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GLOBAL MARKET SURVEILLANCE

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Abstract

This paper provides evidence on market surveillance from stock exchanges and securities commissions from 25 jurisdictions in North, Central and South America, Western and Eastern Europe, Africa and Asia. Stock exchanges as SROs engage in a greater range of single-market surveillance of market manipulation than securities commissions, but the scope of cross-market surveillance activity is very similar among stock exchanges and securities commissions. Cross-market surveillance is more effective with information sharing arrangements, and securities commissions are more likely to engage in information sharing than stock exchanges. The scope of cross-market surveillance is highly positively correlated with trading activity, unlike the scope of single-market surveillance. The data also indicate that as at 2005, there is ample scope for jurisdictions to expand their cross-market surveillance and thereby stimulate investor confidence and trading activity.

Keywords: Market Manipulation, Surveillance, Microstructure, Law and Finance

JEL Codes: G12, G14, G18, K22

1. Introduction

In this paper, we examine the market surveillance activities from exchanges and securities commissions[1] from 25 jurisdictions in North, Central and South America, Western and Eastern Europe, Africa and Asia. We study both single- and cross-market surveillance of market trading to detect manipulative practices carried out by market participants,[2] and relate surveillance activities to trading volume, listings and market capitalization for a sample of emerging and developed stock markets. Exchanges are basically commercial entities in the business of providing a trading platform for securities and other market contracts. Surveillance departments within an exchange carry out its activities at a cost to an exchange organization, or rather, surveillance departments are "cost centers". In this paper we attempt to explore the relationship between surveillance activities and trading activity, deemed to be an exchange's "profit center", to determine the effectiveness of surveillance. Knowing how the costs of surveillance facilitate the profits of trading activity and the like is therefore a fundamental question for market integrity and the operation of a stock exchange (Aitken and Siow, 2003).[3]

Market manipulation refers to a wide range of trading practices that distort prices and enable market manipulators to profit at the expense of other participants, creating information asymmetries. Market surveillance is carried out by exchanges and securities commissions to detect such market manipulation by market participants. The manipulative practices are varied in nature, although there are more "commonplace" practices that are easily identifiable. For example, "insider trading", the trading of securities based on information unavailable to the general public, is an example of a manipulative practice that is easily identifiable by the public. Other less well publicized manipulative practices include "spoofing" or "painting the tape" refers to a trader engaging in a series of transactions reported on a public display facility to give the impression of activity or price movement in a security (e.g. misleading trading, switches, giving up priority, layering bid/asks, fictitious orders for the case of spoofing, etc.). "Pumping and dumping" or "ramping" refers to a trader buying at increasingly higher prices, whereby securities

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[1] For the purposes of this paper reference to exchanges include stock, bonds, commodities and derivatives markets.

[2] Unless otherwise indicated, "cross-market" refers to cross-product, cross-market (e.g., two exchanges in one jurisdiction) as well as cross-border (more than one jurisdiction).

[3] This view was shared by the heads of the market surveillance departments at a number of different securities commissions and stock exchanges around the world at the 2005 SMARTS Inc. Conference in Stockholm.

are sold in the market (often to retail customers) at the higher prices. There are many other examples of manipulative behaviour including but not limited to "advancing the bid", "front running", "churning", "capping/pegging", etc., each defined herein. Ideally, surveillance authorities have sophisticated mechanisms to detect such manipulative trading within their own market, as well as across markets, and jurisdictions.

While the terms insider trading and market manipulation are commonplace in the literature, the formal discipline in which these concepts take centre stage, namely market surveillance, has traditionally been shrouded in secrecy. The oft cited reason for this opaqueness is to refrain from giving would be insider traders and/or market manipulators any idea that might allow them to avoid detection. But arguably, in view of the intense competition for both new listings and trades, companies and investors should be in a position to compare and contrast the capabilities of different surveillance authorities as part of making a considered judgment about the risk/benefits of listing and investing in particular markets. Because manipulative activities are likely to have adverse consequences in terms of attracting new listings/investors to, and retaining existing listings/investors in, a marketplace, both exchanges and securities commissions have developed appropriate regulations and at the same time invested in security market surveillance activities to identify and prosecute such activity. Prior research has analyzed the relationship between surveillance efforts and market integrity (Comerton-Forde and Rydge, 2006). This paper will extend this by looking at the relationship between market integrity and market efficiency. Understanding the effectiveness of security market surveillance departments should help investors to gain confidence in a marketplace and therefore it seems sensible to compare and contrast such divisions. This paper represents a first attempt to do so.

The specific issues addressed in our empirical analyses are as follows. First, to what extent is single- and cross-market market surveillance carried out in different regions around the world? Second, how effective is single- versus cross-market surveillance, and to what extent does single- and cross-market surveillance matter for facilitating an exchange's trading volume and market capitalization? The data examined, while somewhat limited in volume, provide a first-ever international comparison of single- and cross-market surveillance around the world. While prior theory and evidence has examined various aspects of market manipulation and

surveillance of such manipulative practices,[4] no prior study has provided a direct international comparison of single and cross-market surveillance activities.

The new surveillance data introduced in this paper indicate a number of new insights about sources of international difference in market integrity. First, jurisdictions with exchanges which are self-regulatory organizations ("SROs")[5] carry out more intensive single-market surveillance than securities commissions. However, jurisdictions with exchanges as SROs do not play a greater role in cross-market surveillance than jurisdictions in which securities commissions play a significant role in market surveillance.

Second, cross-market surveillance is much more effective when different jurisdictions have information sharing arrangements, and when such information sharing is broader in scope. Interestingly, securities commissions are more likely to engage in information sharing than exchanges. This is perhaps intuitive as securities commissions are less likely to view themselves as competitors among regulatory bodies than exchanges which are more commercial in nature.[6]

Note that there exists considerable debate about the effectiveness of SRO's especially in light of exchanges demutualizing, moving from the not-for-profit model to for-profit model and the resulting conflicts of interest from markets competing with one another (DeMarzo, P. M. et al, 2005; Carson, J, 2003; Fleckner, 2006; Karmel, R, 2000; O'Hara and Mendiola, 2003; Pritchard, 2003; Romano, 2002; Reiffen and Robe, 2007). Our findings contribute to this literature by indicating that exchanges continue to have a self-interested role in maintaining the integrity of their own market in order to attract new listings and increase trading activity. However, exchanges as SROs face barriers to information sharing for cross-market surveillance (as indicated under the second point immediately above) and hence there appears to be a pronounced role for securities commissions in facilitating cross-market surveillance. While the central aim of our paper is not to address the debate about effectiveness of self-regulation in the literature, we hope our evidence inspires further work on topic. Our central interest in this paper is in exploring issues to do with surveillance not previously considered in the literature.

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4 This literature is briefly reviewed in section 2 of this paper.

5 A self regulatory organization (SRO) is an exchange or regulator that has been given the responsibility and authority to regulate its members.

