

Fragmentation and the Canadian Stock Markets

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Wise Persons' Committee

Douglas Cumming
Aditya Kaul
Vikas C. Mehrotra

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Biographies

Douglas Cumming

Douglas Cumming, B.Com. (Hons.), M.A., J.D., Ph.D., CFA, is currently an Assistant Professor of Finance, Economics and Law at the University of Alberta School of Business, and has recently accepted the position of Associate Professor of Finance at the University of New South Wales School of Banking and Finance. He has also held / will hold the following visiting professorships: ABN AMRO Bank Visiting Professor of Finance at the University of Amsterdam Graduate School of Business (2002, 2003), Center for Financial Studies, University of Frankfurt Visiting Scholar (2004), and University of Cambridge Judge Institute of Management Visiting Scholar (2004). Dr. Cumming's research is primarily focused on private equity and venture capital, with a focus on international differences in private equity and venture capital markets, including the European, North American and Asia-Pacific private equity and venture capital markets.

Aditya Kaul

Aditya Kaul is currently an Associate Professor of Finance at the University of Alberta. He joined the business faculty in 1996 with a PhD in Finance from the University of Rochester. His research interests are in the areas of market microstructure, international finance and asset pricing. Dr. Kaul's work has been published in the Journal of Finance and the Journal of Financial Economics, and has been presented at major academic conferences in North America. He is the recipient of several research awards including the 1999 Toronto Society of Financial Analysts award for his study on the effects of changes in the definition of the public float on the Toronto Stock Exchange, and a 2000 Q-Group award for his study of common effects in trading activity, prices and trading costs. He has consulted for government organizations and private firms in Canada and the United States and held a visiting position at the University of Oregon in 2000-2001.

Vikas Mehrotra

Dr. Vikas Mehrotra has been a faculty member at the University of Alberta since 1992, after graduating from the University of Oregon with a doctorate in Finance. He currently holds the position of Associate Dean, MBA Programs, as well as the Collins chair in Finance, at the School of Business there. From July-2001 through June-2002, Dr. Mehrotra was a visiting professor of Finance at the prestigious Kenan-Flagler Business School at the University of North Carolina. Dr. Mehrotra's work deals with corporate restructuring, capital structure, and financial markets. His studies have been published in leading finance journals such as the Journal of Finance, the Journal of Financial Economics, and the Review of Financial Studies.

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Executive Summary

The discussion and analysis of regional and sectoral differences in Canadian markets typically focuses on the characteristics of firms in different provinces and/or the different components of general economic activity in different provinces. The likely reason for this focus on firms in different locations is that data on investor location for companies that are publicly traded on Canada's stock exchanges are difficult, if not impossible, to obtain. In our companion paper, we analyze private equity data that match the provinces of location of the investor and investee. Unfortunately, such location data are confined to Canada's private equity markets, so we are unable to use investor location data in this report. As described below, however, we are able to draw inferences regarding regional fragmentation in Canada by carrying out a rigorous quantitative analysis of the degree of fragmentation of Canada's stock exchanges. Our analysis contributes to the core of the debate on securities regulatory reform for publicly traded companies.

Our empirical analysis of market fragmentation is based on an examination of secondary market trading on the Alberta Stock Exchange (ASE), the Vancouver Stock Exchange (VSE), the TSX Venture Exchange and the Toronto Stock Exchange (TSX). We focus our examination on prices and volume, which are the outcomes of all ownership decisions, and therefore provide implied information about relevant firm characteristics. For example, if there are important regional or sectoral differences across firms listed on regional exchanges, these will be manifested in distinct price and volume patterns. By contrast, if ownership and trading are well dispersed, returns and volume will be highly correlated across markets.

We provide an analysis of data comprising several million observations from the ASE, the VSE, the TSX Venture Exchange and the TSX. We document differences across these stock markets in terms of price levels, price volatility, bid-ask spreads, and trading volume. We also study the price and volume co-movement across these markets as a measure of the interconnectedness of the Canadian public equity markets. Finally, we examine the differences in each of these variables (prices, volatility, spreads, volume, and co-movement) in the pre- and post-TSX Venture Exchange formation periods, as well as differences depending on stock prices (e.g. penny stocks versus blue chip stocks) and trading volume.

Our key findings are as follows. First, we document increases in trading volume for VSE-listed stocks (though, surprisingly, not for ASE-listed stocks) after the formation of the TSX Venture Exchange. The formation of the TSX Venture Exchange brought about regulatory changes that lowered the uniqueness of the ASE and VSE and made them part of a national market. While we are puzzled by the ASE results, it is worth noting that the decline in volume for ASE stocks is substantially lower than the increase for VSE stocks. The most plausible explanation for the increased trading volume in VSE-listed stocks is increased interest in, and ownership of, VSE companies by residents in different jurisdictions in Canada in the post-TSX Venture Exchange period. Our correlation figures (discussed below) confirm this interpretation.

Second, comparing the correlations of returns and volume across markets, we show the extent of equity market integration has fluctuated through time, but was at impressive levels as long as five years ago, and remains strong till 2002, the most recent complete year for our data. The strong correlations suggest that the TSX Venture Exchange and the TSX have been relatively well integrated for some time, and that market participants on the TSX and TSX Venture Exchange are not distinct and separate.

Third, our findings speak to an issue that is often overlooked in the analysis of securities regulation in Canada. The issue is the following: do regional differences in economic activity give rise to differences in regulatory structures across provinces, or do differences in regulatory structures give rise to differences in economic activity across provinces? Our analysis compares the correlation in stock returns and volume for the ASE and the VSE both before and after the formation of the TSX Venture Exchange, which was associated with a significant harmonization of regulations and regulators for the exchanges, at least across the provinces of Alberta and British Columbia. The correlation for ASE and VSE returns and volume increased immediately after the formation of the TSX Venture Exchange, suggesting that a unified regulatory structure promotes integration. A longer-term comparison of the correlations suggests that these beneficial effects are most pronounced in the year following the merger, and revert to more modest pre-merger levels by the end of the second year following the event.

Finally, we document differences in average price levels, trading activity and trading costs between the TSX Venture Exchange and the TSX. Somewhat contrary to popular beliefs, we show striking similarities in listing firm characteristics across markets, notably, the large fractions of low priced and thinly traded stocks in both markets. Approximately one in three stocks on the TSX trades at a price of less than one dollar – one normally does not associate “penny stocks” with the TSX, the senior stock market in Canada. Similarly, we find that many stocks, not only on the TSX Venture Exchange, but also on the TSX, are thinly traded. We find that returns and volume co-move strongly for low-priced stocks on the TSX Venture Exchange and the TSX, for high-priced stocks at the two venues, and for actively- and thinly traded stocks. This finding raises questions about the efficacy of regulating local markets from a sectoral or industry perspective alone. Additionally, these results suggest that stocks with similar attributes but traded in different markets might benefit from similar Canada-wide regulations.

Our analysis points to a different set of policy implications than those currently offered. Instead of an array of disparate regulations across the regions, an alternative mechanism for regulating securities markets would involve a *regulatory umbrella* spanning mini-regulatory frameworks based on differences in firm characteristics (such as market capitalization, trading volume, etc). This umbrella approach is somewhat different from the passport approach or the ‘one-size-fits-all’ options currently under consideration.

Fragmentation and the Canadian Stock Markets¹

1. Introduction

The discussion and analysis of regional and sectoral differences in Canadian markets typically focuses on the characteristics of firms in different provinces and/or the different components of general economic activity in different provinces. A likely reason for this focus on the characteristics of firms in different locations is that investor location data do not exist for publicly traded companies on Canada's stock exchanges. In our companion paper (Cumming, Kaul and Mehrotra, 2003a), we analyze private equity data that match the province of location of the investor and investee. Unfortunately, such location data are confined to Canada's private equity markets. Ownership data for stock markets do not exist, at least not in Canada.²

Given the dearth of ownership data for publicly traded companies, there are two possible approaches to study regional and sectoral fragmentation in Canadian stock markets. The first approach involves analysis of firm characteristics and economic differences in different regions. This type of analysis would apply the following reasoning. For example, in the U.S. context, given that computer companies tend to be located in Silicon Valley, oil and gas companies in Texas, biotechnology companies in Massachusetts, and financial service firms in New York, etc., one may reason that different securities laws are appropriate for these different regions or different industries. As discussed in Section 8 of this paper, this type of reasoning says little, if anything, about the degree of market fragmentation beyond describing local concentration of particular industry sectors.

The second approach involves an analysis of trading activity on the different exchanges. Our paper follows this approach. This approach recognizes the fact that capital markets comprise not only firms but also investors. This is an important difference relative to the first approach that focuses only on firms. It seems logical that investors should not be ignored when studying market fragmentation in the context of securities regulation because, among other reasons, securities regulation is designed for the purpose of investor protection.

¹ We are grateful to members of the Alberta Securities Commission, Denise Hendrickson, David Linder, Stephen Murison and Stephen Sibold, and of the British Columbia Securities Commission, Brent Aitken, Louise Gauvin, Doug Hyndman, Wayne Redwick and Christina Wolf, for generously sharing their time and views with us and for helping us to obtain the data used in this analysis, and to Doug Harris for comments that have greatly improved the analysis and exposition.

² Coval and Moskowitz (2003a, b) have obtained ownership data for a group of U.S. mutual funds. Their data, however, obviously do not completely characterize the U.S. economy. The results are nevertheless interesting as they report a preference for mutual fund investors to invest in publicly traded companies that are geographically proximate (with 100 kilometers) to their investee firms. They also show an informational advantage to being geographically proximate to investees, with average annual returns that are 2.67% higher for mutual funds with a geographically proximate investment strategy. Similar data analysis by Woidtke et al. (2003) also shows the importance of investor identity. Certain datasets (e.g. Thompson Financial Database in the U.S.) contain ownership information for large shareholders (at >10% ownership levels), as trading among owners with a significant stake must be documented. These datasets, too, do not characterize trading activity and ownership for all investors and all stocks. Our interest is in examining integration across a complete set of stocks listed on Canada's stock exchanges.

We believe that the findings in this paper contribute to the core of the debate on integration versus fragmentation in Canada's public equity markets. We hope to shift the debate on the economics of securities regulation away from regional and sectoral analyses of firms, and toward the recognition that integration involves not only firms but also, more importantly, investors and trading outcomes.

Our empirical analysis of market fragmentation is based on an examination of trading activity on the Alberta Stock Exchange (ASE), the Vancouver Stock Exchange (VSE), the TSX Venture Exchange and the TSX. We focus our examination on prices and volume, which are the outcomes of all ownership decisions, and therefore provide implied information about relevant firm characteristics. For example, if there are important regional or sectoral differences across firms listed on regional exchanges, these will be manifested in distinct price and volume patterns. By contrast, if ownership and trading are well dispersed, returns and volume will be highly correlated across markets.

We provide an analysis of data comprising several million observations from the ASE, the VSE, the TSX Venture Exchange and the TSX. We document differences across these stock markets in terms of price levels, price volatility, bid-ask spreads, and trading volume. We also study the price and volume correlations across these markets as a measure of the interconnectedness of Canada's equity markets. Finally, we examine the differences in each of these variables (prices, volatility, spreads, volume, and correlations) in the pre- and post-TSX Venture Exchange formation periods, as well as differences depending on stock prices (e.g. penny stocks versus blue chip stocks) and trading volume.

The data indicate the following key results. First, we document increases in trading volume for VSE-listed stocks (though not the ASE-listed stocks) after the formation of the TSX Venture Exchange. The formation of the TSX Venture Exchange brought about regulatory changes that lowered the uniqueness of the ASE and VSE and made them part of a national market. While we are puzzled by the ASE results, it is worth noting that the decline in volume for ASE stocks is substantially lower than the increase for VSE stocks. The most plausible explanation for the higher trading volume in VSE-listed stocks is increased interest in, and ownership of, VSE companies by residents in different jurisdictions in Canada in the post-TSX Venture Exchange period. Our correlation figures (discussed below) confirm this interpretation.

Second, we compute the correlations between returns and volume for the ASE and the VSE and the TSX, and then for the TSX Venture Exchange and the TSX and find that the correlations and, therefore, the extent of equity market integration have fluctuated through time. However, integration was at impressive levels as long as five years ago. In fact, the return correlations were higher in 1997 than in 2002. The large correlations suggest that the TSX Venture Exchange and the TSX have been relatively well integrated for some time, and that market participants on the TSX and TSX Venture Exchange are homogenous.

Third, our findings speak to an issue that is often overlooked in the analysis of securities regulation in Canada. The issue is the following: do regional differences in economic activity give rise to differences in regulatory structures across provinces, or do differences in regulatory structures give rise to differences in economic activity across provinces? Our analysis compares

the correlation in stock returns for the ASE and the VSE both before and after the formation of the TSX Venture Exchange, which was associated with a significant harmonization of regulations and regulators for the exchanges, at least across the provinces of Alberta and British Columbia. The correlation for ASE and VSE returns and volume increased immediately after the formation of the TSX Venture Exchange, suggesting that a unified regulatory structure might promote integration. However, a longer-term comparison of the correlations suggests that these beneficial effects are most pronounced in the year following the merger, and revert to more modest pre-merger levels by the end of the second year following the event.

Finally, we document differences in average price levels, trading activity and trading costs between the TSX Venture Exchange and the TSX. However, there are also striking similarities across markets, notably, the large fractions of low priced and thinly traded stocks in both markets. Approximately one in three stocks on the TSX trades at a price less than one dollar—one normally does not associate “penny stocks” with the TSX, the senior stock market in Canada. Similarly, we find that many stocks, not only on the TSX Venture Exchange, but also on the TSX, are thinly traded. We find that returns and volume co-move strongly for low-priced stocks on the TSX Venture Exchange and the TSX, for high-priced stocks at the two venues, and for actively- and thinly traded stocks.

Overall, our conclusions are that the regional equity markets in Canada are well integrated along key dimensions; specifically, we note that prices and trading activity in regional markets co-move to a significant degree even after controlling for firm-specific characteristics such as price and volume. These findings call into question sector-specific regulations across the regional markets: after all, when thinly-traded stocks on the TSX Venture Exchange co-move with thinly-traded stocks on the TSX, it is difficult to argue that each market needs idiosyncratic regulation. Instead, we suggest a regulatory model based on trading volume or price levels (or, by extension, market capitalization or firm size) that would remain the same across provincial boundaries.

