in many countries (and therefore are not US-specific holidays), we exclude Christmas day and New Year day from our sample.

3.2 Measures of stock liquidity and informational efficiency of stock prices

We use several daily measures of stock liquidity to evaluate the impact of NYSE closure. First, we use the Number of Shares Traded (NST) in the home market. Second, we use the Trading Volume by Value ($TV), which is daily trading volume in US dollars. If trading volume by value data are not available in Datastream, we calculate this variable as a product of the number of shares traded and value-weighted average price on that day. Third, we calculate Turnover ratio (Turnover) as the number of shares traded divided by the total number of shares outstanding. Fourth, we estimate proportional Bid-Ask Spread (Bid-ask spread) as the difference between closing ask and bid prices divided by the average price of the bid and ask. Fifth, we calculate Amihud's (2002) Illiquidity ratio (Illiquidity) as a ratio of absolute daily return to daily trading volume in US dollars. Numbers of shares traded, trading volume by value, value-weighted average price, number of shares outstanding, closing ask and bid prices and total return (including dividend income) data are obtained from Datastream. Finally, we calculate the daily Realized Volatility (RV) for each stock. We do this by collecting intraday stock price data sampled at a 5-minute frequency from Thomson Reuters Tick History via SIRCA (http://www.sirca.org.au), and compute realized volatility by summing the intraday squared returns.

In addition to measures of stock liquidity, we also estimate a measure of information efficiency of stock prices (Information efficiency), as the autocorrelation of the intraday returns following Comerton-Forde and Putniņš (2015). This price efficiency measure focuses on deviations from the requirement that informationally efficient prices should follow a random walk and not be predictable based on past information. The presence of autocorrelation in the intraday returns, either positive or negative, results in short-run predictability and, therefore, indicates the level of inefficiency in prices. Using intraday stock price data from Thomson Reuters Tick History, we identify the prevailing quoted midpoint at the end of each interval to calculate the midpoint returns and estimate first-order return autocorrelations for each stock over 10-, 30- and 60- second intervals. We then calculate daily averages, take the negative value of the absolute value of the

autocorrelation and estimate the PCA parameter for 10-, 30- and 60- second interval variables.[4] Larger values of the variable indicate more efficient stock prices.

Table 2 reports summary statistics for the measures of stock liquidity and price efficiency, Panel A for all stocks, Panel B for stocks cross-listed on the NYSE (NYSE-listed stocks), and Panel C for domestic stocks. Each Panel reports the mean daily measures and the number of observations for all days, for days when the NYSE was open and for days when the NYSE was closed. Each panel also reports the difference in means between the days when the NYSE was open and days when the NYSE was closed, associated t-statistics and significance level.

INSERT TABLE 2 HERE

Comparing average measures of stock liquidity and price efficiency for cross-listed with domestic stocks (Column (5) and Column (9)), it is evident that cross-listed stocks have greater trading volume both in terms of the number of shares traded (2.4 times greater) and trading volume in US dollars (4.0 times greater) than domestic stocks. However, turnover ratio is greater for domestic stocks, which could indicate that cross-listed stocks tend to have greater market capitalization relative to domestic stocks. Cross-listed stocks also have, on average, lower bid-ask spreads, low illiquidity ratios, lower realized volatilities and greater stock price information efficiency compared with domestic stocks.

For the full sample (All stocks) and for the sub-sample of NYSE listed stocks we document a significant decrease in stock liquidity in their home markets when NYSE is closed. In particular, we observe a significant decrease in the number of shares traded, trading volume in US dollars, turnover ratio, realized volatility, and a significant increase in illiquidity ratio (Panel A, Column (4) and Panel B, Column (8)). For the sub-sample of domestic stocks there are no significant changes in the number of shares traded, turnover ratio and illiquidity ratio. However, we do observe a significant decrease in the trading volume in US dollars and realized volatility on the

[4] We also estimate regressions directly with the autocorrelation over 10-, 30- and 60- second interval variables. The results are consistent and for the sake of brevity we only report the PCA parameter results.

days when NYSE is closed (Panel C, Column (12)). For NYSE–listed stocks the number of shares traded decreases by 13.4% and trading volume in US dollars decreases by 27.8% while domestic stocks there is no significant decrease in the number of shares traded and dollar trading volume decreases by 16.7%. We also observe that NYSE is associated with a significant decrease in information efficiency of stock prices, for the full sample and for both sub-samples of NYSE-listed and domestic stocks.

4. Results

4.1 Model Specification

Summary statistics show a significant decrease in stock liquidity and information price efficiency of non-US stocks on the days when the NYSE is closed and this effect appears to be more profound for non-US stocks cross-listed on the NYSE (Table 2). To assess this effect more formally, we conduct regression analysis (with the measures of stock liquidity and informational efficiency as the dependent variables) that allows controlling for firm- and country-specific characteristics that might affect stock liquidity. Our sample includes both cross-listed and domestic stocks and, based on the discussion in Section 2, we expect these two groups of stocks to be affected differently by the closure of the NYSE. The regression takes the form of a difference-in-difference equation, i.e.

$$\log(Liq_{i,t}) = \alpha + \beta_1 D_{NYSE\_closure} + \beta_2 (D_{NYSE\_closure} * D_{CL}) + \beta_3 D_{CL} + \gamma_m Controls_{m,i,t} + \varepsilon_{i,t}, \qquad (1)$$

where $Liq_{i,t}$ is a measure of stock liquidity or information efficiency discussed in Section 3, $D_{NYSE\_closure}$ is a dummy variable that equals one on days when the NYSE is closed and zero otherwise, D_{CL} is a dummy variable that equals one if the stock is cross-listed on the NYSE and zero otherwise. In this regression, β_1 indicates the effects of NYSE closure for all stocks (cross-listed and domestic), which according to the arguments developed in Section 2 should be negative for measure of liquidity (and positive for measures of illiquidity). Furthermore, β_2 captures the interaction variable between NYSE closure and cross-listed stocks dummy variables ($D_{NYSE\_closure}$* $D_{NYSE\_closure}$), and indicates the additional effects of NYSE closure for cross-listed stocks. Again, as we argued in Section 2, we expect values for β_2 to be negative (positive) for stock liquidity and information efficiency (illiquidity) measures. Finally, $Controls_{m,i,t}$ are a set of control variables. Since stock liquidity is determined by firm characteristics, in the regression analysis we control

for firm size, measured by the market capitalization in US dollars and price-to-book ratio obtained from Datastream. We also control for variation across industries and across countries by including industry fixed effects and country fixed effects.[5] We estimate Equation (1) as a panel data regression with clustered (by stock) standard errors (see Petersen, 2009).

