Understanding the Disparity in Trading Volume for U.S. Cross-Listings: The Effects of Recognition and Investment Risk Exposure

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Abstract

This paper presents new evidence on why we observe striking differences in the percentage of trade in foreign markets for cross-listed stocks. With a large sample of Toronto Stock Exchange (TSX) stocks cross-listed in the U.S. and Canada, we document the effect of investor recognition and risk characteristics on the distribution of trading volume. Firms that are more visible to American investors are traded more heavily in the U.S. At the same time, firms that offer diverse risk characteristics are attractive to Americans because these stocks provide the opportunity to diversify portfolios.

Keywords: cross-listings, trading volume, visibility

JEL: G11, G12, G15

Understanding the Disparity in Trading Volume for U.S. Cross-Listings: The Effects of Recognition and Investment Risk Exposure

Striking differences exist in the percentage of trade in foreign markets for cross-listed stocks, even for firms that are similar in many regards. Yet, little research has attempted to identify the determinants of relative trading volume across markets for the cross-section of firms. Understanding observed patterns in multi-market trading is of great interest to managers who want to maximize their ability to raise capital at low cost, exchanges who vie for new listings, and regulators who are challenged with balancing investor protection and the continued competitiveness of U.S. markets.[1] Moreover, as individuals and institutional investors search for high risk-adjusted performance, international exposure, being a key component in achieving high returns, can also impact relative trading across markets for cross-listed stocks.

In a frictionless world, investors optimally diversify their investment portfolios across markets based on the risk characteristics of the stock. The location of trade should be irrelevant. However, the empirical evidence suggests that investors do not diversify their portfolios internationally and, instead, exhibit a preference for domestic equities or those located close to home. Familiarity with proximate firms may explain the home equity bias (Coval and Moscowitz 1999, Huberman 2001, Ackert, Church, Tompkins, and Zhang 2005). Investor recognition of a firm might also explain the cross-sectional variation in the U.S. share of trading volume.

[1] See, for example, "Regulation a Threat to New York, Report Says," by David Wighton, *Financial Times*, January 22, 2007, page 1, "Moving the Market: E*Trade to Move Bank to Nasdaq," by Gaston F. Ceron, *Wall Street Journal*, December 15, 2006, page C3, and "Global Growing Pains as Capital Markets Continue to Globalize," by Arturo Bris, *Financial Times*, June 2, 2006, page 3.

While this paper acknowledges the significance of firm visibility in investor decision-making, we present evidence corroborating the importance of a cornerstone of finance theory and practice: Investors recognize the benefits of diversification. Most previous research examined the firm's decision to cross-list, and so it provided a supply side argument. This paper examines the demand side of the equation, in the sense of why investors demand certain cross-listed firms and not others. With a sample that spans 16 years and includes 9,549 observations for 527 firms inter-listed in Canada and the United States, we examine the determinants of the U.S. share of trading volume.[2] The disparity in the U.S. share of trading volume is striking, with a minimum of 0.1% and a maximum of 99.9%. Our results suggest that both firm visibility and risk characteristics have significant explanatory power in explaining the variation in the U.S. share of trading volume across firms and time.

Liquid markets are preferred by managers who want to minimize the cost of raising capital and by investors who want to minimize trading costs and benefit from international exposure. According to Merton's (1987) investor recognition hypothesis, when a firm's investor base grows, its cost of capital falls. A critical assumption of the model is that "*an investor uses security k in constructing his optimal portfolio only if the investor knows about security k*" (Merton 1987, page 488). One way a Canadian firm can make its stock more visible and liquid is to list on a U.S. exchange. Foerster and Karolyi (1999) argue that increased investor recognition explains the returns pattern surrounding U.S. cross-listings.

Other theories have been proposed in the literature to explain potential gains to firms and investors from cross-listing. With trading frictions, a firm's cost of capital is expected to fall

[2] Our sample spans a period, before and after the Berlin Wall fell, during which the number of stock exchanges around the world exploded from 63 in 1988 to 145 in the early 2000s. Increased visibility to investors was one of the benefits of the proliferation in stock exchanges globally and facilitated international diversification and trading

after inter-listing because risk premiums that compensated for frictions dissolve. This conventional view of the benefits of cross-listing has been challenged in recent years (Karolyi 2006). Another potential explanation for cross-listing gains lies in the characteristics of the firm. Investors are attracted to stocks with different risk characteristics because these stocks provide the opportunity for further diversification of risk and higher risk-adjusted performance or alpha (Sarkissian and Schill 2004).[3]

In this paper, we examine the effects of investor recognition and risk characteristics on the distribution of trading volume using a large sample of Toronto Stock Exchange (TSX) stocks cross-listed in the U.S. The purpose of this paper is not to examine the firm's decision regarding whether to list abroad as this decision is taken as exogenous to our analysis. This is the supply side argument. Instead, we focus on the decisions of investors to invest in cross-listed stocks, the demand side argument, in order to better understand why the U.S. share of trading volume is so strikingly different across inter-listed firms. Because the trading hours are synchronous, the markets are geographically close, and Canadian shares trade on U.S. markets as ordinary shares, trading frictions should be minimal.[4] Studying the trading volume of Canadian cross-listed stocks on US exchanges thus provides a good laboratory environment to test our hypotheses.

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activity in cross-listed stocks. See "Building a Global Exchange," by Shahin Shojai, *Capco Institute Bulletin*, May 30, 2007.

[3] Sarkissian and Schill focus on the supply side argument of the cross listing decision, whereas we focus on the demand side argument for cross-listings.

[4] Pulatkonak and Sofianos (1999) point out, however, that Canadian shares traded in the U.S. are not fully fungible because investors in the U.S. holds the shares in U.S. dollar denominated accounts and receive dividends in U.S. dollars.

Though many have investigated the inter-listing choice, only a few studies have considered why the distribution of trading volume is so wide.[5] Some have focused on country-specific factors. Pulatkonak and Sofianos (1999) find that proximity to New York and the development of the home market have significant explanatory power for the share of NYSE trading volume. Halling, Pagano, Randl, and Zechner (2006) also find that geography and financial development of the home market are important. Halling, Pagano, Randl, and Zechner further find that the U.S. share of trading volume is larger for small, volatile, and high-tech firms.

The paper most closely related to ours is by Sabherwal (2006) who also considers firms cross-listed in the U.S. and Canada.[6] Sabherwal concludes that the U.S. share of trading volume is related to the location of informed and liquidity traders. Following Kyle (1985) and Admati and Pfleiderer (1988), he argues that the location of trade is related to the mass of informed and liquidity traders in each market. His empirical evidence is consistent with this argument. This paper differs in focus and implementation because our goal is to better understand how firm characteristics relate to the distribution of trading volume across firms over time. Sabherwal's approach is primarily cross-sectional in nature, though he compares two 30-day periods before and after decimalization in the U.S. We chose a larger sample including 16 years of data because the U.S. share of trading volume evolves after a firm is first listed, with some firms experiencing significant migration of trade back to the firm's home country (Halling, Pagano, Randl, and Zechner 2006).

[5] Karolyi (2006) provides a comprehensive review of the vast literature on cross-listings.
[6] Another recent paper examines the long-term effects on firm value of cross-listing in the U.S. for Canadian firms (King and Segal 2006). This paper does not address the great dispersion observed in the amount of U.S. trading volume.

