Regulatory Implications of Transaction Costs in Securities Markets:

Canadian lessons from the Australian experience

by

Emilia Galan

An essay submitted to the Department of Economics

in partial fulfillment of the requirements

for the degree of Master of Arts

Queen's University

Kingston, Ontario, Canada

August 2013

Copyright © Emilia Galan 2013

All rights reserved.

Abstract

This paper examines the implications of federal as opposed to decentralized securities regulation for the transaction costs borne by market participants with the goal of establishing the superiority of either jurisdictional structure for Canada. To determine this I use two cost measures based on the implicit bid-ask spread to estimate the transaction cost changes for Australian firms in the 1998-2004 time frame surrounding the country's 2001 switch from decentralized to federal securities regulation. A Fixed Effects regression with a policy indicator variable reveals that centralizing regulation caused transaction costs to fall by 32% for both cost measures relative to the average transaction costs across all Australian firms in the year before the regulatory change.

Acknowledgments

I would like to extend my thanks to the Queen's Economics and Law Departments faculty and staff for their ongoing support throughout the academic year. My sincere gratitude goes to supervising Professor Frank Milne, who took the time to share his invaluable expertise and insights and provide me with guidance. I would also like to thank Professor Roger Ware for extending his assistance when this topic was still nascent. The econometrics counsel provided by PhD candidate Jeffrey Penney is greatly appreciated. Finally, I am grateful to the Queen's School of Business for generously providing the price data.

Contents

1 Introduction

The regulation of securities markets in the Canadian context has been widely discussed lately because of its unique constraint wherein the Constitution delegates this regulatory responsibility to each province and territory under the division of powers. The federal government has made many attempts to federalize it, most recent of which is the 2011 inquiry to the Supreme Court of Canada on whether Parliament has the legislative authority to pass a Securities Act that would remove securities regulation from provincial and territorial jurisdictions and place it under federal competence (*Reference re Securities Act*, 2011 SCC 66). Though the Court held that securities regulation is firmly within provincial and territorial purview, the question remains whether a centralized federal securities regulator would be better for Canada than the current multijurisdictional regime. This paper undertakes an examination of this question.

A critical overview of the existing literature on the topic renders no definitive answers but does reveal two key issues: interjurisdictional externalities lead to suboptimal enforcement, and market participants face high transactional costs relative to other countries. The subsequent focus of this paper concerns how the transaction costs of Canadian market participants would change under a federal securities regulator. To determine this, I investigate Australian transaction cost dynamics around its 2001 switch to federal securities regulation. Transaction costs for Australian firms are estimated over the surrounding 1998-2004 time frame using two cost measures based on the implicit bid-ask spread. One measure is the original Roll (1984) price covariance estimator, and the other is a variant that uses weekly prices and trade directions imputed by the Lee and Ready (1991) algorithm applied at a weekly level. A Fixed Effects regression with a policy dummy is then employed to determine the effect of the 2001 policy change on transaction costs. New Zealand capital market transaction costs are used as a control because they capture shared trends due to the geographic proximity with Australia.

The results indicate that switching to federal securities regulation caused Australian transaction costs to fall by 0.0225 and 0.0335 for each cost measure. This represents a 49% and 44% drop in the average transaction costs for all Australian firms across all years.

Notably, relative to the average cost for Australian firms in 2000, this represents a 32% cost drop for both cost measures. The convergence of both the Roll and weekly measure to the same estimated cost change substantiates the soundness of these results.

These findings inform the Canadian debate on whether moving to a federal securities regulator would be beneficial, especially as Australia and Canada share geographic and structural capital market features. Transaction costs have broad implications for the goals of investor protection and capital market efficiency that underscore the regulation of securities in Canada. This result indicates that a federal securities regulator would further these goals by decreasing capital market transaction costs.

This paper is organized as follows. In the remainder of the introduction, the current Canadian decentralized securities regulatory regime is briefly described and the relevant literature is outlined. In Section 2, this literature is critically reviewed within a broader framework of market efficiency metrics. Section 3 conducts the empirical analyses for estimating transaction costs and the effect of the Australian move to a federal regulator on these costs. Section 4 concludes and postulates possible extensions for future work.

1.1 The Canadian story

Securities regulation in Canada is uniquely constrained by the legal framework of the country. The constitutional division of powers between federal and provincial governments grants the provinces jurisdiction over securities regulation as part of their property and civil rights competence under s.91(13). The federal government has failed to extricate it from provincial jurisdiction and move it to its general trade and commerce power under s.91(2) (*Constitution Act, 1867*, ss 91-95). As a result, the regulation of securities is divided among thirteen provincial and territorial regulators and a number of self-regulatory organizations (SROs) that are assigned regulatory functions. Each jurisdiction thus has its own governmental agency that is responsible for regulating local securities markets, with its own set of rules and enforcement mechanisms. The Ontario Securities Commission (OSC) is the largest such regulator; other regulators include the Alberta Securities Commission, the British Columbia Securities Commission, and Québec's Autorité des marchés financiers.

In the interest of furthering cooperation among one another the provincial regulators formed the Canadian Securities Administrators (CSA), a collective representation body whose purpose is to coordinate initiatives and policy decisions across Canada. An important effort of the CSA is the implementation of a passport system under which a market participant can have a decision made by its principal regulator recognized by other provinces through a filing system. Notably, Ontario does not adopt this system, so participants in Ontario can access other jurisdictions through the passport system but other participants cannot access Ontario. Instead, Ontario decides on a case-by-case basis whether to adopt the decision of another regulator.[1] Though efforts are made to ensure harmonization across Canada in regulation and enforcement, the securities regulatory structure nonetheless remains intrinsically fragmented. An important question is whether this is detrimental to securities markets participants.

1.2 Literature overview

Numerous studies have been conducted by academics and expert analysts on the issue of whether Canada ought to have a federal securities regulator. Recent examples of reports, all with accompanying research papers, include the Wise Person's Committee (2003), the Crawford Panel (2006 and 2008), and the Hockin Panel (2009).[2] These studies examine the implications of a provincial or federal regulatory system from manifold perspectives, including enforcement and the costs incurred by market participants. Though the general consensus appears to be that a federal regulator is preferable (Anand and Klein, 2003; Sanderson and Neumann, 2003; Puri, 2009), some disagree and argue that such a regulator is not necessarily beneficial or desirable for Canada (Carpentier and Suret, 2009; Lortie, 2011). The arguments on both sides are evaluated below within a framework of market efficiency measures. This broader perspective is educational in establishing the goals of securities regulation, the benchmark against which they can be evaluated, and the shortcomings under the current system.

[1]See Gadinis and Jackson (2007) for an overview of the functioning of securities regulators in Canada.
[2]See Trebilcock (2010) for an overview.

2 Research design

2.1 The purpose of securities regulation

Before considering the optimality of securities regulation, a preliminary step that must be undertaken is ascertaining what its purpose is and how to judge its success in achieving it. Should the goal be to further economic growth, encourage innovation, or minimize regulatory costs? Should its effects be assessed from the point of view of savers, investors, or the government? Should economics lead the analysis and the law inform it, or the other way around? These questions must be answered in order to purposively assess the optimality of competing regulatory frameworks.

To cohesively piece together the motivation and subsequent purpose of regulating securities markets, it is useful to begin with a brief overview of the inner-workings and broader implications of capital markets. The two-fold importance of capital markets is well-established: channeling funds from savers to investors results in job creation, income generation, and overall simulation of economic growth, while the ability to trade risks allows healthy risk diversification and hedging. The assets traded in capital markets are securities; these could be debt (i.e. banknotes, bonds, debentures), equity (i.e. common stocks), or derivative contracts (i.e. options, swaps, forwards). Securities markets channel funds from savers to investors through two processes. First, they give the issuers of securities access to capital in exchange for those securities through trading in the primary market. Second, they let investors trade those securities among one another in the secondary market. Secondary markets could be organized public markets (i.e. Toronto Stock Exchange) or over-the-counter markets, the latter being used by large and sophisticated investors among whom trading takes places without the supervision of an exchange.[3]

The regulatory goals of the primary and secondary markets are analogous. The first goal is to regulate the disclosure of information between issuers and investors in the primary market and between investors and intermediaries in the secondary market to ensure that it is prompt and complete. The second goal is to maintain the integrity of the process through which securities are transacted between issuers and investors in the primary market and

[3]For an overview of securities markets in the context of Canadian securities regulation, see Milne (2010).

between investors and/or intermediaries in the secondary market.[4] These objectives sum up to investor protection and the promotion of efficient capital markets. Another proposed goal is to monitor systemic risk, wherein the default risk of one market participant is transmitted to others.[5]

These regulatory goals are reflected in the legal framework: though there are slight variations in the mandate and legislated purpose of each provincial securities regulator, the key principles are uniform (if not identical) throughout. The *Ontario Securities Act* (*Securities Act*, RSO 1990, c S5, s 1.1) is an apt representation, which is unsurprising as it was enacted based on a report detailing the above considerations (Trebilcock, 2010). Its stated purpose to protect investors and foster fair and efficient capital markets and confidence in capital markets mirrors the regulatory goals previously described. Carrying out these goals requires efficacious disclosure requirements for information, non-prohibitive trading transaction costs, and effective enforcement, which in turn entail an amalgam of factors and concerns such as compliance costs, the necessity for region or industry specific regulation, or optimal and uniform enforcement. These components amount to market efficiency: when they are optimal the goals are reached and capital markets are efficient.

2.2 Overview of market efficiency metrics

With the above motivation in mind, one way to delineate a scheme for the evaluation of market efficiency under different securities regulatory systems is to divide it into three interconnected facets: informational efficiency, transactional or operational efficiency, and allocational efficiency. Informational efficiency ensures that market participants have all available information about investment opportunities, such as their existence and risk. Transactional or operational efficiency refers to keeping transaction costs for transferring funds between the market participants at a minimum. Lastly, allocational efficiency ensures that firms with profitable investment opportunities can fund them through the capital market, thereby facilitating economic growth (Hendry and King, 2004). There is considerable overlap in these components, as will become apparent when taking a closer look at each.

[4]Ibid.

[5]This is recommended by specialist reports and the International Organization of Securities Commissions (IOSCO) (Trebilcock, 2010; IOSCO, 2011).

2.2.1 Informational efficiency

Informational efficiency can be assessed through the lens of the efficient markets hypothesis. A well-known measure of informational efficiency, the efficient markets hypothesis postulates that securities prices reflect all available information by incorporating it through market forces. There are varying degrees of capital market informational efficiency: when the current price of a security reflects all information found in past market prices it is weak-form efficient, when it reflects all information that is publicly available it is semi-strong form efficient, and when it reflects both public and private information it is strong-form efficient. Then, when prices reflect all information, future asset prices cannot consistently be accurately predicted based on historical prices (weak efficiency), prices promptly reflect newly available information (semi-strong efficiency), and investors cannot consistently outperform the market (strong efficiency). This is analogous with the random walk hypothesis that efficient prices cannot be predicted because they evolve randomly (do not exhibit serial autocorrelation) (Malkiel and Fama, 1970). From the standpoint of regulation, disclosure requirements for firms increase the completeness of public information while markets that function well overall (i.e. have low transaction costs such that information is revealed through trading) facilitate the incorporation of this information.

Various metrics test the informational efficiency of capital markets. The predictive value of historical prices reflects weak-form efficiency, as highly predictive past prices violate the random walk hypothesis (Malkiel and Fama, 1970; Lo and MacKinlay, 1988). Analyst coverage,[6] delay,[7] and the price impact of trades,[8] reflect semi-strong efficiency, as they indicate the extent to which new information is incorporated into stock prices. Lastly, abnormal

[6]A higher number of analysts decreases the lag of incorporation of information in the market as they diffuse information (Thomas and Cotter, 2000).

[7]A delay in the incorporation of public information i.e. from the market index into a security price indicates the price is less efficient) (Griffin et al., 2006, 2010).

[8]A buy-order is information that the stock is valuable that increases the stock price for subsequent transactions. Greater price impact indicates more illiquid stocks, which is less efficient (Daske et al., 2011, 2008).

volatility around earnings announcements[9] and percentage bid-ask spreads[10] reflect strong-form efficiency as they represent the dynamics between private and public information. Finally, as the integration of information into securities prices affects the overall dynamics of the market, market metrics like liquidity (Daske et al., 2008),[11] the implied cost of capital (Daske et al., 2011; Li, 2010), or market volatility (Raykovski, 2004), reveal the broader impact of information levels. These measures have been employed in a regulatory context to yield some instructive results. Though not directly relevant to the Canadian question, they indicate points of interest and possible paths for research.