The rest of this report is organized as follows. Section 2 provides a historical perspective on the stock exchanges in Canada, and the degree to which the merger of the ASE and VSE exchanges gave rise to a (partial) harmonization of regulations on the CDN (which later became the TSX Venture Exchange). The daily trading data from the ASE, the VSE, the TSX Venture Exchange and the TSX are described in Section 3. Section 4 provides descriptive statistics on price levels, price volatility, bid-ask spreads, and trading volume for the TSX Venture Exchange and the TSX. Section 5 provides an analysis of co-movement, not only for all stocks, but also for different groups of stocks sorted by trading volume or price. Section 6 documents the effects of the formation of the TSX Venture Exchange on market quality. In Section 7, we discuss the implications of the co-movement analysis for the purpose of securities regulatory reform. Section 8 compares the approach taken in this paper to the alternative approach of studying regional or sectoral concentration of firms. Section 9 concludes. Appendix I summarizes our analysis to verify the robustness of our results.

2. Stock Exchanges and Securities Regulation in Canada

Our empirical analysis focuses on trading on the regional stock exchanges in Canada. We also analyse the merger of the Alberta and Vancouver stock exchanges to form the CDNX (later the TSX Venture Exchange), an event that involved a (partial) merging of rules and regulators governing the exchange. This merging of rules allows us to study the effect of a partial harmonization of rules and regulators on trading patterns and outcomes. In this section, we review relevant details of the historical development of Canada's equity markets.

Five stock exchanges existed in Canada prior to November 26, 1999: the Montreal Exchange (ME), the Toronto Stock Exchange (TSE; TSX after April 8, 2002), the Winnipeg Stock Exchange (WSE), the Alberta Stock Exchange (ASE) and the Vancouver Stock Exchange (VSE). On November 26, 1999, the VSE, the ASE, and the Canadian Dealing Network (CDN) arm of the TSE (TSX) merged to form the Canadian Venture Exchange (CDNX). The ME became the exchange for derivatives trading, and its junior securities were transferred to the CDNX, and its senior securities to the TSE (TSX).³ On November 27, 2000, the WSE merged with the CDNX. On May 30, 2002, the CDNX changed its name to the TSX Venture Exchange, pursuant to the acquisition of the CDNX by the TSX.⁴

The formation of the CDNX out of the ASE, VSE, CDN and ME, and subsequently the WSE, gave rise to a common rulebook for CDNX listed companies. The Alberta Securities Commission (ASC) and British Columbia Securities Commission (BCSC) had joint oversight of the CDNX, ending the Ontario Securities Commission's (OSC) oversight of the CDN, and thereafter the Manitoba Securities Commission's oversight of the WSE. This harmonization was extended to cover the regulations pertaining to the exchanges themselves, but did not pertain to the provincial securities acts, or to the ASC and BCSC.

The ASC and BCSC have both characterized the merged rulebook of the CDNX as a "cherry-picked" combination of, for the most part, the more stringent regulations from both exchanges.⁵ But despite the common policy manual for the CDNX, there is anecdotal evidence that the enforcement of the rules was somewhat different in Alberta and British Columbia.⁶ For instance, the VSE had been wooing foreign directors for listed companies and foreign investors for years while the ASC preferred to deal with players it knew.

³ The realignment initially did not cover small companies listed on the ME, and approximately 150 companies not eligible for listing on the TSE continued to be listed on the ME. In September 2001, a large number of these firms transferred from the ME to the CDNX.

⁴ Sources: www.tsx.com/en/pdf/TSXHistory.pdf; <http://canadagazette.gc.ca/part1/2003/20030726/html/regle2-e.html#i2>.

⁵ Source: authors' meetings with the Alberta Securities Commission (ASC) on June 13, 2003, the British Columbia Securities Commission June 16, 2003, and the Investment Dealers Association (IDA) on July 2, 2003, summarized by Cumming, Kaul and Mehrotra (2003b).

⁶ *Ibid.*

As a second illustration of differences in expertise and philosophy, both the ASC and BCSC expressed the sentiment that the ASC was better at regulating oil and gas companies (that typically have significant operating revenues), whereas the BCSC had superior expertise in the regulation of mining stocks, that typically have few, if any, revenues and for which all expenses (including management fees and office expenses) are paid out of the funds raised on the market.

The Investment Dealers Association of Canada (IDA) has expressed the view that one of the main benefits of the ASE-VSE merger was that it helped to overcome the widely-held view that the VSE was rife with insider trading and market manipulation, an impression left over from the 1980s.⁷ Despite a huge cleanup of the VSE in the mid- late 1990s, the VSE bore the stigma of low market quality. The fact that the CDNX was headquartered in Alberta, not Vancouver, was intended to reinforce this perception of improved market integrity. In the IDA's view, tangible benefits associated with the formation of the CDNX included the introduction of a unique trading engine and cost savings. The integration of the CDNX into the TSX Group to form the TSX Venture Exchange has brought a similar benefit in terms of a perceived increase in market quality.⁸

Relatively recent initiatives include a revised mandate for the TSX Venture Exchange (as of August 2003) to shift its image from that of a regional Western Canadian exchange to that of a national junior exchange, and to increase listings from across Canada, particularly Ontario and Quebec. Additionally, the Canadian Securities Administrators (CSA, an umbrella organization representing the 13 securities regulatory authorities across Canada) initiated the Uniform Securities Legislation (USL) project in 2001, expected to be adopted in 2004.

A large part of our empirical analysis focuses on the November 26, 1999 merger of the ASE and VSE and we conclude this section with a few additional comments on the details of this event. This merger of the exchanges involved a harmonization of stock exchange rules (generally, the higher regulatory standard from the former ASE or VSE had to be met). The merger did *not* involve a merger of the securities acts in Alberta and British Columbia, nor of the ASC and BCSC. For this reason, the ASE-VSE merger is not a pure test of the effect of rule harmonization on market fragmentation. It is, however, the closest available thing to a pure harmonization of rules and, therefore, for our purposes, an important informative event in the history of Canada's stock exchanges. Our empirical tests isolate the effects of the harmonization on trading activity and market quality by introducing appropriate controls.

⁷ *Ibid.*

⁸ *Ibid.*

3. Data

We have obtained daily data for stocks listed on the ASE and the VSE from March 1997-November 26, 1999, and on the TSX Venture Exchange from November 29, 1999-June 2003.⁹ For the purposes of making comparisons, we have also constructed a stock-level dataset for the TSX for the period March 1997 through December 2002.¹⁰ Each of these datasets contains the closing price, bid and ask quotes, and daily trading volume. We divide the sample data into five 12-month periods and carry out our analysis for these 12-month periods. In constructing these intervals, we exclude the two-month period centred on the formation of the CDNX in November 1999, since this is likely to have been a transitional period. Thus, the five intervals examined are November 1, 1997-October 31, 1998, November 1, 1998-October 31, 1999, and the calendar years (i.e. January-December) 2000, 2001 and 2002.

We make use of data for every available stock in each market, and check the general applicability of our results, so-called robustness tests, by examining subsets of the data. Prior work has shown that stock returns and trading costs are influenced by the levels of trading activity and price (see, e.g., Harris, 2002); therefore, we categorize stocks on the basis of volume and price. Specifically, in each 12-month period, we assign each stock to one of three price categories, $P < 1$, $1 \leq P < 5$ and $P \geq 5$, where P is the median price for that period, and to a trading volume quintile formed on the basis of total trading volume in the 12 months. We then repeat our analysis within the price and volume categories. The price categories also serve as a useful proxy for market capitalization categories.

We summarize information on the number of stocks in Table 1. Note that these numbers include non-voting shares, preferred shares, and tracking stocks. For the TSX Venture Exchange the total number of stocks with data is approximately 2900 in 1997 and 1998. Of these, 1700 firms traded in Vancouver and 1200 in Alberta. The drop in the number of firms between 1998 and 1999 is surprising, though the number of firms in 2000 is more consistent with the pre-1999 figures. In excess of 3000 stocks are listed on the TSX Venture Exchange at the end of 2002. The large number of listings reflects the key role of the TSX Venture Exchange as a venue for smaller firms to obtain access to public equity. A comparison of the second and third columns of the table shows that we lose a little over 10% of the firms owing to invalid (negative or zero) prices on the last trading day of the year (this likely reflects thin trading of these stocks, an issue we will return to in the next section). The next three columns provide a breakdown of the firms in terms of the three price categories, and we see that well over 80% of the TSX Venture stocks can be classified as penny stocks.

⁹ While the VSE and CDNX datasets are, to the best of our knowledge, comprehensive, the ASE dataset does not have daily data for approximately 40% of the listed stocks, primarily those that did not trade in a given month and halted, suspended, or unique listings. We are grateful to Rob Aldred at the TSX Venture Exchange for helping us to obtain the ASE data.

¹⁰ Beyond this section, for the sake of clarity, we refer to the TSE as the TSX and the CDNX as the TSX Venture Exchange even before the dates that the new names became effective.

Turning to the TSX, the number of firms with data has declined by 10% between 1997 and 2002. The fact that the number of listings on the TSX has declined through time reinforces the importance of the TSX Venture Exchange as a source of capital for unheralded firms. The number of stocks with invalid prices at the end of each year is generally similar to that for the TSX Venture Exchange. Since, until recently, the TSX was likely to have been synonymous with the 300 relatively large stocks that comprised the former TSE 300 index, it is worth pointing out that the number of firms on the TSX is well over 1000 in every year. In other words, many smaller firms trade on the TSX and, as with the firms that trade on the TSX Venture Exchange, are also likely to have low prices and thin trading. Approximately 30% of TSX firms are in the lowest price category (price less than one dollar), compared to 80% of the firms on the TSX Venture Exchange. We return to the issue of differences in prices and trading activity across the exchanges in the next section.

4. Market Quality for the TSX Venture Exchange and the TSX

We start by summarizing trading activity, trading costs and prices for stocks on the TSX Venture Exchange and the TSX. The purpose is to provide preliminary evidence on the extent to which the trading environments in these two markets differ. Table 2 provides the cross-sectional medians of the following variables: closing price, daily return volatility, the relative spread and trading volume. These medians are calculated over two one-year windows, November 1, 1998 to October 31, 1999 and January 1, 2000 to December 31, 2000, for all stocks, as well as for stocks in the three price and five volume groupings. First, the time series mean is calculated for each stock; then, the median is calculated across all stocks in a particular grouping (e.g. price category 2). We focus on these one-year windows because they are centred on the formation of the TSX Venture Exchange and provide preliminary evidence of its effects.

In addition to price, we provide descriptive statistics on variables that shed light on trading activity and market quality. Daily return volatility is calculated as the absolute value of the daily close-close return and is a measure of price variability. The relative spread is defined as the dollar spread (the difference between the ask and bid prices) divided by the average of the bid and ask quotes and is a measure of trading costs. Trading volume (the number of shares traded) is a natural measure of trading activity.

Starting with the TSX Venture Exchange in Table 2 Panel A, the mean price increases between the two years in every grouping except price category 3. Across all stocks, the increase is 30% (from 0.24 to 0.32), with the largest increase occurring for the heaviest volume quintile (approximately 40%). These results should however, be interpreted with caution, since the price levels are low – a large majority of stocks trades at prices below \$1. There is a substantial price decline in the highest price category (of approximately 60%), but, as shown in Tables 1 and 2, there are relatively few stocks in this category. Rows 3 and 4 show that volatility declines by approximately 15% for all stocks, though it increases for the higher-priced and more actively traded stocks. While we do not separately report statistics for the ASE and VSE, the decline is driven by ASE stocks, since volatility increases for VSE stocks. Likewise, the relative spread declines by approximately 10% across all stocks and in most categories. Trading volume decreases by 10% for all stocks, though there is a 60% increase for stocks in quintile 5

(volume declines by 70% in volume category 1). As with volatility, volume increases for VSE stocks and declines for ASE stocks. Overall, these statistics show generally favourable trends in prices and trading costs between the two periods, consistent with the view that the creation of the TSX Venture Exchange has had a positive effect on market quality. We examine this issue more rigorously in section 6, where we conduct an event study of the effects of the TSX Venture Exchange formation.

Turning to the TSX (Table 2, Panel B), we see that prices increase by approximately 20% between the first and second sample years. Volatility increases for TSX stocks, by 10%-15% for most groupings. Relative spreads are unchanged for many categories, and decline by 20% in price categories 2 and 3 and volume category 3. Finally, volume increases substantially in each category, particularly for the highest price and lower volume stocks.

While the patterns for the TSX Venture Exchange and the TSX are broadly similar, a comparison of the two panels in Table 2 shows a marked disparity in levels between the two markets. For each period and in every grouping, TSX prices are several times higher than prices on the TSX Venture Exchange. Given their lower prices, it is understandable that TSX Venture Exchange stocks display much higher levels of volatility and relative spreads than do the TSX stocks. Finally trading activity is shallower on the TSX Venture Exchange than on the TSX, in part contributing to the higher volatility and spreads on the former.

We also carry out a variance ratio test of market quality. We construct the variance ratio statistic as the weekly return variance divided by 5 times the daily return variance:

$$VR = \frac{\sigma_w^2}{5\sigma_d^2}$$

where σ_w^2 and σ_d^2 denote the variances of weekly and daily returns. If prices follow a ‘random walk’, i.e. prices do not systematically under- or over-react to news, it can be shown that the value of the variance ratio will be 1.0.¹¹ If prices over-react, daily price changes will be large (equivalently, σ_d^2 will be high) but weekly variances, which incorporate some of the eventual correction of prices, will be relatively low. Hence, the variance ratio will be below 1.0. Similarly, if prices under-react, the variance ratio will be greater than 1.0 (since daily price changes do not reflect all of the news, longer term price changes will be greater than a cumulation of daily changes). Thus, this test allows us to draw inferences about the extent to which prices are efficient.

Table 2C summarizes the results of this variance ratio test for the year before and the year after the formation of the TSX Venture Exchange. For ease of interpretation, we subtract 1 from the variance ratio calculated for each stock. Thus, a variance ratio of zero is consistent with efficient prices, while a negative (positive) variance ratio suggests that stock prices are characterized by over-reaction (under-reaction). The fact that the overall average variance ratio is negative in both markets shows that TSX and TSX Venture Exchange stocks display

¹¹ See, for instance, Lo and MacKinlay (1988).

overreaction. For TSX Venture stocks, the overreaction has declined slightly between the two years. By contrast, overreaction has increased for TSX stocks. A possible factor is temporary price pressure (a non-zero price impact of trades that is eventually reversed), which has become more serious through time as the volume of trading has increased. The overall averages conceal different patterns for the two markets, with low volume stocks on the TSX Venture Exchange and high volume stocks on the TSX displaying under-reaction (variance ratios above 1.0). Somewhat surprisingly, excepting the top two TSX volume quintiles, over-reaction is more serious on the TSX than on the TSX Venture Exchange, as seen in the larger negative numbers for the former. On the whole, over-reaction appears to be more of a small stock phenomenon, regardless of trading venue.