The remainder of this paper is organized as follows. Section I outlines our hypotheses regarding the determinants of U.S. trading volume. Section II describes our data and presents descriptive information. Section III provides some perspective on the variation in the amount of trade in the U.S. by focusing on a few sample firms. Section IV presents our primary results and section V reports on some supplementary analysis. Section VI provides concluding remarks.

I. Cross-sectional Determinants of the Location of Trade

In studies of cross-listings, the prior literature has empirically examined numerous explanatory variables. The purpose of this paper is to focus on two determinants of relative trading volume: visibility and investment risk exposure. Though investors will be attracted to the market with lower transactions costs, we do not include a measure of these costs in our empirical model because it is not unambiguously clear how transactions costs factor into our analysis. The U.S. market is generally considered to be more liquid than the Canadian market and the bid-ask spread, a measure of transactions costs, is higher in Canada (Foerster and Karolyi 1998). At the same time, short sales costs are lower in Canada (Ackert and Athanassakos 2005). Furthermore, business practices and regulation in the two countries are very similar. Foerster and Karolyi (1993) provide evidence of some degree of segmentation between the U.S. and Canada, but the level of integration differs across industries with some important industries that are typical of the Canadian market showing little evidence of segmentation.

In our empirical model, we include two measures of visibility. The degree of institutional interest in a stock is one measure of visibility. Merton (1987) notes that firms with little institutional holding are not recognized and are likely to be neglected by investors. We also include analyst following, a measure of visibility proposed in the literature (Bhushan 1989).

Professional financial analysts provide useful information that is publicly disseminated. We hypothesize that the fraction of trade in the U.S. will increase with higher U.S. based institutional holding and greater U.S. based analyst following.[7]

The model also includes measures of the benefits of the risk characteristics of the firms. Although firm size is often a proxy for visibility because larger firms are more visible to investors, we argue that market capitalization is more likely a measure of diverse risk characteristics for our sample of stocks. The Canadian firms in our sample are quite small as compared to the average American firm.[8] This interpretation is consistent with the empirical evidence as Halling, Pagano, Randl, and Zechner (2006) and Sabherwal (2006) report a significant negative relationship between U.S. trading volume and firm size.

Next, our model includes the beta as measured against the Canadian market. Because the Canadian and U.S. markets are quite integrated, an investor who strives to diversify internationally will include Canadian stocks in his portfolio. As Stulz (1999) argues, investors can form lower risk portfolios by investing in other countries. Hence, U.S. investors need Canadian stocks in order to achieve the highest return for a given risk level - but which Canadian stocks? The key is the beta of a Canadian stock against a global portfolio, in contrast to the beta of U.S. stocks again the world portfolio. Stulz (1999) reports that the correlation between the Canadian market and the world market is -0.0170. This is quite different from the correlation of the U.S. market and the world market which is estimated to be 0.6940. In this sense, if an investor seeks exposure to the Canadian market, he will most likely need to invest in stocks with

[7] Of course, these variables are likely to be positively correlated. Later when the results are discussed we will see that multicollinearity is not a concern for the multivariate analysis.

[8] The average market value of our sample stocks is $1.3 billion Canadian, while small cap stocks in the U.S. are defined as stocks with a market cap between $600 million and $1.8 billion U.S. dollars (Stanyer 2006).

higher beta against the Canadian market. That is, a stock that is highly correlated with the Canadian market will allow the investor to better diversify risk.

Our third measure of a firm's risk characteristics is the percentage of the firm's assets in the U.S. A firm with a large proportion of its assets in the U.S. is very similar to other domestic (U.S.) firms and provides little in the way of diversification benefits. We hypothesize that the fraction of trade in the U.S. will decrease with increases in firm size, increase with increases in the Canadian beta, and decrease with a greater percentage of U.S. assets.[9]

We also recognize that industry may have an important impact on the location of trade because risk characteristics vary across industries. Foerster and Karolyi (1993) present evidence that the level of integration differs across industries. Following Sabherwal (2006) we include dummy variables for resource and tech or telecom firms. Resource firms constitute a large segment of the Canadian market and we hypothesize that U.S. trading volume will be higher for firms in this industry because they offer diversification benefits.[10] Tech firms are viewed as a specialty of the U.S. market so we predict that U.S. trading volume will be lower for Canadian high-tech firms.

In addition to the variables of primary interest, we also include some control variables. First we include indicator variables for firms with initial public offerings (IPOs) in Canada and the United States. Some Canadian stocks are first listed publicly in the United States and the location of trade may be concentrated in the U.S. as a result. We include dummy variables for

[9] Halling, Pagano, Randl, and Zechner (2006) include correlation with the U.S. market in their analysis. They predict (but do not find) that low correlation stocks will be demanded. Their prediction is consistent with our diversification predictions because our beta indicates correlation with the Canadian market and high U.S. assets indicate less diversification benefits.

[10] It was recently reported that the TSX index includes 16.43% materials and 26.98% energy stocks, whereas the S&P500 includes only 3.1% materials and 10.1% energy stocks. In comparison, the representations of the information technology, industrial, and health care industries are higher in the S&P 500 with percentages of 14.9% (versus 5.3% in the TSX) for information technology, 10.9% (versus 5.3% in the TSX) for industrials, and 11.9%

Canadian and U.S. IPOs in order to examine whether the country of initial listing impacts the location of trade. In addition, we control for the exchange of U.S. listing.

In the following section we describe our sample and present descriptive information. After a univariate perspective on the percentage of trade in the U.S., we provide more formal analysis.

II. Data and Descriptive Information

We began our data collection with all Canadian stocks reported as cross-listed in the United States and Canada in the *TSX Index Review* from March 1987 through December 2002. We next hand-collected information on institutional holdings from Standard and Poor's *Stock Guide*. Standard and Poor's Corporation obtains institutional holdings data for investment companies, banks, insurance companies, college endowments, and "13F" money managers from Vickers Stock Research. Non-U.S. institutional holdings are included to the extent that these investors report voluntarily. The data was then matched to the Compustat, Canadian Financial Markets Research Centre (CFMRC), I/B/E/S, and Thomson Financial's Securities Data Company (SDC) Global New Issues (IPO) databases. Because financial statement data is quarterly, we sample monthly series using the last month of each quarter. The final sample includes 9,549 quarterly observations for 527 firms.

Table I reports summary information for the cross-listed firms included in our sample. Panel A reports descriptive statistics for the overall sample. The table includes the mean, median, minimum, maximum, 25% and 75% percentile values, and standard deviation of each variable. US/CDNRatio is the ratio of the Canadian dollar value of trading volume in the United States

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(versus 0.81% in the TSX) for health care. See "Time for a Critical Look at the S&P/TSX Composite," by Rob Carrick, *Globe and Mail, Report on Business*, June 16, 2007, page B15.

and Canada with the value of trade in the U.S. and Canada both from the *TSX Index Review*. The %Institutions is the percentage of shares held by institutional investors and is collected from Standard and Poor's *Stock Guide*. Beta is measured using Canadian returns (CDNBeta) and market capitalization is in millions of Canadian dollars (Size) at the beginning of the quarter, and both are from CFMRC.[11] Next the table reports descriptive statistics on analyst following (#Analysts), which is from the I/B/E/S database. Finally, firm assets in the United States in millions of U.S. dollars (USAssets) are from Compustat.