4.2 Estimation Results

4.2.1. NYSE closure and cross-listed stocks

We begin our analysis with the evaluation of the impact of NYSE closure on all stocks, by estimating Equation (1) without the interaction variable between NYSE closure and cross-listed stocks dummy variables. Panel A of Table 1 reports the estimation results for each measure. NYSE closure variable is significant for all measures of stock liquidity and information efficiency. In particular, we observe a significant decrease in the number of shares traded, trading volume in US dollars, turnover ratio, realized volatility, and information efficiency, and a significant increase in bid-ask spread and illiquidity ratio in the home market on the days when the NYSE is closed. This supports the argument that the absence of trading on the NYSE results in a significant decrease in global market liquidity because equity trading on the NYSE provides information important for trading in other equity markets, and confirms and extends the findings of Cheung and Kwan (1992).

Estimates for the cross-listed stocks dummy variable (CL stocks) suggest that there are no significant differences in dollar trading volume, turnover ratio and information efficiency between cross-listed and matching domestic stocks, while cross-listed stocks have higher number of shares traded, bid-ask spread, illiquidity ratio and realized volatility. With regards to the control variables, larger firms have significantly greater number of shares traded, dollar trading volume and turnover ratio and significantly lower bid-ask spread, illiquidity ratio and realized volatility. Finally, stocks with higher price-to-book ratios have significantly lower number of shares traded.

[5] We have also estimated regressions with country level variables, such as market liquidity and the level of economic and financial development, instead of the country fixed effects and obtained very similar results. In addition, the differences in daily stock liquidity could be an outcome of the 'day of the week' effect. We have estimated the regressions with day-of-the-week dummies and find that our results are robust to controlling for this.

INSERT TABLE 3 HERE

Next, we estimate Equation (1) to evaluate whether NYSE closure affects cross-listed stocks to a higher degree than domestic stocks. Panel B of Table 3 reports the estimation results for each measure. The dummy variable for NYSE closure remains significant with coefficient estimates comparable to those reported in Panel A for all measures except bid-ask spread that becomes insignificant. This confirms that all stocks, cross-listed and domestic, are significantly affected by NYSE closure. In addition, the interaction variable between NYSE closure and cross-listed stocks dummy variable (Closure x CL stocks) is significant for all measures but one (illiquidity ratio). This indicates that liquidity and information efficiency of prices of stocks cross-listed on the NYSE is affected by NYSE closure more significantly than those of domestic stocks. This finding is broadly in line with the findings of Tannous and Zhang (2008) who study the impact of US closure on Canadian-US cross-listed stocks, and supports our argument that the NYSE is an important source of information for global equity trading and even more so for cross-listed stocks.

4.2.2 The degree of importance of the NYSE for cross-listed stocks

Cross-listing does not always result in active trading and high visibility of the cross-listed stock in the foreign market. In other words, not all cross-listed companies are successful in attracting investors' interest in the foreign market (Baruch et al., 2007; Halling et al., 2008; King and Segal, 2009). If the importance of the NYSE varies across cross-listed stocks, then the impact of NYSE closure on trading of cross-listed stocks could also be different. In particular, cross-listed stocks that have significant trading volume and high visibility on the NYSE should be affected by NYSE closure more significantly. To examine whether visibility on the NYSE affects the impact of closure on liquidity in the home market, we compute the NYSE's share of trading as a measure of importance of the NYSE in the stock's trading and use two measures of a stock's visibility on the NYSE, the duration of listing on the NYSE and foreign ownership.

First, we examine whether cross-listed stocks that are more actively traded on the NYSE on normal days are more significantly affected by NYSE closure. Baruch et al. (2007) and Halling et al. (2008) report that the US share of trading, i.e. the fraction of trading in the US exchange as a

percentage of the stock's total trading volume, of non-US stocks cross-listed on the US exchanges varies significantly across stocks. We use annual averages of the NYSE share of trading calculated as a ratio of the stock's trading volume on the NYSE (in US dollars) to the stock's total trading volume (in US dollars), that is the sum of the stock's trading volume in the home market and the NYSE, on the days when NYSE is open. Trading volume data are obtained from Datastream.

We estimate Equation (1) where we replace the interaction variable ($D_{NYSE\_closure}$*D_{CL}), the product of NYSE closure variable and cross-listed stocks dummy variable, with an interaction variable ($D_{NYSE\_closure}$*TVS_{NYSE}), which is the product of NYSE closure variable and the NYSE's share of trading variable (TVS_{NYSE}).[6] Panel A of Table 4 reports the estimation results. NYSE closure variable remains significant for measures except for the bid-ask spread, same as it was documented in Panel B of Table 3. The interaction variable between NYSE closure and the NYSE's share of trading variable (Closure x TVS_{NYSE}) is significant for four liquidity measures, showing that stocks with higher trading volume in the US see a greater decrease in the number of shares traded, dollar trading volume, turnover ratio and a greater increase bid-ask spread. In addition we note that the coefficient estimates for these variables are greater and with higher statistical significance compared with the estimates from the interaction variable between NYSE closure and cross-listed stocks dummy variables (Closure x CL stocks) reported in Panel B of Table 3. This is supportive of our expectation that cross-listed stocks that have an active market on the NYSE on normal days are affected more significantly by NYSE closure.

INSERT TABLE 4 HERE

As an alternative way of assessing the impact of trading volume in the US, we break down the NYSE's share of trading variable (TVS_{NYSE}) into three variables: 1) low NYSE's share of trading (TVS_{NYSE}^{Low}), which is a dummy variable that equals one if the NYSE's share of trading is less than 0.33, and zero otherwise; 2) medium NYSE's share of trading (TVS_{NYSE}^{Medium}), which is a dummy variable that equals one if the NYSE's share of trading is more than 0.33 and less than 0.67, and zero otherwise; and 3) high NYSE's share of trading (TVS_{NYSE}^{High}), which is a dummy variable that

[6] For domestic stocks TVS_{NYSE} is zero.

equals one if the NYSE's share of trading is more than 0.67 and zero otherwise. Panel B of Table 4 reports the estimation results. It is evident that cross-listed stocks' liquidity is affected by NYSE closure more significantly than liquidity of domestic stocks when their NYSE's share of trading is high, i.e. more than two thirds of trading volume normally takes place on the NYSE.

Second, we test whether stocks that are listed on the NYSE for longer are more significantly affected by NYSE closure. We calculate the duration of the NYSE listing as log of the number years since the cross-listing. Cross-listing dates are obtained from the NYSE's web-site. We estimate Equation (1), where we replace the interaction variable ($D_{NYSE\_closure}$*D_{CL}), the product of NYSE closure variable and cross-listed stocks dummy variable, with an interaction variable ($D_{NYSE\_closure}$*Years_CL), which is the product of NYSE closure variable and the duration of the NYSE listing variable. The estimation results, reported in Panel A of Table 5, suggest that the longer a stock has been cross-listed on the NYSE, the more significantly it is affected by NYSE closure.