6 For example, this view was shared by the surveillance authorities at NASD in conversations held in late May 2007 in Washington DC.

Third, there is scant evidence in the data herein that single-market surveillance is related to trading volume when the 25 jurisdictions are compared. However, there is significant evidence that cross-market surveillance is highly positively correlated with trading activity. In this paper we provide simultaneous equation analyses that control for the endogeneity of surveillance activities vis-à-vis trading activity. The data continue to show a strong positive relation between cross-market surveillance and trading activity even in a multivariate context with numerous control variables and with specifications for endogeneity. The evidence is consistent with the view that cross-market surveillance facilitates trading activity. This finding holds when control variables are used for the sophistication of the market and the need for cross-market surveillance (such as the number of products, number of cross-listed securities, etc).

Finally, as at 2005, the data indicate that most jurisdictions are focused on single-market surveillance, and have insufficient experience and/or technology to properly carry out cross-market surveillance. There is ample scope for jurisdictions to expand their cross-market surveillance. The data are consistent with the view that an increase in cross-market surveillance would stimulate investor confidence and trading activity.

This paper is organized as follows. Section 2 describes the institutional details in regards to market surveillance and briefly surveys some related literature. The data are introduced in section 3. Multivariate tests are carried out in section 4. Section 5 discusses extensions and future research in relation to the analyses carried out in this study. The last section concludes.

2. A Brief Review of Market Manipulation and Surveillance

As with most trading platforms, surveillance systems within exchanges around the world are automated (Harris, 2002; Clayton et al., 2006). Real time computer surveillance systems alert surveillance staff of unusual trading activity based on orders and executed trades. Such alerts are not usually based on single trades but are generated based on patterns of trading to detect potential manipulative practices. Computer software providers, such as SMARTS Group, Inc.,[7] customizes its system to manage the type of alerts provided to surveillance staff. Such customization is necessary as each exchange or securities commissions around the world differ in

[7] http://www.smartsgroup.com/ More generally, see Harris (2002).

scope and requirements for surveillance. The set of alerts in conjunction with manipulative practices depicted in Table 1 is comprehensive for most surveillance systems however, and these alerts apply to both single-market manipulations as well as cross-market manipulations. The central focus of the empirical analyses herein is first in documenting the extent to which scope of manipulations in Table 1 are suspected/detected, and second the scope of single- and cross-market surveillance in relation to trading liquidity and other measure of market quality in different exchanges around the world.

[Table 1 About Here]

Compared to cross-market surveillance systems, single- market surveillance systems can be directly implemented at comparatively low costs relative to the market capitalization of most any given exchange around the world. Many smaller exchanges do not have the resources to effectively carry out single-market surveillance themselves (this involves appropriate technology as well as strong market knowledge, effective regulation, strong political will, etc.) External surveillance providers offer outsourcing (even in a different country relative to the country in which the exchange is based) of full service standard single-market surveillance for a minimal cost. For example, SMARTS Group (www.smartsgroup.com) has installed security market surveillance systems at the Saudi Arabian Stock Exchange, the Abu Dhabi Securities Market, the Dubai Financial Markets and the Securities and Commodities Commission of the UAE and provides a staff member and full service single-market surveillance off-site from Sydney Australia. SMARTS Group can be contacted directly for their pricing schedules; at the time of writing, the annual cost was easily affordable by even the smallest exchanges. The SMARTS Group also provides on-site surveillance for the London Stock Exchange and many other exchanges around the world.

Cross-market surveillance (including cross-product, cross-market within a country and cross-border), involves much greater technical sophistication that is not easily replicated by an exchange for the following reasons. The level of sophistication of financial trading patterns across different products (such as derivatives and securities) is much more complicated (and our data below suggest many surveillance authorities in different countries do not appear to be aware of the ways in which traders can carry out manipulative cross-market trades). Computer software to detect cross-market manipulations to pick up patterns of trading across markets needs significantly greater sophistication than the simple single-market trading alerts. External

surveillance providers such as SMARTS Group do provide cross-market surveillance, but such productized or customized solutions come at a substantially higher cost both for the development of the technology and the on-going surveillance effort. Surveillance staff members need to coordinate surveillance across different markets monitored, which requires proper organizational alignment. As well, for cross-market and cross-border surveillance there needs to be information sharing arrangements and coordination of surveillance for cross-market and cross-border surveillance to be effective. Such coordination is further complicated by the protectionist policies arising from the commercial self interest of the respective markets and the related cross jurisdictional legality issues. In short, cross-market surveillance is much more costly and complicated than single-market surveillance

It is important to note that the different types of market manipulation identified in Table 1 can be the subject of both single- and cross-market surveillance. Any type of single-market manipulation can also be a cross-market manipulation (e.g., for a security that is listed on more than 1 exchange.) For example, wash trades may take place across markets (in fact, multiple transactions across markets could be used as a way to disguise wash trades). Front-running may also take place across markets where brokers place orders ahead of client orders for the same security traded on a different exchange. It is also important to note that short sales and trade throughs may not be considered manipulative behavior per se, as indicated in Table 1, but were considered important enough by various surveillance authorities that vetted our list of manipulations (these items can be manipulative in conjunction with other activities). Regardless, we considered the empirics and regressions with and without short sales and trade throughs as manipulative and did not find any material differences in our results.

In addition to examining the scope of single- and cross-market surveillance, we also assess in this paper the effectiveness of the surveillance systems in different jurisdictions around the world. Effectiveness depends on a number of factors. First, alerts should minimize false positive and maximize true positive manipulative practices. To be able to do this, the surveillance system needs to ascertain normal trading activity to set alert parameters. For example, normal price and volume measures need to be set for typical trading ranges for a particular product traded on the exchange. Second, a surveillance department should be able the reconstruct all trading activity to replay the full order/quote schedule. It is also important for market surveillance to identify the activity of each market participant. Third, the surveillance staff needs to be versed on the issues that need to be investigated. The quality of a surveillance

system depends on the quality of the software used and the degree to which the surveillance staff are educated and trained with regard to using the information provided in the alerts. Fourth, the effectiveness of a surveillance system also depends on the degree to which market participants are informed about the surveillance activities. Fifth, for cross-market surveillance, surveillance effectiveness depends to a significant degree on the extent to which information is shared across jurisdictions. Sixth, the efficiency of the surveillance system depends on the regulatory framework. In many jurisdictions around the world, the exchanges themselves are SROs whereby they establish their own listing standards, monitor and discipline market participants for violation of their rules of operation. In other jurisdictions, the securities commission has a greater role in setting listing standards and trading rules. Recent empirical evidence is consistent with the view that private enforcement benefits markets while public enforcement does little to benefit markets (La Porta *et al*., 2006) and more specifically, recent theory finds that SROs that are for-profit organizations have greater incentives to enforce rules than not-for-profit SROs and misreporting by reportees is more likely when an SRO is not-for profit (Reiffen and Robe, 2007).