The averages presented in Table 2 do not provide a picture of the complete distribution of prices and trading activity, e.g. the percentage of firms in each market with prices below \$1 or daily trading volume of less than 1000 shares. To address this issue, we examine the cross-sectional distribution of prices and volume for the TSX Venture Exchange and the TSX for the first trading day in November in each year, 1997-2002 (the first trading day in November is selected randomly). We separate prices into the three categories defined above, i.e. $P < \$1$, $\$1 \leq P < \5 , and $P \geq \$5$. We form seven categories for volume on the day in question, $Vol = 0$; $0 \leq Vol < 1,000$; $1,000 \leq Vol < 10,000$; $10,000 \leq Vol < 100,000$; $100,000 \leq Vol < 500,000$; $500,000 \leq Vol < 1,000,000$; and $Vol \geq 1,000,000$. To interpret the volume and price frequencies in terms of the actual number of firms in the relevant price or volume category, the reader should multiply the number of firms (in the last column) by the frequency, e.g. 4 firms ($=0.2\% \cdot 1971$) have trading volume above \$1,000,000 shares in November 1997.

The top panel of Table 3 presents the results for the TSX Venture Exchange. An overwhelming fraction of stocks in each year consists of penny stocks (recall that stocks in price category 1 have prices below \$1.00), and the percentage of penny stocks has risen through time, from 78% in 1997 to 95% in 2002. Most of this increase occurs between 1997 and 1998. Accompanying the increase in the fraction of penny stocks is a decline in both the fraction and the number of stocks with prices between \$1 and \$5 and those with prices above \$5. For instance, the number of stocks with prices between \$1 and \$5 has dropped from 345 ($=0.20 \cdot 1724$) in 1997 to 94 ($=0.046 \cdot 2060$) in 2002. The corresponding numbers for the highest priced stocks (prices above \$5) are 34 in 1997 and 12 in 2002.

Moving on to trading activity, we find that TSX Venture Exchange stocks are very thinly-traded. In recent years, in fact, a majority of stocks does not trade at all (i.e. more than 50% of the TSX Venture Exchange stocks are in volume category 1) and the proportion of firms in category 1 has grown larger through time (i.e. has grown from 41% to 62% over this five-year period). Also illustrative of the low level of trading activity are the facts that (a) between 75% and 80% of the firms have a daily volume of less than 1000 shares, and (b) no more than 5% of the firms have volume exceeding 100,000 shares.

The bottom panel of Table 3 presents matching results for the TSX. It is clear that the frequency of low-priced stocks is appreciably lower for the senior market. A majority of stocks (626 stocks, or 50.5%) has a price in excess of \$5 in 1997. While the proportion and number of

stocks in the highest price category declines through time, it still has the largest representation (503 stocks, or in excess of 40%) in 2002. Over this five-year period, the percentage of the lowest priced stocks (prices below \$1) increases from just under 20% to just under 30% (their number increases from 241 to 337), and that of the mid-priced stocks declines from 30% to 26% (their number declines from 373 to 290). Thus, even though the price levels of low-priced stocks on the two exchanges are different, there appears to be a trend towards the increasing presence of low-priced stocks in both markets.

As expected, the non-trading frequencies are appreciably lower on the TSX, although a surprisingly significant fraction (as many as 20%) of all TSX listings does not record any trading activity in each year. Fifty percent of TSX stocks have a daily volume of 10,000 shares or more, and 15% of the firms have traded more than 100,000 shares a day in recent years. Thus, on average, TSX stocks are much more actively traded than are TSX Venture Exchange stocks.

The results in Tables 2 and 3 show similarities and differences between the TSX and the TSX Venture Exchange. On the one hand, unsurprisingly, there is a marked difference in the broad levels of prices and trading activity in the two markets. This lends credence to the popular view that the two markets have distinct trading environments. On the other hand, simultaneously, many TSX and TSX Venture Exchange stocks share similar price and trading attributes. That is, the number of low priced and thinly-traded stocks in both markets is substantial. In the next section, we examine the extent to which these two markets are fragmented in terms of co-movement of prices and trading volume.

5. Analysis of Co-movement Across Markets

In this section, we carry out tests of co-movement between the TSX Venture Exchange and TSX, as a direct measure of the interconnectedness of the Canadian public equity markets.¹² As we stated in the introduction, a test of integration must ultimately focus on investors spread across the several geographically distinct markets. If investor sentiment and valuations (translating into trading activity and returns) are seen to be decoupled from each other, we have a strong case for the existence of segmented regional markets. On the other hand, if we find that trading activity and returns are positively correlated across the regional markets, this would favour integrated markets.

The strength of co-movement and changes in the degree of co-movement provide us with additional clues in assessing the degree and direction of market integration in Canada. As we discuss in Section 8, we favour this quantitative approach to assessing market integration as opposed to a more descriptive approach involving cataloguing sectoral and industry differences in listings. While the latter approach tells us something about where oil and gas

¹² Comovement has been studied by several recent papers, e.g. Lo and Wang (2000), Hasbrouck and Seppi (2001) and Harford and Kaul (2003).

stocks are listed as vis-à-vis bio-tech listings (for instance), it is of limited use in assessing how integrated these separate markets are in terms of trading and price changes from an investor's point of view.¹³

We provide cross-market correlations in returns (i.e. percentage price changes), and show differences in these correlations in the pre- and post-TSX Venture Exchange formation periods, as well as differences depending on volume and stock prices (e.g. penny stocks versus blue chip stocks). We also conduct parallel examinations of the correlations in trading volume on the TSX and the TSX Venture Exchange.

This section is organized as follows. We first examine TSX and TSX Venture Exchange return co-movement in section 5(a), and then follow it with an examination of volume co-movement in section 5(b). In each section, we consider co-movement across all stocks first, and then consider co-movement across trading volume and price portfolios in subsections.

(a) *Co-movement of Daily Stock Returns*

Stock prices are affected both by idiosyncratic and market-wide news. If two markets are completely segmented, common factors do not affect prices in both markets, and the correlation in the returns for the two markets will be low. On the other hand, if the markets are well-integrated, common news should be reflected in prices in both markets, and their returns (price changes) should exhibit a high degree of return correlation. Thus, our first test of integration relies on measuring the correlation between stock returns on the TSX and the TSX Venture Exchange. These results are described in the next three sub-sections.

(i) Return Co-movement Using all Stocks

We study the correlation in daily returns for stocks listed on the TSX Venture Exchange and the TSX Index. If the regional markets and the TSX are well integrated, the correlation in daily returns for stocks on the TSX Venture Exchange and stocks on the TSX should be large and growing through time. Furthermore, if the formation of the TSX Venture Exchange has promoted integration, the return correlations should increase noticeably after this event.¹⁴

¹³ It is clear that the sectoral composition of the two markets will influence the correlations. However, to the extent that the sectoral composition of each market has not changed radically between years, the *trends* in the correlations should still be informative of *changes* in the degree of integration. This is our focus. As an aside, note that the differing composition is likely to drive the correlations towards zero. By contrast, we find respectable correlations, in the region of 40% and as high as 80%. Were we to examine the correlations by sector (a task made impossible by the lack of industry affiliation data), we are confident that these would be even higher.

¹⁴ The correlation coefficient lies between +1.0 and -1.0. The sign indicates the direction of association, i.e. whether the variables are directly or inversely related. The size of the coefficient indicates the strength of the association, with closeness to plus or minus 1.0 indicative of a stronger positive or negative association, and zero indicating no association.

In Figure 1, we plot the cumulative returns (which equal long-horizon price changes) for the regional market and the TSX. These plots allow us to see how the two market indexes have evolved from two years prior to the TSX Venture Exchange creation to two years afterwards. (We tabulate and discuss correlations from two years before the formation of the TSX Venture Exchange to three years afterwards, but do not wish to ‘overcrowd’ the figures.)

Figure 1A displays the cumulative daily returns for the TSE 300 Index and the cumulative equally-weighted returns for the TSX Venture Exchange (“equally-weighted” means that we have taken a simple average of the returns for all stocks in the market on each date). The plot covers the period November 1, 1997 through December 31, 2001, roughly spanning the four years centered on the merger of the ASE and the VSE, while excluding the month on either side of the merger. The period of the merger (November 1, 1999 through December 31, 1999) is anchored as date 0, with the preceding period using data from the ASE and VSE, and the period after this date using data from the TSX Venture Exchange.

Figure 1A shows that the two series generally move together, although far from perfectly. The correlation between these two series is 0.30 in the year before the TSX Venture Exchange formation, and it increases to 0.46 in the year after this event. While the increase in the correlation indicates greater integration following the merger, the level of the correlations is moderate. A possible factor is the differing composition of the two indexes. In particular, the TSE 300 index is a value-weighted index that is dominated by large cap stocks, while the TSX Venture Exchange equally-weighted index assigns a relatively larger weight to small cap stocks.

To address this possibility, we repeat the plot and correlation analysis using an equally-weighted TSX index (which assigns a greater weight to smaller stocks, including a non-zero weight to stocks outside the TSE 300) and the same TSX Venture Exchange equally-weighted index. In Figure 1B, we see that the two series appear to move together closely, although the TSX Venture Exchange cumulative returns are lower than the TSX equally-weighted returns. The correlation between the equally-weighted indexes from the two markets is appreciably higher, both prior to the merger (0.66), and one year after the merger (0.85), although the correlation two years after the merger drops to 0.66. We note two things from these results. First, the return correlation of TSX Venture Exchange stocks is greater with the equally-weighted TSX index (which assigns a greater weight to small stocks) than with the TSE 300 Index. Second, in the immediate aftermath of its creation, the TSX Venture Exchange appears to be more closely integrated with the TSX than the former ASE and VSE were.

To the extent that stocks with higher prices and greater trading volume dominate the TSX (and not the TSX Venture Exchange), these results suggest caution in drawing inferences regarding integration in the case of stocks with fundamentally different characteristics. For example, a concern is that thinly traded stocks may not display a high degree of co-movement simply because of insufficient trades, creating a spurious impression of segmentation. Similarly, stocks with very low prices, so-called penny stocks, might display a low degree of co-movement because of price staleness, or transactions costs, both of which affect penny stocks to a greater

extent vis-à-vis higher-priced stocks.¹⁵ We address this issue by analyzing return co-movement for price and volume sub-groups in the following sections.

(ii) Return Co-movement for Volume Portfolios

In Table 4 we provide the correlations between returns to five portfolios constructed from TSX and TSX Venture Exchange stocks by separating stocks on the basis of volume (we will also refer to these groupings as *volume quintiles*). We focus on the two years immediately surrounding the formation of the TSX Venture Exchange, panels B and C. The columns represent TSX volume quintiles, with quintile 1 consisting of the lowest volume stocks, and the rows denote volume quintiles from the TSX Venture Exchange. The diagonal elements of this matrix are of special interest to us since these denote the return correlations for similar quintiles on the two exchanges.

Over the period November 1, 1998 though October 31, 1999, for example, the return correlation for quintile 1 stocks (the lowest volume category) in the two markets is 0.011, indicating that for thinly traded stocks the two markets were not integrated immediately prior to the formation of the TSX Venture Exchange. Note that the return correlation increases more or less consistently as we look at higher quintiles, which suggests that trading activity plays an important and constructive role in linking markets. The highest return correlation is for quintile 5 stocks in each market, and equals 0.60, indicating a more than moderate level of return co-movement.

Panel C shows that the return correlation increases dramatically for all volume quintiles in the year immediately after the formation of the TSX Venture Exchange. This suggests that the markets became more closely integrated in the immediate aftermath of the formation of the TSX Venture Exchange (whether or not this was sustained over longer periods is answered in the subsequent panels). For all but the lowest quintile, the post-TSX Venture Exchange formation period is marked by moderate to high return correlations, ranging from 0.41 for quintile 2 to 0.83 for quintile 5. By contrast, in the pre-TSX Venture Exchange period, the corresponding correlations range from 0.20 for quintile 2 to 0.60 for quintile 5. Note that, as in the pre TSX Venture period, the cross-market correlations increase steadily with volume. The high cross-market correlations for the top two volume quintiles are consistent with the more actively traded stocks having a wider national investor base after the formation of the TSX Venture Exchange. That is, these stocks are likely to have attracted inter-provincial investors even before the formation of the TSX Venture Exchange, but the number of such investors swells following the introduction of a national small cap market.

One interpretation of these results is that the formation of the TSX Venture Exchange brought about economically significant increases in cross-market integration. But we caution that the analysis of a longer period is necessary to confirm this conclusion. Accordingly, the remaining panels of Table 4 present return correlations for 12-month periods starting two years before, and one and two years after, the formation of the TSX Venture Exchange. These results

¹⁵ Price also serves as a proxy for market capitalization, for which data are not available. It is typically the case that stocks with smaller market caps have lower prices.

suggest some caution in interpreting the correlation-based evidence. In particular, the level of the correlations fluctuates across years. For instance, the correlations in Panel A (two years before through one year before the formation of the TSX Venture Exchange) are similar to the corresponding levels in panel C (except for the top two quintiles), and the increase in Panel D is more modest compared to Panel B. We believe, however, that a comparison of correlations across adjacent years is reasonable, and provides the best evidence regarding the short-term impact of the merger. Correlations over longer-horizons, while providing evidence on the sustainability of co-movement, are plagued by more noise due to the possibility of significant changes in the ownership or trading environment over longer periods, and hence more difficult to ascribe to the merger event.

The large increase in the correlations in the year following the formation of the TSX Venture Exchange indicates that these 12 months were somewhat unusual, possibly due to a realignment of investors across the two markets. Once this had stabilized, the return correlations reverted to more modest levels. Recall from section 5(a)(i) that the market-level return correlation two years following the formation of the TSX Venture Exchange is identical (0.66) to the correlation in the prior period.

We also provide a graphical illustration of co-movement by plotting the cumulative returns for corresponding volume quintiles in the two markets. For example, Figure 2A plots the cumulative daily returns for stocks from the lowest volume quintile on the TSX and the TSX Venture Exchange. Figure 2B through Figure 2E display the cumulative returns for the remaining four volume quintiles from both markets. In all cases we see that, although the decline for the TSX Venture Exchange portfolio is steeper than the decline for the TSX portfolio, the two series track each other reasonably closely. Overall these results paint a picture of markets that display moderate levels of integration in terms of returns, especially in more recent years.

(iii) Return Correlations for Price Categories

We now turn to an examination of return co-movement for stocks in different price categories. As stated earlier, we are concerned that low priced stocks, particularly those that trade at prices below \$1, might have a differential and potentially large impact on the return correlations. In Table 5 we provide the correlations between equally-weighted indexes formed from TSX and TSX Venture Exchange stocks divided into three price categories. In the year prior to the formation of the TSX Venture Exchange (Panel B), the low and medium price portfolios in the two markets display moderate return correlations (0.61 or less) while the correlation is lowest for the highest price portfolios (0.28).