The descriptive data in Panel A of Table I indicates significant differences across the sample. The stock of some sample firms is not traded at all in the U.S., whereas others are traded almost exclusively in U.S. The median ratio of U.S. and Canadian trading volume is 51%, so that about half of the trade is in U.S. markets for the median observation, though clearly the distribution is highly skewed. The median percentage of institutional holdings is 1.68%, with a range of less than 1/10 of 1% to over 65%. Not surprisingly, the median beta is very close to 1.0, though the range is quite wide with a minimum of .6257 and maximum of 1.4003. We also observe diversity in firm size, with a median of $179.43 million and range of $0.17 to $116,487.29 million. Finally, we see that some Canadian firms have few assets in the U.S., while others have large investments in their neighbor. The median value of U.S. assets is $330.18 million with a range of $0.50 to $297,915 million.

Panel B of Table 1 reports summary information by industry with industry groupings from the *TSX Index Review*. The sample includes 4,245 observations for firms in the mining or natural resources industry (RESOURCE), 1,465 observations for firms in the tech or telecom industries (TECH), and 3,839 observations for the remainder of the sample (Other). Firms in the

[11] The CFMRC estimates beta using 60 months of trailing returns data, if available. If a 60-month history is not available, beta is estimated with as few as 24 trailing monthly observations. The market portfolio is the value-

TECH classification have more trading volume in the U.S., larger holdings by institutional investors, and a higher beta, on average. RESOURCE firms have slightly more following by financial analysts. Firms that are not TECH or RESOURCE are larger and have more assets in the U.S.

Panel C of Table 1 includes descriptive statistics for observations categorized by the country in which the firm first listed for trading by the public. The sample includes 663 observations for firms with initial public offering on a Canadian stock exchange after January 1, 1987 (CDNIPO) and 122 observations for firms with an initial public offering on a U.S. stock exchange after January 1, 1987 (USIPO). The majority of sample observations (n = 8,764) are for firms with IPOs prior to 1987.[12] Compared to other inter-listed firms in our sample, firms with relatively recent IPO's in Canada have lower risk (as measured by beta) and are smaller (as measured by market capitalization).

The final panel of Table I Panel D provides information for firms by U.S. exchange of trading with exchange information from the *TSX Index Review*. We separate the data across exchanges because, as discussed in more detail in section V of the paper, trading volume for NYSE and NASDAQ are not always reported on a consistent basis. The sample includes 1,707 observations for stock traded only on the NYSE (NYSE), 4,452 observations for stock traded only on NASDAQ (NASDAQ), and 3,390 for all others (n = 3,390), including those trading on both NYSE and NASDAQ. As with the full sample, we observe that the distributions of the variables are highly skewed, so that the following discussion is based on medians. Canadian firms that trade on the NYSE are traded more frequently in the U.S., have greater holdings by

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weighted CFMRC universe stock index.

[12] The IPO data available to us through Thomson Financial's Securities Data Company (SDC) Global New Issues (IPO) databases includes only IPOs after January 1, 1987. We attempted to hand collect information on IPO

institutions, are larger, have more analysts following, and invest more heavily in U.S. assets. Firms that trade subsequently on NASDAQ are slightly more risky, as measured by beta.

III. Some Perspective on the Factors Affecting U.S. Trading Volume

As the previous discussion of the characteristics of our sample indicates, there is much dispersion among sample firms. Although the median trading volume in the U.S. is 51%, some firms trade almost exclusively in one market or the other. Figure 1 illustrates the wide ranges of observed trading volume in the U.S. for four sample firms. The four firms are all in the natural resource industry. CE Franklin, Ltd. (CFT) and Canadian Southern Petroleum (CSW) have most of their trading volume in the U.S., whereas trading for GW Utilities (GWT) and Rio Algom Ltd. (ROM) is concentrated in Canada.

Understanding why the trading volume patterns are so different is our challenge. To better appreciate the demanding nature of this challenge, we consider additional information about these four firms. Table II reports descriptive statistics for the four natural resource firms. Because of the skewness of many of the variables, the table reports median values, though means provide a similar picture.

Recall that our predictions are as follows. A higher percentage of U.S. trading volume should be associated with higher institutional holdings, larger size, more analyst following, higher Canadian beta, and fewer U.S. assets. Firms in the resource industry will be attractive to American investors. To provide perspective, we selected two firms in this industry with a high degree of trade in the U.S. and two with trading volume concentrated in Canada.

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location with little success. Many of our sample firms have changed names, merged, or are no longer public so that working backward through history provided extremely few data points.

There is no obvious pattern across these four firms in the relationship between U.S. trading volume and our explanatory variables, with perhaps one exception. Sometimes we see relationships we expected (e.g., CFT has a high beta and high U.S. volume) and sometimes we do not (ROM has high analyst following and little U.S. trading volume). The possible consistent pattern is the relationship between U.S. trading volume and firm size. We observe that the stocks of smaller firms trade more often in the U.S., whereas the volume for the larger is concentrated in Canada. If size was a proxy for visibility, this relationship is not consistent with expectations. However, the stocks of small Canadian firms may offer diversification benefits to U.S. investors. These small stocks are quite small (micro-cap) in American terms and could make available investment opportunities with very different risk characteristics.

The benefit of a multivariate approach is to isolate the effects of each explanatory variable. As discussed in the following section, overall, we find strong empirical support for our hypotheses.

IV. Primary Results

In order to more formally examine the relationship between firm characteristics and the ratio of trading volume of cross listed Canadian firms in the U.S., we estimate the following regression:

$$Ln(US/CDN_{i,t}) = Intercept + b_1 Ln\%Inst_{i,t} + b_2 \#Analysts_{i,t} + b_3 LnSize_{i,t} + b_4 CDNBeta_{i,t} + b_5 Ln(USAssets/Size)_{i,t}$$
$$+ b_6 RESOURCE_{i,t} + b_7 TECH_{i,t} + b_8 CDNIPO_{i,t} + b_9 USIPO_{i,t} + b_{10} NYSE_{i,t} + b_{11} NASDAQ_{i,t} + e_{i,t} \qquad (1)$$

where the dependent variable, $Ln(US/CDN_{i,t})$, is the natural logarithm of the ratio of the dollar value of trading volume in the United States and Canada in Canadian dollars for firm i and time t. The independent variables include the natural logarithm of the percentage of shares held by institutional investors (Ln%Inst), analyst following (#Analysts), the natural logarithm of market capitalization (LnSize), beta as measured using Canadian returns (CDNBeta), and the natural logarithm of the ratio of firm assets in the United States in millions of U.S. dollars and size (LnUSAssets/Size). In our empirical model, we take natural logarithm transformations for highly skewed variables. In addition, six independent dummy variables are included which take the value of 1 when the firm is in the mining or natural resources industry (RESOURCE), in the tech or telecom industries (TECH), had its initial public offering on a Canadian stock exchange after January 1, 1987 (CDNIPO), had its initial public offering on a U.S. stock exchange after January 1, 1987 (USIPO), traded on the NYSE (NYSE), or traded on NASDAQ (NASDAQ).