The central conjecture that is tested in this paper is that the scope of single-market surveillance is unrelated to trading volume, while the scope of cross-market surveillance is significantly positively correlated with trading volume. Because single-market surveillance can be easily replicated on any exchange and at comparatively low cost, single-market surveillance does not distinguish an exchange and inspire confidence among traders relative to that of competitor exchanges. By contrast, cross-market surveillance is sufficiently complex and costly that it cannot be replicated by lower quality exchanges. Cross-market surveillance will be carried out in higher quality exchanges and inspire confidence among traders and facilitate trading volume. We expect a bi-directional causality between the scope of cross-market surveillance and trading volume, as larger exchanges will have larger budgets for surveillance, and surveillance inspires market confidence and thereby attracts traders and facilitates trading.

Our central hypotheses are related to a number of papers on the law and economics of securities regulation, market surveillance, market efficiency and market integrity. There is evidence from a few country- and market-specific studies that manipulative trading impedes market integrity, as well as theoretical work on topic. For instance, Hillion and Suominen (2004) study manipulation around closing times. Merrick *et al*. (2005) study the effect of trading activities in one market in relation to price changes in another market, thereby enabling manipulators to profit from what is known as a "squeeze". Pirrong (1993, 1995, 1999, 2004)

studies the relationship between commodity and financial markets and the ability of market manipulators to profit from cross-market manipulation. Easterbrook (1986) and Kumar and Seppi (1992) provide similar analyses of manipulation of futures markets. As well, Ni *et al*. (2005) provide evidence of manipulative trading as between stock prices and derivative prices in that stock prices tend to converge on the strike price of the associated derivative at the time of expiration of the derivative (see also Jarrow, 1992, 1994, for evidence of manipulation of derivatives markets). Aggarwal and Wu (2003) provide evidence from the United States ("US') that market manipulation impedes market efficiency (see also Allen and Gale, 1992, and Allen and Gorton, 1992, for related theoretical work). Comerton-Forde and Rydge (2006) show surveillance efforts improve market integrity in Australia. Aitken and Siow (2003) provide international evidence of market efficiency in terms of transaction costs and market integrity based on the likelihood of a security being subject to ramping in the last 15 minutes of trading; they find a strong positive correspondence between efficiency and integrity.[8] La Porta *et al*. (2006) and Daouk *et al*. (2005) provide evidence that market integrity around the world depends critically on securities regulation.[9] Overall, therefore, we may infer that market integrity depends not only on market regulation but also on the quality of market surveillance that limits the extent of market manipulation. Prior work, however, has not directly examined the role of single- and cross-market surveillance in facilitating market integrity in an international setting. Our paper fills this gap in the literature.

Our empirical analyses in the next sections are based on a new dataset which measures the scope of single-and cross-market surveillance. The data match a number of exchange characteristics and outcomes with the scope of surveillance activities, among other things. The data are introduced in the next section.

3. Data and Summary Statistics

The data in this paper are derived from questionnaires sent to 75 jurisdictions around the world.[10] One limitation to obtaining data through a survey is the possibility of sample selection and response bias. While we acknowledge that this is a possibility, we believe

[8] See also Gerard and Nanda (1992), Felixson and Pelli (1999), Mahoney (1999) and Vitale (2000).

[9] For related work, see La Porta *et al*. (1997, 1998, 1999a,b, 2002), Romano (1993, 2002), Berkowitz *et al.* (2003), Pistor *et al.* (2003) and Pistor and Xu (2003).

[10] A copy of the survey is available upon request from the authors.

from a detailed analysis of the responses received and the data obtained from the responses that this concern does not arise in this exercise. First, the jurisdictions were identified from various sources including the membership of The World Federation of Exchanges, the trade association of the exchange industry, which comprises 54 exchanges that account for over 97% of global stock market capitalization, and the affiliate and correspondent organizations of the federation (another 55 organizations).[11] Potential respondents were also identified from the International Organization of Securities Commissions' (IOSCO) membership which comprises 110 securities commissions.[12] Of the potential respondents however, 35 transitional or frontier markets with more negligible market capitalization have been excluded because we believe that the possibility of sample selection bias is mitigated by extent of total global market capitalization of the exchanges/jurisdictions that were sent survey questionnaires. Second, survey data were gathered for a final sample of 25 jurisdictions which we believe to be an extremely good response rate in view of the very detailed confidential information required of the respondents. The jurisdictions participating in the study comprise 16 exchanges and 9 securities commissions from North, Central and South America, Western and Eastern Europe, Africa and Asia. There were no overlaps of exchanges and securities commissions. For reasons of confidentiality, we do not identify any particular jurisdiction due to the sensitive nature of some of the data collected and the potential for readers to identify specific organizations based on location. The geographic distribution of the exchanges is however represented in Figure 1. Finally, the survey questionnaires we designed were also vetted by Regulation Services, Inc. (Canada), SMARTS, Inc. (Australia), the Singapore Stock Exchange and the Australian Stock Exchange to ensure that the possibility of sample selection bias is further mitigated by the breadth of information obtained. The questionnaires were directed towards the Head of the Surveillance Departments in the exchange and/or securities regulators in the jurisdiction. We realise that we cannot absolutely rule out the possibility of a sample selection and response bias due to the unique nature of the data collection and the rather limited number of jurisdictions that have a significant enough market activity. Limitations in our sample size, as well as the limited information about comparable academic work on single-market versus cross market surveillance, however, makes reliable statistical comparisons of our sample nearly impossible.

[Figure 1 About Here]

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[11] See e.g., http://www.world-exchanges.org the official web site of The World Federation of Exchanges.

[12] See e.g., http://www.iosco.org, the official web site of the International Organization of Securities Commissions.

Summary statistics by region are provided in Table 2. Table 2 indicates the characteristics of the survey respondents versus non-respondents. Table 2 indicates that the mean market capitalization for the exchanges in the Americas in our sample is 0.26 the size of the mean for the non-included exchanges, but the median is 4.98 times larger for the exchanges in our sample. Similarly, the mean value of the market capitalization of the exchanges in Asia is 0.83 of the mean value of the exchanges in Asia not included in our sample, while the median market capitalization is 4.06 times larger than the median market capitalization of exchanges not included in the data. Finally, in Europe/Africa the mean value of the market capitalization is 1.75 times the mean value of the exchanges in Asia not included in our sample, while the median market capitalization is 0.56 of the value of the median market capitalization of exchanges not included in the data. These differences between means and medians for the exchanges included versus excluded from our sample are attributable to the non-normal distribution of market capitalization of exchanges. For instance, in North, Central and South America there are a few very large exchanges and many small exchanges. The same applies to the other regions around the world.

[Table 2 About Here]

While the small samples do not enable very statistically accurate comparison of mean and median tests in Table 2, we nevertheless provide these tests (of course, the most appropriate test is for the full sample where there are 25 observations in the group of included jurisdictions). In the regression analyses below, we control for proxies for exchange size and consider the robustness of the results to outliers. We recognize potential limitations with the data and have presented as much information as possible, subject to not violating confidentiality to obtain the data. But as this is the first time this type of study has been carried out, we also recognize that the data are exploratory in nature and hope there will be further studies on topic, as we discuss in section 5 below.