Regulatory changes in disclosure requirements reveal the impact of information on capital markets. The adoption around the world of the International Financial Reporting Standards (IFRS),[12] which generally require greater disclosure than local standards (Ashbaugh and Pincus, 2001), is an example of such a regulatory change. Empirical work for a world-wide panel of countries found that serious adoptions by firms (as opposed to mere label adoptions) correspond to an increase in market liquidity and decrease in the cost of capital (Daske et al., 2008, 2011). In the European Union (E.U.) specifically, those adopting the IFRS on a mandatory basis experienced a significant decrease in the cost of equity, part of which was found to be caused by greater disclosure and information comparability across firms. Notably, this decrease is only present in countries that have strong legal enforcement (Li, 2010). Another example of a change in disclosure requirements is the mandated con-

[9] Abnormal volatility around annoucements is a proxy for the difference between private and public information, as it can be used to determine to what extent private information was incorporated into prices before an announcement. A high return volatility around earnings announcements indicates that private information had not leaked into the market. Whether pre-announcement private information leakage leads to more of less efficient prices is debated: some argue that leakage improves price efficiency and is welfare-improving, whereas others argue that insider trading crowds out outside trading and results in less efficient long-run prices (Griffin et al., 2006).

[10] The bid-ask spread is the difference between the asking price and bid received in response. It acts as a proxy for information asymmetry, where larger spreads indicate greater asymmetry (Daske et al., 2011; Castura et al., 2010).

[11] The market liquidity of an asset, or its ability to be sold without incurring a loss in value (price decrease), is important because it affects an asset's price and expected return. Lower liquidity makes it more expensive to trade an asset, leading investors to require a higher return in compensation (Amihud and Mendelson, 1986). Further, greater market liquidity encourages arbitrage, which enhances market efficiency by leading to a convergence of prices to the random walk, and leads to the incorporation of information into prices (Chordia et al., 2008). Conversely, it is expected that greater informational efficiency leads to higher liquidity (Hendry and King, 2004). Proxies for market liquidity estimation include the proportion of zero returns, the price impact of trades, total trading costs, and bid-ask spreads (Daske et al., 2008).

[12] The IFRS were developed after 2001 building on the previously existing International Accounting Standards to harmonize accounting standards and have been adopted, either on a voluntary or mandatory basis, in over 100 countries (IFRS, 2012).

tinuous disclosure legislated in 2001 in Australia. This change was found to be correlated to a significant decrease in market and share price volatility, though a causal relationship was not established (Raykovski, 2004).

The connection between the supporting legal environment of regulatory regimes and the efficiency of information incorporation and has also been examined. An assessment of the relationship between the legal environment and incorporation into security prices of private and public information in developing versus developed countries found that the most developed markets experience high return volatility around earnings announcements while most emerging markets do not. Conversely, the typical emerging market shows less infomation delay in the incorporation of public information than developed markets. This indicates that securities laws can be used to promote the incorporation into prices of private information but may not be as useful for public information (Griffin et al., 2006).[13] Similarly, a probe into the relationship between the effectiveness of securities regulation and its supporting legal institutions in terms of disclosure requirements, liability standards, enforcement, and overall quality of the legal system found that firms in countries with relatively extensive disclosure requirements, strong securities regulation, and strict enforcement mechanisms have a lower cost of capital.[14] In the same vein, it was found that transparency and market abuse regulatory changes in E.U. led to increased market liquidity, the effect being stronger in countries with better implementation and enforcement (Christensen et al., 2011).

The usefulness of these results is that they help establish the mechanisms available for improving informational market efficiency so that an assessment of these mechanisms in the context of different frameworks for securities regulation can be conducted. For instance,

[13] Delay estimates indicate that the average emerging market is slightly better than developed markets at incorporating public information into prices. Thus, the regulatory system appears extraneous to public information incorporation into prices. On the other hand, the low return volatility around earnings announcements signals that the average emerging market does not respond to earnings announcements, possibly indicating that the information had already been incorporated through leakages. A cross-country analysis shows that the regulatory climate, i.e. the allowance of short-sales and good investor protection, is strongly associated with high return volatility around announcements, leading to informative earnings announcements. As no correlation is found between the response to earnings announcements and delay, the leakage of private information is not associated with public information incorporation. Thus, the legal system may influence the incorporation of private information into prices, namely prevent the leakage of private information through insider trading (Griffin et al., 2006).

[14] The effect of the legal system on the cost of capital decreases as markets become more integrated globally, which is consistent with the theory that market integration decreases the asset pricing effects of country-specific factors (Hail and Leuz, 2006).

though securities laws appear to be immaterial to the incorporation into prices of public information (i.e. poor laws do not hinder it), they are germane to the incorporation into prices of private information (i.e. by controlling insider trading). This is vital as private information plays a major role in increasing transaction costs for investors and capital costs for firms because it creates a systematic risk for the investors not privy to the private information that they need to be compensated for.[15] Further, empirical results support the significance of disclosure regulations for market liquidity and the cost of capital and indicate the importance of the legal system (i.e. enforcement) in the effectiveness of these regulations. Consequently, the difference between federal and decentralized securities regulations can have a significant bearing on informational market efficiency, particularly in the context of the efficiency of disclosure requirements enforcement.

2.2.2 Transactional (operational) efficiency

The transactional efficiency of securities markets includes several elements. One way to systematically approach their analysis is by considering two points of view: that of market participants, namely firms and investors, and that of the government. From the perspective of market participants, transactional efficiency is primarily about the costs of participation. For firms, this is the expense incurred in the process of accessing the market, i.e. registration and compliance costs for their traders, the cost of raising capital through initial public offerings (IPOs), or the cost of acquisitions. For investors, this is the expense incurred in the process of engaging in market transactions, i.e. the cost of making an investment. From the government's perspective, the pertinent issues are setting up optimal regulation and enforcement while considering regional needs, the potential benefits of regulatory competition, and their cost and uniformity.

Transactional efficiency: market participants' perspective

Three cost-bearers in capital markets are capital-seeking firms, securities dealers or advisers, and investors. Firms seeking capital face the costs of IPOs or take-overs, dealers

[15] Private information creates a risk for uninformed investors to hold a stock because informed investors can better alter their porftolios to incorporate new information. As a result, uninformed investors always hold too many stocks with bad news and not enough stocks with good news, and this risk cannot be eliminated by holding more stocks as they are always on the wrong side (Easley and O'Hara, 2004).

or advisers incur registration and compliance costs so that their employees can participate in trading, and investors pay commission fees to the dealers. Further, brokers and investors also incur implied transaction costs.[16]

One study assessed the costs for registrants and issuers in Canada based on feedback from three market participants in each type of transaction. The study considers how material incremental costs, namely the threshold above which the costs of complying with the securities laws of provinces other than the firms' own are significant, would vary between a passport system, uniform securities legislation, or single regulator system. The costs considered are pre-trading expenditure for the registrants (i.e. costs of registration in each jurisdiction), transaction costs (filing and lawyer fees i.e. to prepare prospectus application), compliance costs (the fees that have to be paid to remain registered and internal compliance time), opportunity cost risk (the risk of delaying or losing doing business because of the variation in time needed by each regulator to i.e. respond to registration applications), and employee costs (whether firms need to hire more employees to deal with the multiple applications i.e. for registration and ongoing compliance). Though some costs were immaterial for the case study participants, registrants and issuers of IPOs reported considerable opportunity risk and employee costs. Nonetheless, based on a comparison of costs in the various regulatory options, it could not be determined that any one of the models would reduce incremental costs more than the others (Anand and Klein, 2003).

A study on a larger scale (using data for 1997-1999) found that the direct cost of a Canadian large-cap issue (over US$100 million) is similar to the United States (U.S.) cost and that of a junior issue (US$1 to 10 million) is slightly lower than the U.S. cost (15.98% rather than 17.99%) (Suret and Kooli, 2002). It was argued that because IPO costs for Canadian firms under the multijurisdictional regime are no higher than those of U.S. firms under a federal regulator there is no evidence to suggest that a Canadian national securities regulator would be beneficial (Lortie, 2011). However, this raw comparison of issuer costs may or may not be illuminating, especially in light of the fragmented regulatory

[16] In Canada, firms that make IPOs must obtain receipts for their prospectus from an appointed principal regulator who can then provide comments on behalf of other jurisdictions. However, they still pay fees to all regulators. Firms exempt from prospectus applications nonetheless pay filing costs to all jurisdictions. Similarly, persons or companies wishing to trade, underwrite, or give advice as to securities need to register and comply with regulatory requirements (Anand and Klein, 2003).

structure in the U.S. Overall, it appears that significant direct costs do exist under the current decentralized regulatory system, particularly for registrants rather than issuers and especially in terms of opportunity cost risk.

Both brokers and investors face another set of costs that result from securities regulation indirectly through the broader market. Common proxies for the transactional costs of trading are the bid-ask spread for brokers and the bid-ask spread plus broker commissions for investors (Lesmond et al., 1999; Hasbrouck, 2009). Both these components are likely to also reflect the direct regulatory costs incurred by registrants.[17] An estimation of the bid-ask spread for medium and small-cap securities in Canada found that their transaction costs are more than double compared to the U.S. (between 1.3-3%, compared to the US 0.75%) (Cleary et al., 2002). However, it was argued that as the cost of securities commissions is a small percentage of the total trading cost for any given year, any cost savings from decreasing regulatory costs would be minute (Carpentier and Suret, 2009).[18] However, the benefits of a reduction in transaction costs may be amplified through broader market implications. For instance, a U.S. study found that a reduction of transaction costs in securities trading leads to a greater volume of trading that results in decreased stock return volatility (Jones and Seguin, 1997).

Overall, there seems to be evidence of significant transaction costs for Canadian issuers and especially registrants that are directly caused by the current regulatory system. It is not unlikely that these costs are transmitted to investors. Further, the broader indirect effects of the securities regulator may lead to transaction cost implications affecting both registrants and investors. All these transaction costs lead to a reduction in trading volume, greater stock return volatility and risk, and a subsequently increased capital costs that feeds back to firms. The existence or magnitude of this issue and whether or not this could be remedied by a national regulator requires further study.

[17]Further study of the extent of competition in the securities brokerage market, and whether this is at all influenced by the regulatory structure, could be indicative of whether commissions place an overly high burden on investors or are kept at a low level due to competition in the brokerage industry.

[18]The 2005 budgets for commissions were approximately $143.3 million for all provinces and territories. The 2005 TSX trading volume was $1,075 billion, so total trading costs are between $14-32 billion.

Transactional efficiency: government's perspective

Two possible concerns from the government's perspective in terms of the operational efficiency of securities markets are optimal regulation and enforcement. Optimal regulation brings up questions of the potential need for regional specialization, the possible benefits of fostering regulatory competition, and regulatory costs. Optimal enforcement is concerned with effectiveness, uniform application, and enforcement costs.

A point of contention in regard to optimal regulation is the alleged need for regional specialization contingent on the features of the Canadian capital market. A break-down in terms of issuer size in Canadian capital markets indicates a high proportion of micro-cap (market capitalization under $5 million) and small-cap (market capitalization between $5 and $75 million) issuers, most of whom are hosted in Alberta, B.C., and Ontario. Similarly, there is industry-wise regional market specialization in each of Alberta, (oil and gas), B.C. (mining and technology), Ontario (mining, technology, financial services, communications and medial, life sciences), and Quebec (communications and media, life sciences) (Puri, 2009). Even though regional specialization in terms of industries does seem prevalent, investors are often located in a province other than the host of the issuer and regionally based issuers raise capital nationally, not only in their province: only seven out of 298 small and medium enterprises that raised capital through IPOs in the 2002 - 2006 time period did so in their home province alone (Puri, 2009; Milne, 2010). However, when considering firms accessing the capital market through all financing sources (IPOs, reverse takeovers, capital pool companies), most small IPO offerings and non-IPO offerings take place in only one province (Carpentier and Suret, 2009).