One concern about our model (1) is the potential for a multicollinearity problem. Table III reports correlation coefficients for the variables of interest. Many of the variables are significantly correlated. Of particular concern to us was the high correlation between USAssets and Size (0.331, $p < 0.01$). It seems that USAssets may simply proxy for firm size. Thus, in (1) we define assets in the U.S. relative to firm size, rather than the absolute dollar value of U.S. assets.[13] As reported subsequently, our concern about multicollinearity dissipated as the estimated coefficients of our model are statistically significant.

Table IV reports estimates of the coefficients (1) using four estimation techniques and quarterly data from March 1987 through December 2002. The first two columns report estimates of the model using pooled ordinary least squares (OLS) and generalized method of moments (GMM) techniques (Wooldridge 2006). Method of moments estimators have good properties, in general, including unbiasedness and consistency in the presence of heteroskedastic and autocorrelated residuals. In the third column, the estimates are averages of quarterly OLS estimates, following Fama and MacBeth (1973). Because of the possibility of cross-sectional correlation in the residuals in a given quarter, we used an approach suggested by Fama and MacBeth (1973) to avoid the possibility of biased standard error estimates. We estimate regression (1) for each quarterly period, and then average the quarterly estimates across quarters. Significance levels are based on pooled t-statistics, computed as follows:

$$t_j = \frac{\bar{b}_{j,t}}{\sigma_j / \sqrt{T}} \qquad (2)$$

where the numerator is the average of the quarterly coefficient estimates for a particular independent variable (j), σ is the standard deviation of the coefficient estimates of a particular variable, and T is the number of quarterly sample periods.[14] Finally, we estimate regression (1) following Peterson (2007), who further adjusts the Fama and MacBeth's (1973) standard errors for firm and time effects.

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[13] The correlation between relative assets and the other variables included in the regression is significantly lower than that between the level of assets. However, the inferences described subsequently do not change if we include the natural logarithm of assets, rather than relative assets.

[14] Note that the R^2 using the Fama MacBeth approach is the average of R^2 from the quarterly regressions.

The coefficient estimates reported in Table IV for Ln%Inst and #Analysts are consistent with our hypothesis that firms that are more visible to U.S. investors trade more in the U.S. In most cases, the coefficients of Ln%Inst and #Analysts are significantly positive at $p < 0.05$.

The estimated effect of LnSize is significantly negative ($p < 0.01$) for all four estimation techniques, indicating that large firms are less likely to trade in the U.S., consistent with the hypothesis that the diversification benefits of small firms attract U.S. investors. Halling, Pagano, Randl, and Zechner (2006) and Sabherwal (2006) also observe a negative relationship between U.S. trading volume and firm size. This result is compelling because it supports our view that investors are interested in stocks with diverse risk characteristics. Instead of market capitalization measuring visibility, size may be a measure of diversification benefit with small firms offering more in this regard.

The estimated effects of CDNBeta and Ln(USAssets/Size) are also consistent with expectations and significant at $p < 0.05$ in most cases. Firms with higher Canadian betas trade more in the U.S., which is consistent with our hypothesis that these firms offer American investors the opportunity to invest in stocks with high exposure to the Canadian market. In addition, the results indicate that firms with greater investment in U.S. based assets are traded less often in the U.S., which is consistent with our hypothesis that these firms provide little diversification benefits. Also consistent with our expectations, firms in the technology industry (TECH) have a lower share of trading volume in the U.S. This industry is viewed as a specialty of the U.S. and investors are looking for new opportunities for diversification. However, we hypothesized that firms in the natural resources (RESOURCE) industry would have a large share of trading volume in the U.S. Instead, we find that for the full sample these firms are also traded less in the U.S.

Finally, Table IV reports estimates for some control variables. The evidence weakly indicates that firms with IPOs in Canada (CDNIPO) and the U.S. (USIPO) after 1987 trade less in the U.S. This suggests that the U.S. share of trading volume is larger for firms that have been listed longer, consistent with Sabherwal (2006).

V. Additional Analysis

In addition to the full sample regression estimates reported in Table IV, we re-estimate (1) for firms traded only on NASDAQ because trading volume for NASDAQ stocks tends to be overestimated, as compared to the volume of trade on the NYSE (Dyl and Anderson 2005). The TSX and the NYSE are auction markets in which most trades are between a buyer and a seller, whereas in a dealer market like the NASDAQ, a dealer participates in trade. Adjusting NASDAQ volume by 50% is not necessarily appropriate because inter-dealer trade can be large. Furthermore, because electronic communications networks (ECNs) have emerged in recent years, the relationship between NYSE and NASDAQ volume is not constant through time.[15] In addition, Dyl and Anderson (2005) present evidence that the overstatement of volume is larger for firms with higher trading volume. Thus, because it is not clear how we can appropriately transform volume figures to arrive at comparable measures across exchanges, we estimate (1) including only firms traded on the NASDAQ exchange.

Estimates reported in Table V indicate some notable differences from the full sample estimates. Ln%Inst and #Analysts are no longer significant and there is little evidence that visibility has explanatory power for the U.S. share of trading volume. Risk characteristics, however, are important. The U.S. share of trading volume is higher for stocks with higher betas and fewer U.S. based assets. Furthermore, larger firms are of less interest to U.S. investors.

These firms add little to investors' ability to add stocks to their portfolios with different risk characteristics. For NASDAQ firms, the evidence, though weak, suggests that firms in the resource industry have a larger share of U.S. trading volume, whereas firms in the technology industry have a lower share. Consistent with our hypotheses, trade moves to (away from) the U.S. for resource (technology) firms because American investors are interested in stocks with greater (fewer) diversification benefits.

In addition, we considered whether the implementation of Regulation Fair Disclosure, or Reg FD, impacted the location of trade for our sample firms. Reg FD is often blamed for less competitive US markets.[16] The ruling, implemented in October 2000, mandates disclosure of information to investors simultaneously. We repeated all regressions reported in Tables IV and V adding a dummy variable representing the period after Reg FD was enacted and found no evidence that the regulation impacted the U.S. share of trading volume for our sample of firms.

VI. Concluding Remarks

This paper presents new evidence on the effects of investor recognition and risk characteristics on the distribution of trading volume using a large sample of Toronto Stock Exchange (TSX) stocks cross-listed in the U.S.. The focus is on the decisions of investors because we want to better understand why the U.S. share of trading volume is so strikingly different across inter-listed firms. The sample includes 16 years of data and 527 cross-listed firms. Our results indicate that firm visibility and risk characteristics both influence the U.S. share of trading volume for inter-listed Canadian firms. Firms that are more visible to American investors are traded more heavily in the U.S. At the same time, firms that offer diverse risk

[15] These ECNs post market makers' best prices and lower the cost of trading to the public.

characteristics are attractive to Americans because they provide the opportunity to diversify their portfolios.

Our results contrast with the predictions of a model of multi-market trading recently proposed by Baruch, Karolyi, and Lemmon (2003). In their model, trading volume moves to the market within which the foreign stocks have the highest correlation with the domestic stocks. In other words, investors are attracted to stocks that are similar to those already trading in their home market. Our evidence indicates that instead, investors are drawn to stocks that offer distinct risk characteristics. This is consistent with the view that investors understand and value the benefits of international diversification.