Figure 2 presents the scope of single- and cross-market surveillance analyzed by the exchanges. In view of the fact that the potential respondents are from both developed and emerging markets around the world, a definition of each manipulative practice was provided in the survey to ensure uniformity in identifying the “standard” manipulative practices which may not necessarily be the same across markets. Note also that while there may be other more

contemporary or enlightened ways to manipulate markets we limited our analysis to the 22 we have listed as they are deemed to be more recognizable and the more universal forms of manipulation (as vetted by the abovementioned organizations) . We then asked the respondents to indicate whether for each type of manipulative practice surveillance is carried out on a single-market or cross-market level. The scope of single-market surveillance is indicated as a percentage of all 25 exchanges. The most common types of manipulation subject to single-market surveillance includes wash trades, matched orders, spoofing/painting the tape, pumping and dumping and marking the close for exchanges (all defined in Table 1). Cross-market surveillance is more intensive for capping/pegging, insider trading and dissemination of false and misleading information.

[Figure 2 About Here]

The scope of cross-market surveillance in Figure 2 is indicated as a percentage of the jurisdictions with foreign companies listed on the local exchange (13 jurisdictions in total), and not as a percentage of the total number of jurisdictions (25). Note that all jurisdictions in the sample comprised exchanges that traded a multitude of products, and hence cross-market surveillance is relevant for all exchanges. However, cross-border surveillance is less applicable to some of the exchanges. Hence, Figure 2 presents the extent of cross-market surveillance in a way that provides a favorable view (that is, favorable to the surveillance authorities) as to the degree of importance of the issue of cross-market surveillance in relation to what is actually monitored, in comparison to the extent of single-market surveillance. The data clearly indicate that there is a dearth of cross-market surveillance relative to the need for such cross-market surveillance, even when the scope of cross-market surveillance is perhaps overstated relative to its need as in Figure 2.

Table 3 provides definitions of the different variables considered, categorized by surveillance, exchange and jurisdiction variables. The scope of single-market surveillance is the sum of dummy variables equal to 1 where surveillance in the jurisdiction involves considering the market matters in Table 1. This means for each type of manipulation a dummy variable of 0 or 1 is assigned depending on whether this issue is investigated by the regulator and that these variables are then summed across the market. Similarly, for the scope of cross-market surveillance it is the sum of dummy variables equal to 1 where surveillance in the jurisdiction involves considering the market matters in Table 1 either on a cross-product, cross-exchange or

cross-jurisdiction basis. As explained in the text accompanying Table 1 in section 2 above, the different types of manipulation can be carried out on a single- or cross-market basis.

[Table 3 About Here]

Figure 3 presents a graphical analysis of trading activity in relation to the scope of market surveillance. The data indicate that the scope of single-market manipulations suspected/detected is uncorrelated with trading activity (the correlation is 0.13; see Table 4 below).[13] However, the data quite clearly depict a positive relation between the scope of cross-market surveillance and trading activity (the correlation is 0.77; see Table 5 below). One interpretation of the data is that larger jurisdictions with richer countries are more inclined to invest in cross-market surveillance, and also have more intensive trading activity. A second interpretation is that cross-market surveillance facilitates increased confidence in the market and thereby enhances trading activity. This dual causality hypothesis is considered in the multivariate empirical analyses provided below in the next section.

[Figure 3 About Here]

Table 4 Panel A indicates the average exchange in the data carries out surveillance on 14-15 different types of manipulation on a single-market basis, but only 2-3 different types of manipulations on a cross-market basis. As indicated above and in Table 3, these numbers are derived by adding up the dummy variables equal to 1 where surveillance for each type of manipulation is carried out on a single-market or cross-market basis.

[Table 4 About Here]

Table 4 Panel B provides data on the extent to which exchanges versus commissions are involved in surveillance. The data are provided on a ranking scale from 1-5, where 1 indicates the securities commission is primarily responsible and 5 indicates the exchange is primarily responsible. For the average jurisdiction, the responsibility is shared in terms of establishing

[13] Note, however, that this does not refer to the quality of single-market surveillance. We may expect that exchanges with higher quality surveillance (in terms of technology and people, for example) are better able to facilitate market confidence and thereby enhance trading activity, etc. See, e.g., Aitken and Siow (2003). Below, in this paper we also provide some evidence about the quality of surveillance.

rules, monitoring and enforcement. In most jurisdictions the exchange has the primary role for real time surveillance as well as post trade surveillance. The typical exchange shares information on 4 of 9 dimensions (these 9 dimensions are defined in Table 2), has 1 surveillance department, and provides a self ranking of 2.15 out of 5 for effectiveness on the different dimensions of surveillance (the effectiveness dimensions are also defined in Table 3).

The data were provided on a completely confidential basis and as such, median minimum and maximum values are not indicated in Table 4 for market variables in order to maintain confidentiality. We are nevertheless able to indicate averages, medians and standard deviations. Table 4 Panel A indicates that the average exchange in the data is small relative to the trading activity on the US exchanges, as expected since the data are from a broad array of exchanges from emerging and developed markets from around the world. The average exchange in the data has 567 listed companies, of which 5% are foreign and 2% are cross listed on the US exchanges. As well, the average [median] number of products traded is 7.36 [8], thereby giving rise to a significant need for cross-product surveillance (e.g., as between derivatives and stocks, etc.).

Table 4 Panel B provides evidence about the scope of single-and cross-market surveillance as it differs between exchanges and securities commissions. Exchanges as SROs engage in a greater range of different types of single-market surveillance than securities commissions, but the scope of cross-market surveillance activity is very similar among exchanges and securities commissions. Table 4 Panel B also presents evidence in which the surveillance authorities were asked to provide a self-evaluation in respect of their effectiveness in regard to various aspects of their surveillance. On average, exchanges are more confident than securities commissions in respect of their effectiveness. Figure 4 presents similar evidence of actual manipulations detected (excluding false positives) in relation to the number of trades in the jurisdiction. The data in Figure 4 is presented for a limited sample of 5 exchanges and 6 securities commissions (these extremely detailed data could not be obtained from the other jurisdictions). Consistent with Table 4 Panel B, the data in Figure 4 indicate exchanges typically have more success in detecting manipulations than securities commissions, although this difference has been narrowing over the period 2002-2005.[14]

[14] While the use of subjective assessments is not ideal, the use of a 5-point scale is widely regarded as the most appropriate (see, e.g., Kidd, 1975). As well, note that the information in Figure 4 is very consistent with the rankings regarding the effectiveness of surveillance across securities commissions versus exchanges in Table 4 Panel B (a greater proportion of manipulations are detected by exchanges and exchanges ranked their effectiveness higher in Table

[Figure 4 About Here]

Table 4 Panel B also presents data in regards to information sharing arrangements across jurisdictions, and differences as between exchanges and securities commissions. The data clearly indicate securities commissions are much more likely to have information sharing arrangements than exchanges, and share a greater amount of information. The types of information shared are graphically illustrated in Figure 5, and there are clear pronounced differences in the willingness of exchanges to coordinate information sharing relative to securities commissions.