This leads to an argument in favour of the current multijurisdictional regulatory framework on account that it caters to regional economic differences and small cap firms in a way that a federal regulator could not (Lortie, 2011), preserving the characteristics of the existing market (Carpentier and Suret, 2009). On the other hand, some argue that this is unnecessary as Canadian markets are overall national and international, fact underscored by the 2001 consolidation of the five exhanges in existence before 1999 under the TMX Group (Trebilcock, 2010). It is also argued that even if regional differences did have to be preserved a national regulator could accommodate this while being better equipped to deal with issues stretching across Canada and globally (Hockin, 2011). Evidence from the more general perspective of trading characteristics (price levels, price volatility, bid-ask spreads, and trading volume, price and volume co-movement) seems to indicate that Canadian capital markets are not as provincially fragmented as the IPO data may suggest. The correlation between price and volume is indicative of the degree of sectoral differences across firms listed on regional exchanges or the degree of dispersal between ownership and trading: low correlation indicates fragmentation whereas high correlation indicates that trading and ownership are spread out. A study using several million observations from the Alberta Stock Exchange (ASE), Vancouver Stock Exchange (VSE), and the Toronto Stock and Venture Exchanges (TSX, TSX VE) found a high correlation of return and volumes that indicates significant market correlation between the exchanges. It further concluded that differences in regulatory structures result in differences in economic activity, suggesting that a unified regulatory structure promotes integration (Cumming et al., 2003).[19] This determination calls into question whether the much-debated regional specialization is a result of inherent market characteristics or simply a consequence of the regulatory framework.

As similar regional specialization arguments were discussed when Australia switched to a federal securities regulator, its post-change experience is instructive regarding the dynamics of IPOs, concentration, and share market participation of investors, especially as its capital markets share some regional features with Canada. In the post-federalisation period, Australia experienced significant growth in equity markets in terms of volume and value of investments. Notably, the contribution to IPOs of Western Australia (the most remote regional capital market in Australia and somewhat analogous to Alberta) was robust. Even though in light of global trends this growth may be coincidental rather than causal, it indicates that federalisation may not have had a detrimental impact on the participation in the equity market of either densely populated or peripheral states (Simmonds and da Silva Rosa, 2003).

Overall, the evidence on whether Canadian securities regulation should remain at a provincial level to properly support the regional specialization of firms is mixed, but in light

[19] The result that differences in regulatory structures lead to differences in economic activity is based on a comparison on stock return and volume correlation for the ASE and VSE before and after the TSX VE was formed, as this involved harmonization for regulation in Alberta and B.C.

of cross-Canada capital market integration and the non-negative Australian regional experience it appears that there is no need for decentralized regulation. This may be especially poignant when considering the disadvantageous regulatory constraints of a decentralized system in terms of dealing with broader issues introduced by the globalization of securities markets (i.e. systemic risk).

Arguments in favour of the current decentralized system are also made based on the alleged beneficial existence of regulatory competition between provincial regulators to attract issuers and investors to their jurisdictions. The regulatory competition argument has been similarly used against the proposal that U.S. securities regulation move to a United Kingdom-like single regulator (Silvia, 2007).[20] However, the positive effects of regulatory competition are often disputed (Fischel, 1981; Vogel, 1995). For instance, in the context of disclosure rules, regulatory competition is not necessarily beneficial as it creates arbitrage opportunities so that companies hide bad news but does not create an incentive for rule writers to create cost-effective rules. This follows as investors respond to companies that choose less stringent disclosure by assuming that they have something to hide, making capital more expensive for the firms because they must compensate investors for this risk. Switching to a more lax regulator is thus costly for firms, but regulators do not account for this and thereby render futile regulatory competition (Black, 2001). Notwithstanding, regardless of whether or not it would be beneficial, competition between regulators in Canada is weak because the costs of switching to other regulators are high for both investors and issuers (Trebilcock, 2010; Carpentier and Suret, 2009; Sanderson and Neumann, 2003). All in all, even if opportunities for regulatory arbitrage do exist, particularly in an international context in light of increasing globalization in securities markets (Licht, 1997; Cox, 1992; Chaffee, 2010), fostering regulatory competition does not seem to be aligned with the goals of securities regulation to protect investors and increase confidence in the market.

Another possible concern for the government is the direct costs associated with operating the various provincial commissions. The total costs of regulation for provincial and territorial securities commissions, excluding enforcement, are given by their yearly oper-

[20] Although U.S. securities regulation is federalised, it has multiple regulators. The Securities and Exchange Commission competes with federal and state courts, the Commodity Futures Trading Commission, self regulated organizations, the Department of Treasury, and the Federal Reserve Board.

ating budgets (i.e. totaling $106 million in 2002). The estimated cost savings (i.e. due to economies of scale) under a single regulator are $44.8 million, almost half of current expenses (Sanderson and Neumann, 2003). However, this figure is criticized as it assumes a framework where regulation and oversight budgets are extremely low everywhere except in Ontario (Carpentier and Suret, 2009). A further argument is that costs are not even a concern because regulatory costs per issuer in Canada are low when compared to other jurisdictions.[21] All in all, if the point of reference for considering whether regulatory costs are high in Canada is a single regulator as opposed to the costs in other countries, some savings would likely emerge notwithstanding the precise quantum.

Optimal enforcement is another possible concern from the point of view of the government, and it entails issues of effective and uniform application across the provinces as well as cost minimization. The cost aspect of enforcement appears to be a smaller problem than effectiveness.[22] The main concerns in regard of enforcement in the current multijurisdictional regulatory framework include investigative jurisdictional limitations, overlap or duplication in indictments, and consistent sanctions. All of these are exacerbated when dealing with interjurisdictional externalities like systemic risks or sophisticated infractions that require resource-intensive enforcement action.

The outcome of suboptimal enforcement activity under the decentralized regulatory system is aptly illustrated using game theory. Whereas in the past parallel proceedings in different provinces were not uncommon, regulators currently coordinate across Canada such that the degree of overlap and duplication is minimized. However, the principal problem is that each province does not take into account the positive or negative externalities of its enforcement decisions on other jurisdictions. Because most registrants and issuers have a market presence nationally as opposed to only within the province of the infraction, the prosecuting regulator incurs all of the costs but does not internalize the full extent of the benefit to market participants in other provinces. As a result, from the viewpoint of national interests, enforcement resources may be allocated suboptimally leading to regulatory failure

[21] The total regulatory costs in Canada for 2003, including enforcement, are $33,600 per issuer, compared to $123,000 in Australia, $37,300 in the UK, and $324,700 in the US (Carpentier and Suret, 2009).

[22] Current enforcement costs in Canada are $21.3 million, with the cost savings of a single regulator estimated at $1.8 million (Sanderson and Neumann, 2003).

(Sanderson and Neumann, 2003). This explains the criticisms of the current system for failure to prosecute high profile cases and delaying prosecution after misconduct is detected (Puri, 2009). On the other hand it is argued that centralization is not necessary and is unlikely to be sufficient to resolve the existing problems because, although the number of investigations and the responsiveness of the Canadian securities enforcement system is below expectations or the U.S. and U.K. levels, this cannot be attributed solely to the provincial regulatory system (Carpentier and Suret, 2009).

However, prosecution failures and delays are not the only concerns. The interjurisdictional dynamics present a further problem in the case of systemic risk, which is a negative jurisdictional externality: not only is it suboptimally prosecuted in each provice for the above reasons, but it is difficult to comprehensively monitor in an international context as recommended by industry specialists (Trebilcock, 2010; IOSCO, 2011). Further, economies of scale apply not only to costs but also to the capability of each regulator to police elaborate infractions. The dispersal of enforcement resources and further dilution due to inter-provincial coordination costs constrains the magnitude of problems with which the regulators can deal, particularly in light of the increasingly sophisticated market transactions prevalent nowadays (Milne, 2010). An example of this is high frequency trading, an advanced process whose supervision and subsequent regulatory enforcement calls for considerable resources (Gomber et al., 2011).

Overall, regulatory concerns tend to support the move to a single regulator, as regional specialization and regulatory competition are either not necessary or not beneficial and some regulatory cost savings would result notwithstanding their precise quantum. Similarly, though there is no definitive evidence that centralizing securities regulators is necessary to improve enforcement of securities laws (Carpentier and Suret, 2009), there are indications that enforcement is currently suboptimal and a single regulator would be an improvement in this regard through enabling the internalization of all benefits (Trebilcock, 2010; Sanderson and Neumann, 2003). This is key because enforcement levels affect the successful implementation of regulations like disclosure requirements that lower the cost of capital (Li, 2010; Hail and Leuz, 2006) or stricter securities laws for market abuse and transparency that increase market liquidity (Christensen et al., 2011). In light of the pervasive importance of enforcement and the increasing need to oversee sophisticated market transactions and monitor systemic risk any improvement in enforcement is likely to have wide-ranging consequences.

2.2.3 Allocational efficiency

Optimal informational and transactional efficiency translate into the allocational efficiency of securities markets wherein funds are optimally allocated from investors to firms. Key illustrative metrics of allocational efficiency are the number of IPOs, market capitalization, and the cost of capital.

The number of IPOs in Canada, an indicator of the health of capital markets, appears robust relative to that in the U.S. and Australia. For instance, around the 1990s, Canada has almost two thirds of the offerings of the U.S., a much bigger market, and more listings than Australia.[23] Similarly, Canada experienced more growth in the number of IPOs than the U.S. between 1990 and 2006, leading to corresponding growth in the number of companies listed on the TSX.[24] It has been argued that the relative robust performance of Canadian IPO listings indicates that the regulation regime in Canada facilitates market access such that there is no need for a centralized regulator (Lortie, 2011; Carpentier and Suret, 2009).

Market capitalization, the total value of outstanding shares on a market, is an indicator of market development. When compared to a country's gross domestic product (GDP) it allows for cross-country comparisons in market activity. The market capitalization of Canadian stock markets compares favourably to those in the U.S. and U.K.;[25] this was used as an argument that Canadian capital markets are efficient (Lortie, 2011).

Finally, the cost of equity capital is a key indicator of the health of securities markets, and it encapsulates the market efficiency characteristics discussed under informational and

[23] The average number of listings in Canada between 1986 and 2006 is 214, compared to the 313 US initial offerings in 2004. Note that the US number does not include state-level offerings. The number of listing transactions (IPOs, capital pool companies, and reverse takeovers) in Canada between 1995 and 2000 is 1295, compared to the 457 initial offerings in Australia (Carpentier and Suret, 2009).

[24] IPO activity between 1990 and 2006 increased by 396% in Canada and by 129% in the U.S. Between 1996 and 2008, the total number of companies listed on the TSX increased by 10.6% and the number of companies listed on a U.S. exchange declined by 38.8% (Lortie, 2011).

[25] The market capitalization of the TSX and TSX VE was 98% of GDP in 2003, compared to the market caps of 130% of GDP in the U.S. (for the New York Stock Exchange, NASDAQ, and the American Stock Exchange) and 79% of GDP in the U.K. (for the London Stock Exchange) (Hendry and King, 2004)

transactional efficiency. For instance, strict disclosure and enforcement were found to lead to a decrease in the cost of equity capital (Daske et al., 2011; Li, 2010; Hail and Leuz, 2006). The cost of capital in Canada is comparable to that in the U.S. and lower than in the U.K., Australia, and New Zealand.[26] This was used in support of the argument for the efficiency of the current multijurisdictional regulatory structure (Lortie, 2011).

Overall, these findings are not indicative of anything other than the fact that Canadian capital markets appear competitive internationally in terms of the number of IPOs, total market capitalization, and the cost of capital. Comparing Canadian market performance to other countries is not in itself indicative of whether improvements in regard of access to capital are possible with a change in the securities regulation structure. The real question in the context of the preferability of a single securities regulator is whether such a move would improve capital market efficiency in Canada, in terms of the above metrics, relative to the current system.