INSERT TABLE 5 HERE

In addition, we break down the duration NYSE listing variable (Years_CL) into three variables: 1) recently cross-listed on the NYSE (Years_$CL_{0\text{-}2}$), which is a dummy variable that equals one if the number of years since cross-listing on the NYSE is less than 2 years, and zero otherwise; 2) cross-listed for some time (Years_$CL_{3\text{-}7}$), which is a dummy variable that equals one if the number of years since cross-listing on the NYSE is more than 2 years and less than 7 years, and zero otherwise; 3) cross-listed for long time (Years_CL_{over7}), which is a dummy variable that equals one if the number of years since cross-listing on the NYSE is more than 7 years, and zero otherwise. We re-estimate the model (reported in Panel A of Table 5) with these three variables instead of the duration of the NYSE listing variable. Panel B of Table 5 reports the estimation results. It is evident that cross-listed stocks are affected by NYSE closure more significantly than domestic stocks when they've been cross-listed on the NYSE for over 7 years.

Third, we test whether presence of foreign institutional investors can explain the impact of NYSE closure on stock liquidity in other markets. Foreign institutional investors have greater access to

trading in various markets than domestic investors, and, therefore, on the days when the NYSE is closed potentially could trade cross-listed stocks in their home markets instead of the NYSE. In this case, the liquidity of cross-listed stocks would increase when the NYSE is closed. On other hand, if equity trading on the NYSE provides a vital source of information for equity trading in other markets, then foreign institutional investors would generally trade less when the NYSE is closed. While foreign institutional investors could invest in both cross-listed and domestic stocks, potentially, cross-listing improves a stock's visibility in the foreign market and increases foreign ownership (Foerster and Karolyi, 1993). If this is the case, cross-listed stocks are affected more significantly by NYSE closure possibly due to greater foreign institutional ownership. To test this proposition, we obtain foreign institutional ownership data, which is a percentage of common shares owned by institutional investors domiciled outside of the stock's home country, from Datastream. To account for the effects of presence of foreign investors for all stocks (cross-listed and domestic) and also to evaluate additional effects of presence of foreign investors for cross-listed stocks we estimate the following equation:

$$\log(Liq_{i,t}) = \alpha + \beta_1(D_{NYSE\_closure} * ForInvestors) + \beta_2(D_{NYSE\_closure} * ForInvestors * D_{CL}) + \\ + \beta_3 D_{CL} + \gamma_m Controls_{m,i,t} + \varepsilon_{i,t} \quad , \quad (2)$$

where $Liq_{i,t}$ is a measure of stock liquidity or information efficiency (discussed in section 3); $D_{NYSE\_closure}$ is a dummy variable that equals one on the days when the NYSE is closed and zero otherwise; *ForInvestors* is foreign institutional investors variable; D_{CL} is a dummy variable that equals one if the stock is cross-listed on the NYSE and zero otherwise; $Controls_{m,i,t}$ are control variables including market capitalization, and price-to-book ratio. The interaction variable between NYSE closure and foreign investors variables ($D_{NYSE\_closure}$*$ForInvestors$) indicates the effects of foreign ownership for all stocks while the interaction variable between NYSE closure, foreign investors and cross-listed stocks dummy variables ($D_{NYSE\_closure}$*$ForInvestors$* D_{CL}) indicates the additional effects of foreign ownership for cross-listed stocks.

We estimate Equation (2) first without the interaction variable between NYSE closure, foreign investors and cross-listed stocks dummy variables (reported in Panel A of Table 6) and then full specification of Equation (2) (reported in Panel B of Table 6). We observe that the interaction variable between NYSE closure and Foreign investors variables is positive and significant only

for illiquidity ratio, providing a weak evidence that for stocks (both cross-listed and domestic) that have greater foreign institutional ownership stock liquidity decreases on the days when the NYSE is closed. However, the interaction variable between NYSE closure, foreign investors and cross-listed stocks dummy variable (Closure x Foreign investors x CL) is insignificant for five measures and negative for bid-ask spread and Illiquidity (Panel B, Table 6). This suggests that foreign ownership of cross-listed stocks cannot explain the deterioration in stock liquidity and information efficiency of stock prices as the results of NYSE closure.

INSERT TABLE 6 HERE

4.2.3. The importance of the NYSE: country level effects

Until now we have considered the degree of the NYSE's importance at the stock level. It is, however, possible that the role of the NYSE for equity trading varies across various markets. One way to quantify the degree of the NYSE's importance at the country level is to estimate market return correlations between the US equity market and other equity markets. The higher the market return correlation with the US market return the more important the NYSE is, and the more interconnected the markets are. We use market return data on the Datastream Total market indices, obtained from Datastream, to estimate correlations with the US market return for all home countries in our sample.

To account for the effects of market return correlations for all stocks (cross-listed and domestic) and also to evaluate additional effects of market return correlations for cross-listed stocks, we estimate the following equation:

$$\begin{aligned}\log(Liq_{i,t}) = \alpha + \beta_1(D_{NYSE\_closure} * Correlation) + \beta_2(D_{NYSE\_closure} * Correlation * D_{CL}) + \\ + \beta_3 D_{CL} + \gamma_m Controls_{m,i,t} + \varepsilon_{i,t}\end{aligned}, \quad (3)$$

where $Liq_{i,t}$ is a measure of stock liquidity and information efficiency discussed in section 3; $D_{NYSE\_closure}$ is a dummy variable that equals one on the days when the NYSE is closed and zero otherwise; *Correlation* is log of correlation coefficient between the home market return and the

US market return; D_{CL} is a dummy variable that equals one if the stock is cross-listed on the NYSE and zero otherwise; $Controls_{m,i,t}$ are control variables including market capitalization, and price-to-book ratio. The interaction variable between NYSE closure and correlation variables ($D_{NYSE\_closure}$*$Correlation$) indicates the effects of market return correlation between the home market and the US market for all stocks, while the interaction variable between NYSE closure, correlation and cross-listed stocks dummy variables ($D_{NYSE\_closure}$*$Correlation$*D_{CL}) indicates the additional effects of market return correlation for cross-listed stocks.

We estimate Equation (3) first without the interaction variable between NYSE closure, correlation and cross-listed stocks dummy variables (reported in Panel A of Table 7) and then the full specification of Equation (3) (reported in Panel B of Table 7). We observe that the interaction variable between NYSE closure and market return correlation variables is highly significant for all measures (negative for the number of shares traded, trading volume, turnover, realized volatility and information efficiency, and positive for bid-ask spread and illiquidity ratio), suggesting that for stocks (both cross-listed and domestic) that originate in markets that have higher correlation of market returns with the US market returns stock liquidity decreases significantly on the days when the NYSE is closed. Furthermore, the interaction variable between NYSE closure, correlation and cross-listed stocks dummy variable (Closure x Foreign investors x CL) is significant for three liquidity measures and for information efficiency of stock prices (Panel B, Table 7). This suggests that the NYSE's importance at the country level, measured by market return correlations between the home market and the US market, contributes to the additional effects of NYSE closure on liquidity of cross-listed stocks. These results support the argument that markets are connected and what happens in one market spills over into another. When one market (in this case the US) is closed, information cannot spill-over to other markets and this may reduce the trading activity in the home market.