[Figure 5 About Here]

Table 5 provides correlations across a number of the surveillance and market variables in the data. The correlations indicate that jurisdictions with exchanges responsible for surveillance are typically engaged in a greater scope of single-market surveillance, but not cross-market surveillance. Jurisdictions whereby there are a greater number of departments involved in surveillance are more likely to be engaged in cross-market surveillance. Exchanges that are more directly involved than securities commissions in establishing trading rules, monitoring and enforcing rules are more likely to provide a self-evaluation of greater effectiveness in terms of quality of surveillance. This evidence is consistent with the somewhat related research on new listings and the ineffectiveness of public enforcement of securities regulation around the world (La Porta *et al*., 2006).

[Table 5 About Here]

In terms of the relations between surveillance variables and market variables, the correlations in Table 5 indicate jurisdictions that engage in a greater scope of single-market surveillance are more likely to have a greater number of trades, but not in a statistically significant way (the correlation is 0.13). Nevertheless, consistent with Figure 2, there is a statistically significant correlation of 0.77 between the scope of cross-market surveillance and the number of trades in a jurisdiction. The scope of cross-market surveillance is also positively and

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4 Panel B), which suggests the rankings are consistent with practice in the jurisdictions. We tried to overcome the use of subjective assessments by comparing the responses of securities commissions versus exchanges in the same jurisdiction to see if the responses were consistent, but were unable to obtain such data.

significantly correlated with the total value of trades (correlation equal to 0.62), the number of listed companies (0.51), market capitalization (0.58), the proportion of companies cross-listed in the US (0.42) and the number of products traded on the exchange (0.40).

In addition to providing suggestive relations between variables of interest, the correlations in Table 4 provide guidance as to potential problems for multicollinearity in the multivariate analyses in the next section below. Further to the correlation evidence, the multivariate analyses below sort out issues of causality between surveillance activity and trading, among other things.

4. Multivariate Analyses

Our multivariate analyses are separated into two parts. The first part, reported in subsection 4.1, considers the *scope* of surveillance activity. Thereafter subsection 4.2 considers the *effectiveness* of such market surveillance.

4.1. The Scope of Market Surveillance

Section 3 presented graphs and univariate correlations indicating a relationship between cross-market surveillance and trading activity, along with other variables in the data. The correlation evidence is suggestive, but does not get at the question of whether surveillance is caused by, and/or causes, trading activity. That is, an increase in surveillance should enhance market confidence and market participation thereby enhancing trading activity. Similarly, markets with greater trading activity have greater revenues from which to invest in surveillance.

In order to address this issue of simultaneous causality between surveillance and trading, we employ three-stage least squares methods whereby trading and single- and cross-market surveillance are simultaneously explained. We control for proxies for exchange size and consider the robustness of the results to outliers in order to make sure the specifications do not pick up a spurious relation between cross-market surveillance and trading due to the sophistication of the market (due to the number of products and cross listed securities, for example). As fully as possible, we control for market characteristics to observe the importance of surveillance over and above the market characteristics. We focus our discussion on Model (1) in Table 6 which comprises the following set of three simultaneous equations:

(1) Scope of Single-market Surveillance = *f* (the degree to which the exchange versus the securities commission is involved in post trade surveillance, the number of trades)

(2) Scope of Cross-market Surveillance = *f* (the degree to which the exchange versus the securities commission is involved in post trade surveillance, the extent of information sharing in neighbour jurisdictions, the number of trades, the number of products traded, the proportion of US cross-listings)

(3) Number of Trades = *f* (the scope of single-market surveillance, the scope of cross-market surveillance, civil law dummy variable, GDP per capita, and the proportion of US cross listings)

In this system of three equations, the scope of single-market surveillance, cross-market surveillance and the number of trades are considered endogenous variables. The other variables are considered exogenous. We also use as an instrument the number of departments involved in surveillance in order to ensure the system of equations is identified in Model (3), as discussed further below. Below, we briefly explain the rationale underlying this specification. Note as well that other specifications were considered and are quite robust to alternative specifications (available upon request).

The degree to which the exchange versus the securities commission is involved in surveillance is likely to have a significant influence on the scope of surveillance in equations (1) and (2) for two possible alternative reasons. On one hand, the exchange has a self-interested financial role in providing the highest integrity market to enhance trading activity and revenues, suggesting there should be a positive relation between the role of the exchange and surveillance. On the other hand, public enforcement may be associated with greater surveillance insofar as public regulators have more severe enforcement powers, and can secure more information from market participants through legal proceedings, etc.[15]

[15] These competing hypotheses are the central focus in La Porta *et al.* (2006) in the context of securities regulation and initial public offerings around the world, and are summarized more completely therein. La Porta *et al.* find evidence in support of the view that private enforcement benefits markets, but not public enforcement, which is consistent with our results presented below.

The extent to which trading activity takes place in a market is likely a predictor of both single- and cross-market surveillance. Jurisdictions with more intensive trading have greater revenues and therefore greater financial ability to put in place more sophisticated technology and better trained staff to be engaged in surveillance. While there are other proxies that are highly correlated with trading volume, such as GDP per capita, market capitalization, etc., we do not simultaneously include these control variables in order to avoid collinearity problems.

In equation (2) for cross-market surveillance we also include a variable for the extent of information sharing across jurisdictions. To a certain degree this variable will be exogenous in that information sharing is due to the neighbouring jurisdiction's predisposition to engage in information sharing. Information sharing, however, is endogenous to cross-border surveillance insofar as only jurisdictions with cross-border listed securities will have a more direct incentive to share information. The specification reported below does not control for this endogeneity issue for three reasons. First, our definition of 'cross-market' concerns anything from cross-product to cross-border trading, and not just cross-border activities. Second, even where exchanges do not have cross-border listed securities, traders may nevertheless engage in trades across jurisdictions, and this renders all exchanges subject to facing a need to share information regardless of the extent of cross-listed and/or foreign securities. Third, even when we did consider instruments to control for potential endogeneity of information sharing vis-à-vis cross-market surveillance (such as location variables), the results did not vary in a statistically significant way; therefore, we report the results without the instruments for this variable.

There is arguably less of a concern with regard to the endogeneity of the variables for the number of products and the proportion of US cross-listed securities in equation (2). Introducing a new product gives rise to (causes) more surveillance, and not vice versa. Cross listing in the US is the decision of the listed company, not the exchange. As such, we treat these explanatory variables as exogenous in the system.