In the year following the formation of the TSX Venture Exchange (Panel C), there is a large increase in the correlation of returns for the matching price portfolios (e.g. to 0.79 for the lowest priced stocks and to 0.65 for the highest priced stocks). Again, this comparison of the two years surrounding the formation of the TSX Venture Exchange indicates that this event has increased the extent to which the regional market and the TSX are integrated. While the correlations decline in the second year following the formation of the TSX Venture Exchange (Panel D), the increase in the correlation appears to be sustained for the low and mid price

portfolios, though not for the highest price stocks. Panel A shows surprisingly large correlations two years before the formation of the TSX Venture Exchange, and Panel E shows a slight decline in integration in the year 2001-2002 relative to the previous year.

Curiously, the level of the correlation declines with price in every period. We suspect this is driven by the small sample size of high priced stocks on the TSX Venture Exchange (see Tables 1 and 2). A second, more intriguing possibility, and one consistent with partial segmentation, is that institutional investors are constrained to invest in higher priced stocks, and that there exists a local geographical bias in institutional investment.¹⁶ To the extent that low price stocks are dominated by retail investors, a similar argument suggests that the large correlations for the low price portfolios could be driven by geographically correlated retail investor sentiment.

(b) *Volume Co-movement*

Our examination of volume co-movement provides evidence on market integration beyond that provided by the foregoing analysis of return co-movement. This is because a high volume correlation indicates that trading decisions are correlated across markets, irrespective of the price effects of the trades themselves. For instance, assuming that the TSX and the TSX Venture Exchange are well-integrated, investors (taken together) will often buy stocks trading on the TSX and sell stocks on the TSX Venture Exchange. This might drive returns in opposite directions, and will lower the extent to which returns co-move in the same direction; however, the volume correlation will be large even in these circumstances. Integrated trading implies that, as with returns, volume will display strong cross-market correlations, while fragmented trading implies that the volume correlations will be low.

We first examine the extent of co-movement in mean trading volume for all stocks trading on the TSX and all stocks trading on the TSX Venture Exchange (see also Figure 1, panel C). The volume correlation in the year prior to the formation of the TSX Venture Exchange is 0.57, indicative of moderately integrated markets. Following the formation of the TSX Venture Exchange, the correlation increases to 0.78, indicating a strengthening of the degree of integration. When we widen the window of inquiry, we see similar patterns to those for returns. Specifically, the volume correlation declines two and three years after the formation of the TSX Venture Exchange. With volume, however, the correlation remains appreciably above its pre-TSX Venture Exchange levels. For instance, the correlation two years after the formation of the TSX Venture Exchange is 0.40 compared to 0.30 two years before this event.

In order to get a deeper view of integration, we calculate the correlations in mean volume for the TSX and TSX Venture Exchange trading volume quintiles. The results are provided in Table 6. As before, we focus on the two years centred on the formation of the TSX Venture Exchange (Panels B and C). Panel B shows that the volume correlation ranges from 0.22 for quintile 1 to 0.55 for the most actively traded quintile in the pre-TSX Venture Exchange period. In Panel C, we find that each of these correlations gets stronger following the formation of the TSX venture exchange, with values ranging from 0.44 for quintile 1 to 0.75 for quintile 4.

¹⁶ See, for instance, Coval and Moskowitz (2003a, b).

So far, the volume results parallel the return results, suggesting first, that the equity markets displayed a low to moderate degree of integration of trading prior to the formation of the TSX Venture Exchange; and second, that following this event, trading patterns in the two markets became significantly more correlated. Examining volume co-movement one year after the formation of the TSX Venture Exchange, we see that the volume correlation declines to its pre-event level for every quintile pair. Note that the low volume quintiles generally exhibit lower cross-market correlations than quintiles containing more actively traded stocks, possibly due to thin trading *per se*, or to higher transaction costs for thinly traded stocks.

Figure 4 provides a plot of average daily trading volume per stock for the TSX and TSX Venture Exchange quintiles. Our interest here is in how closely the two series track each other. While it is clear that for each quintile pair, average trading volume is greater for the TSX quintile than for the corresponding TSX Venture Exchange quintile, the two series exhibit coincident ups and downs in trading activity, confirming the correlation evidence presented above.

Table 7 and Figure 5 provide evidence on the volume correlations for the three price categories. Table 7 shows a jump in the volume correlations in the year following the formation of the TSX Venture Exchange relative to the preceding year, and for the lower priced stocks in particular. The weaker results for the high-priced stocks are due, at least in part, to the small number of TSX Venture Exchange stocks with high prices. Figure 5 provides similar plots for mean daily volume in the three price groupings on the TSX and the TSX Venture Exchange. These plots show that low and medium priced stocks on the TSX and the TSX Venture Exchange exhibit strong co-movement, but high priced stocks show less of an association.

We have mentioned the limitations of comparing the correlations across widely-spaced years. Keeping that caveat in mind, our results can be summarized as follows: Overall, the return and volume correlations, for all stocks and separately for the price and volume portfolios, paint a picture of equity markets that are moderately integrated immediately prior to the formation of the TSX Venture Exchange and are more strongly integrated immediately following the formation of the TSX Venture Exchange.¹⁷

6. Merger Event Study: Analysis of the Formation of the TSX Venture Exchange

The merger of the ASE and the VSE in November 1999 led to the creation of the TSX Venture Exchange as the primary venue for trading junior equities in Canada. As discussed in Section 2, the formation of the TSX Venture Exchange provides a natural experiment to study

¹⁷ We also compute within-market correlations for the volume and price portfolios, e.g. for volume quintile 1 and volume quintile 5 on the TSX (and similarly on the TSX Venture Exchange). The within-market correlations display similar overall trends to the cross-market numbers provided in the tables. Generally, the increases in the correlations between markets are similar to those within markets, with the increases in the within TSX Venture Exchange correlations being slightly larger, and those for the TSX somewhat lower, than the increases in the TSX Venture–TSX correlations. It is possible that other factors besides the merger are driving the patterns in the return and volume correlations (e.g. more comprehensive computer systems to trade stocks Canada-wide). However, these factors seem to have had similar effects on all of the correlations. In other words, integration is increasing both within and across markets. Since our mandate is to analyze the degree of market fragmentation, our focus is on the cross-market correlations.

the effects of harmonized regulations and scale economies in regulation. Specifically, the merger of the ASE and the VSE resulted in a common set of rules governing trading at the two exchanges. While this falls short of a uniform set of securities regulation and common regulators, the limited harmonization offers a microcosm of what larger scale regulatory harmonization might bring.

To shed light on these effects, we carry out an *event study* of the formation of the TSX Venture Exchange. The previous section provided aggregate results that might obfuscate stock level findings associated with the merger. Our goal is to study the effects of the harmonization on both the market quality of the ASE and VSE and the degree of integration of the ASE and the VSE. We begin by calculating the mean stock price, relative spread, trading volume and volatility for the intervals November 1, 1998 through October 31, 1999 (for brevity, year -1 relative to the formation of the TSX Venture Exchange); January 1, 2000 through December 31, 2000; and January 1, 2001 through December 31, 2001 (years $+1$ and $+2$). The three intervals represent one year before and two consecutive years after the formation of the TSX Venture Exchange (as before, we exclude the month on either side of the event, to avoid transition-related effects). Improvements in market quality will be reflected in a higher average price and volume, and a lower relative spread and volatility.

Accordingly, we calculate the difference between the average value for each variable in year $+1$ and year $+2$ relative to year -1 . This calculation proceeds in two steps. First, we calculate the average price (for instance) for each stock on the TSX Venture Exchange in calendar year 2000 (year $+1$) and also for the period November 1, 1998-October 31, 1999 (year -1) and subtract the average price for year -1 for each stock from its year $+1$ average. In the second stage, we calculate the cross-sectional median of the stock-by-stock differences, and report the median in the table. We proceed similarly with trading volume, volatility and the relative spread. Due to the problems associated with comparisons across stocks with differing levels of prices and volumes, we calculate and summarize the percentage change in mean price and mean volume for each stock. Also, in order to control for market-wide effects, we calculate similar differences for all TSX firms, which provide a benchmark for the TSX Venture Exchange formation effects. This analysis is carried out for ASE and VSE firms that survive on the TSX Venture Exchange. However, we do not impose the condition that the firms be listed for the entire calendar year 2000.¹⁸

Table 8 describes these results. We separately report the results for all ASE and VSE stocks, though (in order to save space) not for the price or volume categories. The price of the median ASE (VSE) stock is higher by 18% (11%) in year $+1$ relative to year -1 , compared to an increase of 3% for the median TSX stock. Trading volume increases by 51% in year $+1$ for VSE stocks and by 28.3% for the TSX. Surprisingly, volume decreases by 32% for ASE stocks; however, it is notable that this reduction is substantially smaller than the increase for VSE stocks, so that the net effect is increased trading volume on the TSX Venture Exchange. The relative spread declines in year $+1$ for both ASE and VSE stocks (and by more for the former, despite the reduction in volume), though not for TSX stocks. Finally, volatility increases on

¹⁸ We wish to mitigate the effects of survivorship bias, which could, for instance, inflate the measured price differential. See for instance, Kothari, Shanken and Sloan (1995). We do, however, impose the condition that a minimum of 30 observations be available.

both the VSE and the TSX, though not on the ASE. The increase for VSE stocks is more than twice as large as that for TSX stocks. Overall, with the exception of the volume results for the ASE and the volatility results for the VSE, the formation of the TSX Venture Exchange appears to have had a favourable effect on market quality.

We examine a longer window to confirm the price effect. When we compare prices from year +2 to year -1 we find that the price effect is large and negative for the TSX Venture Exchange (-37% for the VSE and -17% for the ASE) relative to the TSX (-7%). This is also a substantial reduction in volume for the VSE and especially the ASE, and a large increase in trading costs for ASE and VSE stocks (the volatility results are mixed). We suspect these results are unrelated to the formation of the TSX Venture Exchange for two reasons. First, the immediate effect of the merger on prices and volume is generally positive, and the further out one goes from the event, the greater the noise associated with drawing conclusions. Second, the market decline during this period, particularly the precipitous drop in the value of tech and small cap stocks, is likely associated with these price changes for stocks listed on the TSX Venture Exchange. A longer-term examination as well as comparisons across industries might provide useful insights. These tasks are left to future work.

The effects of the TSX Venture Exchange formation on integration are summarized in Table 9 through Table 12. These results parallel those in Section 5, with Tables 9 and 10 providing the correlations for volume and price portfolios formed from ASE and VSE stocks, and Tables 11 and 12 the corresponding volume correlations.

These results can be summarized as follows. First, our untabulated results for the entire set of stocks from the ASE and VSE show a significant jump in the cross-market correlation associated with the formation of the TSX Venture Exchange. Specifically, the return correlation increases from 0.57 to 0.88 between years -1 and +1, while the volume correlation increases from 0.52 to 0.93. Second, a similar increase is seen for the volume and price portfolios, with the largest increases occurring for the highest volume and low price stocks (quintiles 4 and 5 and price portfolio 1). Third, the increase in the volume correlations is more pronounced than the rise in the return correlations, reflecting greater synchronicity of trading decisions with the formation of a single exchange.¹⁹

In sum, the event study results point to a favourable impact of harmonized regulations on trading in secondary markets. Previously separate markets appear to move together to a greater extent following the partial merger of their rulebooks. Also, the merger seems to have lifted prices and volumes (for the most part), and lowered trading costs. Given the market-wide decline in equity values in 2000, however, we are unable to say whether the beneficial short-term effects of harmonized trading rules on market quality are sustainable.

¹⁹ As with the correlations in Section 5, the ASE-VSE correlations both are volatile and decline following year +1. We focus our discussion on the effects in years -1 and +1 but present the entire set of correlations.

7. Implication of the Analysis for Securities Regulatory Reform

The ASE, VSE, TSX Venture Exchange and TSX data analyzed in this paper yield the following important results. First, we document increases in trading volume for VSE-listed stocks (though not ASE-listed stocks) after the formation of the TSX Venture Exchange. The formation of the TSX Venture Exchange brought about regulatory changes that lowered the uniqueness of the ASE and VSE and made them part of a national market. While we are puzzled by the ASE results, it is worth noting that the decline for ASE stocks is substantially lower than the increase for VSE stocks. The most plausible explanation for the increased trading volume is increased interest in, and ownership of, TSX Venture Exchange companies by residents in different jurisdictions in Canada in the post-TSX Venture Exchange period. Our correlation analysis confirms this interpretation. Thus, the formation of a single market appears to promote nation-wide interest in the constituent stocks.

Second, we compute the correlations between returns and volume for the ASE and the VSE and the TSX, and then for the TSX Venture Exchange and the TSX and find that the correlations and, therefore, the extent of equity market integration, have fluctuated through time. However, integration was at impressive levels as long as five years ago. In fact, the return correlations were higher in 1997 than in 2002. The large correlations suggest that the TSX Venture Exchange and the TSX have been relatively well-integrated for some time, and that market participants on the TSX and TSX Venture Exchange are homogenous. This result, in turn, suggests that there were no barriers to investors trading in regional markets despite the lack of uniform regulations. In other words, a moderately high level of integration was achieved even prior to the creation of the TSX Venture Exchange (which, as shown elsewhere in this study, further reinforced integration).

Third, our findings speak to an issue that is often overlooked in the analysis of securities regulation in Canada. The issue is whether regional differences in economic activity give rise to differences in regulatory structures across provinces, or differences in regulatory structures give rise to differences in economic activity across provinces. Our analysis compares the correlation in stock returns for the ASE and the VSE both before and after the formation of the TSX Venture Exchange, which was associated with a significant harmonization of regulations and regulators for the exchanges, at least across the provinces of Alberta and British Columbia. The correlation for ASE and VSE returns and volume increased immediately after the formation of the TSX Venture Exchange, suggesting that a unified regulatory structure might promote integration. However, a longer-term comparison of the correlations suggests that these beneficial effects are most pronounced in the year following the merger, and revert to pre-merger levels by the end of the second year following the event.

Finally, we document differences in average price levels, trading activity and trading costs between the TSX Venture Exchange and the TSX. However, there are also striking similarities across markets, notably, the large fractions of low price and thinly traded stocks in both markets. Approximately one in three stocks on the TSX trades at a price less than one dollar – one normally does not associate “penny stocks” with the TSX, the senior stock market in Canada. Similarly, we find that many stocks, not only on the TSX Venture Exchange, but also on the TSX, are thinly traded. We find that returns and volume co-move strongly for low-priced

stocks on the TSX Venture Exchange and the TSX, for high-priced stocks at the two venues, and for actively- and thinly traded stocks. The fact that returns and volume co-move for stocks with similar attributes but trading in different markets suggests that these stocks might benefit from similar Canada-wide regulation.