INSERT TABLE 7 HERE

Another way to quantify the degree of the importance of the US market as a sources of information is to estimate telephone traffic between the US and other countries. The higher the telephone traffic to and from the US the more informationally interconnected the markets are, and the more

important the US market is as a source of information. We use annual international telephone traffic data obtained from FCC's web-site to estimate telephone traffic with the US (scaled by the country's GDP in US dollars) for all countries in our sample. We estimate equation (3) where instead of Correlation variable we include Telephone traffic variable. Table 8 reports the estimation results.

INSERT TABLE 8 HERE

We observe that the interaction variable between NYSE closure and Telephone traffic variables is highly significant for all measures (negative for the number of shares traded, trading volume, turnover, realized volatility and information efficiency, and positive for bid-ask spread and illiquidity ratio), suggesting that for stocks (both cross-listed and domestic) that originate in markets that have higher information links (measured with telephone traffic) with the US market stock liquidity and information efficiency decreases significantly on the days when the NYSE is closed. The interaction variable between NYSE closure, telephone traffic and cross-listed stocks dummy variable (Closure x Tel traffic x CL) is significant only for the number of shares traded (Panel B, Table 8). This may suggest that when a home country and the US already have significant information links the effects of cross-listing on the NYSE are less significant. Overall, there is evidence that all stocks in a country that has strong information links with the US are affected by NYSE closure, however, there is no robust evidence that cross-listed stocks are affected to a greater degree.

4.3 Robustness Tests

4.3.1 Canada vs. other home countries

As discussed in Section 3, a significant portion of the sample consists of Canadian stocks. Canadian stocks are more likely to cross-list in the US, and generally have a considerable share of trading taking place in the US markets (see e.g. Eun and Sabherwal, 2003). Also, the Canadian market is geographically and economically more proximate to the US market than any other markets in our sample. In this section, we test whether the effects of NYSE closure are different for Canadian stocks than for stocks from other markets. Table 9 reports estimation results of

Equation (1) for two subsamples: (i) Canadian stocks (Canada) and (ii) all other stocks excluding Canadian stocks (ex Canada).

INSERT TABLE 9 HERE

Estimation results (reported in Table 9) show that Canadian stocks, and particularly, Canadian cross-listed stocks, are significantly affected by NYSE closure, in line with findings of Tannous and Zhang (2008). Moreover, we find that the effect is not limited to Canadian stocks. Stocks from other countries also experience a significant decrease in stock liquidity, measured by the number of shares traded, trading volume in US dollars, turnover ratio, bid-ask spread and realized volatility when the NYSE is closed. Hence, our results are not solely driven by the impact on the Canadian market.

5. Conclusion

In this study, we examine the impact of NYSE closure on the trading volume in the home market for cross-listed and domestic stocks. Prior literature has suggested that the US market forms an important source of information for stocks around the globe, and with the US markets closed an important source of information is missing, which affects trading volume around the globe. We show that closure of the NYSE significantly reduces the liquidity and information price efficiency of the stocks in our sample confirming the importance of the US market as a source of information. Moreover, we document that stocks that are cross-listed in the US see a greater reduction in trading volume than their domestic counterparts. This suggests that the informational environment and, accordingly, liquidity and price efficiency of stocks cross-listed in the US depends to a greater degree on information produced in the US markets. We further find that cross-listed stocks are more affected by NYSE closures when their NYSE trading volume on normal days is higher, and when the stock's home market returns correlate more with the US market returns. Overall, our findings have important implications for our understanding of the transmission of information across markets, and add an extra dimension to the relation between spill-over effects, information transmission and cross-listed stocks.

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Table 1. Sample description

Home country	Number of all stocks	Number of cross-listed stocks	Number of domestic stocks
Argentina	18	9	9
Australia	12	5	7
Belgium	2	2	0
Brazil	52	23	29
Canada	230	90	140
Chile	20	9	11
China	58	14	44
Colombia	5	2	3
Denmark	2	1	1
Finland	2	1	1
France	14	7	7
Germany	8	4	4
Greece	8	2	6
Hong Kong	2	1	1
India	19	9	10
Indonesia	4	2	2
Ireland	5	3	2
Israel	11	5	6
Italy	7	3	4
Japan	42	18	24
Korea	15	8	7
Luxembourg	2	1	1
Mexico	37	17	20
Netherlands	16	8	8
New Zealand	2	1	1
Norway	6	3	3
Peru	8	3	5
Philippines	1	1	0
Portugal	3	1	2
Russia	9	4	5
South Africa	16	8	8
Spain	7	3	4
Switzerland	11	4	7
Taiwan	10	5	5
Turkey	2	1	1
United Kingdom	62	25	37
All countries	**728**	**303**	**425**

Table 2. Liquidity measures: Summary statistics

Daily liquidity measures	Panel A. All stocks				Panel B. NYSE-listed stocks				Panel C. Domestic stocks			
	All days	NYSE open	NYSE closed	Difference in means (3) – (2)	All days	NYSE open	NYSE closed	Difference in means (7) – (6)	All days	NYSE open	NYSE closed	Difference in means (11) – (10)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
NST	5,720.4	5,729.9	5,316.1	-413.8***	8,711.4	8,738.4	7,566.3	-1,172.1***	3,609.6	3,606.6	3,739.5	132.9
	N=922,905	N= 901,613	N= 21,292	(-4.04)	N=381,823	N=373,051	N=8,772	(5.85)	N=541,082	N=528,562	N=12,520	(1.35)
$TV	33,588.1	33,783.5	25,315.8	-8,467.7***	59,871.0	60,255.9	43,501.6	-16,754.3***	15,043.3	15,101.7	12,575.1	-2,526.6***
	N=922,973	N=901,680	N=21,293	(-18.02)	N=381,826	N=373,054	=8,772	(17.25)	N=541,147	N=528,626	N=12,521	(-7.77)
Turnover	0.0048	0.0048	0.0044	-0.0005***	0.0038	0.0039	0.0029	-0.0010***	0.0054	0.00544	0.00542	0.000016
	N=922,905	N=901,613	N=21,292	(5.75)	N=381,823	N=373,051	N=8,772	(-12.49)	N=541,082	N=528,562	N=12,520	(0.14)
Bid-ask spread	0.0135	0.0135	0.0124	-0.0011***	0.0070	0.0070	0.0069	-0.0001	0.0179	0.0180	0.0162	-0.0018***
	N=928,904	N=907,405	N=21,499	(-4.08)	N=378,157	N=369,430	N=8,727	(0.24)	N=550,747	N=537,975	N=12,772	(-4.43)
Illiquidity	0.0005	0.00047	0.00051	0.00005***	0.0001	0.0001	0.0002	0.00006***	0.0007	0.0007	0.00073	0.00004
	N=920,084	N=898,858	N=21,226	(2.63)	N=381,653	N=372,886	N=8,767	(4.27)	N=538,431	N=525,972	N=12,459	(1.25)
RV	2.448	2.452	2.266	0.186***	2.191	2.195	2.021	-0.174***	2.632	2.636	2.441	-0.196***
	N=730,118	N=713,611	N=16,507	(12.54)	N=304,294	N=297,425	N=6,869	(-8.83)	N=425,824	N=416,186	N=9,638	(-9.30)
Information	-0.0012	0.0019	-0.1331	-0.1350***	0.0036	0.0076	-0.1678	-0.1755***	-0.0048	-0.0024	-0.1075	-0.1051***
efficiency	N=625,940	N=611,512	N=14,428	(-11.67)	N=267,223	N=261,092	N=6,131	(9.94)	N=358,717	N=350,420	N=8,297	(6.86)