2.3 Conclusions and approach

The above results are informative in determining the key issues in regard of the optimality of a federal securities market regulator in Canada. Informational efficiency, while not specifically applied to this question in the Canadian context, yields instructive results. Securities laws are seemingly immaterial for the incorporation of public information into prices, but they can affect the incorporation into prices of private information. Their potency depends on the the underlying legal system, such as the effectiveness of enforcement. Further, disclosure regulations also affect market metrics by decreasing the cost of capital and increasing liquidity when they are effective. Transactional efficiency indicates that transaction costs in the current system relative to a single regulator are significant for registrants moreso than issuers, especially in terms of opportunity cost risk, and investors bear a high cost burden relative to the U.S. What's more, a reduction in transaction costs could have pervasive effects by leading to more trading and subsequently less stock price volatility. In the same vein, there does not seem to be a particular need for regional specialization

[26] Between 1992 and 2001, the cost of capital is estimated at 10.52% in Canada, 10.24% in the US, 10.64% in the UK, 10.72% in Australia, and 11.14% in New Zealand (Hail and Leuz, 2006).

in securities regulation, nor is regulatory competition something that ought to be fostered through a continued decentralized structure. Further, the switch to a centralized regulator would result in some cost savings. Enforcement is suboptimal in a decentralized system relative to a federal regulator, which is particularly problematic in light of the changing nature of capital markets that requires monitoring of interjurisdictional externalities like systemic risk or sophisticated infractions such as high-frequency trading. Allocational efficiency metrics indicate that Canadian capital markets seem to be competitive internationally in terms of IPO population, market capitalization, and cost of capital, but give no indication of how they fare relative to a single regulator. Overall, these findings highlight the potency and significance of the legal system in facilitating each type of market efficiency.

Two cardinal concerns emerge: interjurisdictional externalities that lead to suboptimal enforcement and the high transaction cost burden for market participants. The subsequent analysis focuses on the latter issue of transactional costs. To elucidate whether these costs are problematic for Canadian market participants and whether a single regulator could reduce them this paper estimates the change in transaction costs in Australia as a result of its switch to a federal securities regulator on July 15, 2001. This gives a broad indication of the transaction cost dynamics upon a change from a decentralized to a federal securities regulator that can inform the Canadian debate in that regard.

3 Empirical analysis: snapshot of Australian transaction costs

A two-fold empirical analysis is undertaken to determine the effect on the transaction costs of Australian firms due to the country's centralization of securities regulation in 2001. First, transaction costs for a large sample of Australian and New Zealand firms in the 1998 - 2004 time frame around the change are estimated using two cost measures. Second, Australian and New Zealand transaction costs are used in a Fixed Effects regression with a policy dummy to examine the effects of the 2001 Australian exogenous policy change to a federal securities regulator. New Zealand costs are chosen as a control to isolate the effect of the policy change because its geographic proximity indicates that they may capture the same trends as Australian costs. Another set of costs is also estimated for Canadian data for the same period to verify the performance of the cost estimate methods.

3.1 Transaction costs

3.1.1 Methodology

A traditional estimator of transaction costs for all market participants in a securities trade is the sum of the quoted bid ask spread, which is the difference between the ask price and bid price quoted by a dealer at a point in time, and commissions.[27] This estimator covers the order processing costs, inventory holding costs, and adverse information costs incurred by a dealer (Stoll, 1989). However, there are two problems with measures based on it: some trades may take place at prices inside the bid-ask quotes, and broker commissions may reflect more than the cost of executing a trade (Lesmond et al., 1999).

Because of the limitations of the quoted bid-ask spread plus commission as an estimate of transaction costs, models have emerged that instead estimate the implied bid-ask spread. There are two such classes of models: serial covariance spread estimation and order flow regression estimation.[28] In the first class, a representative model is the Roll (1984) approach that uses the serial covariance of daily equity returns as an estimate of the implicit bid-ask spread and calls this the effective spread.[29] In the second class of models, transaction costs are inferred by treating as latent and estimating the direction of the transaction (buy or sell) and the efficient price, using either Maximum Likelihood (Glosten and Harris, 1988) or Markov Chain Monte Carlo (MCMC) Bayesian Gibbs sampling (Hasbrouck, 2009). Further, to capture implicit costs like price impact or opportunity cost, Lesmond et al. (1999) developed an alternative measure that infers the cost of trade from the occurence of zero returns. Their measure estimates the difference between the zero price move with transaction costs and what the price would have moved to if there were no transaction costs.

This paper builds on the Roll (1984) model because it can be easily estimated using daily stock prices. Transaction cost estimates are computed using both the original model, which

[27] This differs from the realized spread, which is the average difference between the price at which a dealer buys at a point in time and sells at a later point in time, and is lower than the quoted spread (Stoll, 1989).

[28] For details, see Zhang and Hodges (2011).

[29] The effective spread is an estimate of the realized spread in an efficienct market (Stoll, 1989).

estimates costs from the serial covariance of prices, as well as a variant using weekly price data, which first estimates trade direction and then costs. The weekly cost measure has not been previously used in the literature. I construct it to make up for the shortcoming of the Roll model wherein no estimate can be calculated when price autocovariance is positive and to implicitly test the estimation results by having a comparison. Both of these methods are explained in detail below.

The original Roll model

Roll (1984) proposed the effective spread estimate of the bid-ask spread. This estimate has been examined and applied in Harris (1990), Zhang and Hodges (2011), and Fong et al. (2011), and extended with Bayesian methods in Hasbrouck (2004, 2009) and Griffin et al. (2006) among others. A detailed derivation of the Rolls estimator is undertaken based on these papers because it illustrates the foundational assumptions and operation.[30] The starting point is the price dynamics in an efficient market:

$$m_t = m_{t-1} + u_t \qquad u_t \overset{iid}{\sim} N(0, \sigma_u^2), \tag{1}$$

where m_t is the logarithm of the unobserved efficient price with perfect information, i.e the expected value of a security conditional on all public information including trade history, and evolves as a normal random walk, and u_t is a Gaussian error term that reflects new public information. This gives the bid and ask prices

$$\begin{aligned} b_t &= m_t - c \\ a_t &= m_t + c, \end{aligned} \tag{2}$$

where b_t and a_t are respectively the bid and ask prices at time t and c is half of the bid-ask spread that represents the execution cost paid by the buyer or seller. Whether the incoming order is a bid (sale) or an ask (buy) is determined by the Bernoulli random variable $q_t \in \{-1, 1\}$ with a discrete probability distribution that takes either value 1 for an order to buy or -1 for an order to sell with equal probabilities. Then, depending on q_t,

[30] Though the final results are correct as per existing literature, the author takes all responsibility for any errors in the intermediary steps.

the log observed price is either at the bid or the ask:

$$
\begin{aligned}
p_t &= \begin{cases} b_t = m_t - c & \text{if} \quad q_t = -1 \\ a_t = m_t + c & \text{if} \quad q_t = 1 \end{cases} \\
&= m_t + cq_t
\end{aligned} \tag{3}
$$

The change in two consecutive prices can then be written as

$$
\begin{aligned}
p_t - p_{t-1} &= \underbrace{m_t - m_{t-1}}_{u_t} + \underbrace{cq_t - cq_{t-1}}_{c(q_t - q_{t-1})} \\
\Delta p_t &= c\Delta q_t + u_t.
\end{aligned} \tag{4}
$$

Time series price data $p = \{p_1, p_2, \ldots, p_T\}$ can be used to estimate the above model.

In the Roll (1984) Method of Moments approach the first order autocovariance of the price changes is calculated as follows:

$$
\begin{aligned}
\operatorname{cov}(\Delta p_t, \Delta p_{t-1}) &= \mathrm{E}\big[\big(\Delta p_t - \mathrm{E}[\Delta p_t]\big)\big(\Delta p_{t-1} - \mathrm{E}[\Delta p_{t-1}]\big)\big] \\
&= \mathrm{E}\big[\Delta p_t \Delta p_{t-1} - \Delta p_t \mathrm{E}[\Delta p_{t-1}]\big] \\
&= \mathrm{E}[\Delta p_t \Delta p_{t-1}] - \underbrace{\mathrm{E}\big[\Delta p_t \mathrm{E}[\Delta p_{t-1}]\big]}_{0} - \underbrace{\mathrm{E}\big[\mathrm{E}[\Delta p_t]\Delta p_{t-1}\big]}_{0} + \\
&\quad + \underbrace{\mathrm{E}\big[\mathrm{E}[\Delta p_t]\mathrm{E}[\Delta p_{t-1}]\big]}_{0} && (5) \\
&= c^2 \underbrace{\mathrm{E}[\Delta q_t \Delta q_{t-1}]}_{-1} + c \underbrace{\mathrm{E}[\Delta q_t u_{t-1}]}_{0} + c \underbrace{\mathrm{E}[\Delta q_t u_t]}_{0} + \underbrace{\mathrm{E}[u_t u_{t-1}]}_{0} && (6) \\
&= -c^2. && (7)
\end{aligned}
$$

The expectations in (5) vanish because of the probability distributions of price changes and the expectations in (6) vanish due to structural independence assumptions. The probability distributions of price changes follow from the possible paths of the observed market price p_t across time periods, as is illustrated in Figure 1 and the consequent Tables 1 and 2. Figure 1 shows the ways in which an observed price can move if starting with a sale to the market maker, at their bid, without new information. Starting with a buy yields an opposite pattern, and all paths are equally likely. As such, the joint probability of consecutive price and corresponding trade flow changes follows directly from this and depends on whether the last transaction was a buy (ask price) or a sell (bid price). Trade flow changes Δq_t follow the same probabilities. As the mean of the price change at each time point is zero, the middle row and column in each table can be ignored and (5) can be simplified.

Figure 1: Consecutive price path possibilities

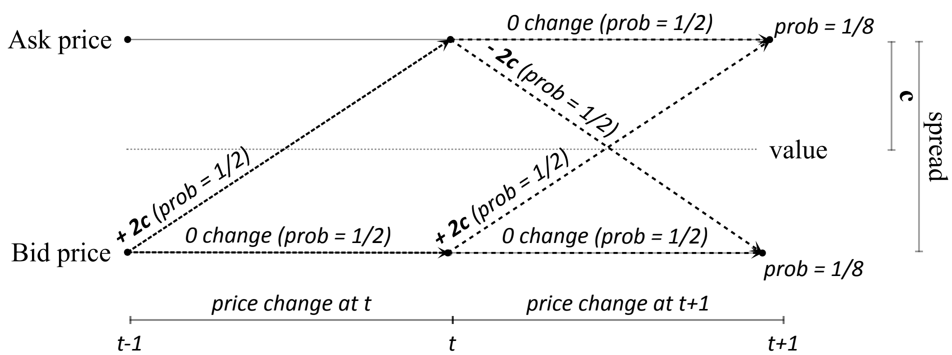


Figure based on Roll (1984).

Table 1: Joint probabilities of consecutive price changes

		$\Delta p_t =$		
		$-2c$	0	$+2c$
$\Delta p_{t+1} =$	$-2c$	0	1/8	1/8
	0	1/8	1/4	1/8
	$+2c$	1/8	1/8	0

Table 2: Joint probabilities of trade flow changes

		$\Delta q_t =$		
		-2	0	$+2$
$\Delta q_{t+1} =$	-2	0	1/8	1/8
	0	1/8	1/4	1/8
	$+2$	1/8	1/8	0

Similarly, (6) simplifies due to the structural assumptions that the types of successive transactions are independent (8), the flow of orders (trade directions) do not contain information about future fundamental price changes (9), changes in fundamental value do not predict order flows (10), the innovations in the fundamental price process reflect public information and are independent (11), and the half-spread estimate is a constant (12):

$$\mathrm{E}[q_t q_{t-1}] = 0 \quad (8) \qquad \mathrm{E}[\Delta q_t u_{t-1}] = 0 \quad (10) \qquad c = k \quad (12)$$

$$\mathrm{E}[\Delta q_{t-1} u_t] = 0 \quad (9) \qquad \mathrm{E}[u_t u_{t-1}] = 0 \quad (11)$$

Then, from (7), the estimated efficient bid-ask spread can be written:

$$\hat{c} = \sqrt{-\mathrm{cov}(\Delta p_t, \Delta p_{t-1})}. \tag{13}$$

This measure can only be calculated when the autocovariance is negative, the occurrence of which depends on the dataset. The requirement of a negative autocovariance for the estimate to exist is one of the criticisms of this model, as positive serial correlation often occurs almost half the time in daily data. Further, the measure may understate the true cost of trading because it does not take into account price impact or commissions (Agarwal and Wang, 2007). The estimate is also affected by the inclusion in the dataset of prices for days when there are no trades, in which case the reported price is the midpoint of the closing bid and ask. Keeping these prices leads to a downward bias in the estimator as the midpoint does not reflect costs, while dropping them may cause heteroskedasticity as the efficient price innovations may stretch across several days (Hasbrouck, 2009). However, while the absolute accuracy of the estimator is an important consideration, the key requirement for the purposes of this paper is that the cost estimates be consistent so that the change in costs over time can be examined.