Overall, our conclusions are that the regional equity markets in Canada are well integrated with one another, and that prices and trading activity in regional markets co-move to a significant degree even after controlling for firm-specific characteristics such as price and volume. These findings call into question sector-specific regulations across the regional markets: after all, when thinly-traded stocks on the TSX Venture Exchange co-move with thinly-traded stocks on the TSX, it is difficult to argue that each market needs idiosyncratic regulation. Instead, we suggest a regulatory model based on trading volume or price levels (or, by extension, firm size) that would remain the same across provincial boundaries.

8. Comparison with Approaches Studying Issuer Characteristics

The discussion and analysis of regional and sectoral differences in Canadian markets typically focuses on the characteristics of firms in different provinces and/or the different components of general economic activity in different provinces. It is likely that a primary reason for the focus on characteristics of firms in different locations is that investor location data do not exist for publicly traded companies on Canada's stock exchanges. For the purpose of designing an appropriate securities regulatory structure for Canada, however, this type of analysis is incomplete for a number of reasons. For example, it fails to account for the fact that the same firm may have operations in different provinces. It also fails to account for the fact that a firm's suppliers of capital may not be located in the same province as that in which the firm is based. If companies are owned by investors in several provinces, the need for different securities regulatory structures in different regions of Canada is significantly weakened, and any documented differences in economic activity in different regions are not necessarily relevant for the purpose of redesigning securities regulation in Canada.²⁰

Briefly, there are many reasons why investors should be the primary focus when analyzing market fragmentation and securities regulatory reform and the debate on jurisdiction or sector specific securities laws. First, many investors, particularly those investors in publicly traded companies, will not reside in the same jurisdiction as the firm in which they invest. Second, investors tend to hold diversified portfolios of companies from different industries. Third, fragmented regulation and regulators increase regulatory uncertainty and compliance costs, exacerbate the differences in the type of information provided to market participants by different firms, and therefore increase the costs of firm diversification across jurisdictions that are regulated differently. Fourth, given the third point, fragmented regulation lowers liquidity, which in turn increases the cost of capital (required rate of return) for firms. Similarly, regulatory fragmentation increases bid-ask spreads. Fifth, fragmented regulation directly increases the costs of litigation for investors when there is in fact an issue involving litigation.

²⁰ The differences are nevertheless of potential factual interest. Some differences in the characteristics of reporting issuers by province, GDP activity, among other things, are provided in a descriptive analysis by Puri (2003).

Sixth, the very reason for securities regulation is for the purpose of investor protection, which is seriously undermined in light of issues #1-5.

In view of these issues, we believe that an analysis of investor behaviour across regional equity markets is central to the study of securities regulatory reform in Canada. The findings in this paper contribute to the core of the debate on integration versus fragmentation in Canada's public equity markets. We hope to shift the debate on the economics of securities regulation away from regional and sectoral analyses of firms, and toward the recognition that integration involves not only firms but also, more importantly, investors and trading outcomes. Securities regulation is about the twin objectives of investor protection and market efficiency. Clearly, companies stand to benefit from a reduced cost of capital when the interests of investors as capital contributors are upheld.

9. Conclusion

In the debate on Canadian securities markets regulation, academic and practitioner reports on regional and sectoral fragmentation in Canadian stock markets typically focus on the characteristics of reporting issuers and/or economic activity in different provinces. Such analysis provides little guidance as to the appropriate securities regulatory structure for publicly listed Canadian companies. As we have explained, even if there are differences in the types of companies located in different provinces, publicly listed companies may have investors that are widely dispersed across Canada. This alone reduces the benefits of disparate regulation.

The tendency to focus on characteristics of firms in different locations is likely to be driven by the fact that investor location data for publicly traded companies on Canada's stock exchanges do not exist. In our companion paper (Cumming, Kaul and Mehrotra, 2003a), we analyze private equity data that match the provinces of location of the investor and investee. Unfortunately, such location data are unique to Canada's private equity markets.

Although ownership and investor location data do not exist for publicly traded companies in Canada, one can nevertheless ascertain the degree of integration/fragmentation in Canadian markets through an empirical analysis of prices, volatility, bid-ask spreads, trading volume, and return/volume co-movement for stocks listed on the different exchanges. This paper addresses these measures of integration. Importantly, we focus on the correlations in prices and volume across the ASE/VSE, the TSX Venture Exchange and the TSX, and compare these correlations in the pre- and post-TSX Venture Exchange formation periods, as well across stocks with different prices and trading volumes.

Our main findings were as follows. First, we document increases in trading volume for VSE-listed stocks (though not the ASE-listed stocks) after the formation of the TSX Venture Exchange. The formation of the TSX Venture Exchange brought about regulatory changes that lowered the uniqueness of the ASE and VSE and made them part of a national market. While we are puzzled by the ASE results, it is notable that the decline in volume for ASE stocks is substantially lower than the increase for VSE stocks. The most plausible explanation for the increased trading volume is increased interest in, and ownership of, VSE companies by residents

in different jurisdictions in Canada in the post-TSX Venture Exchange period. Our correlation figures (discussed below) confirm this interpretation.

Second, we compute the correlations between returns and volume for the ASE and the VSE and the TSX, and then for the TSX Venture Exchange and the TSX and find that the correlations and, therefore, the extent of equity market integration have fluctuated through time. However, integration was at impressive levels as long as five years ago. The large correlations suggest that the TSX Venture Exchange and the TSX have been relatively well-integrated for some time, and that market participants on the TSX and TSX Venture Exchange are homogenous.

Third, our findings speak to an issue that is often overlooked in the analysis of securities regulation in Canada. The issue is the following: do regional differences in economic activity give rise to differences in regulatory structures across provinces, or do differences in regulatory structures give rise to differences in economic activity across provinces. Our analysis compares the correlation in stock returns for the ASE and the VSE both before and after the formation of the TSX Venture Exchange, which was associated with a significant harmonization of regulations and regulators for the exchanges, at least across the provinces of Alberta and British Columbia. The correlation between the ASE and the VSE increased in the year following the formation of the TSX Venture Exchange, suggesting that a unified regulatory structure promotes integration, although these effects got weaker over longer intervals.

Finally, we document differences in average price levels, trading activity and trading costs between the TSX Venture Exchange and the TSX. However, there are also striking similarities across markets, notably, the large fractions of low priced and thinly traded stocks in both markets. Approximately one in three stocks on the TSX trades at a price less than one dollar – one normally does not associate “penny stocks” with the TSX, the senior stock market in Canada. Similarly, we find that many stocks, not only on the TSX Venture Exchange, but also on the TSX, are thinly traded. We find that returns and volume co-move strongly for low-priced stocks on the TSX Venture Exchange and the TSX, for high-priced stocks at the two venues, and for actively- and thinly traded stocks.

Overall, our conclusions are that the regional equity markets in Canada are well integrated, and that prices and trading activity in regional markets co-move to a significant degree even after controlling for firm-specific characteristics such as price and volume. These findings call into question sector-specific regulations across the regional markets: after all, when thinly-traded stocks on the TSX Venture Exchange co-move with thinly-traded stocks on the TSX, it is difficult to argue that each market needs idiosyncratic regulation. Instead, we suggest a regulatory model based on trading volume or price levels (or, by extension, firm size) that would remain the same across provincial boundaries.

Appendix I Robustness Tests

This appendix describes the results of additional tests to confirm the robustness of our earlier results in Section 5 and Section 6. First, while we show that stock prices increase slightly and relative spreads decline sharply following the formation of the TSX Venture Exchange, we also show that trading volume increases substantially (see Table 2 and Section 6). Thus, an alternative explanation for our results is that increased trading volume leads to lower relative spreads and hence to higher prices (Amihud and Mendelson (1986) were the first to document a relation between trading costs and prices; see also Brennan and Subrahmanyam (1995)).

In order to address this possibility, we run the following time-series regressions between a stock's relative spread or its price and trading volume:

$$\begin{aligned} Relspr_t &= \alpha + \delta Dum_{TSE-V} + \beta Volume_t + \varepsilon_t \text{ and} \\ \frac{1}{P_t} &= \alpha + \delta Dum_{TSE-V} + \beta Volume_t + \varepsilon_t \end{aligned}$$

Here, Dum_{TSE-V} is a dummy variable that is one after the formation of the TSX Venture Exchange and zero beforehand, $Volume_t$ is daily volume on day t and $Relspr_t$ and $Price_t$ are the relative spread and closing price for day t . We choose to run the regression for price in terms of its inverse in order to minimize potential problems associated with the non-stationarity of prices. We estimate this regression for each stock that is listed on the ASE (or VSE) and the TSX Venture Exchange and report the mean coefficients in Panel A of Table 13.

In interpreting these numbers, note that the mean post-TSX Venture Exchange effect for each stock is given by $\alpha + \delta$ and the mean pre-TSX Venture Exchange effect is given by α . Thus, if increased trading volume explains the higher price or lower relative spread, the coefficient δ should be insignificantly different from zero. On the other hand, if the change in the mean price or relative spread remains favourable after accounting for volume, δ will be negative in both regressions (recall that we examine the relation between volume and the inverse of price; hence an improvement in price is signified by a negative value of δ).

For each variable (price and relative spread) we separate ASE, VSE and TSX stocks (the latter is included as a benchmark). Coefficients in boldface are significant at the 5% level of significance. The mean values of the intercept and the coefficients on the dummy variable and volume are significantly different from zero for stocks trading on the TSX Venture Exchange as well as on the TSX. Most importantly, for ASE and VSE stocks, the coefficient on the dummy variable is significantly negative in the regressions for the relative spread and price even after we control for volume. Thus, the improvement in prices and relative spreads following the formation of the TSX Venture Exchange cannot be attributed to the increased volume (at least for VSE stocks) that accompanied its formation.

To benchmark these effects, we repeat the regression for TSX stocks. While the value of δ in the relative spread regression is appreciably smaller than the values for the ASE and VSE, it is *positive* and insignificantly different from zero in the price regression. Thus, relative to TSX stocks, there is a larger abnormal decline in the spreads for venture stocks, and a larger abnormal increase in their prices. It is worth noting that the smaller intercepts for TSX stocks suggest higher TSX prices and lower relative spreads compared to TSX Venture Exchange stocks. This is reassuring because it is consistent with the descriptive statistics in Table 2.

As a specification check, the lower panel of Table 13 provides a similar regression, but estimated cross-sectionally. Here, for each market (ASE, VSE, TSX), we regress the change in the average relative spread or in the average price between the year after and the year before the formation of the TSX Venture Exchange on the corresponding change in average trading volume:

$$\begin{aligned}\bar{S}_{postTSX-V} - \bar{S}_{preTSX-V} &= \alpha + \beta(\bar{V}_{postTSX-V} - \bar{V}_{preTSX-V}) + \varepsilon_t \text{ and} \\ \bar{P}_{postTSX-V} - \bar{P}_{preTSX-V} &= \alpha + \beta(\bar{V}_{postTSX-V} - \bar{V}_{preTSX-V}) + \varepsilon_t\end{aligned}$$

where S is the relative spread, P is the stock price and V is volume, and the bar above each variable indicates that this is the mean value for each stock over the period shown in the subscript. In this specification, α represents the mean change in the price or relative spread associated with the formation of the TSX Venture Exchange for the sample of ASE or VSE stocks. If, controlling for volume, the event is associated with a lower mean relative spread and a higher mean price, α will be negative in the spread regression and positive in the price regression. As shown in Panel B of Table 13, there is general support for this conclusion.

The coefficient on volume is negative in the regression for relative spreads, and this is consistent with the fact that more heavily-traded stocks have lower relative spreads. The matching coefficient in the price regression is positive (though not always significant), indicating that stocks that experience larger volume increases see their prices rise more sharply. Both of these observations are consistent with existing microstructure research (see Harris, 2002, for a good summary). It is seen that the intercept in the price regression is positive but not significantly different from zero for either the ASE or the VSE. Thus, cross-sectional differences in changes in volume appear to explain the mean price increase around the formation of the TSX Venture Exchange.

By contrast, the intercept in the relative spread regression remains reliably below zero for both the ASE and the VSE, indicating that mean relative spread declines in the post-TSX Venture Exchange period, even after controlling for volume changes. The corresponding regressions for TSX stocks indicate a larger mean price increase and similar declines in the mean spread, relative to the TSX Venture Exchange. Overall, the earlier conclusions from the event study analysis remain unchanged.

A second and somewhat related concern is that the volume quintiles are non-comparable through time. Specifically, since trading activity has increased through time, a particular quintile consists of stocks that trade more actively in the post-TSX Venture Exchange period relative to the pre-TSX Venture Exchange period. In order to deal with this concern we replicate our results holding the definition of the quintile breakpoints fixed. In other words, we form quintiles on the basis of trading volume over the year preceding the formation of the TSX Venture Exchange and then define the volume quintiles in the post-TSX Venture Exchange period using the same volume cutoffs as in the pre-TSX Venture Exchange period. Our conclusions are identical when we fix the breakpoints.

Third, a possible concern is that, by considering every stock on each exchange, we have allowed the composition of the indexes to change. We address this concern by restricting the TSX Venture Exchange portfolios to stocks that were also listed on the ASE and VSE. Our results and conclusions are similar to those reported in the paper.

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Table 1
The Number of Stocks Trading during Each Year, 1997-2002

The table presents the total number of listed firms, the number of firms with positive prices, and their breakdown between three price categories for the Vancouver Stock Exchange and the Alberta Stock Exchange (1997-1998), the TSX-Venture Exchange (1999-2002) and the TSX (1997-2002) on the last trading day in the year. Price categories 1, 2 and 3 consist of stocks with prices $P < \$1$, $\$1 \leq P < \5 , and $P \geq \$5$ on the last day of the year. For 1997 and 1998, the Vancouver data are presented in the first row and the Alberta data in the second row.

Year	VSE/TSX-Venture				
	Total # stocks	# stocks with valid prices	# stocks pr_cat1	# stocks pr_cat2	# stocks pr_cat3
1997	1705	1406	1191	192	23
	1165	1157	892	218	47
1998	1705	1474	1323	112	39
	1199	1192	1013	144	35
1999	2132	2027	1750	238	39
2000	2926	2745	2409	290	46
2001	2986	2677	2479	172	26
2002	3186	2880	2698	163	19

Year	TSX				
	Total # stocks	# stocks with valid prices	# stocks pr_cat1	# stocks pr_cat2	# stocks pr_cat3
1997	1417	1322	294	394	634
1998	1426	1316	391	342	583
1999	1465	1363	359	376	628
2000	1465	1329	367	364	598
2001	1397	1254	347	346	561
2002	1287	1180	317	339	524

Table 2A
TSX Venture Exchange Market Quality

The median price, volume, volatility and spread on the TSX Venture Exchange. *Before* refers to the period November 1, 1998 through October 31, 1999, for which the market is the composite of the Alberta and Vancouver Stock Exchanges. *After* refers to the period January 1, 2000 through December 31, 2000, for which the market is the TSX Venture Exchange. Volatility is the absolute value of the daily return, Relative Spread is calculated as the bid-ask spread normalized by the stock price. Price categories 1, 2 and 3 consist of stocks with median prices $P < \$1$, $\$1 \leq P < \5 , and $P \geq \$5$. Volume quintile 1 consists of the stocks with the lowest trading volume and quintile 5 of stocks with the highest volume.