Table 3. NYSE Closure and Global Stock Market Liquidity

	Panel A							Panel B						
	NST	$TV	Turnover	Bid-ask spread	Illiquidity	RV	Information efficiency	NST	$TV	Turnover	Bid-ask spread	Illiquidity	RV	Information efficiency
	(1)	(2)	(3)	(5)	(4)	(6)	(7)	(8)	(9)	(10)	(12)	(11)	(13)	(14)
NYSE closure	-0.50***	-0.50***	-0.41***	0.05***	0.05***	-0.11***	-0.07***	-0.42***	-0.40***	-0.31***	0.01	0.05***	-0.09***	-0.03*
	(-27.67)	(-27.82)	(-27.92)	(6.57)	(9.09)	(-18.01)	(-4.57)	(-18.82)	(-18.19)	(-17.08)	(0.70)	(5.78)	(-12.28)	(-1.87)
Closure x CL								-0.20***	-0.26***	-0.24***	0.11***	0.01	-0.03**	-0.10***
								(-5.00)	(-6.72)	(-7.38)	(6.20)	(0.48)	(-2.57)	(-2.85)
CL stocks	0.30**	0.12	0.04	0.17***	0.10**	0.07***	-0.01	0.31**	0.13	0.04	0.17***	0.10**	0.07***	-0.01
	(2.24)	(1.24)	(0.47)	(3.11)	(2.57)	(2.77)	(-0.28)	(2.27)	(1.30)	(0.55)	(3.06)	(2.57)	(2.79)	(-0.22)
Firm size	0.62***	1.08***	0.07***	-0.41***	-0.25***	-0.10***	-0.01	0.62***	1.08***	0.07***	-0.41***	-0.25***	-0.10***	-0.01
	(16.41)	(39.54)	(2.91)	(-22.89)	(-17.92)	(-8.64)	(-0.76)	(16.41)	(39.53)	(2.91)	(-22.89)	(-17.92)	(-8.64)	(-0.76)
PTB ratio	-0.32***	-0.02	0.06	-0.04	-0.02	-0.01	-0.02	-0.32***	-0.02	0.06	-0.04	-0.02	-0.01	-0.02
	(-4.07)	(-0.36)	(1.29)	(-1.07)	(-0.92)	(-0.93)	(-0.76)	(-4.07)	(-0.36)	(1.29)	(-1.07)	(-0.92)	(-0.93)	(-0.77)
Constant	0.23	-2.70***	-8.49***	-1.74***	-6.27***	2.13***	0.05	0.23	-2.70***	-8.49***	-1.74***	-6.27***	2.13***	0.05
	(0.38)	(-5.60)	(-30.95)	(-8.16)	(-29.05)	(24.84)	(0.30)	(0.38)	(-5.61)	(-30.97)	(-8.16)	(-29.05)	(24.84)	(0.29)
Home country fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	922,905	922,973	922,905	928,904	920,084	730,118	625,940	922,905	922,973	922,905	928,904	920,084	730,118	625,940
R-squared	0.59	0.79	0.36	0.53	0.39	0.21	0.21	0.59	0.79	0.36	0.53	0.39	0.21	0.21

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4. NYSE Closure, NYSE's Trading Volume Share and Liquidity of Cross-listed Stocks

	Panel A							Panel B						
	NST	$TV	Turnover	Bid-ask spread	Illiquidity	RV	Information efficiency	NST	$TV	Turnover	Bid-ask spread	Illiquidity	RV	Information efficiency
	(1)	(2)	(3)	(5)	(4)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
NYSE closure	-0.31***	-0.35***	-0.30***	0.01	0.05***	-0.10***	-0.05***	-0.41***	-0.39***	-0.31***	0.01	0.05***	-0.09***	-0.03*
	(-11.50)	(-15.00)	(-16.75)	(0.88)	(5.50)	(-14.56)	(-3.31)	(-18.80)	(-18.19)	(-17.10)	(0.76)	(5.79)	(-12.28)	(-1.88)
Closure x TVS_{NYSE}	-1.05***	-0.87***	-0.63***	0.23***	-0.01	-0.04	-0.11							
	(-7.54)	(-7.69)	(-7.38)	(4.44)	(-0.32)	(-1.40)	(-1.43)							
Closure x TVS_{NYSE}^{Low}								0.24***	0.03	-0.04	0.10***	0.02	-0.03*	-0.11**
								(2.87)	(0.43)	(-0.74)	(2.60)	(0.94)	(-1.74)	(-2.54)
Closure x TVS_{NYSE}^{Medium}								-0.18*	-0.20**	-0.28***	-0.01	0.00	-0.05**	-0.10*
								(-1.68)	(-2.30)	(-3.76)	(-0.22)	(0.16)	(-2.02)	(-1.65)
Closure x TVS_{NYSE}^{High}								-1.03***	-0.85***	-0.55***	0.25***	-0.02	-0.02	-0.08
								(-6.91)	(-7.06)	(-6.63)	(4.62)	(-0.42)	(-0.75)	(-1.06)
CL stocks	0.31**	0.12	0.04	0.17***	0.10***	0.07***	-0.01	0.31**	0.12	0.04	0.17***	0.10***	0.07***	-0.01
	(2.31)	(1.21)	(0.59)	(3.08)	(2.65)	(2.81)	(-0.22)	(2.26)	(1.18)	(0.57)	(3.08)	(2.63)	(2.82)	(-0.19)
Firm size	0.62***	1.08***	0.07***	-0.41***	-0.25***	-0.10***	-0.01	0.62***	1.08***	0.07***	-0.41***	-0.25***	-0.10***	-0.01
	(16.35)	(39.79)	(2.89)	(-22.94)	(-17.98)	(-8.61)	(-0.76)	(16.35)	(39.80)	(2.89)	(-22.94)	(-17.98)	(-8.61)	(-0.76)
PTB ratio	-0.32***	-0.02	0.06	-0.04	-0.02	-0.01	-0.02	-0.32***	-0.02	0.06	-0.04	-0.02	-0.01	-0.02
	(-4.09)	(-0.34)	(1.26)	(-1.05)	(-0.92)	(-0.92)	(-0.77)	(-4.09)	(-0.34)	(1.26)	(-1.05)	(-0.92)	(-0.92)	(-0.77)
Constant	0.24	-2.71***	-8.49***	-1.74***	-6.27***	2.13***	0.05	0.25	-2.70***	-8.49***	-1.74***	-6.27***	2.12***	0.05
	(0.39)	(-5.63)	(-31.02)	(-8.15)	(-29.02)	(24.84)	(0.29)	(0.40)	(-5.62)	(-31.01)	(-8.15)	(-29.01)	(24.84)	(0.28)
Home country fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	918,763	918,831	918,763	924,788	915,942	726,664	623,171	918,763	918,831	918,763	924,788	915,942	726,664	623,171
R-squared	0.59	0.79	0.36	0.53	0.39	0.21	0.21	0.59	0.79	0.36	0.53	0.39	0.21	0.21