Weekly variant

The second measure of the costs of securities market transactions is a variation of the above model. Instead of using the first order autocovariance of prices as an estimate of the bid-ask spread like in Roll (1984), the spread is obtained through a simple OLS regression of

$$\Delta p_t = c\Delta q_t + u_t, \qquad u_t \overset{iid}{\sim} N(0, \sigma_u^2), \tag{4 revisited}$$

where the coefficient c is the cost estimate. To obtain it I construct a dataset of prices from the fifth day of the week for each firm and estimate q_t for each stock using the Lee and Ready (1991) algorithm applied on week-level instead of traditional intra-day data. Specifically, if the price on the fifth day of the week is higher (lower) than the previous day's price, this is an uptick (downtick) and indicates a buy (sell). If the price is the same as the previous day's price, keep going back for as long as two weeks until a price change is found. If the last price change was an uptick (downtick), this is a zero-uptick (zero-downtick) that indicates a buy (sell). As described above, q is given a value of 1 for a buy and -1 for a sell. If no price change is found within the two week timeframe, q is given a value of 0. This algorithm can be illustrated:

$$q_t = \begin{cases} 1 & \text{if } p_k > p_{k-1} \quad \text{or} \quad p_k = p_{k-1} \ \text{ and } \ p_{k-i} > p_{k-1-i}, \quad i \in [1,9] \\ -1 & \text{if } p_k < p_{k-1} \quad \text{or} \quad p_k = p_{k-1} \ \text{ and } \ p_{k-i} < p_{k-1-i}, \quad i \in [1,9] \\ 0 & \text{if } p_{k-i} = p_{k-1-i} \quad \forall i, \end{cases} \tag{14}$$

where k is the position of a fifth-day-of-the-week price in the time series and t is a new weekly time counter. Equation 4 is estimated using this population of q_t and the dataset of fifth-day prices to obtain the coefficient of Δq_t as the spread estimate.

3.1.2 Data

Three datasets of daily stock prices for firms traded in Australia, Canada, and New Zealand in the 1998 - 2004 time period are obtained from Datastream. I prepare the data as follows. There is missing price data for most firms. The reason for this is unknown but could include reporting errors or no trading taking place on a particular day. Firms with more than 50 missing observations are dropped so that the dataset does not have excessive gaps.[31] The remainder of missing observations for each firm are replaced with the mean value over all of the firm's observations. There is a tradeoff between the number of firms that are kept in the final dataset and the number of missing observations that is allowed. In the case of Australia, especially, about two thirds of firms have almost a third of observations missing. Those firms are dropped in favour of more consistent transaction cost estimates even though this eliminates much of the dataset. If the main cause for missing price information is that there were no trades, and if this is more prevalent for small firms, it is possible that this data is biased towards including a higher proportion of big firms than would be representative of capital markets. This would likely make the cost estimates understate transaction costs. However, the exclusion of firms with a lot of missing price data is preferred as it increases the precision of the estimates.

[31]The number of missing observations above which a firm is dropped was chosen arbitrarily.

Roll original

For Australia, there are 1,915 firms (variables) in the original dataset with 1,827 price observations for each. After the firms with more than 50 missing observations are dropped, 514 firms remain.[32] For Canada, there are 2,111 firms in the original dataset with 1,827 prices for each. After the firms with more than 50 missing observations are dropped, 907 firms remain.[33] For New Zealand, there are 403 firms in the original dataset with 1,827 prices for each. After the firms with more than 50 missing observations are dropped, 211 firms remain.[34] This data forms the first dataset and it is used to estimate the original Roll transaction cost measure.

Weekly variant

A second dataset is created from the above data by extracting fifth day of the week prices for every firm and estimating a q value for each using the Lee and Ready (1991) algorithm on week-level data as described earlier. The price extraction and q calculation begins with the first full week, namely the price observations on Monday, January 3, 1998. The Australian weekly dataset consists of 514 firms with 365 price observations for each. There are 25,725 of 187,610 zero q-values for all firms and years for when no price change was found within the past two weeks. The Canadian weekly dataset consists of 907 firms with 365 observations. There are 49,824 of 331,962 zero q-values for all firms and years for when no price change was found within the past two weeks. The New Zealand weekly dataset consists of 211 firms with 365 observations. There are 44,328 of 77,015 zero q-values for when no price change was found within the past two weeks. This dataset is used to estimate the weekly variant model.

[32]Had I allowed 300 missing observations, only 23 extra firms would have been kept. I would have had to allow 900 (half) missing observations to keep 701 firms.

[33]Had I allowed 300 missing observations, only 46 extra firms would have been kept.

[34]Had I allowed 300 missing observations, only 5 extra firms would have been kept.

3.1.3 Empirical application and results

Roll original

Using the daily price dataset, the first order autocovariance for prices is estimated for each firm over a year. This is used to calculate the Roll spread estimate. If the covariance is positive, the cost estimate for firm i at time t is set equal to 0:

$$c_{it}^{Roll} = \begin{cases} \sqrt{-\text{cov}(\Delta p_t, \Delta p_{t-1})} & \text{when } \text{cov}(\Delta p_t, \Delta p_{t-1}) < 0 \\ 0 & \text{when } \text{cov}(\Delta p_t, \Delta p_{t-1}) \geq 0 \end{cases} \tag{15}$$

For Australia, there are 1,129 zero of 3,598 total cost estimates for all firms and years, for Canada 1,072 of 6,349 zero cost estimates, and for New Zealand 1,058 of 1,477 zero cost estimates.

Weekly variant

Using the weekly price dataset, the coefficient c is estimated to obtain the cost estimate c_{it}^{Weekly} for each firm over a year:

$$\Delta p_t = c\Delta q_t + u_t, \qquad u_t \overset{iid}{\sim} N(0, \sigma_u^2). \tag{4 revisited}$$

For Australia, there are 166 cost estimates less than or equal to zero of 3,598 total cost estimates for all firms and years, for Canada 259 of 6,349 cost estimates less than or equal to zero, and for New Zealand 797 of 1,477 cost estimates less than or equal to zero.

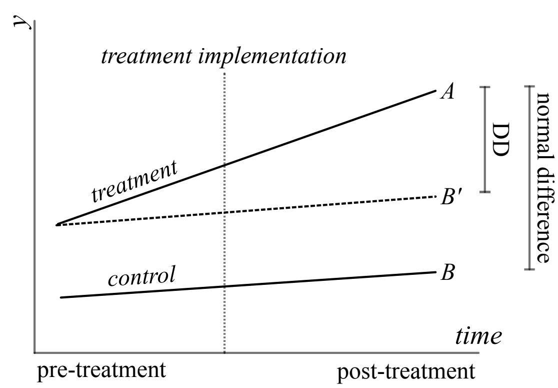
For a detailed comparison of the Roll and weekly cost estimation methods, see Table 4 in Appendix A. The Roll estimator performs better in bigger datasets, as it yields valid estimates 83% of the time for the biggest sample (Canada) and only 28% of the time for the smallest sample (New Zealand). The weekly estimator yields valid estimates around 20% more often than the Roll method, as it does not depend on the sign of the price autocovariance.

3.2 Difference-in-differences

3.2.1 Methodology

A Fixed Effects estimator with a policy dummy is used to determine the effect on Australian transaction costs of the change to federal securities regulation. This estimator is known as a difference-in-differences (DD) identification strategy. The simplest way to establish the extent of the change would be to compare the average costs for firms in Australia, which operate under the federal regulator, to the average costs for firms in another country, where firms are not exposed to this change. However, such a simple difference estimator is accurate only if the two sets of firms would be no different apart from the securities regulator under which they operate. This is a very strong assumption in light of heterogeneity among firms and diverse business conditions. A weaker assumption is that, without a change in regulation, the unobserved differences between the two groups of firms are the same over time. This is the assumption that the DD estimator is based on, as it assesses the effect of an exogenous change by calculating the difference in the change in average costs between the two groups of firms. This approach is illustrated in Figure 2.

Figure 2: Difference-in-differences estimator approach



In this case, the Australian firms are the treatment group and New Zealand firms form the control group. New Zealand firms are chosen because they are presumably exposed to the same influences on transaction costs as Australia due to their regional proximity and thus capture the same trends.

Further, each firm has unique characteristics that affect its transaction costs. To account for this individual fixed effect, I use a Fixed Effects (FE) regression with dummy variables for each firm. This removes the time-invariant firm characteristics affecting their costs so that the policy effect can be isolated. Similarly, time period dummies are included to absorb influences on transaction costs that vary by year (i.e. economic conditions). Finally, a policy indicator variable captures the change to a federal securities regulator. This variable's coefficient, β_1, describes the causal effect of moving to a federal regulator. The model is summarized by the following regression:

$$costs_{it} = \beta_0 + \beta_1 policy_{it} + \beta_2 year1999_t + \beta_3 year2000_t + \cdots + \beta_7 year2004_t + \varepsilon_{it}, \quad (16)$$

where $costs_{it}$ are the estimated transaction costs for firm i at time t. This equation is estimated using both OLS and FE. I expect OLS to yield biased and inconsistent results, as this is the case when a regressor (i.e. policy) is correlated to anything in the error term. Because OLS does not account for firm fixed effects, firm heterogeneity is captured in the error term, so OLS would be biased and inconsistent if the policy or year variables are correlated with the firm fixed effects. On the other hand, the FE regression is expected to yield unbiased and consistent estimates, as it uses "long differencing" to perform a within transformation of the included variables to express them as deviations from their group means, thus eliminating the heterogeneity term and leaving the remaining variables uncorrelated with the error term. To illustrate, the error term for firm i at time t can be written:

$$u_{it} = e_t + v_i + \varepsilon_{it}, \quad (17)$$

where e_t is a time fixed effect on all cost observations at time t, v_i is a firm fixed effect on all costs for firm i, and ε_{it} is an effect only on firm i at time t. The time fixed effect e_t is accounted for by using year dummies, leaving the firm fixed effect v_i and ε_{it}. Whereas for the OLS estimator to be consistent it requires the error terms and individual firm effects to be uncorrelated, FE allows for correlation between the error term and individual firm fixed effects (Davidson and MacKinnon, 2004, p. 296). The FE estimator is consistent only if these time-invariant characteristics are not correlated between firms (the error term and constant for each firm are uncorrelated) and there is no regressor that varies across firms but does not vary across time for a specific firm (there is no perfect multicollinearity between a regressor and the individual fixed effect). These are plausible assumptions to make for the datasets of Australian and New Zealand firms. Lastly, as FE standard errors are often inconsistent and understate the standard deviation of the estimators, cluster bootstrap standard errors are used to take into account the autocorrelation in the data. This correction was found to be effective at correcting for overrejection in difference-in-differences estimation (Bertrand et al., 2004).

3.2.2 Data

For the difference-in-differences estimation, the Australian and New Zealand datasets of Roll and weekly cost estimates obtained earlier are appended to obtain two datasets of estimated transaction costs for each methodology.

To ensure the integrity of the estimation procedure, I examine the imputed transaction cost figures (see Table 5 in Appendix A). There are 5,075 cost estimates in the panel dataset of cost estimates obtained using the Roll original method. Of these, 2,187 are zero cost estimates, 7 are greater than 20, and 38 are greater than 2; 99% of the estimates are less than 1.5. Similarly, there are 5,075 cost estimates in the panel dataset of cost estimates obtained using the weekly prices method. Of these, 78 are negative cost estimates, 883 are zero cost estimates, 14 are greater than 20, and 42 are greater than 4; 99% of the cost estimates are less than 3.05.

Upon inspection, a number of clear outliers (cost estimates above 20) are evident in both the Roll original and the weekly variant estimator datasets (see Figures 3-6 in Appendix A). Many of the extreme estimates from both methodologies are for the same firms, and the original stock price data for these firms appears to be corrupted (i.e. reported price data is in the eight figures), likely due to reporting errors. These cost estimates thus appear to reflect missing or unreliable stock price data, so they are dropped together with the remainder of the top percentile (thus above 2 in the first dataset and above 4 in the second). Similarly, all zero cost estimates are dropped in both datasets. Recall that in the first dataset these are caused by the occurrence of positive first order auto covariance, and in the second dataset they are caused by a zero q-value due to not finding a change in price. In the second dataset negative estimates are also dropped as they indicate computation errors in the q values.