	All Stocks	Price Cat 1	Price Cat 2	Price Cat 3	Volume Quintile 1	Volume Quintile 2	Volume Quintile 3	Volume Quintile 4	Volume Quintile 5
Price Before	0.24	0.20	1.67	19.88	0.27	0.20	0.23	0.25	0.27
Price After	0.32	0.25	1.72	12.92	0.27	0.27	0.27	0.31	0.38
Volatility Before	0.055	0.058	0.044	0.030	0.031	0.045	0.056	0.055	0.063
Volatility After	0.047	0.047	0.049	0.032	0.019	0.032	0.048	0.062	0.073
Rel Spread Before	0.22	0.23	0.08	0.08	0.28	0.26	0.23	0.20	0.13
Rel Spread After	0.21	0.23	0.08	0.08	0.29	0.25	0.21	0.17	0.12
Volume Before	10547	10755	9094	5893	1464	4595	9084	15354	40828
Volume After	8916	8246	14693	2294	495	2345	6075	15697	63020

Table 2B
TSX Market Quality

The median price, volume, volatility and spread on the TSX. *Before* refers to the period November 1, 1998 through October 31, 1999. *After* refers to the period January 1, 2000 through December 31, 2000. Volatility is the absolute value of the daily return, Relative Spread is calculated as the bid-ask spread normalized by the stock price. Price categories 1, 2 and 3 consist of stocks with median prices $P < \$1$, $\$1 \leq P < \5 , and $P \geq \$5$. Volume quintile 1 consists of the stocks with the lowest trading volume and quintile 5 of stocks with the highest volume.

	All Stocks	Price Cat_1	Price Cat_2	Price Cat_3	Volume Quintile_1	Volume Quintile_2	Volume Quintile_3	Volume Quintile_4	Volume Quintile_5
Price Before	3.86	0.38	2.34	15.65	4.55	2.80	2.31	2.76	4.40
Price After	4.57	0.42	2.41	16.03	4.65	2.96	2.77	3.34	6.28
Volatility Before	0.026	0.052	0.029	0.017	0.018	0.026	0.030	0.031	0.031
Volatility After	0.030	0.056	0.033	0.021	0.021	0.031	0.034	0.035	0.037
Rel Spread Before	0.04	0.12	0.05	0.02	0.08	0.06	0.05	0.03	0.02
Rel Spread After	0.04	0.10	0.04	0.02	0.07	0.06	0.04	0.03	0.02
Volume Before	20166	22446	15755	21276	798	4728	14955	44320	160574
Volume After	29975	28204	23880	36924	1378	7433	22208	59546	217254

Table 2C
TSX Venture Exchange and TSX Variance Ratio Tests

For each stock, a variance ratio is calculated as the ratio of the weekly return variance to five times the daily return variance. The table presents the cross-sectional median of the distribution of the variance ratio less 1.0 for the TSX and the TSX Venture Exchange, which is the composite of the Alberta and Vancouver Stock Exchanges before November 1999. *Before* refers to the period November 1, 1998 through October 31, 1999. *After* refers to the period January 1, 2000 through December 31, 2000. Price categories 1, 2 and 3 consist of stocks with median prices $P < \$1$, $\$1 \leq P < \5 , and $P \geq \$5$. Volume quintile 1 consists of the stocks with the lowest trading volume and quintile 5 of stocks with the highest volume.

	All Stocks	Price Cat 1	Price Cat 2	Price Cat 3	Volume Quintile 1	Volume Quintile 2	Volume Quintile 3	Volume Quintile 4	Volume Quintile 5
TSX Venture									
Variance Ratio Before	-0.2086	-0.1927	-0.3375	-0.0839	1.1260	0.1697	-0.1975	-0.2985	-0.3638
Variance Ratio After	-0.1857	-0.1759	-0.2575	-0.0288	0.5804	0.1143	-0.1350	-0.3309	-0.3462
TSX									
Variance Ratio Before	-0.2456	-0.3723	-0.2829	-0.1304	-0.0347	-0.1115	-0.0948	-0.0023	0.0049
Variance Ratio After	-0.2721	-0.4293	-0.3410	-0.1647	-0.2034	-0.3101	-0.1420	0.0321	0.0279

Table 3
The Cross-Section of Stock Prices and Volumes on the First Trading Day in November, 1997-2002

The table presents the percentage of firms in three price and seven volume categories and the total number of firms on the TSX Venture Exchange and the TSX on the first trading day in November of the years, 1997-2002. Before the year 2000, the TSX Venture Exchange is the composite of the Alberta and Vancouver Stock Exchanges. Price categories 1, 2 and 3 consist of stocks with prices $P < \$1$, $\$1 \leq P < \5 , and $P \geq \$5$. The seven categories for volume on the day in question are: $Vol = 0$; $0 \leq Vol < 1,000$; $1,000 \leq Vol < 10,000$; $10,000 \leq Vol < 100,000$; $100,000 \leq Vol < 500,000$; $500,000 \leq Vol < 1,000,000$; and $Vol \geq 1,000,000$. Note that the total number of firms for all price and all volume categories is not equal due to some stocks having missing prices or volumes for the day in question.

TSX-V												
Year	Price category				Volume category							
	1	2	3	Num firms	1	2	3	4	5	6	7	Num firms
1997	78.1	19.9	2.0	1724	40.8	26.0	15.7	15.4	1.6	0.3	0.2	1971
1998	89.8	9.4	0.9	1519	46.2	3.7	22.8	24.1	2.5	0.3	0.3	1551
1999	87.8	10.8	1.4	1488	39.4	6.9	25.1	25.5	3.0	0.3	0.1	1560
2000	87.3	11.8	1.0	2157	50.9	4.3	20.2	21.4	3.0	0.2	0.1	2233
2001	94.5	5.0	0.5	2237	63.4	3.8	13.5	16.6	2.4	0.2	0.0	2341
2002	94.9	4.6	0.6	2060	62.0	5.0	13.2	16.9	2.7	0.2	0.1	2185

TSX												
Year	Price category				Volume category							
	1	2	3	Num firms	1	2	3	4	5	6	7	Num firms
1997	19.4	30.1	50.5	1240	20.7	7.7	24.3	33.5	10.8	2.2	0.9	1278
1998	28.5	27.9	43.6	1272	24.2	7.5	23.3	29.8	11.5	1.8	1.9	1291
1999	27.2	28.7	44.1	1237	21.7	7.9	28.8	29.3	9.9	1.3	1.2	1251
2000	24.5	28.5	47.0	1245	17.7	8.4	23.9	32.9	12.1	3.0	1.9	1258
2001	30.8	26.7	42.4	1178	23.5	8.2	24.7	27.4	10.6	3.0	2.6	1185
2002	29.8	25.7	44.5	1130	20.8	8.8	23.5	29.1	12.3	2.2	3.2	1143

Table 4
Cross Market Return Correlations for Volume Portfolios

This table presents correlations between equally-weighted daily returns for TSX and TSX Venture Exchange volume portfolios. Five portfolios are formed for each market using total volume for the 12-month period.

TSX-V volume portfolio	TSX volume portfolio				
<i>Panel A. Nov 1997-Oct 1998</i>					
	1	2	3	4	5
1	0.235	0.232	0.268	0.267	0.203
2	0.393	0.443	0.448	0.450	0.400
3	0.404	0.512	0.495	0.502	0.443
4	0.479	0.612	0.662	0.663	0.604
5	0.520	0.666	0.743	0.783	0.728
<i>Panel B. Nov 1998-Oct 1999</i>					
	1	2	3	4	5
1	0.011	0.027	0.162	0.145	0.119
2	0.191	0.202	0.341	0.299	0.251
3	0.283	0.343	0.472	0.469	0.469
4	0.245	0.272	0.398	0.378	0.395
5	0.226	0.375	0.543	0.568	0.601
<i>Panel C. Jan 2000-Dec 2000</i>					
	1	2	3	4	5
1	0.204	0.249	0.325	0.340	0.311
2	0.305	0.427	0.473	0.501	0.414
3	0.384	0.441	0.589	0.643	0.532
4	0.457	0.616	0.697	0.766	0.711
5	0.432	0.658	0.733	0.855	0.827
<i>Panel D. Jan 2001-Dec 2001</i>					
	1	2	3	4	5
1	0.087	0.094	0.158	0.126	0.049
2	0.286	0.306	0.354	0.320	0.290
3	0.200	0.372	0.323	0.313	0.278
4	0.318	0.466	0.443	0.432	0.392
5	0.439	0.629	0.538	0.607	0.546
<i>Panel E. Jan 2002-Dec 2002</i>					
	1	2	3	4	5
1	0.025	0.078	0.078	0.058	0.047
2	0.052	0.079	0.151	0.143	0.093
3	0.089	0.212	0.260	0.256	0.275
4	0.273	0.297	0.448	0.455	0.392
5	0.286	0.329	0.500	0.608	0.533

Table 5
Cross Market Return Correlations for Price Portfolios

This table presents correlations between equally-weighted daily returns for TSX and TSX Venture Exchange price portfolios. Three portfolios are formed for each market using the median price for the 12-month period.

TSX-V price portfolio	TSX price portfolio		
<i>Panel A. Nov 1997-Oct 1998</i>			
	1	2	3
1	0.771	0.744	0.575
2	0.701	0.764	0.675
3	0.386	0.479	0.426
<i>Panel B. Nov 1998-Oct 1999</i>			
	1	2	3
1	0.611	0.606	0.399
2	0.392	0.493	0.383
3	0.234	0.267	0.275
<i>Panel C. Jan 2000-Dec 2000</i>			
	1	2	3
1	0.794	0.782	0.647
2	0.775	0.826	0.755
3	0.553	0.623	0.648
<i>Panel D. Jan 2001-Dec 2001</i>			
	1	2	3
1	0.626	0.575	0.479
2	0.524	0.567	0.492
3	0.062	0.180	0.130
<i>Panel E. Jan 2002-Dec 2002</i>			
	1	2	3
1	0.631	0.587	0.322
2	0.478	0.499	0.279
3	0.303	0.254	0.147

Table 6
Cross Market Volume Correlations for Volume Portfolios

This table presents correlations between mean daily volume in TSX and TSX Venture Exchange volume portfolios. Five portfolios are formed for each market using total volume for the 12-month period.

TSX-V volume quintile	TSX volume quintile				
<i>Panel A. Nov 1997-Oct 1998</i>					
	1	2	3	4	5
1	0.031	-0.027	-0.253	-0.250	0.222
2	-0.094	-0.012	0.024	0.134	0.139
3	-0.083	-0.042	-0.068	0.060	0.188
4	0.073	0.159	0.249	0.355	0.299
5	0.047	0.170	0.311	0.427	0.218
<i>Panel B. Nov 1998-Oct 1999</i>					
	1	2	3	4	5
1	0.220	0.141	0.106	0.234	0.003
2	0.307	0.382	0.305	0.269	-0.019
3	0.315	0.274	0.290	0.271	0.081
4	0.226	0.220	0.223	0.261	0.201
5	0.069	0.098	0.187	0.226	0.553
<i>Panel C. Jan 2000-Dec 2000</i>					
	1	2	3	4	5
1	0.443	0.426	0.493	0.402	0.281
2	0.545	0.524	0.650	0.578	0.435
3	0.410	0.410	0.538	0.514	0.434
4	0.292	0.605	0.663	0.750	0.665
5	0.164	0.629	0.659	0.847	0.706
<i>Panel D. Jan 2001-Dec 2001</i>					
	1	2	3	4	5
1	0.444	0.409	0.366	0.400	0.264
2	0.408	0.354	0.376	0.361	0.238
3	0.381	0.438	0.430	0.364	0.215
4	0.319	0.371	0.449	0.292	0.221
5	0.248	0.433	0.540	0.449	0.295
<i>Panel E. Jan 2002-Dec 2002</i>					
	1	2	3	4	5
1	0.243	0.208	0.289	0.275	0.143
2	0.275	0.290	0.395	0.314	0.104
3	0.338	0.357	0.507	0.411	0.144
4	0.358	0.338	0.568	0.567	0.323
5	0.309	0.464	0.621	0.588	0.313

Table 7
Cross Market Volume Correlations for Price Portfolios

This table presents correlations between mean daily volume in TSX and TSX Venture Exchange price portfolios. Three portfolios are formed for each market using the median price for the 12-month period.

TSX-V price portfolio	TSX price portfolio		
<i>Panel A. Nov 1997-Oct 1998</i>			
	1	2	3
1	0.166	0.282	0.260
2	0.028	0.134	0.169
3	-0.023	0.118	0.163
<i>Panel B. Nov 1998-Oct 1999</i>			
	1	2	3
1	0.542	0.364	0.299
2	0.339	0.231	0.225
3	-0.079	0.038	0.260
<i>Panel C. Jan 2000-Dec 2000</i>			
	1	2	3
1	0.791	0.799	0.274
2	0.672	0.758	0.317
3	0.456	0.600	0.331
<i>Panel D. Jan 2001-Dec 2001</i>			
	1	2	3
1	0.390	0.483	0.254
2	0.194	0.328	0.279
3	-0.049	-0.022	0.050
<i>Panel E. Jan 2002-Dec 2002</i>			
	1	2	3
1	0.442	0.268	0.148
2	0.292	-0.008	0.154
3	0.226	-0.133	0.066

Table 8
Changes in Prices and Market Quality around the TSX Venture Exchange Formation

For each stock on the TSX and TSX Venture Exchange with available data, the mean price, volume, relative spread and volatility are computed for three periods surrounding the formation of the TSX Venture Exchange. The three periods are one year before (November 1, 1998-October 31, 1999), and one and two years after the formation of the TSX Venture Exchange (January 1, 2000-December 31, 2000 and January 1, 2001-December 31, 2001 respectively). Next, the differences between the mean values from one and two years after and the mean value from one year before are calculated for each stock. The table presents the cross-sectional medians of these differences. For instance, the column labeled *2 years after less 1 year before* contains the medians of the percentage difference between the mean stock price and volume, and of the raw difference between relative spread and volatility calculated over the calendar year 2001 and the mean values calculated over November 1, 1998-October 31, 1999. Figures in bold are significant at the 5% level of significance. Volatility is the absolute value of the daily return, and relative spread is calculated as the bid-ask spread normalized by the stock price.