[16] See, for example, "Things Paulson Can Do to Boost U.S. Markets," *Wall street Journal*, November 10, 2006, page A17 and "Stock Market Brawl," by Elizabeth MacDonald, **www.Forbes.com**, November 2, 2006.

Figure 1

Figure 1a: CSW Canadian Southern Petroleum (CSW)

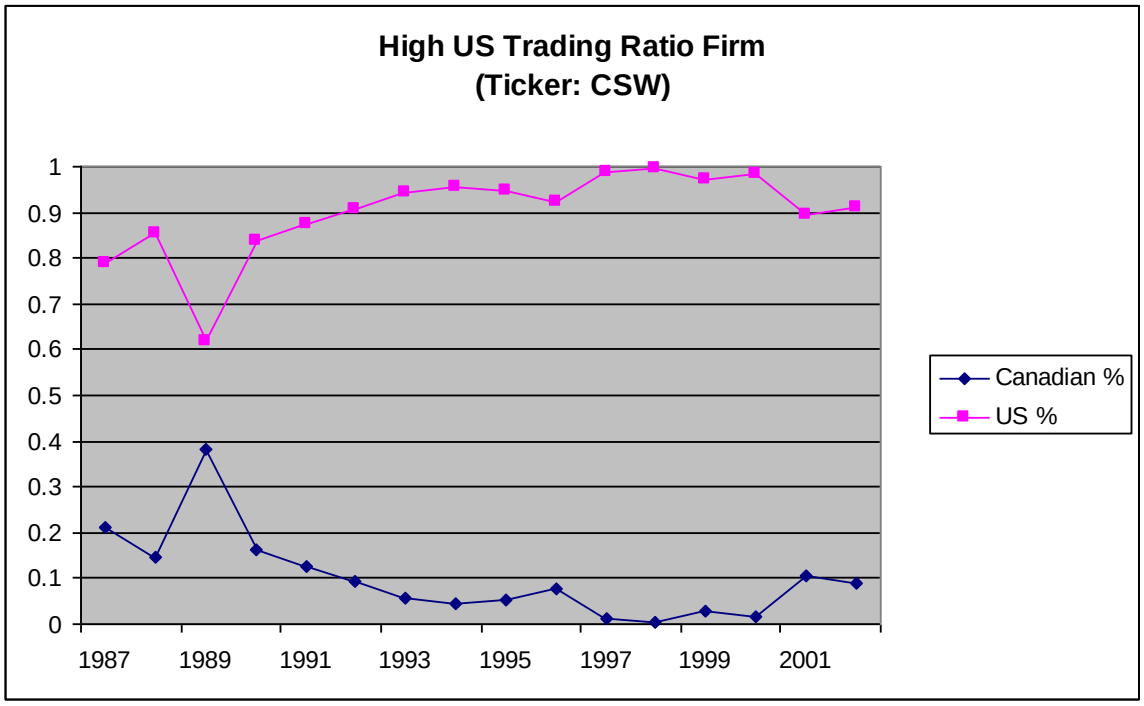

Figure 1b: CE Franklin, Ltd. (CFT)

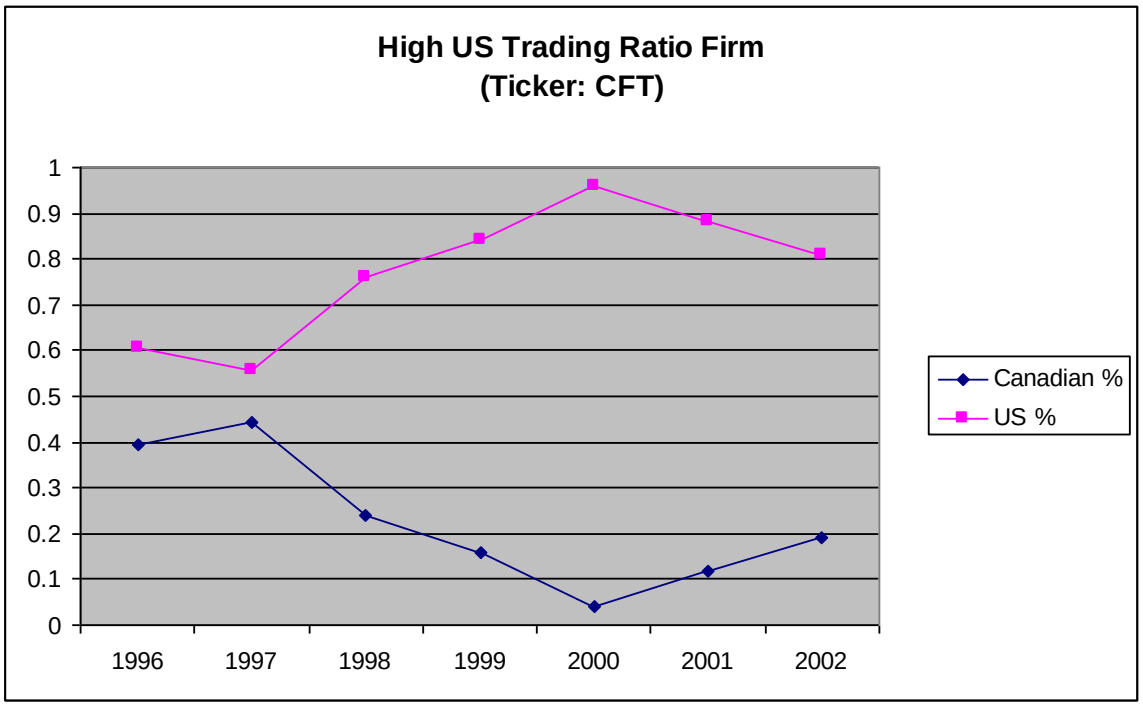

Figure 1c: GW Utilities (GWT)