To summarize, in the first dataset of Roll cost estimates, 2,187 zero cost estimates are dropped due to positive serial autocorrelation in stock prices and 38 cost estimates are dropped due to potential errors in the original data. In the second dataset of weekly cost estimates, 78 negative and 883 zero cost estimates are dropped due to misspecification in the q values and 42 cost estimates are dropped due to potential errors in the original data. This leaves 2,850 cost estimates for Australia and New Zealand in the first dataset and 4,072 in the second. After cleaning the data, the cost estimates are more narrowly distributed (see Table 6 and Figures 3-6 in Appendix A).

To assess the output of the cost estimators the same cleaning procedure is conducted for both sets of Canadian cost estimates. A comparison of both cost measures for all three countries reveals that they appear to capture trends well, as the same patterns are seen in all three estimates (see Figures 7 and 8 in Appendix A). The correlation is especially clear for Australian and Canadian estimated costs. A comparison across both estimators shows that although they result in average costs of approximately the same magnitude (between .025 and .2 for all three countries), the weekly estimator yields less sharp movements than the Roll estimator (for instance, there is no abrupt drop in costs for Canada between 2000 and 2001). Similarly, the Roll estimate is lower than the weekly estimate. This is not unanticipated because a downward bias is expected for the Roll estimator as it does not account for price impact or commissions and it includes midpoint prices that do not reflect costs from days when no trading took place. Notwithstanding these differences, the cost estimators seem consistent. This indicates that the DD assumption of common trends is not unreasonable. The analysis thus proceeds with the transaction costs for Australia and New Zealand estimated using both the Roll and weekly procedure. See Figures 9 and 10 in Appendix A for descriptive statistics of the average cost movements across time for both countries.

3.2.3 Empirical application and results

An Ordinary Least Squares and a Fixed Effects regression with cluster bootstrap standard errors is run for each of the Roll and weekly datasets described above:

$$costs_{it} = \beta_0 + \beta_1 policy_{it} + \beta_2 year1999_t + \cdots + \beta_7 year2004_t + \varepsilon_{it} \qquad (\text{16 revisited})$$

The results of this regression using both OLS and FE are reported in Table 3, with the full results in Table 7 in Appendix B. The OLS estimates yield a positive policy parameter coefficient. However, the FE estimates, which take into account the possibility that firm fixed effects are correlated with the policy change, yield a negative coefficient for the policy change parameter. Because FE is always consistent in this situation, it is reasonable to conclude that the FE regression gives the proper estimate of the causal effect of the policy change. Further, because of the sign change in the policy parameter between the two sets of estimates, a Hausman test would be superfluous. As the policy change takes place in July 2001 and the policy dummy is set to include all of 2001, the above equation is also estimated by FE excluding the year 2001 (see Table 8 in Appendix B). Although the policy effect is of greater magnitude when excluding the year 2001, the difference is not significant. This indicates that the inclusion of 2001 data does not substantially alter the results.

In conclusion, as the FE regression is consistent, the results of this difference-in-differences analysis suggest that the move to federal securities regulation in Australia caused transaction costs in securities markets to decrease. The policy parameter coefficients for both cost measures are precisely estimated, with a narrow 95% confidence interval of [-.039, -.006] for Roll and [-.054, -.017] for weekly cost estimates.

Table 3: Effect of change to federal securities on Australian transaction costs

Cost estimator	(1) Roll cost estimates		(2) Weekly cost estimates	
DD method	OLS	FE	OLS	FE
Policy change	**0.0257****	**-0.0225*****	**0.0257****	**-0.0355*****
	(0.0119)	(0.00735)	-0.0119	(0.00925)
Observations	2,850	2,850	4,072	4,072
R-squared	0.008	0.037	0.008	0.029
Number of id	N/A	619	N/A	636

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

4 Conclusion and extensions for future work

4.1 Conclusion

Securities regulation in Canada is based on the foundational goals of investor protection and capital market efficiency. Prior literature found transactional costs for Canadian market participants to be high according to direct feedback from registrants as well as relative to costs in the U.S. This paper examines how these costs would be affected by a Canadian switch to a federal securities regulator through assessing the transaction cost dynamics for the Australian experience in its own 2001 move to federal regulation.

Transaction costs for Australian and New Zealand firms (as a control) are obtained using daily and weekly prices by means of two estimates of the implicit bid-ask spread: the Roll original covariance estimation, and a weekly variant with imputed trade directions. These estimates are then used to appraise the effect on Australian securities market transaction costs of its 2001 switch from a decentralized to a federal securities regulator through a Fixed Effects regression with a policy indicator variable. The results indicate that the move to federal regulation resulted in a decrease in Australian securities market transaction costs of 0.0225 for the Roll cost estimates and 0.0355 for the weekly cost estimates. For all Australian firms across all years, this represents a 49% drop in transaction costs for the average Roll cost and a 44% decrease in transaction costs for the average weekly cost. Relative to average transaction costs across all Australian firms in the year 2000, this represents a 32% (31.98 and 31.93) cost drop for both Roll and weekly costs. Though the cost savings resulting from the policy change appear to be sensitive to high cost firms, the consistent results indicate economically significant savings. The estimation of the same percentage drop in average costs relative to the year 2000 for both cost measures indicates the soundness of these results.

These findings are directly relevant for the Canadian debate on the optimality of a federal securities regulator as opposed to the current multijurisdictional system, especially as Canada and Australia have common features both in terms of geography and capital market structures. Transaction costs are an important part of the goals of investor protection and capital market efficiency promotion that underscore securities regulation in Canada. They are a key component in both transactional and overall capital market efficiency: low costs facilitate informational efficiency through the incorporation of information into prices and allocational efficiency through enabling trading that decreases stock return volatility and thereby increases access to capital. Transaction costs in Canada are high relative to the U.S. and it can now be concluded that a federal regulator is likely to lower them. The extent to which this should inform the legal issue of constitutional interpretation in regard of federal competence over securities regulation is another question.

4.2 Extensions

The above study could benefit from substantiating the statistical significance by further developing the statistical methods and extending the economic significance of the result by considering more market metrics. The confidence of the results could be increased by refining the transaction cost and difference-in-differences estimates. Using a MCMC Bayesian estimation could confirm and improve the precision of the cost estimates. Similarly, the adequacy of New Zealand firms as a control could be verified and more controls (i.e. industry specific) could be employed to fine-tune the transaction cost trends. To improve the accuracy of the DD estimation, a more precise dummy for the policy change could be obtained by splitting up the year so that the July 15 policy change is more precisely identified. Further, the precision of the transactional costs effects could be improved by decomposing and estimating the bid-ask spread. Also, the transaction cost DD approach could be extended to other countries and optimality metrics other than transaction costs could be assessed. To solidify the conclusions for Canada, the effect on the Canadian economy of a 32% decrease in securities market transaction costs could be estimated as indicative of the expected effects of a federal regulator.

Appendices

A Transaction costs descriptive statistics

Table 4: Performance of Roll and weekly cost estimators

	(1) Roll cost estimate			(2) Weekly cost estimate		
	Australia	Canada	New Zealand	Australia	Canada	New Zealand
Dataset						
Number of firms (variables)	514	907	211	514	907	211
Number of prices (observations)	1827	1827	1827	365	365	365
Cost estimates						
Total	3598	6349	1477	3598	6349	1477
Zero or less than zero	1129	1072	1058	166	259	797
Positive, all years	2469	5277	419	3432	6090	680
Positive, 1998	338	810	59	494	870	121
Positive, 1999	350	811	58	497	876	121
Positive, 2000	342	806	66	484	874	102
Positive, 2001	363	714	73	488	865	99
Positive, 2002	373	699	59	494	862	84
Positive, 2003	343	716	56	487	863	77
Positive, 2004	360	721	48	488	880	76
Percentage postive, all years	*69%*	*83%*	*28%*	*95%*	*96%*	*46%*

Table 5: Australia and New Zealand cost estimates

Descriptive statistics, original

	(1) Roll cost estimates					(2) Weekly cost estimates			
	Percentiles	Smallest				Percentiles	Smallest		
1%	0	0			1%	-0.001367	-0.197352		
5%	0	0			5%	0	-0.160594		
10%	0	0	Obs	5075	10%	0	-0.081556	Obs	5075
25%	0	0	Sum of Wgt.	5075	25%	0.0018125	-0.055278	Sum of Wgt.	5075
50%	0.0011671		Mean	0.1379709	50%	0.0084965		Mean	0.4814703
		Largest	Std. Dev.	2.475807			Largest	Std. Dev.	9.34487
75%	0.0079581	56.36892			75%	0.0285892	161.3094		
90%	0.0295884	65.00073	Variance	6.13E+00	90%	0.0890834	202.2466	Variance	8.73E+01
95%	0.07388	83.74071	Skewness	29.60656	95%	0.2506786	326.7763	Skewness	33.35867
99%	**1.505398**	9.80E+01	Kurtosis	962.2528	99%	**3.049222**	435.424	Kurtosis	1305.864

Table 6: Australia and New Zealand cost estimates

Descriptive statistics, corrected

	(1) Roll cost estimates					(2) Weekly cost estimates			
	Percentiles	Smallest				Percentiles	Smallest		
1%	0.000135	8.46E-07			1%	0.0005	8.46E-06		
5%	0.0005104	1.27E-05			5%	0.0013363	6.82E-05		
10%	0.0009241	2.23E-05	Obs	2850	10%	0.0022931	0.0001161	Obs	4072
25%	0.0024161	2.41E-05	Sum of Wgt.	2850	25%	0.0052626	0.0001721	Sum of Wgt.	4072
50%	0.0059585		Mean	0.0413741	50%	0.0132334		Mean	0.0706732
		Largest	Std. Dev.	0.1689264			Largest	Std. Dev.	0.2605857
75%	0.0180933	1.876016			75%	0.0362412	3.308107		
90%	0.0519252	1.890967	Variance	0.0285361	90%	0.1045	3.417209	Variance	0.0679049
95%	0.1455739	1.946779	Skewness	7.702994	95%	0.2643265	3.467066	Skewness	8.115812
99%	**1.018351**	1.967125	Kurtosis	69.48364	99%	**1.335255**	3.511559	Kurtosis	82.01254