Variable	ASE/TSX-Venture		VSE/TSX-Venture		TSX	
	1 year after less 1 year before	2 years after less 1 year before	1 year after less 1 year before	2 years after less 1 year before	1 year after less 1 year before	2 years after less 1 year before
<i>% Chg Price</i>	0.1791	-0.1730	0.1110	-0.3730	0.0329	-0.0734
<i>% Chg Volume</i>	-0.3176	-0.5792	0.5119	-0.0292	0.3269	0.1878
<i>Chg Relative spread</i>	-0.01030	0.02370	-0.00380	0.03650	0.00003	0.00003
<i>Chg Volatility</i>	-0.0308	-0.0433	0.0092	0.0001	0.0039	0.0012

Table 9
Cross Market Return Correlations for ASE and VSE Volume Portfolios

This table presents correlations between equally-weighted daily returns for Alberta and Vancouver Stock Exchange volume portfolios. Five portfolios are formed for each market using total volume for the 12-month period.

VSE volume quintile	ASE volume quintile				
<i>Panel A. Nov 1997-Oct 1998</i>					
	1	2	3	4	5
1	-0.010	0.155	0.098	0.160	0.185
2	0.158	0.180	0.259	0.303	0.461
3	0.097	0.258	0.320	0.505	0.504
4	0.114	0.257	0.317	0.519	0.591
5	0.111	0.295	0.358	0.532	0.774
<i>Panel B. Nov 1998-Oct 1999</i>					
	1	2	3	4	5
1	-0.030	0.073	0.117	0.074	0.124
2	0.101	0.150	0.129	0.144	0.280
3	0.069	0.127	0.219	0.263	0.389
4	0.098	0.169	0.315	0.217	0.364
5	0.108	0.204	0.363	0.276	0.461
<i>Panel C. Jan 2000-Dec 2000</i>					
	1	2	3	4	5
1	0.021	0.134	0.283	0.258	0.251
2	0.060	0.301	0.349	0.414	0.438
3	0.127	0.298	0.354	0.438	0.568
4	0.236	0.340	0.554	0.606	0.742
5	0.205	0.292	0.507	0.673	0.869
<i>Panel D. Jan 2001-Dec 2001</i>					
	1	2	3	4	5
1	0.076	0.064	0.116	-0.021	0.095
2	0.131	0.138	0.140	0.147	0.188
3	-0.010	-0.034	0.189	0.136	0.234
4	0.028	0.043	0.120	0.134	0.400
5	0.079	0.144	0.175	0.274	0.499
<i>Panel E. Jan 2002-Dec 2002</i>					
	1	2	3	4	5
1	0.006	-0.028	0.078	-0.088	0.085
2	0.103	0.007	0.120	-0.002	0.206
3	0.137	0.035	0.252	0.110	0.259
4	0.037	0.008	0.180	0.210	0.316
5	0.002	0.082	0.215	0.233	0.451

Table 10
Cross Market Return Correlations for ASE and VSE Price Portfolios

This table presents correlations between equally-weighted daily returns for Alberta and Vancouver Stock Exchange price portfolios. Three portfolios are formed for each market using the median price for the 12-month period.

VSE price portfolio	ASE price portfolio		
<i>Panel A. Nov 1997-Oct 1998</i>			
	1	2	3
1	0.725	0.593	0.052
2	0.690	0.602	0.053
3	0.377	0.413	-0.044
<i>Panel B. Nov 1998-Oct 1999</i>			
	1	2	3
1	0.507	0.370	0.153
2	0.406	0.346	0.096
3	0.158	0.065	0.090
<i>Panel C. Jan 2000-Dec 2000</i>			
	1	2	3
1	0.833	0.775	0.578
2	0.753	0.801	0.551
3	0.283	0.353	0.242
<i>Panel D. Jan 2001-Dec 2001</i>			
	1	2	3
1	0.521	0.280	0.081
2	0.295	0.222	0.008
3	0.104	0.091	-0.027
<i>Panel E. Jan 2002-Dec 2002</i>			
	1	2	3
1	0.477	0.218	0.006
2	0.332	0.162	0.105
3	0.273	0.150	0.046

Table 11
Cross Market Volume Correlations for ASE and VSE Volume Portfolios

This table presents correlations between mean daily volume in Alberta and Vancouver Stock Exchange volume portfolios. Five portfolios are formed for each market using total volume for the 12-month period.

VSE volume quintile	ASE volume quintile				
<i>Panel A. Nov 1997-Oct 1998</i>					
	1	2	3	4	5
1	0.165	-0.036	0.043	-0.011	-0.068
2	-0.341	-0.459	-0.550	-0.496	-0.461
3	-0.330	-0.488	-0.542	-0.498	-0.429
4	-0.323	-0.352	-0.467	-0.427	-0.309
5	-0.181	-0.140	-0.206	-0.141	0.032
<i>Panel B. Nov 1998-Oct 1999</i>					
	1	2	3	4	5
1	0.248	0.197	0.160	0.108	-0.124
2	0.338	0.165	0.213	0.143	-0.127
3	0.211	0.179	0.248	0.123	-0.078
4	0.125	0.080	0.099	0.257	0.068
5	-0.033	-0.072	-0.084	0.038	0.526
<i>Panel C. Jan 2000-Dec 2000</i>					
	1	2	3	4	5
1	0.456	0.491	0.527	0.505	0.547
2	0.518	0.657	0.624	0.666	0.616
3	0.461	0.584	0.574	0.695	0.716
4	0.476	0.650	0.716	0.811	0.798
5	0.390	0.654	0.650	0.824	0.915
<i>Panel D. Jan 2001-Dec 2001</i>					
	1	2	3	4	5
1	0.041	0.182	0.205	0.124	-0.053
2	0.223	0.252	0.260	0.277	0.098
3	0.124	0.293	0.204	0.189	0.236
4	0.205	0.158	0.214	0.162	0.183
5	0.187	0.169	0.297	0.346	0.226
<i>Panel E. Jan 2002-Dec 2002</i>					
	1	2	3	4	5
1	0.158	0.096	0.227	0.136	0.172
2	0.302	0.275	0.333	0.219	0.225
3	0.268	0.133	0.244	0.246	0.260
4	0.207	0.211	0.292	0.259	0.364
5	0.168	0.266	0.308	0.268	0.393

Table 12
Cross Market Volume Correlations for ASE and VSE Price Portfolios

This table presents correlations between mean daily volume in Alberta and Vancouver Stock Exchange price portfolios. Three portfolios are formed for each market using the median price for the 12-month period.

VSE price portfolio	ASE price portfolio		
<i>Panel A. Nov 1997-Oct 1998</i>			
	1	2	3
1	-0.244	-0.002	0.048
2	0.131	0.202	0.084
3	0.062	0.096	0.075
<i>Panel B. Nov 1998-Oct 1999</i>			
	1	2	3
1	0.449	0.471	0.054
2	0.231	0.303	0.062
3	0.016	-0.061	-0.008
<i>Panel C. Jan 2000-Dec 2000</i>			
	1	2	3
1	0.921	0.719	0.582
2	0.800	0.726	0.581
3	0.498	0.459	0.357
<i>Panel D. Jan 2001-Dec 2001</i>			
	1	2	3
1	0.305	0.193	0.071
2	0.082	0.374	0.087
3	-0.011	0.072	0.061
<i>Panel E. Jan 2002-Dec 2002</i>			
	1	2	3
1	0.458	0.305	0.123
2	0.262	0.302	0.142
3	0.150	0.142	0.036

Table 13
Regression Evidence

This table presents time-series (panel A) and cross-sectional (panel B) regressions of the determinants of changes in prices and relative spreads around the formation of the TSX Venture Exchange. In each panel, coefficients in bold are significant at the 5% level of significance. Panel A of the table presents time series tests of the price and relative spread effects around the formation of the TSX Venture Exchange. The following regressions are estimated for each firm, and the table presents the median coefficients.

$$Relspr_t = \alpha + \delta Dum_{TSE-V} + \beta Volume_t + \varepsilon_t \text{ and } \frac{1}{P_t} = \alpha + \delta Dum_{TSE-V} + \beta Volume_t + \varepsilon_t,$$

where Relspr is the relative spread, P is the closing stock price, Dum = 1 after the formation of the TSX Venture Exchange and is zero otherwise, and Volume is daily trading volume. Panel B presents coefficients from the following cross-sectional regression, where the bar indicates the mean:

$$\bar{S}_{postTSX-V} - \bar{S}_{preTSX-V} = \alpha + \beta(\bar{V}_{postTSX-V} - \bar{V}_{preTSX-V}) + \varepsilon_t \text{ and}$$

$$\bar{P}_{postTSX-V} - \bar{P}_{preTSX-V} = \alpha + \beta(\bar{V}_{postTSX-V} - \bar{V}_{preTSX-V}) + \varepsilon_t,$$

where S is the relative spread, V is volume and P is the stock price.

Panel A. Time series regression coefficients

Coefficient	ASE/TSX-Venture		VSE/TSX-Venture		TSX	
	Dep var= Relspr _t	Dep var= 1/P _t	Dep var= Relspr _t	Dep var= 1/P _t	Dep var= Relspr _t	Dep var= 1/P _t
α	0.2073	6.5414	0.2213	6.7054	0.0702	1.3930
δ	-0.0110	-1.1497	-0.0061	-0.2962	-0.0034	0.0211
$\beta(*10^7)$	-3.78	4.22	-5.13	78.78	-1.9789	2.7935

Panel B. Cross-sectional regression coefficients

Dep variable	ASE/TSX-Venture			VSE/TSX-Venture			TSX		
	α	$\beta(*10^9)$	$A\delta\phi P^2$	α	$\beta(*10^9)$	$A\delta\phi P^2$	α	$\beta(*10^9)$	$A\delta\phi P^2$
Chg mean price	0.8747	2550	-0.0011	0.0064	2780	0.0117	1.2407	0.4175	-0.0007
Chg mean rel spread	-0.0114	-352.58	0.0715	-0.0048	-337.51	0.0711	-0.0049	-8.6127	0.0041

Figure 1
Cumulative Returns and Average Volume for the TSX and TSX Venture Exchange

Panel A presents the cumulative returns for the TSX index (in grey) and an equally-weighted TSX Venture Exchange index (in black). Panel B presents the cumulative returns for equally-weighted indexes for the TSX (grey) and the TSX venture exchange (black). Panel C presents average daily volume for the TSX (grey) and the TSX Venture Exchange (black). The sample period is November 1, 1997 (shown as day -500) through December 31, 2001 (day 500).

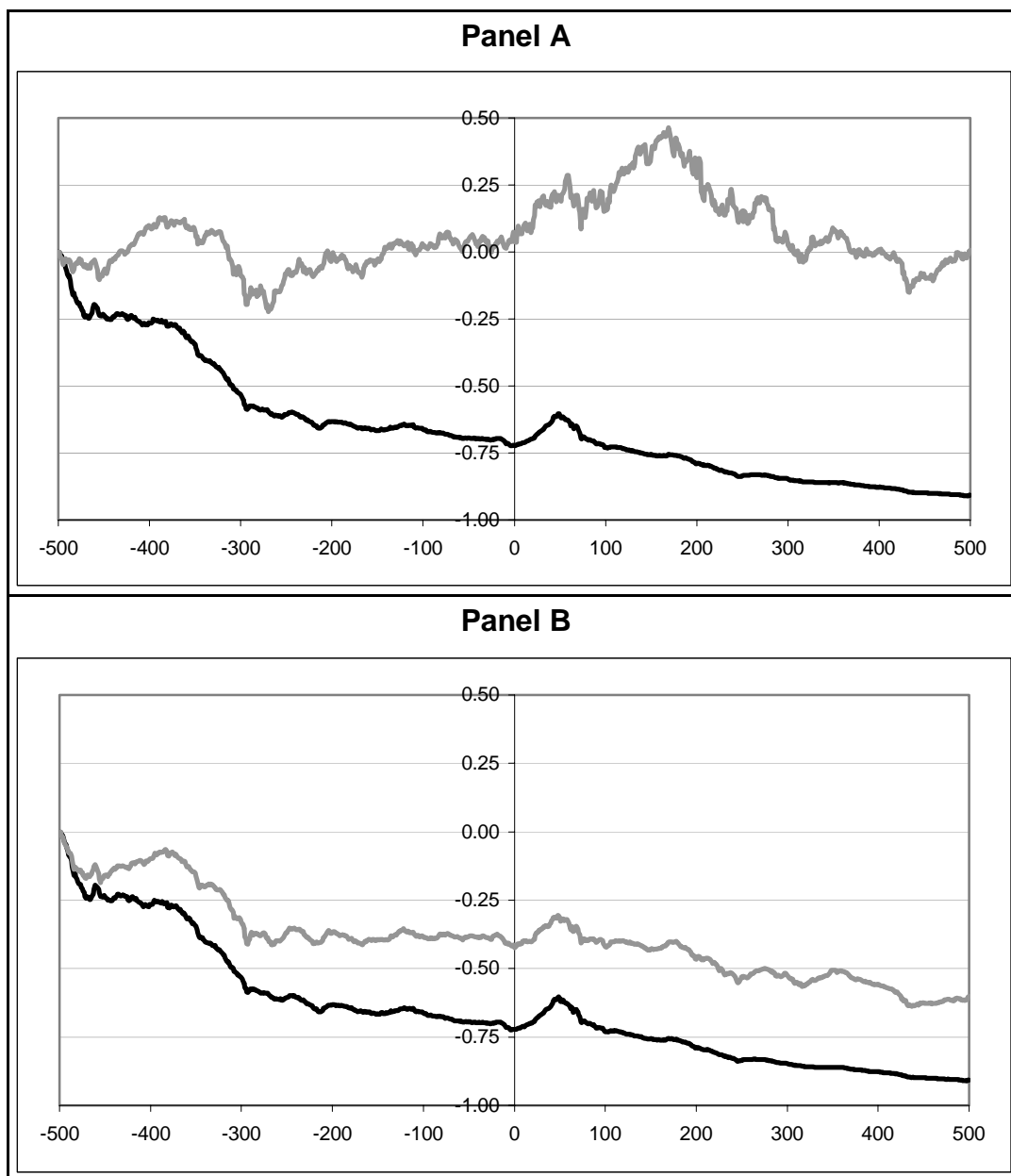


Figure 1 (cont'd)

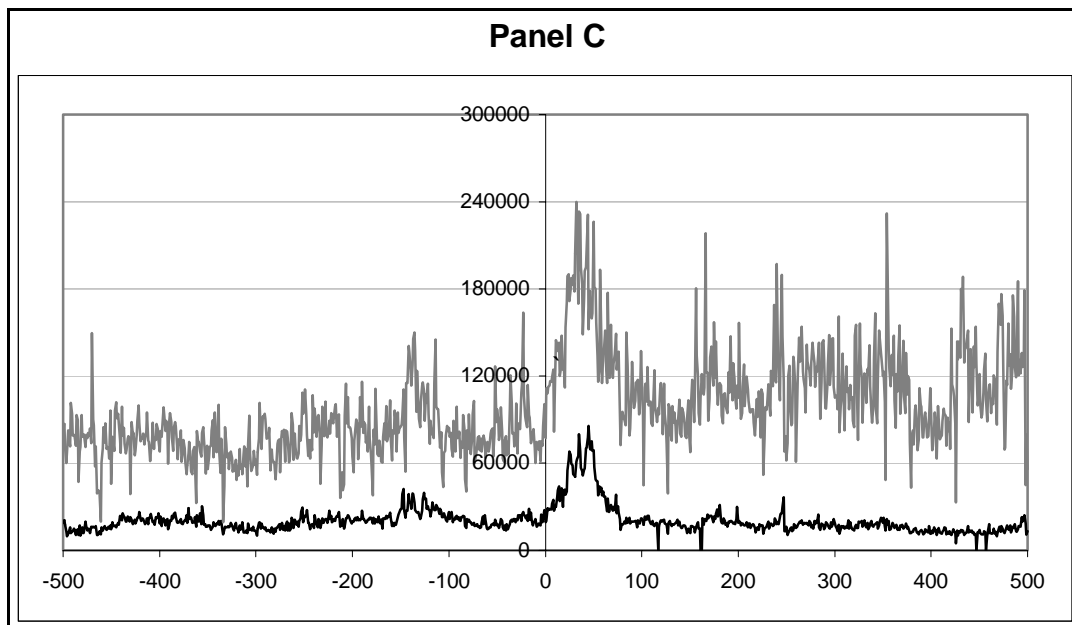


Figure 2
Cumulative Returns for TSX and TSX Venture Exchange Volume Portfolios

The figure presents the cumulative returns for five volume portfolios constructed from stocks trading on the TSX (in grey) and on the TSX Venture Exchange (in black). The cumulative returns are equally-weighted in each portfolio, and the portfolios are formed on the basis of aggregate volume in each 12-month period. The sample period is November 1, 1997 (shown as day -500) through December 31, 2001 (day 500).