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5. NYSE Closure, Duration of NYSE's Cross-listing and Liquidity of Cross-listed Stocks

	Panel A.							Panel B.						
	NST	$TV	Turnover	Bid-ask spread	Illiquidity	RV	Information efficiency	NST	$TV	Turnover	Bid-ask spread	Illiquidity	RV	Information efficiency
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
NYSE closure	-0.57***	-0.60***	-0.50***	0.09***	0.05***	-0.12***	-0.11***	-0.42***	-0.40***	-0.31***	0.01	0.05***	-0.10***	-0.03*
	(-22.92)	(-24.26)	(-24.62)	(8.61)	(7.93)	(-14.79)	(-4.53)	(-18.89)	(-18.37)	(-17.27)	(0.86)	(6.32)	(-12.53)	(-1.76)
Closure x Years_CL	-0.02***	-0.02***	-0.02***	0.01***	0.00	-0.003**	-0.01***							
	(-4.80)	(-6.46)	(-7.17)	(6.16)	(0.20)	(-2.53)	(-2.89)							
Closure x Years_CL$_{0-2}$								-0.37*	-0.30*	-0.31**	-0.06	-0.15**	-0.03	-0.16
								(-1.82)	(-1.82)	(-2.49)	(-0.75)	(-2.08)	(-0.48)	(-1.41)
Closure x Years_CL$_{3-7}$								-0.21	-0.19	-0.21*	0.03	-0.12***	0.00	-0.07
								(-1.13)	(-1.50)	(-1.94)	(0.44)	(-2.65)	(0.09)	(-0.77)
Closure x Years_CL$_{over7}$								-0.19***	-0.26***	-0.24***	0.12***	0.02	-0.04**	-0.11***
								(-3.89)	(-5.84)	(-6.35)	(5.82)	(1.37)	(-2.51)	(-2.90)
Years_CL	0.03**	0.01	0.00	0.02***	0.01***	0.01**	0.00	0.03**	0.01	0.00	0.02***	0.01***	0.01**	-0.00
	(2.24)	(1.16)	(0.42)	(3.17)	(3.01)	(2.52)	(-0.08)	(2.24)	(1.16)	(0.42)	(3.18)	(3.01)	(2.52)	(-0.07)
Firm size	0.62***	1.08***	0.07***	-0.41***	-0.25***	-0.10***	-0.01	0.62***	1.08***	0.07***	-0.41***	-0.25***	-0.10***	-0.01
	(16.24)	(39.12)	(2.93)	(-22.80)	(-17.99)	(-8.47)	(-0.83)	(16.23)	(39.12)	(2.93)	(-22.80)	(-18.00)	(-8.47)	(-0.83)
PTB ratio	-0.32***	-0.03	0.06	-0.04	-0.02	-0.01	-0.02	-0.32***	-0.03	0.06	-0.04	-0.02	-0.01	-0.02
	(-4.07)	(-0.39)	(1.26)	(-1.05)	(-0.82)	(-0.98)	(-0.74)	(-4.07)	(-0.39)	(1.26)	(-1.05)	(-0.82)	(-0.98)	(-0.74)
Constant	0.47	-2.61***	-8.47***	-1.60***	-6.18***	2.18***	0.05	0.47	-2.61***	-8.47***	-1.60***	-6.18***	2.18***	0.05
	(0.77)	(-5.44)	(-30.57)	(-7.39)	(-28.62)	(23.39)	(0.27)	(0.77)	(-5.44)	(-30.57)	(-7.39)	(-28.63)	(23.39)	(0.27)
Home country fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	922,905	922,973	922,905	928,904	920,084	730,118	625,940	922,905	922,973	922,905	928,904	920,084	730,118	625,940
R-squared	0.59	0.79	0.36	0.53	0.39	0.21	0.21	0.59	0.79	0.36	0.53	0.39	0.21	0.21

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 6. NYSE Closure, Foreign Institutional Ownership and Global Stock Market Liquidity