Figure 3: Australia Roll cost estimates
Original and corrected

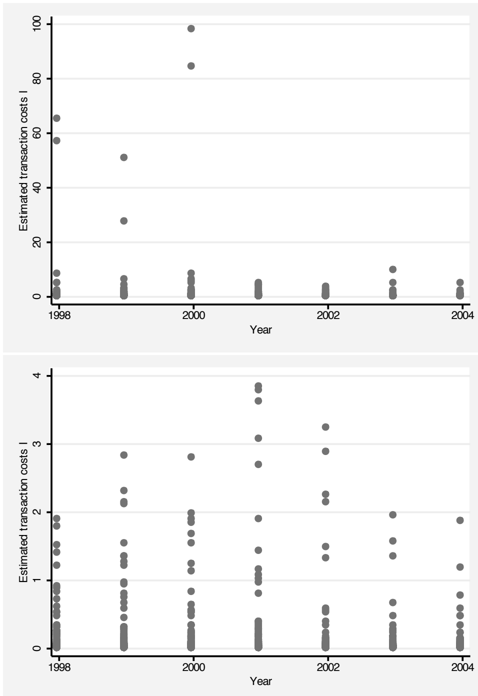


Figure 4: Australia weekly cost estimates
Original and corrected

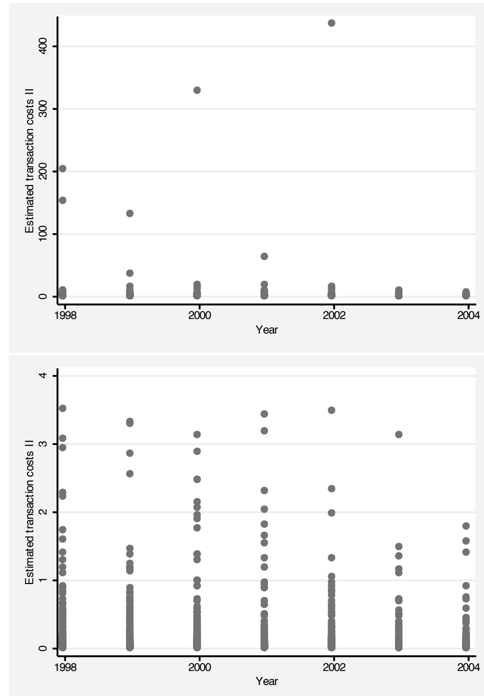


Figure 5: New Zealand Roll cost estimates
Original and corrected

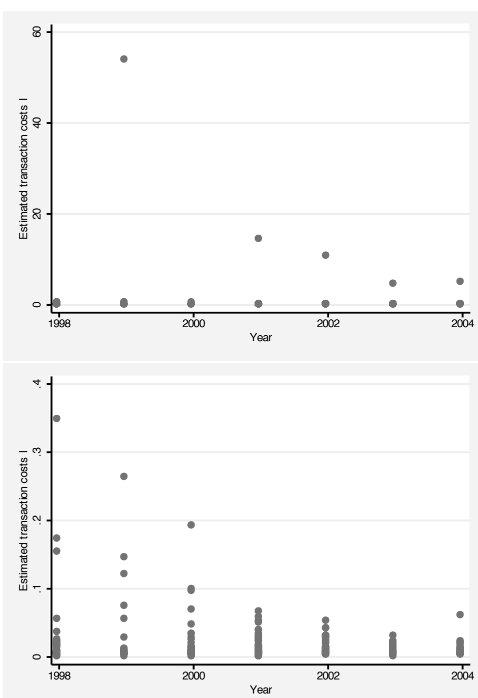


Figure 6: New Zealand weekly cost estimates
Original and corrected

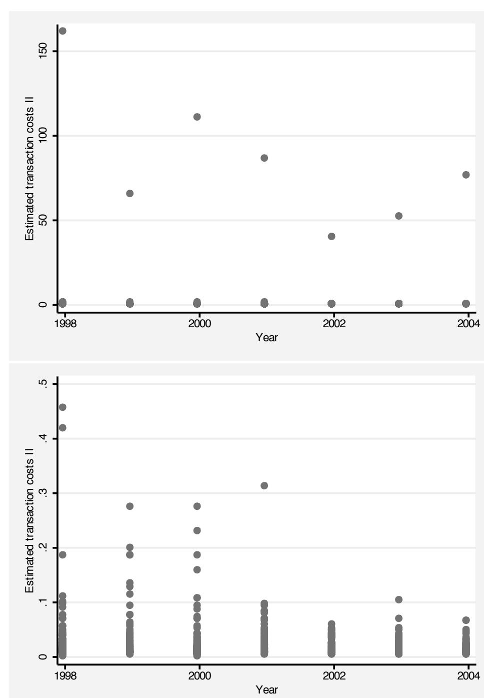


Figure 7: Roll estimated transaction costs
Australia, Canada, and New Zealand

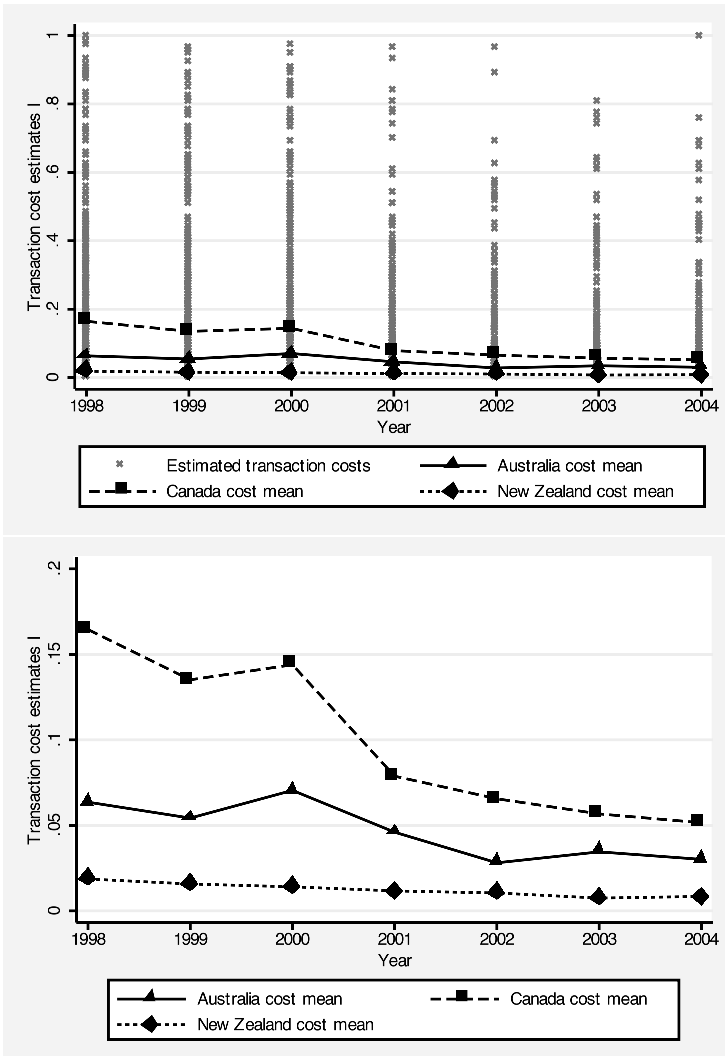


Figure 8: Weekly estimated transaction costs
Australia, Canada, and New Zealand

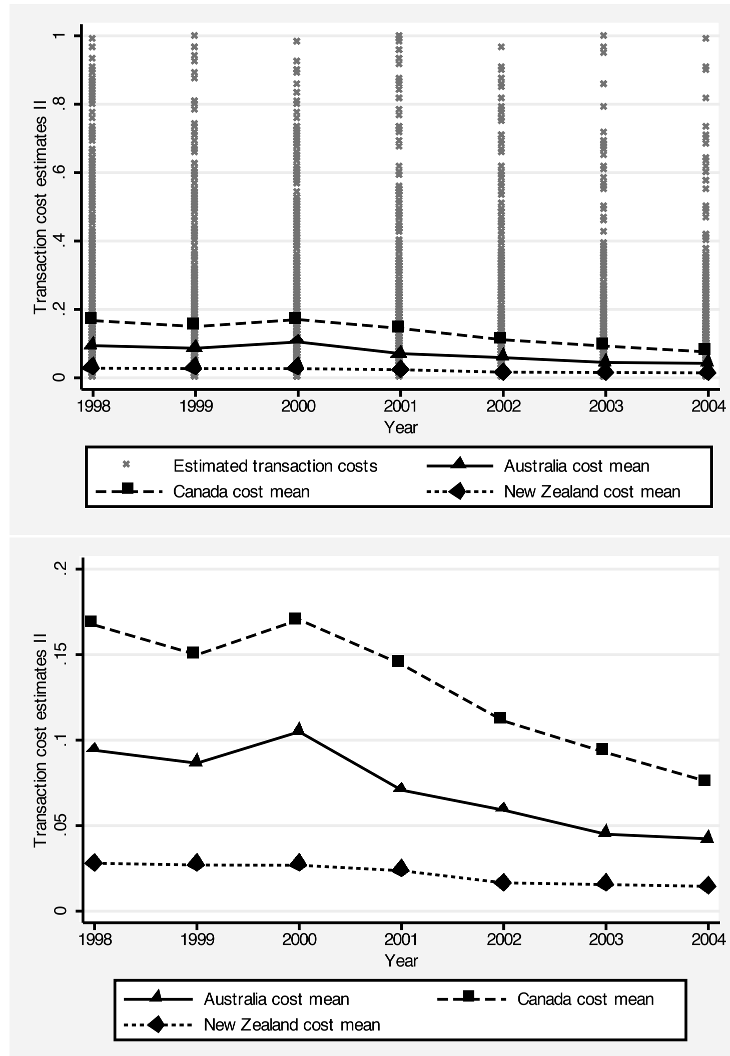


Figure 9: Roll estimated transaction costs
Australia and New Zealand

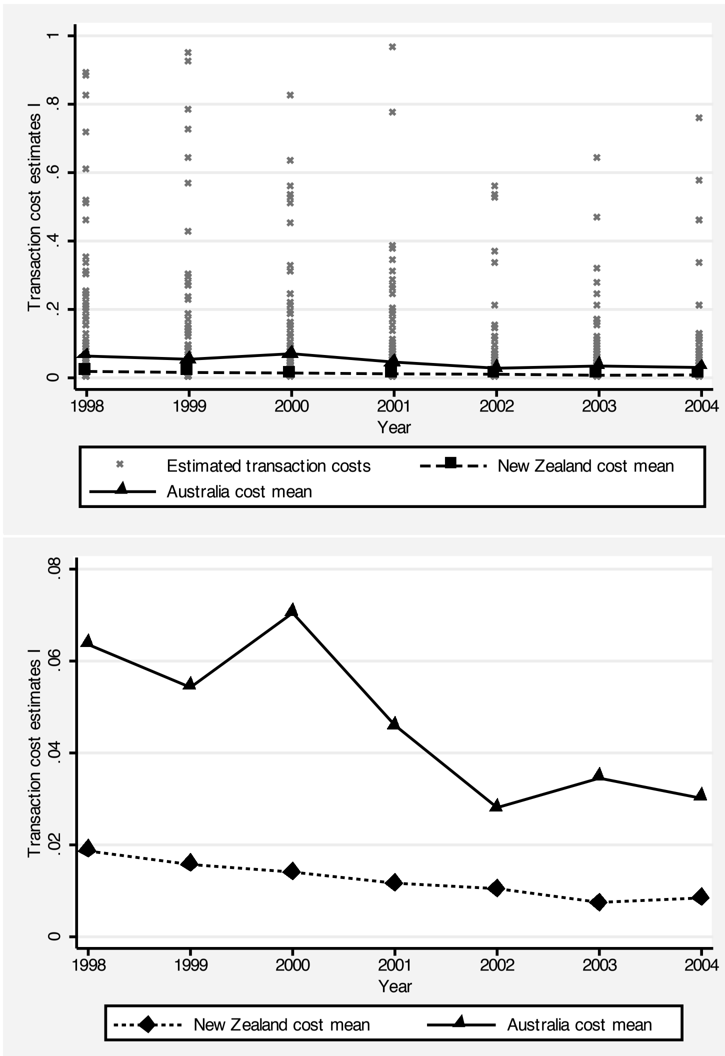
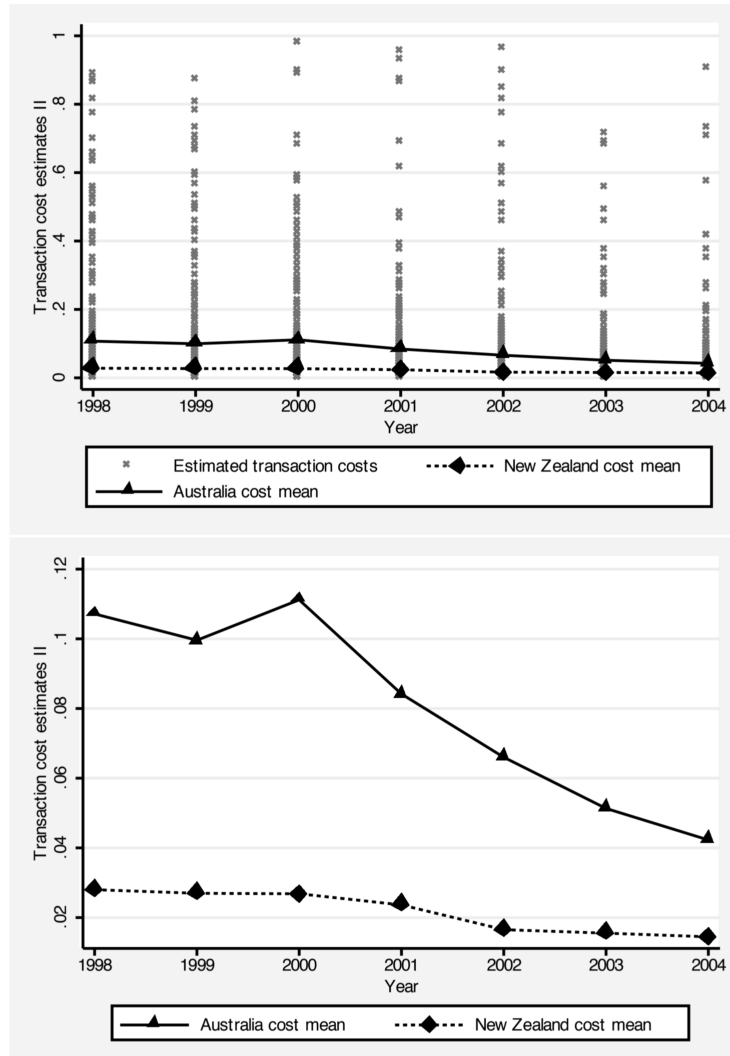