The dependent variable in equation (3) is the number of trades. The right-hand-side variables include controls for civil versus common law and GDP per capita, which is consistent with La Porta *et al*. (1997, 1998, 2006). Equation (3) also controls for the proportion of US cross-listings, which is considered to be exogenous as in equation (2). Both the single- and cross-market surveillance activity in the system of equations is considered endogenous.

Table 6 presents three alternative Models. Model (1) uses trading activity. Models (2) and (3) in Table 6 are very similar, with the exception that Model (2) uses the number of listed companies instead of the number of trades and Model (3) uses market capitalization instead of the number of listed companies. These variables are positively correlated with one another, and as such they are not considered in the same model. The objective in Models (2) and (3) is similar to Model (1): to control for the endogeneity of surveillance vis-à-vis market integrity and exchange performance. Two versions of Model (3) are presented (Models 3a and 3b) in order to show robustness to identification with statistically significant coefficients.

[Table 6 About Here]

The evidence in Table 6 indicates a strong positive association between the role of an exchange in post-trade surveillance and the scope of single-market surveillance. The economic significance is such that a 20% increase in the role of the exchange versus the securities commission (an increase in the ranking by 1 point out of 5) is associated with surveillance of 3 additional types of single-market manipulations, and this effect is significant at the 1% level of significance. Trading activity, however, is statistically unrelated to single-market surveillance in Table 6, consistent with the graphical depiction of the data in Figure 3.

While trading activity and single-market surveillance are statistically uncorrelated, trading activity is strongly positively associated with the scope of cross-market surveillance in a statistically significant way in Table 6. An increase in trading activity by 100 million trades is associated with an increase in the scope of surveillance by 4 types of cross-market surveillance, and this effect is significant at the 1% level. The scope of cross-market surveillance is also affected by the extra of US cross-listings: a 2% increase in US cross-listings is associated with a greater scope in cross-market surveillance by 1 type of market manipulation (and this effect is likewise significant at the 1% level).

Model (1) in Table 6 further indicates trading activity is enhanced by the extent of cross-market surveillance (although not single-market surveillance). An increase in the scope of surveillance by 1 extra type of manipulation is associated with 25 million extra trades per year. The economic significance of this effect is quite large, and as such, we considered the role of influential observations and outliers in driving this result. Cook's distances and leverage plots

consistently pointed to one influential observation, and this observation is graphically apparent in Figure 3: the observation from the exchange with the greatest number of trades. We re-ran the regressions in Table 6 without that one influential observation and found the economic significance reduced by approximately half (and the effect remained statistically significant at the 1% level); in particular, an increase the scope of cross-market surveillance by 1 type of manipulation is associated with 10 million extra trades per year.

As a further alternative specification (not explicitly reported but available upon request), we used a variable for the number of trades per listed company, and the effect continued to remain significant at the 1% level. The economic significance was such that an increase in scope of cross-market surveillance facilitates an extra 9,800 trades per listed company in equation (3). Conversely, in equation (2) the effect of the number of trades per listed company on the scope of cross-market surveillance remained significant at the 1% level, whereby an extra 100,000 trades per company is associated with an extra 8 types of cross-market manipulations investigated.

Other variables in Model (1) equation (3) explaining trading activity are less significant than and/or not as robust as the cross-market surveillance variable. For instance, despite the strong correlation of 0.31 between GDP per capita and the number of trades in Table 5 (which is significant at the 10% level of significance), the multivariate evidence in Table 6 does not support a significant relation between GDP per capita and the number of trades in Model 1. Table 6 also indicates exchanges with a greater proportion of US cross-listings have fewer trades. We note, however, that that effect is not robust and is highly influenced by the inclusion/exclusion of the other variables. However, when we exclude the variable for the proportion of the US cross-listings in Model (1) for equation (3), the other variables are not affected in any statistically significant way.

In sum, Model (1) in Table 6 indicates a strong relation between cross-market surveillance and trading activity, and this relation is stronger and more robust than any other variable considered. As the statistical relation between cross-market surveillance and trading activity is central new finding in this paper, it is worth stressing the nature of this relation that is apparent in the data. The data are cross-country in nature, and do not involve a time series. As such, the data should not be used to infer that an exchange can directly increase its trading activity by increasing the scope of cross-market surveillance. A change in the scope of surveillance without any change in the underlying factors that explain why some countries have

extensive cross-market surveillance and others do not may not result in any notable change in trading activity. Rather, the correct interpretation of the statistical relations in Table 6 is as follows: the data indicate that the factors that explain the additional cross-market surveillance in certain jurisdictions also facilitate additional trading in those jurisdictions by enhancing the confidence of market participants. By contrast, as many exchanges with and without high integrity nevertheless purport to have extensive single-market surveillance, single-market surveillance does not distinguish one exchange from another and is hence unrelated to trading activity.

Models (2) and (3a and 3b) provide analogous regressions to Model (1), albeit with a few main differences that are worth highlighting in regards to the use of the number of listed companies in Model (2) and market capitalization in Model (3a and 3b) instead of the number of trades. In Model (2), the scope of cross-market surveillance is associated with a greater number of listed companies. An increase in cross-market surveillance is by 1 type of manipulation is associated with an increase in the number of companies by 196. As this effect is unrealistically large, we re-ran this regression without the outlier observation (as discussed immediately above), and the economic significance of this effect reduced to 15 newly firms listed associated with an increase in the scope of surveillance by 1 extra type of manipulation. Note as well that there is a negative association between the scope of single-market surveillance and the number of listed companies. Referring back to Table 5, we find a positive correlation of 0.51 between cross-market surveillance and the number of listed companies, and a negative correlation of -0.22 between the number of listed companies and single-market surveillance. One explanation for this somewhat puzzling result is that companies are more inclined to list in lower integrity markets whereby company insiders can trade in ways that are personally beneficial and not subject to detection by surveillance. This effect may also be different for different levels of exchange integrity (i.e., a nonlinear relation), but the extent of data do not enable such tests of nonlinearities.

Model (3a) in Table 6 provides evidence of a positive relation between the scope of cross-market surveillance and market capitalization. An increase in the scope of cross-market surveillance is associated with an increase in market capitalization by US$62.6 billion. The economic significance of this effect is robust to the inclusion/exclusion of outlier observations. As discussed above, this does not necessarily mean that an exchange can increase its market capitalization by increasing cross-market surveillance; rather, it means that in comparing

exchanges around the world, the factors that have given rise to additional cross-market surveillance have also facilitated an increase in market capitalization.