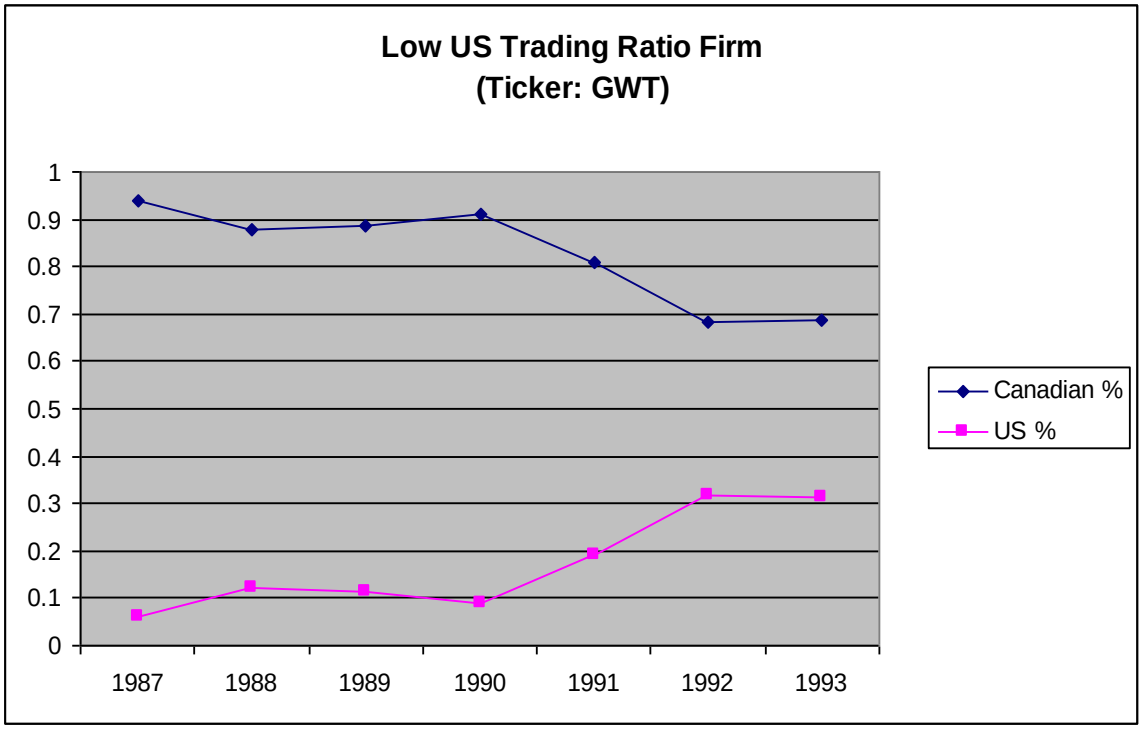

Figure 1d: Rio Algom Ltd. (ROM)

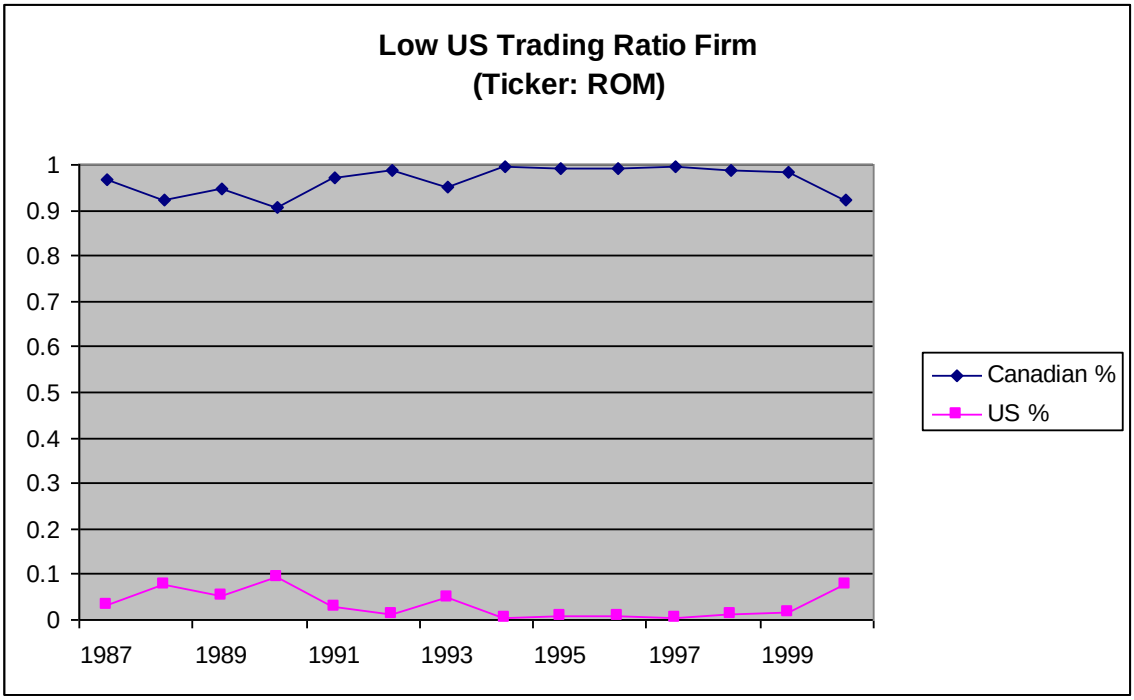

Table I
Descriptive Statistics

The table reports summary information for 527 firms cross-listed in Canada and the United States. The sample includes 9,549 quarterly observations. Quarterly data are available from March 1987 through December 2002. Panel A reports descriptive statistics for the overall sample, Panel B for firms in the mining or natural resources industry (RESOURCE, n = 4,245), in the tech or telecom industries (TECH, n = 1,465), and in the remainder of the sample (Other, n = 3,839), Panel C for firms with initial public offering on a Canadian stock exchange after January 1, 1987 (CDNIPO, n = 663), an initial public offering on a U.S. stock exchange after January 1, 1987 (USIPO, n = 122), and the remainder of the sample (n = 8,764), and Panel D for firms with stock subsequently traded on the NYSE (NYSE, n = 1,707), subsequently traded on NASDAQ (NASDAQ, n = 4,452), and all others (n = 3,390), including those trading on both NYSE and NASDAQ. US/CDNRatio is the ratio of the Canadian dollar value of trading volume in the United States and Canada. The value of trade in the U.S. and Canada are from the TSX Index Review. The %Institutions is the percentage of shares held by institutional investors and is collected from Standard and Poor's *Stock Guide*. The beta as measured using Canadian prices (CDNBeta), market capitalization in millions of Canadian dollars (Size), and shares outstanding are from CFMRC. Next the table reports descriptive statistics on analyst following (#Analysts), which is from the I/B/E/S database. Finally, firm assets in the United States in millions of U.S. dollars (USAssets) are from Compustat.

Panel A: Overall

Variable	Mean	Median	Minimum	Maximum	Percentile		Standard Deviation
					25%	75%	
US/CDNRatio	4.9220	0.5106	0	999.0000	0.1062	1.7100	38.2382
%Institutions	0.0212	0.0168	0.0001	0.6527	0.0074	0.0315	0.0202
#Analysts	9.99	8.00	1.00	48.00	3.00	15.00	8.46
Size	1,302.37	179.43	0.17	116,487.29	39.71	851.51	3,513.78
CDNBeta	1.0389	1.0003	-2.0000	4.9667	0.6257	1.4003	0.6889
USAssets	3,822.67	330.18	0.05	297,915.00	53.75	1,846.10	16,651.86

Panel B: By Industry

Variable	Industry	Mean	Median	Minimum	Maximum	Percentile		Standard Deviation
						25%	75%	
US/CDNRatio	RESOURCE	4.3441	0.4514	0.0000	999.00	0.0905	1.5840	35.6671
	TECH	10.0032	0.8051	0.0000	999.00	0.2121	2.2363	68.1325
	Other	3.6188	0.4793	0.0000	499.00	0.0858	1.6561	21.1671
%Institutions	RESOURCE	0.0203	0.0163	0.0001	0.6527	0.0077	0.0298	0.0214
	TECH	0.0237	0.0182	0.0001	0.1269	0.0077	0.0339	0.0213
	Other	0.0217	0.0171	0.0001	0.1108	0.0071	0.0342	0.0183
#Analysts	RESOURCE	10.55	9.00	1.00	42.00	3.00	17.00	8.44
	TECH	9.99	7.00	1.00	48.00	2.00	14.00	9.89
	Other	9.43	8.00	1.00	45.00	2.00	14.00	7.97
Size	RESOURCE	927.89	137.68	0.30	23,216.18	26.84	762.81	2,077.96
	TECH	1,244.12	130.63	0.17	116,487.29	31.72	499.23	4,984.49
	Other	1,704.41	252.46	0.02	38,513.92	68.20	1,185.63	3,994.28
CDNBeta	RESOURCE	1.1394	1.12067	-1.996	4.8333	0.7487	1.5187	0.6775
	TECH	1.2517	1.1950	-2.00	4.9667	0.7113	1.7062	0.9044
	Other	0.8635	0.84350	-1.999	4.9603	0.5213	1.1502	0.5753
USAssets	RESOURCE	1,977.27	228.91	0.13	297,915.00	48.38	1,729.20	14,522.19
	TECH	5,188.39	186.87	2.24	98,651.00	45.53	870.47	13,502.65
	Other	5,312.71	463.20	0.05	172.819.00	73.93	2,783.00	19,376.12