Figure 10: Weekly estimated transaction costs
Australia and New Zealand



B Difference-in-differences estimation results

Table 7: Effect of change to federal securities regulator on Australian transaction costs

Cost estimator	(1) Roll cost estimates		(2) Weekly cost estimates	
DD method	OLS	FE	OLS	FE
Policy change	**0.0257****	**-0.0225*****	**0.0445*****	**-0.0355*****
	(0.0119)	(0.00735)	(0.0154)	(0.00925)
Costs in 1999	-0.00807	0.00299	-0.00620	-0.00726
	(0.0120)	(0.00725)	(0.0149)	(0.00869)
Costs in 2000	0.00436	0.0119*	0.00497	0.00145
	(0.0120)	(0.00714)	(0.0151)	(0.00610)
Costs in 2001	-0.0380**	0.0109	-0.0545***	0.0114
	(0.0154)	(0.00720)	(0.0198)	(0.00894)
Costs in 2002	-0.0534***	-0.00447	-0.0707***	-0.0108
	(0.0157)	(0.00602)	(0.0201)	(0.00852)
Costs in 2003	-0.0482***	-0.0143**	-0.0835***	-0.0246***
	(0.0158)	(0.00588)	(0.0202)	(0.00909)
Costs in 2004	-0.0520***	-0.0169**	-0.0915***	-0.0342***
	(0.0159)	(0.00673)	(0.0202)	(0.00820)
Constant	0.0568***	0.0540***	0.0915***	0.0965***
	(0.00851)	(0.00773)	(0.0105)	(0.0112)
Observations	2,850	2,850	4,072	4,072
R-squared	0.008	0.037	0.008	0.029
Number of id	N/A	619	N/A	636

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Table 8: Effect of change to federal securities regulator on Australian transaction costs, excluding 2001

	(1) Roll cost estimates	(2) Weekly cost estimates
Policy change	**-0.0260****	**-0.0429*****
	(0.0113)	(0.0111)
Costs in 1999	0.00333	-0.00692
	(0.00734)	(0.00977)
Costs in 2000	0.0124*	0.00161
	(0.00645)	(0.00624)
Costs in 2001	-0.000973	-0.00342
	(0.00688)	(0.00762)
Costs in 2002	-0.00947	-0.0167**
	(0.00738)	(0.00846)
Costs in 2003	-0.0121*	-0.0276***
	(0.00658)	(0.00750)
Costs in 2004	0.0542***	0.0967***
	(0.0102)	(0.0144)
Observations	2,421	3,492
R-squared	0.039	0.033
Number of id	613	636

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

References

Agarwal, Vikas and Lingling Wang, "Transaction costs and value premium," Technical Report, CFR Working Paper 2007.

Amihud, Yakov and Haim Mendelson, "Asset pricing and the bid-ask spread," *Journal of financial Economics*, 1986, *17* (2), 223–249.

Anand, A. and P. Klein, "The Costs of Compliance in Canadas Securities Regulatory Regime," *Research Study Prepared for the Wise Persons Committee http://www.wiseaverties. ca/reports/WPC_11. pdf*, 2003.

Ashbaugh, Hollis and Morton Pincus, "Domestic accounting standards, international accounting standards, and the predictability of earnings," *Journal of accounting research*, 2001, *39* (3), 417–434.

Bertrand, Marianne, Esther Duflo, and Sendhil Mullainathan, "How much should we trust differences-in-differences estimates?," *The Quarterly Journal of Economics*, 2004, *119* (1), 249–275.

Black, Bernard, "The legal and institutional preconditions for strong securities markets," *As published in UCLA Law Review*, 2001, *48*, 781–855.

Carpentier, C. and J. M. Suret, "Proposal for a Single Securities Commission: Comments and Discussion," Technical Report, CIRANO 2009.

Castura, Jeff, Robert Litzenberger, Richard Gorelick, and Yogesh Dwivedi, "Market efficiency and microstructure evolution in US equity markets: A high-frequency perspective," *Manuscript, RGM Advisors, LLC*, 2010.

Chaffee, Eric C, "Finishing the Race to the Bottom: An Argument for the Harmonization and Centralization of International Securities Law," *Seton Hall L. Rev.*, 2010, *40*, 1581.

Chordia, Tarun, Richard Roll, and Avanidhar Subrahmanyam, "Liquidity and market efficiency," *Journal of Financial Economics*, 2008, *87* (2), 249 – 268.

Christensen, Hans B, Luzi Hail, and Christian Leuz, "Capital-market effects of securities regulation: Hysteresis, implementation, and enforcement," Technical Report, National Bureau of Economic Research 2011.

Cleary, Sean, Kevin Kerr, and John Schmitz, "Transactions Costs for TSE-listed stocks," *Canadian Investment Review*, 2002, *15* (1), 20–26.

Cox, James D, "Rethinking US Securities Laws in the Shadow of International Regulatory Competition," *Law and Contemporary Problems*, 1992, *55* (4), 157–198.

Cumming, D., A. Kaul, and V. C. Mehrotra, "Fragmentation and the Canadian Stock Markets," *Its Time*, 2003, p. 357.

Daske, Holger, Luzi Hail, Christian Leuz, and Rodrigo Verdi, "Mandatory IFRS reporting around the world: Early evidence on the economic consequences," *Journal of accounting research*, 2008, *46* (5), 1085–1142.

—, —, —, and —, "Adopting a label: heterogeneity in the economic consequences around voluntary IAS and IFRS adoptions," *Available at SSRN 1864771*, 2011.

Davidson, Russell and James G MacKinnon, *Econometric theory and methods*, Oxford University Press New York, 2004.

Easley, David and Maureen O'Hara, "Information and the cost of capital," *The journal of finance*, 2004, *59* (4), 1553–1583.

Fischel, Daniel R, "Race to the Bottom Revisited: Reflections on Recent Developments in Delaware's Corporation Law," *Nw. UL Rev.*, 1981, *76*, 913.

Fong, Kingsley, Craig Holden, and Charles Trzcinka, "What are the best liquidity proxies for global research?," *Available at SSRN 1558447*, 2011.

Gadinis, S. and H. Jackson, "Markets as Regulators: A Survey," *Southern California Law Review*, 2007, *80*, 1239.

Glosten, Lawrence R and Lawrence E Harris, "Estimating the components of the bid/ask spread," *Journal of financial Economics*, 1988, *21* (1), 123–142.

Gomber, Peter, Björn Arndt, Marco Lutat, and Tim Uhle, "High-frequency trading," *Available at SSRN 1858626*, 2011.

Griffin, J. M. . M., P. J. . J. Kelly, and F. Nardari, "Do Market Efficiency Measures Yield Correct Inferences? A Comparison of Developed and Emerging Markets," *Review of Financial Studies*, 8 2010, *23* (8), 3225–3277.

Griffin, J., P. Kelly, and F. Nardari, "Measurement and determinants of international stock market efficiency," Technical Report, Working paper. University of Texas-Austin 2006.

Hail, Luzi and Christian Leuz, "International Differences in the Cost of Equity Capital: Do Legal Institutions and Securities Regulation Matter?," *Journal of Accounting Research*, 6 2006, *44* (3), 485–531.

Harris, Lawrence, "Statistical properties of the Roll serial covariance bid/ask spread estimator," *The Journal of Finance*, 1990, *45* (2), 579–590.

Hasbrouck, Joel, "Liquidity in the futures pits: Inferring market dynamics from incomplete data," *Journal of Financial and Quantitative Analysis*, 2004, *39* (2).

—, "Trading costs and returns for US equities: Estimating effective costs from daily data," *The Journal of Finance*, 2009, *64* (3), 1445–1477.

Hendry, S. and M. King, "The Efficiency of Canadian Capital Markets: Some Bank of Canada Research," *Bank of Canada Review, Summer*, 2004.

Hockin, Thomas, "Arguments for a National Securities Regulator," *Pierre Lortie (avec les commentaires de Thomas Hockin),≪Securities Regulation in Canada–The Case for Effectiveness≫, IRPP Study [Institute for Research on Public Policy]*, 2011, (19), 32.

IFRS, "Annual Report," Technical Report, IFRS 2012.

IOSCO, "Mitigating Systemic Risk A Role for Securities Regulators," *IOSCO*, 2 2011.

Jones, Charles M. and Paul J. Seguin, "Transaction costs and price volatility: evidence from commission deregulation," *The American Economic Review*, 1997, pp. 728–737.

Lee, Charles and Mark J Ready, "Inferring trade direction from intraday data," *The Journal of Finance*, 1991, *46* (2), 733–746.

Lesmond, David A., Joseph P. Ogden, and Charles A. Trzcinka, "A new estimate of transaction costs," *Review of Financial Studies*, 1999, *12* (5), 1113–1141.

Li, Siqi, "Does mandatory adoption of international financial reporting standards in the European Union reduce the cost of equity capital?," *The Accounting Review*, 2010, *85* (2), 607–636.

Licht, Amir N, "Regulatory arbitrage for real: international securities regulation in a world of interacting securities markets," *Va. J. Int'l L.*, 1997, *38*, 563.

Lo, Andrew W and Archie Craig MacKinlay, "Stock market prices do not follow random walks: Evidence from a simple specification test," *Review of financial studies*, 1988, *1* (1), 41–66.

Lortie, P., *Securities Regulation in Canada: The Case for Effectiveness*, Institute for Research on Public Policy, 2011.

Malkiel, Burton G. and Eugene F. Fama, "Efficient Capital Markets: A review of theory and empirical work," *The Journal of Finance*, 1970, *25* (2), 383–417.

Milne, Frank, "The Impact of Innovation and Evolution on the Regulation of Capital Markets," Technical Report, Queen's University 2010.

Puri, Poonam, "A Model for Common Enforcement in Canada: The Canadian Capital Markets Enforcement Agency and the Canadian Securities Hearing Tribunal," Technical Report 2009.

Raykovski, Entcho, "Continuous Disclosure: Has Regulation Enhanced the Australian Securities Market," *Monash UL Rev.*, 2004, *30*, 269.

Roll, Richard, "A Simple Implicit Measure of the Effective Bid-Ask Spread in an Efficient Market," *The Journal of Finance*, 1984, *39* (4), 1127–1139.

Sanderson, M. and M. Neumann, "Securities Enforcement in Canada: The Effect of Multiple Regulators," *Research Study (Wise Persons Committee), Charles River Associates*, 2003.

Silvia, J., "Efficiency and Effectiveness in Securities Regulation: Comparative Analysis of the United States Competitive Regulatory Structure and the United Kingdoms Single Regulator Model," 2007.

Simmonds, R. and R. da Silva Rosa, "The Impact of Federalising Securities Regulation in Australia: A View from the Periphery," *Research Papers*, 2003, p. 180.

Stoll, Hans R, "Inferring the Components of the Bid-Ask Spread: Theory and Empirical Tests," *The Journal of Finance*, 1989, *44* (1), 115–134.

Suret, Jean-Marc and Maher Kooli, "How cost-effective are Canadian IPO markets?," Technical Report, CIRANO 2002.

Thomas, Randall S. and James F. Cotter, "Measuring securities market efficiency in the regulatory setting," *Law & Contemp. Probs.*, 2000, *63*, 105.

Trebilcock, Michael, "National securities regulator report," Technical Report, University of Toronto 2010.

Vogel, David, *Trading up: Consumer and environmental regulation in a global economy*, Wiley Online Library, 1995.

Zhang, Hao and Stewart Hodges, "An Extended Model of Effective Bid-ask Spread," *Available at SSRN 1904670*, 2011.