	Panel A.							Panel B.						
	NST	$TV	Turnover	Bid-ask spread	Illiquidity	RV	Information efficiency	NST	$TV	Turnover	Bid-ask spread	Illiquidity	RV	Information efficiency
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
NYSE closure	-0.48***	-0.48***	-0.40***	0.05***	0.04***	-0.11***	-0.08***	-0.39***	-0.36***	-0.30***	-0.01	0.02*	-0.09***	-0.04**
	(-24.79)	(-25.36)	(-25.37)	(6.44)	(6.73)	(-16.30)	(-5.01)	(-12.87)	(-12.46)	(-13.48)	(-0.55)	(1.89)	(-10.55)	(-2.13)
Closure x CL								-0.21***	-0.31***	-0.26***	0.15***	0.05**	-0.04**	-0.10***
								(-3.16)	(-5.23)	(-5.94)	(4.70)	(2.23)	(-2.42)	(-2.63)
Closure x Foreign investors	-0.00	-0.00	-0.00	-0.00	0.001***	-0.00	0.002**	-0.00	-0.00*	-0.00	0.00	0.004***	-0.00	0.00
	(-1.57)	(-1.25)	(-0.62)	(-0.65)	(2.69)	(-0.11)	(2.34)	(-1.04)	(-1.95)	(-1.29)	(1.49)	(2.85)	(-1.20)	(0.69)
Closure x Foreign investors x CL								0.00	0.01	0.00	-0.01*	-0.01**	0.00	0.00
								(0.56)	(1.63)	(1.22)	(-1.70)	(-2.40)	(1.53)	(0.93)
Foreign investors	-0.01***	-0.01***	-0.01***	0.01***	0.003**	0.00	0.00	-0.01***	-0.01***	-0.01***	0.01***	0.003**	0.00	0.00
	(-2.86)	(-3.88)	(-4.17)	(3.90)	(2.39)	(1.61)	(0.73)	(-2.86)	(-3.88)	(-4.17)	(3.90)	(2.39)	(1.61)	(0.73)
CL stocks	0.30**	0.11	0.03	0.18***	0.10***	0.06**	-0.01	0.31**	0.12	0.04	0.18***	0.10***	0.06**	-0.01
	(2.27)	(1.14)	(0.43)	(3.28)	(2.61)	(2.52)	(-0.23)	(2.30)	(1.20)	(0.50)	(3.24)	(2.61)	(2.54)	(-0.18)
Firm size	0.62***	1.09***	0.07***	-0.41***	-0.25***	-0.10***	-0.01	0.62***	1.09***	0.07***	-0.41***	-0.25***	-0.10***	-0.01
	(16.53)	(41.29)	(3.00)	(-23.08)	(-18.16)	(-8.43)	(-0.90)	(16.53)	(41.30)	(3.01)	(-23.09)	(-18.17)	(-8.43)	(-0.90)
PTB ratio	-0.32***	-0.03	0.06	-0.04	-0.02	-0.01	-0.02	-0.32***	-0.03	0.06	-0.04	-0.02	-0.01	-0.02
	(-4.14)	(-0.43)	(1.34)	(-1.12)	(-1.00)	(-0.83)	(-0.78)	(-4.14)	(-0.43)	(1.34)	(-1.12)	(-1.00)	(-0.83)	(-0.78)
Constant	0.45	-2.42***	-8.31***	-1.93***	-6.35***	2.11***	0.02	0.44	-2.42***	-8.31***	-1.93***	-6.35***	2.11***	0.02
	(0.73)	(-5.01)	(-30.52)	(-8.65)	(-28.83)	(23.99)	(0.13)	(0.73)	(-5.02)	(-30.53)	(-8.65)	(-28.84)	(23.98)	(0.12)
Home country fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	906,842	906,910	906,842	912,502	904,187	717,076	612,917	906,842	906,910	906,842	912,502	904,187	717,076	612,917
R-squared	0.59	0.79	0.37	0.54	0.39	0.21	0.21	0.59	0.79	0.37	0.54	0.39	0.21	0.21

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 7. NYSE Closure, Stock Market Correlations and Global Stock Market Liquidity

	Panel A.							Panel B.						
	NST	$TV	Turnover	Bid-ask spread	Illiquidity	RV	Information efficiency	NST	$TV	Turnover	Bid-ask spread	Illiquidity	RV	Information efficiency
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
NYSE closure	0.05**	0.05***	0.06***	-0.06***	-0.01	-0.01	0.03	0.05**	0.05***	0.06***	-0.06***	-0.01	-0.01	0.02
	(2.52)	(2.66)	(3.94)	(-5.13)	(-1.29)	(-0.57)	(1.03)	(2.55)	(2.69)	(4.06)	(-5.13)	(-1.28)	(-0.59)	(0.95)
Closure x Correlation	-1.11***	-1.13***	-0.95***	0.23***	0.13***	-0.21***	-0.21***	-0.92***	-0.99***	-0.85***	0.23***	0.13***	-0.20***	-0.13**
	(-23.82)	(-24.30)	(-24.30)	(8.53)	(6.17)	(-9.97)	(-3.46)	(-16.77)	(-18.45)	(-19.73)	(7.41)	(4.77)	(-8.85)	(-2.18)
Closure x Correlation x CL								-0.44***	-0.32***	-0.24***	0.00	-0.00	-0.03	-0.17***
								(-5.46)	(-4.51)	(-4.17)	(0.10)	(-0.04)	(-1.10)	(-2.60)
Market correlation	0.10	0.26*	0.65***	0.52***	-0.06	0.85***	-2.07***	0.10	0.26*	0.65***	0.52***	-0.06	0.85***	-2.07***
	(0.58)	(1.69)	(5.27)	(4.41)	(-0.85)	(11.61)	(-6.79)	(0.58)	(1.69)	(5.27)	(4.41)	(-0.85)	(11.61)	(-6.79)
CL stocks	0.30**	0.12	0.03	0.17***	0.10**	0.06**	0.00	0.31**	0.13	0.03	0.17***	0.10**	0.06**	0.00
	(2.23)	(1.22)	(0.43)	(3.05)	(2.58)	(2.51)	(0.04)	(2.27)	(1.26)	(0.46)	(3.05)	(2.58)	(2.52)	(0.09)
Firm size	0.62***	1.08***	0.07***	-0.41***	-0.25***	-0.10***	-0.01	0.62***	1.08***	0.07***	-0.41***	-0.25***	-0.10***	-0.01
	(16.38)	(39.50)	(2.97)	(-22.72)	(-17.91)	(-8.49)	(-1.16)	(16.38)	(39.50)	(2.97)	(-22.72)	(-17.91)	(-8.49)	(-1.16)
PTB ratio	-0.32***	-0.03	0.06	-0.04	-0.02	-0.02	-0.02	-0.32***	-0.02	0.06	-0.04	-0.02	-0.02	-0.02
	(-4.07)	(-0.38)	(1.25)	(-1.11)	(-0.91)	(-1.21)	(-0.51)	(-4.07)	(-0.37)	(1.25)	(-1.11)	(-0.91)	(-1.21)	(-0.51)
Constant	0.19	-2.82***	-8.78***	-1.97***	-6.25***	1.76***	0.96***	0.18	-2.82***	-8.78***	-1.97***	-6.25***	1.76***	0.96***
	(0.30)	(-5.80)	(-31.10)	(-8.82)	(-28.54)	(18.58)	(4.37)	(0.30)	(-5.80)	(-31.09)	(-8.81)	(-28.54)	(18.58)	(4.37)
Home country fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	922,905	922,973	922,905	928,904	920,084	730,118	625,940	922,905	922,973	922,905	928,904	920,084	730,118	625,940
R-squared	0.59	0.79	0.36	0.53	0.39	0.22	0.22	0.59	0.79	0.36	0.53	0.39	0.22	0.22

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 8. NYSE Closure, Telephone Traffic and Global Stock Market Liquidity