Panel C: By Location of IPO

Variable	Industry	Mean	Median	Minimum	Maximum	Percentile		Standard Deviation
						25%	75%	
US/CDNRatio	CDNIPO	4.2370	0.6051	0.0000	4,225.7900	0.0893	2.1546	25.8880
	USIPO	1.6306	0.3441	0.0000	713.9200	0.1074	1.2026	4.2389
	Other	5.0213	0.5080	0.0000	999.0000	0.1074	1.6954	39.2904
%Institutions	CDNIPO	0.0189	0.0145	0.0001	0.0638	0.0049	0.0302	0.0160
	USIPO	0.0233	0.0217	0.0004	0.0532	0.0129	0.0337	0.0130
	Other	0.0213	0.0167	0.0001	0.6527	0.0074	0.0315	0.0206
#Analysts	CDNIPO	8.19	5.00	1.00	32.00	2.00	13.00	7.73
	USIPO	7.97	7.00	1.00	20.00	3.00	12.00	5.42
	Other	10.14	8.00	1.00	48.00	3.00	15.00	8.51
Size	CDNIPO	402.89	130.14	0.91	7,195.64	50.04	333.15	912.51
	USIPO	1,005.18	703.10	2.34	6,372.43	64.34	1,617.65	1,076.24
	Other	1,394.49	183.62	0.1697	116,487.29	38.43	925.68	3,637.71
CDNBeta	CDNIPO	0.9916	0.8737	-1.8727	3.3550	0.5297	1.4533	0.7359
	USIPO	1.0712	0.7120	-2.0000	4.1070	0.4470	1.1967	1.0460
	Other	1.0412	1.0060	-1.9990	4.9667	0.6347	1.3983	0.6820
USAssets	CDNIPO	1,507.51	219.51	2.24	24,171.52	41.27	666.84	4,225.79
	USIPO	696.42	275.23	3.89	2,493.26	169.54	1,1221.00	713.92
	Other	4,060.73	346.59	0.05	279,915.00	54.73	2,064.93	17,370.93

Panel D: By U.S. Exchange of Secondary Listing

Variable	Industry	Mean	Median	Minimum	Maximum	Percentile		Standard Deviation
						25%	75%	
US/CDNRatio	NYSE	3.5492	0.5674	0.0010	999.00	0.1318	1.0268	37.6272
	NASDAQ	5.7731	0.4164	0.0000	999.00	0.1455	2.0864	38.6724
	Other	4.7362	0.6103	0.0010	999.00	0.0858	1.6954	38.8717
%Institutions	NYSE	0.02674	0.0239	0.0001	0.3518	0.0142	0.0365	0.01879
	NASDAQ	0.0219	0.0184	0.0001	0.1801	0.0064	0.0313	0.0193
	Other	0.0208	0.0161	0.0001	0.6527	0.0070	0.0310	0.0216
#Analysts	NYSE	14.45	13.00	1.00	45.00	7.00	19.00	9.65
	NASDAQ	7.04	6.00	1.00	27.00	2.00	11.00	5.40
	Other	10.67	9.00	1.00	48.00	4.00	16.00	8.07
Size	NYSE	3,792.03	1,896.79	1.34	39,668.71	777.26	4,993.64	4,859.02
	NASDAQ	390.31	120.27	2,988.61	22,912.29	34.68	352.88	999.83
	Other	2,633.87	595.04	0.33	116,487.22	119.17	2,228.68	5,699.46
CDNBeta	NYSE	1.0573	1.0487	-0.1493	2.7100	0.7580	1.3493	0.4646
	NASDAQ	1.1290	1.1003	-2.000	4.9603	0.6720	1.5900	0.7928
	Other	0.9367	0.8873	-1.8650	4.3457	0.5670	1.2510	0.5660
USAssets	NYSE	5,149.95	2,490.69	43.02	39,656.70	1,001.42	6,149.90	7,107.49
	NASDAQ	1,003.52	95.74	0.36	154,432.00	36.56	347.37	10,288.95
	Other	4,099.86	941.59	0.05	297,915.00	170.50	4,128.54	10,660.97

Table II
Descriptive Statistics

The table reports summary information for 4 firms in the natural resource industry that are cross-listed in Canada and the United States. CFT is CE Franklin, Ltd., CSW is Canadian Southern Petroleum, GWT is GW Utilities and ROM is Rio Algom Ltd. For each firm and variable the median value is reported. US/CDNRatio is the ratio of the Canadian dollar value of trading volume in the United States and Canada. The value of trade in the U.S. and Canada are from the TSX Index Review. The %Institutions is the percentage of shares held by institutional investors and is collected from Standard and Poor's *Stock Guide*. The beta as measured using Canadian prices (CDNBeta), market capitalization in millions of Canadian dollars (Size), and shares outstanding are from CFMRC. Next the table reports descriptive statistics on analyst following (#Analysts), which is from the I/B/E/S database. Finally, firm assets in the United States in millions of U.S. dollars (USAssets) are from Compustat.

Variable	CFT	CSW	GWT	ROM
US/CDNRatio	0.833	14.625	0.114	0.012
%Institutions	0.009	0.003	0.0004	0.016
#Analysts	4	0	4	13
Size	81.744	83.930	936.136	1,038.654
CDNBeta	1.719	0.833	0.440	1.071
USAssets	81.778	12.713	1,707.610	0.046

Table III
Correlation Coefficients

The table reports correlation coefficients for 9,549 quarterly observations of 527 firms cross-listed in Canada and the United States. Quarterly data are available from March 1987 through December 2002. US/CDNRatio is the ratio of the Canadian dollar value of trading volume in the United States and Canada, the %Institutions is the percentage of shares held by institutional investors and market capitalization is in millions of Canadian dollars (Size). The table also includes correlations for analyst following (#Analysts), beta measured using Canadian prices (CDNBeta), and firm assets in the United States in millions of U.S. dollars (USAssets). Finally, the table reports correlations for six dummy variables which take the value of 1 for firms in the mining or natural resources industry (RESOURCE), in the tech or telecom industries (TECH), with initial public offering on a Canadian stock exchange after January 1, 1987 (CDN-IPO), with initial public offering on a U.S. stock exchange after January 1, 1987 (US-IPO), subsequently traded on the NYSE (NYSE), or subsequently traded on NASDAQ (NASDAQ). *, ** indicates significance at the 5%, 1% level.