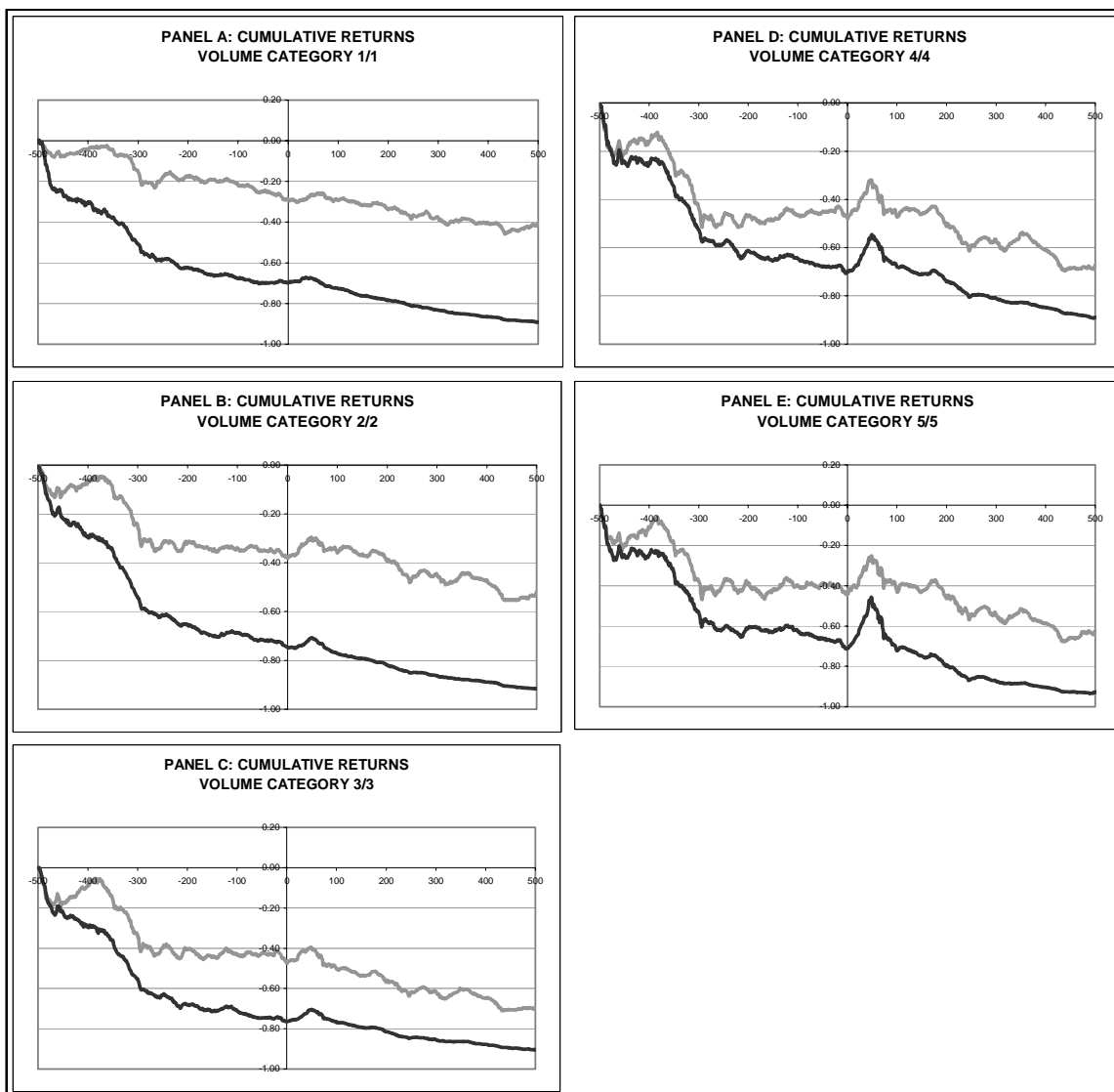


Figure 3
Cumulative Returns for TSX and TSX Venture Exchange Price Portfolios

The figure presents the cumulative returns for three price portfolios constructed from stocks trading on the TSX (in grey) and on the TSX Venture Exchange (in black). The returns are equally-weighted in each portfolio, and the portfolios are formed on the basis of the median price in each 12-month period. The sample period is November 1, 1997 (shown as day -500) through December 31, 2001 (day 500).

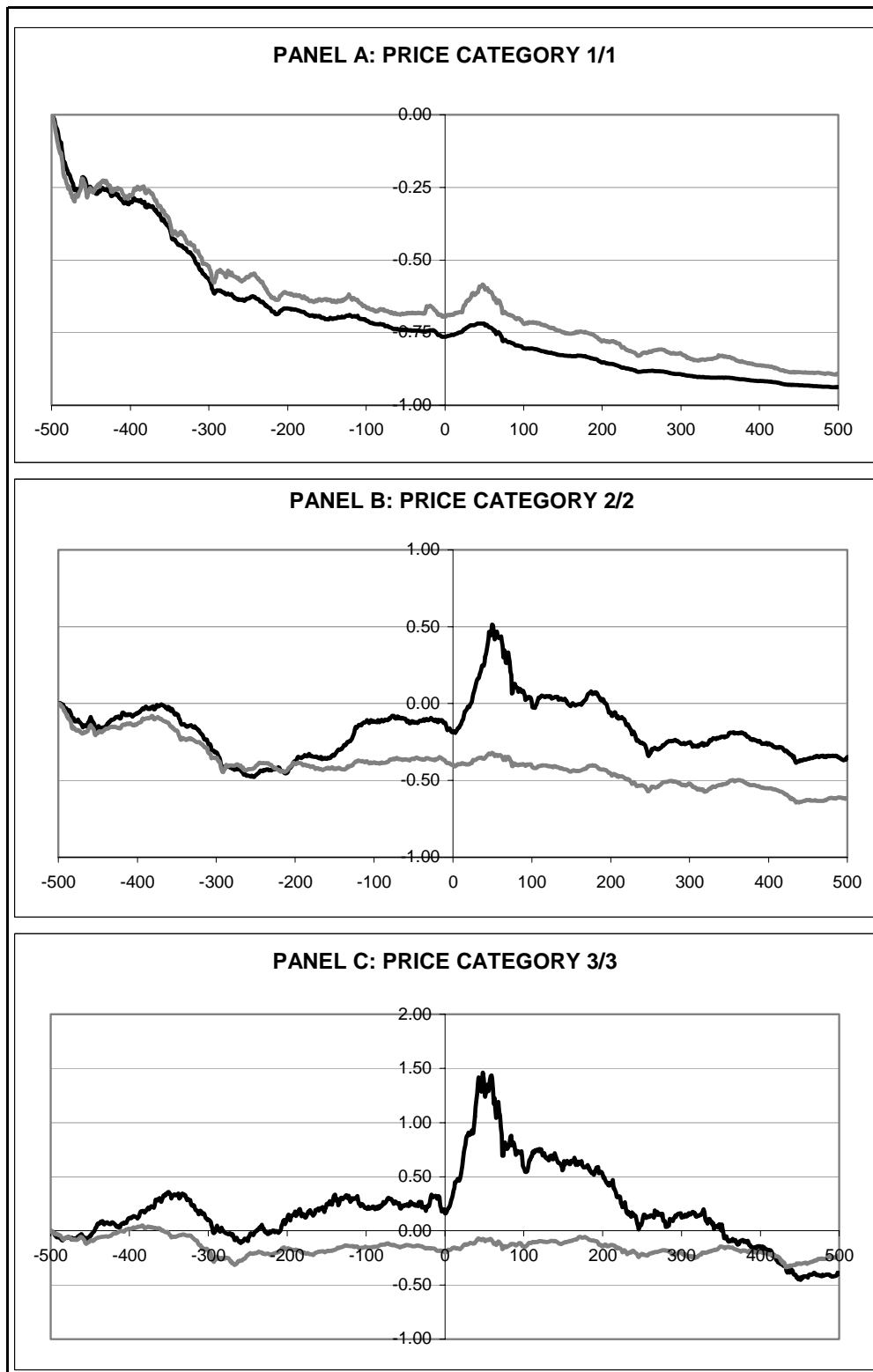


Figure 4
Average Daily Volume for TSX and TSX Venture Exchange Volume Portfolios

The figure presents the average daily volume in five volume portfolios constructed from stocks trading on the TSX (in grey) and on the TSX Venture Exchange (in black). The portfolios are formed on the basis of aggregate volume in each 12-month period. The sample period is November 1, 1997 (shown as day -500) through December 31, 2001 (day 500).

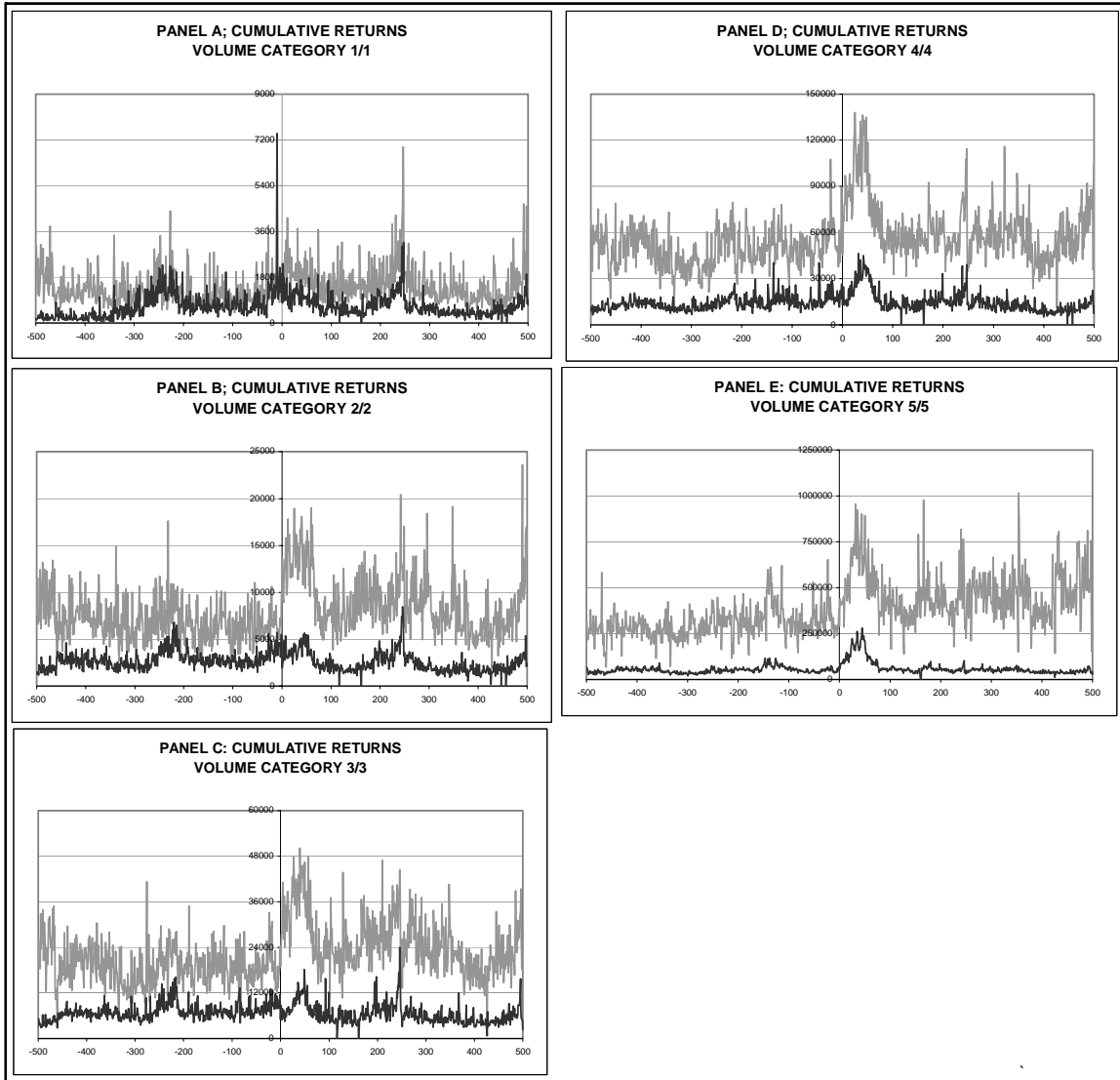


Figure 5
Average daily volume for TSX and TSX Venture Exchange price portfolios

The figure presents the average daily volume in three price portfolios constructed from stocks trading on the TSX (in grey) and on the TSX Venture Exchange (in black). The portfolios are formed on the basis of the median price in each 12-month period. The sample period is November 1, 1997 (shown as day -500) through December 31, 2001 (day 500).