Model (3b) is presented to show robustness to identify the models with statistically significant coefficient estimates. In Model (3b) the variables were selected to ensure each equation was identified in the 3SLS system with statistically significant coefficients. The variables are similar to those in Model (3a), but with a slightly more parsimonious specification. As well, in equation (2) in Model (3b), the number of surveillance departments is used instead of the number of traded products as that coefficient estimate is statistically significant. The estimated coefficient of interest is extremely similar to that in equation (3) of Model (3a): an increase in the scope of cross-market surveillance is associated with an increase in market capitalization by US$53.1 billion, and this result continues to be significant at the 1% level, and the scope of single-market surveillance continues to be statistically insignificant. Broadly speaking, selecting identifying variables for their statistical significance in the set of equations does not impact the statistical significance of the estimated coefficients relating single- and cross-market surveillance to market activity. There are some differences in the economic significance, but not to the degree that changes our qualitative conclusions about the role of cross-market surveillance in exchange operation.[16]

Overall, Models (1) – (3) provide strong evidence that exchange quality (number of trades, listed companies and market capitalization) and cross-market surveillance are highly related. Controlling for simultaneous causality to the fullest extent possible given the limitations with the sample size, the data are consistent with the view that exchanges can enhance their market integrity by increasing the scope of their cross-market surveillance. The regressions were quite robust (except where otherwise noted), and have fairly high adjusted R^2 values explaining up to 60% of the variation in the dependent variables.

Section 5 below qualitatively discusses limitations and extensions associated with the regression evidence on the scope of surveillance and related issues not addressed by the data. But

[16] Also, we considered mining equations (1) and (2) for more parsimonious specifications that enabled more statistically significant coefficient estimates for the identifying variables. None of the specifications considered warranted a change in the inferences drawn from the data as discussed above. Alternative specifications are available upon request.

before proceeding to that discussion, we first address the empirical issue of factors related to international differences in the effectiveness of surveillance in subsection 4.2.

4.2. The Effectiveness of Market Surveillance

In this subsection we provide OLS and ordered logit estimates of the effectiveness of market surveillance. The dependent variables in this section are the qualitative rankings on the 1 (low effectiveness) – 5 (high effectiveness) scale.[17] These data to some degree are of course subject to a self-reporting bias, but nevertheless provide guidance as to the factors that affect the self-satisfaction of surveillance authorities with the quality of the work they carry out. We present 7 models (labeled Models 4 – 10 in Table 7) with different specifications of the dependent and explanatory variables.

[Table 7 About Here]

Models (4) – (6) use the average ranking variable for all elements of effectiveness defined in Table 3, In Models (7) – (10) the dependent variable is defined differently. Model (7) uses the ranking for real time surveillance, while Models (8), (9) and (10) use the rankings for cross-product, cross-market and cross-border surveillance, respectively. Models (7) – (10) use ordered logit models, not OLS, as the dependent variable is an ordinal ranking variable that takes on a finite number of discrete variables. Models (4) – (6) use an average ranking and hence can assume a continuous range of values such that OLS was used. Tobit regressions were also estimated for Models (4) – (6) (since the dependent variable is bounded), but since the regression results were not materially different we only present the OLS estimates (Tobit estimates are available upon request).

Table 7 Models (4) – (6) indicate jurisdictions are much more inclined to provide a higher effectiveness rating where the exchange is more directly involved in surveillance. While La Porta *et al.* (2006) do not examine market surveillance, the finding herein that exchanges are more effective at market surveillance than securities commissions is nevertheless consistent with evidence on provided in La Porta *et al*. (2006) in regards to enforcement of securities laws. The

[17] Figure 4 provided companion evidence on effectiveness of surveillance; however, as discussed *supra* note 15 and accompanying text, that data was limited in that only 13 jurisdictions provided data used in Figure 4 and therefore those data are not used in the regression analyses in this subsection.

data generally indicate a 1-point increase (out of 5) in the role of the exchange versus the securities commission is associated with a 0.7 increase in the effectiveness rating.

Model (6) also indicates a positive association between information sharing arrangements and effectiveness; however, that effect is not robust to the specifications in Models (4) and (5). Model (3) further indicates a positive association between effectiveness and the average value of trades and the number of products traded on the exchange. One possible explanation for these latter results is that those exchanges have greater operating budgets for surveillance technology and staff.

Consistent with Models (4) – (6), Model (7) indicates a positive association between the role of the exchange versus the securities commission and the effectiveness of real time surveillance. However, note that the role of the exchange is not associated with effectiveness for cross-product, cross-market or cross-border surveillance. Effectiveness of cross-market and cross-border surveillance is positively associated with the scope of information sharing arrangements, and that effect is significant at the 10% level in Model (9) for cross-market and at the 1% level for cross-border in Model (10). Recall as well from Table 4 Panel B and Figure 5 that securities commissions are more likely than exchanges to engage in information sharing arrangements and share a greater scope of information pertaining to surveillance.

In sum, the data introduced in this paper present a picture whereby jurisdictions are more satisfied with domestic single-market surveillance where the exchange plays a primary role in the surveillance. Exchanges, however, are less adept than securities commissions at establishing information sharing arrangements. Likewise, jurisdictions with exchanges playing a primary role in surveillance over securities commissions are likewise less satisfied with the effectiveness of their cross-market surveillance than their single-market surveillance. Therefore, there appears to be ample scope for exchanges to expand their information sharing arrangements; this in turn would thereby facilitate trading volume.

5. Limitations and Extensions

This paper presented a first-ever direct comparison of market surveillance across financial markets around the world. The data are nevertheless limited in scope. In this study we were able to obtain confidential private data from 25 jurisdictions from North, Central and South

America, Western and Eastern Europe, Africa and Asia. Our empirical analyses presented a variety of robustness checks and controls for potential endogeneity and collinearity, among other things. Additional robustness checks were discussed and are available upon request. For instance, we considered dropping certain exchanges from the data as potential outliers. Any single exchange in the data did not materially influence the statistical significance of the results, although we did discuss cases in which economic significance was affected by the exclusion of the largest exchange in the data. As well, excluding groups of exchanges at the same time was not possible with the limited degrees of freedom.

In subsection 4b we considered the possibility of self reporting biases in regards to the respondent's perceptions of their own surveillance effectiveness. That type of self-reported information is nevertheless informative as it enables a qualitative assessment of where exchanges are at in terms of their own self satisfaction, and what drives differences in the level of satisfaction across exchanges. All of the exchanges were informed about, and assured of the confidentiality of their data, which we believe minimizes self-reporting biases. We also noted that the perceptions were very consistent with other hard data provided by the exchanges and commissions. For example, Figure 4 and Table 4 Panel B provided very robust findings about surveillance effectiveness in terms of self-assessment and the proportion of manipulations detected relative to trading activity.

Ideally, one would like to expand the number of jurisdictions, but at this stage our data comprise all exchanges and securities commissions that were willing to participate given the extent and sensitivity of information that was sought. Future research could also examine issues in surveillance in relation to changes in technology and the structure of stock exchanges around the world.

For the purposes of this paper, we concentrated on an exchange's or securities regulator's surveillance of potentially manipulative trading practices on both a single-market and cross-market level, which is usually carried out with the use of sophisticated computer surveillance systems. While we recognize that there are other factors which contribute to the effectiveness of surveillance activities, such as an educated and diligent surveillance staff, investigation and enforcement powers and a management with political will and not subject to conflicts of interest (Pritchard, 2003), we believe that the extent to which trading is now wholly automated make surveillance activities very much dependent upon system capabilities. It is therefore not within

the scope of this paper to analyze exchange surveillance on the more general level, but our survey data we nevertheless as generalizable as possible. Further research could shed additional light on international difference in surveillance effectiveness.