	US/CDNRatio	%Institutions	Size	#Analyst	CDNBeta	USAssets	Industry		IPO		Exchange Listing
							RESOURCE	TECH	CDN	US	NYSE
%Institutions	-0.015										
Size	-0.042**	0.033**									
#Analysts	-0.043**	0.136	0.156**								
CDNBeta	0.003	0.087*	-0.073**	0.094**							
USAssets	-0.028	-0.017	0.331**	0.156**	-0.095**						
RESOURCE	-0.013	-0.047**	-0.093**	0.331**	0.134**	-0.098**					
TECH	0.057**	0.044**	-0.007	-0.093**	0.118**	0.032**	-0.379**				
CDNIPO	-0.005	-0.025	-0.068**	-0.007	-0.016	-0.038	-0.071	0.065			
USIPO	-0.010	0.015	-0.009	-0.068**	0.004	-0.026	-0.036**	0.190**	-0.038**		
NYSE	-0.017	0.142**	0.215**	-0.009	0.009**	0.030	-0.011*	-0.038**	-0.051**	-0.007	
NASDAQ	0.020*	0.015	-0.148**	0.215**	0.074**	-0.085**	-0.035**	0.062**	0.026**	-0.006	-0.091**

Table IV
Estimation Results

The table reports estimates of the coefficients (1) using four estimation techniques and quarterly data from March 1987 through December 2002. The first two columns report estimates of the model using OLS and GMM. In the third column, the estimates are averages of quarterly OLS estimates, following Fama and MacBeth (1973) and in the final column the estimates follow the method suggested by Peterson (2007). The dependent variable is the natural logarithm of the ratio of the dollar value of trading volume in the United States and Canada in Canadian dollars. The independent variables include the natural logarithm of the percentage of shares held by institutional investors (Ln%Inst), the natural logarithm of market capitalization (LnSize), analyst following (#Analysts), beta as measured using Canadian prices (CDNBeta), and the natural logarithm of the ratio of firm assets in the United States in millions of U.S. dollars and size (LnUSAssets/Size). In addition, six independent dummy variables are included which take the value of 1 when the firm is in the mining or natural resources industry (RESOURCE), in the tech or telecom industries (TECH), had its initial public offering on a Canadian stock exchange after January 1, 1987 (CDNIPO), had its initial public offering on a U.S. stock exchange after January 1, 1987 (USIPO), subsequently traded on the NYSE (NYSE), or subsequently traded on NASDAQ (NASDAQ). The t-statistic is reported below each coefficient estimate in parentheses. *, ** indicates significance at the 5%, 1% level.

Independent variables	Pooled OLS	GMM	Fama-MacBeth	Peterson
Intercept	3.4631 (5.48)**	3.4631 (5.24)**	3.3983 (9.27)**	3.4631 (1.83)
Ln%Inst	0.2441 (5.44)**	0.2441 (5.51)**	0.2405 (7.49)**	0.2441 (2.14)*
#Analysts	0.0161 (3.36)**	0.0161 (3.67)**	0.0160 (8.95)**	0.0161 (1.01)
LnSize	-0.3580 (-11.37)**	-0.3580 (-12.38)**	-0.3564 (-21.87)**	-0.3580 (-3.66)**
CDNBeta	0.3887 (4.89)**	0.3887 (5.03)**	0.3954 (18.55)**	0.3887 (1.99)*
Ln(USAssets/Size)	-0.2322 (-6.89)**	-0.2322 (-5.22)**	-0.2347 (-12.96)**	-0.2322 (-1.56)
RESOURCE	-0.1327 (-1.51)	-0.1327 (-1.57)	-0.1392 (-6.43)**	-0.1327 (-0.36)
TECH	-0.6851 (-4.07)**	-0.6851 (-4.86)**	-0.7086 (-10.15)**	-0.6851 (-1.48)
CDNIPO	-0.3614 (-1.54)	-0.3614 (-2.11)*	-0.3570 (-2.07)	-0.3614 (-1.01)
USIPO	-0.5450 (-1.84)	-0.5450 (-3.18)**	-0.5530 (-4.46)*	-0.5450 (-1.63)
NYSE	0.1152 (1.34)	0.1152 (1.30)	0.1190 (3.28)*	0.1152 (0.42)
NASDAQ	0.7795 (4.18)**	0.7795 (4.40)**	0.8324 (4.74)*	0.7795 (2.10)*
Adjusted R^2	13.69%	13.69%	12.55%	13.65%

Table V
Estimation Results: NASDAQ Firms

The table reports estimates of the coefficients (1) using four estimation techniques for firms with secondary U.S. trading on NASDAQ and quarterly data from March 1987 through December 2002. The first two columns report estimates of the model using OLS and GMM. In the third column, the estimates are averages of quarterly OLS estimates, following Fama and MacBeth (1973) and in the final column the estimates follow the method suggested by Peterson (2007). The dependent variable is the natural logarithm of the ratio of the dollar value of trading volume in the United States and Canada in Canadain dollars. The independent variables include the natural logarithm of the percentage of shares held by institutional investors (Ln%Inst), the natural logarithm of market capitalization (LnSize), analyst following (#Analysts), beta as measured using Canadian prices (CDNBeta), and the natural logarithm of the ratio of firm assets in the United States in millions of U.S. dollars and size (LnUSAssets/Size). In addition, four independent dummy variables are included which take the value of 1 when the firm is in the mining or natural resources industry (RESOURCE), in the tech or telecom industries (TECH), had its initial public offering on a Canadian stock exchange after January 1, 1987 (CDNIPO), or had its initial public offering on a U.S. stock exchange after January 1, 1987 (USIPO). The t-statistic is reported below each coefficient estimate in parentheses. *, ** indicates significance at the 5%, 1% level.

Independent variables	Pooled OLS	GMM	Fama-MacBeth	Peterson
Intercept	-2.4856 (-2.00)*	-2.4856 (-1.77)	-1.6283 (-2.55)	-1.4572 (-0.68)
Ln%Inst	-0.1112 (-1.20)	-0.1112 (-1.51)	-0.0730 (-1.64)	-0.0667 (-0.48)
#Analysts	-0.0135 (-0.60)	-0.0135 (-0.53)	0.0020 (0.16)	0.0026 (0.06)
LnSize	-0.2540 (-3.44)**	-0.2540 (-3.12)**	-0.3372 (-5.29)*	-0.3235 (-1.87)
CDNBeta	1.1721 (6.64)**	1.1721 (6.60)**	1.0339 (28.72)**	1.0131 (3.72)**
Ln(USAssets/Size)	-0.5229 (-5.99)**	-0.5229 (-3.66)**	-0.5541 (-4.36)*	-0.5164 (-2.34)*
RESOURCE	0.4520 (1.87)	0.4520 (1.48)	0.5116 (4.52)*	0.5193 (0.98)
TECH	-0.6189 (-2.25)*	-0.6189 (-2.66)**	-0.3661 (-2.48)	-0.3432 (-0.70)
CDNIPO	-0.5489 (-1.68)	-0.5489 (-2.05)*	-0.4402 (-2.48)	-0.3007 (-0.79)
USIPO	-3.2942 (-3.09)**	-3.2942 (-6.10)**	-2.8323 (-8.27)**	-2.80 (-4.01)**
Adjusted R^2	32.52%	32.52%	27.72%	30.69%

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