	Panel A.							Panel B.						
	NST	$TV	Turnover	Bid-ask spread	Illiquidity	RV	Information efficiency	NST	$TV	Turnover	Bid-ask spread	Illiquidity	RV	Information efficiency
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
NYSE closure	-0.28***	-0.28***	-0.23***	0.01	0.02***	-0.08***	0.00	-0.28***	-0.28***	-0.23***	0.01	0.02***	-0.08***	0.00
	(-18.83)	(-18.97)	(-19.47)	(1.39)	(3.49)	(-11.66)	(0.20)	(-18.97)	(-19.04)	(-19.49)	(1.39)	(3.51)	(-11.66)	(0.20)
Closure x Tel traffic	-0.05***	-0.05***	-0.04***	0.01***	0.01***	-0.01***	-0.02***	-0.04***	-0.05***	-0.04***	0.01***	0.01***	-0.01***	-0.01***
	(-15.90)	(-16.19)	(-15.18)	(6.02)	(6.32)	(-5.96)	(-4.62)	(-6.92)	(-9.87)	(-10.82)	(3.92)	(4.87)	(-4.06)	(-3.11)
Closure x Tel traffic x CL								-0.04***	-0.01	-0.00	-0.00	-0.01**	-0.00	-0.01
								(-2.78)	(-1.03)	(-0.26)	(-0.64)	(-2.29)	(-1.22)	(-1.52)
Telephone traffic	0.09***	0.10***	0.08***	-0.02**	-0.01	0.07***	0.02*	0.09***	0.10***	0.08***	-0.02**	-0.01	0.07***	0.02*
	(6.06)	(6.53)	(6.16)	(-2.44)	(-0.71)	(11.12)	(1.85)	(6.06)	(6.53)	(6.16)	(-2.44)	(-0.72)	(11.12)	(1.85)
CL stocks	0.30**	0.12	0.03	0.18***	0.10**	0.07***	-0.01	0.30**	0.12	0.03	0.18***	0.10***	0.07***	-0.01
	(2.21)	(1.21)	(0.44)	(3.12)	(2.57)	(2.68)	(-0.30)	(2.24)	(1.22)	(0.44)	(3.12)	(2.60)	(2.69)	(-0.27)
Firm size	0.62***	1.08***	0.07***	-0.41***	-0.25***	-0.10***	-0.01	0.62***	1.08***	0.07***	-0.41***	-0.25***	-0.10***	-0.01
	(16.45)	(39.54)	(3.01)	(-22.91)	(-17.87)	(-8.53)	(-0.72)	(16.45)	(39.54)	(3.01)	(-22.91)	(-17.87)	(-8.53)	(-0.72)
PTB ratio	-0.32***	-0.02	0.06	-0.04	-0.02	-0.01	-0.02	-0.32***	-0.02	0.06	-0.04	-0.02	-0.01	-0.02
	(-4.05)	(-0.35)	(1.30)	(-1.08)	(-0.92)	(-0.90)	(-0.76)	(-4.05)	(-0.35)	(1.30)	(-1.08)	(-0.92)	(-0.90)	(-0.76)
Constant	0.12	-2.82***	-8.59***	-1.71***	-6.27***	2.05***	0.03	0.12	-2.82***	-8.59***	-1.71***	-6.27***	2.05***	0.03
	(0.19)	(-5.84)	(-31.26)	(-8.00)	(-28.90)	(23.75)	(0.16)	(0.19)	(-5.84)	(-31.25)	(-8.00)	(-28.90)	(23.75)	(0.16)
Home country fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	922,905	922,973	922,905	928,904	920,084	730,118	625,940	922,905	922,973	922,905	928,904	920,084	730,118	625,940
R-squared	0.59	0.79	0.36	0.53	0.39	0.22	0.21	0.59	0.79	0.36	0.53	0.39	0.22	0.21

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 9: NYSE Closure and Global Stock Market Liquidity: Canada vs. Other Home Countries

	NST		$TV		Turnover		Bid-ask spread		Illiquidity		RV		Information efficiency	
	Canada	ex. Canada	Canada	ex. Canada	Canada	ex. Canada	Canada	ex. Canada	Canada	ex. Canada	Canada	ex. Canada	Canada	ex. Canada
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
NYSE closure	-0.78***	-0.30***	-0.78***	-0.29***	-0.65***	-0.23***	0.06***	-0.00	0.12***	0.03***	-0.16***	-0.07***	-0.19***	0.01
	(-20.33)	(-13.85)	(-20.89)	(-13.72)	(-19.97)	(-13.70)	(2.66)	(-0.01)	(6.28)	(4.06)	(-10.06)	(-9.16)	(-5.42)	(0.58)
Closure x CL	-0.45***	-0.16***	-0.45***	-0.19***	-0.42***	-0.15***	0.17***	0.07***	-0.02	0.00	-0.06**	-0.02*	-0.38***	0.03
	(-8.37)	(-4.27)	(-8.64)	(-5.02)	(-9.20)	(-5.32)	(4.47)	(4.24)	(-0.66)	(0.13)	(-2.11)	(-1.92)	(-6.60)	(0.88)
CL stocks	0.04	0.46**	-0.02	0.28**	-0.03	0.13	0.19***	0.13	0.24***	0.01	0.12***	0.04	0.20***	-0.11**
	(0.28)	(2.51)	(-0.26)	(2.02)	(-0.29)	(1.29)	(3.42)	(1.63)	(3.80)	(0.12)	(2.69)	(1.53)	(3.92)	(-2.02)
Firm size	0.69***	0.61***	1.22***	0.96***	0.23***	-0.06	-0.47***	-0.34***	-0.35***	-0.17***	-0.11***	-0.07***	-0.01	-0.01
	(18.67)	(10.18)	(50.20)	(21.49)	(10.15)	(-1.64)	(-32.73)	(-10.42)	(-19.28)	(-9.41)	(-7.09)	(-4.28)	(-0.58)	(-0.37)
PTB ratio	-0.13	-0.38***	0.04	-0.04	0.04	0.07	-0.03	-0.05	-0.04	-0.02	-0.01	-0.01	-0.05*	-0.02
	(-1.48)	(-3.72)	(0.68)	(-0.46)	(0.82)	(1.23)	(-0.94)	(-0.99)	(-1.03)	(-0.76)	(-0.53)	(-0.87)	(-1.67)	(-0.45)
Constant	1.17***	-0.51	-1.02***	-2.06***	-7.87***	-7.74***	-1.71***	-2.46***	-6.27***	-6.83***	1.55***	1.72***	0.42***	-0.05
	(4.78)	(-0.72)	(-7.08)	(-3.71)	(-57.90)	(-22.08)	(-18.43)	(-8.80)	(-52.95)	(-27.91)	(16.16)	(15.14)	(4.27)	(-0.23)
Home country fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	280,135	642,770	280,135	642,838	280,135	642,770	288,979	639,925	279,571	640,513	256,421	473,697	213,794	412,146
R-squared	0.56	0.56	0.85	0.77	0.22	0.43	0.56	0.47	0.41	0.39	0.24	0.19	0.02	0.24

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1