6. Conclusions

Market manipulation refers to a wide range of trading practices that distort prices and inhibit market integrity and efficiency, and the detection of such practices is carried out by market surveillance. This paper presented a first-ever direct comparison of the scope of single- and cross-market surveillance of such manipulative practices around the world. The data examined also enabled consideration of the effectiveness of single- and cross-market surveillance.

The new data introduced in this paper indicated a number of new insights about international differences in market surveillance in relation to market quality and integrity. On one hand, the data showed that jurisdictions with exchanges as SROs are more intensive in regards to single-market surveillance than securities commissions. On the other hand, SRO exchanges do not play a greater role in cross-market surveillance. Cross-market surveillance is more effective with information sharing arrangements, and securities commissions are more likely to engage in information sharing than exchanges.

The empirical analyses in this paper showed that single-market surveillance is uncorrelated with trading activity, while cross-market surveillance is highly positively correlated with trading activity. This evidence was robust in terms of simple univariate evidence as well as in the context of simultaneous equation analyses that control for the endogeneity of surveillance activities vis-à-vis trading.

As at 2005, there is a dearth of cross-market surveillance in most jurisdictions around the world. The data in this paper are consistent with the view that there is ample scope for jurisdictions to expand their cross-market surveillance. Such a change would stimulate market integrity, enhance investor confidence, and facilitate trading activity. Future research could fruitfully examine issues involving market integrity alongside the expanding scope of cross-market surveillance, changes in the structure of exchanges, and the willingness to coordinate information sharing around the world.

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Figure 1. Regions Represented in the Data and Exchanges versus Regulators

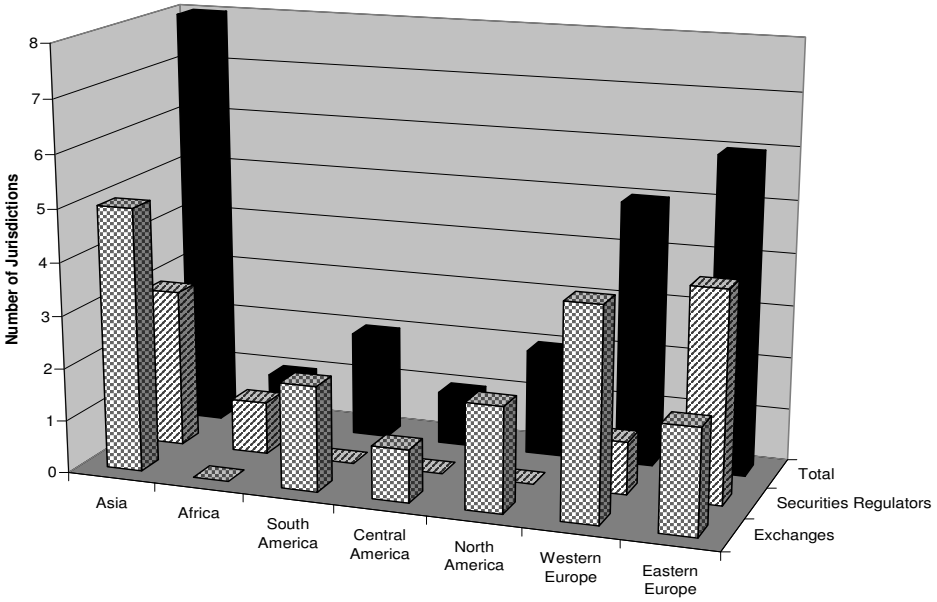

Figure 1 summarizes the jurisdictions in the data. In total there are 25 jurisdictions. Securities regulators provided the data from some jurisdictions and exchange provided the data in others. There is no overlap in the data from securities commissions and exchanges in the same jurisdiction. More precise exchanges or countries are not indicated due to confidentiality restrictions to obtain the data.

Figure 2. Scope of Single- and Cross-Market Surveillance Suspected or Detected

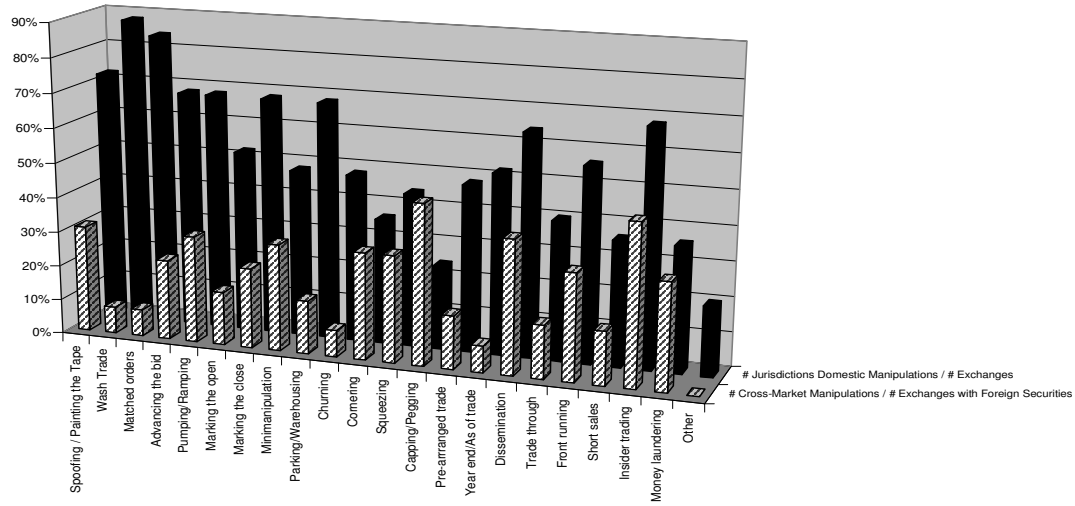

Figure 2 summarizes the scope of single- and cross-market surveillance suspected or detected for all 25 jurisdictions in the sample. The scope of surveillance is defined as follows: for each type of manipulation (summarized in Table 1), a dummy variable of 0 or 1 is assigned depending on whether or this issue is investigated by the regulator and that these variables are summed across the market. The scope of single-market surveillance is indicates in solid bars in the back row and is expressed as a percentage of the 25 jurisdictions in the data. The scope of cross-market surveillance is indicated in hatched bars in the front row and is expressed as a percentage of the 13 jurisdictions with foreign based companies listed on their exchange. Note that cross-market also refers to cross-product and as such the scope of cross market surveillance is if anything overstated relative to the need for cross-market surveillance in this figure as all 25 exchanges traded more than 1 product on their exchange.

Figure 3. Relationship between Scope of Single- and Cross-Market Surveillance and Trading Activity

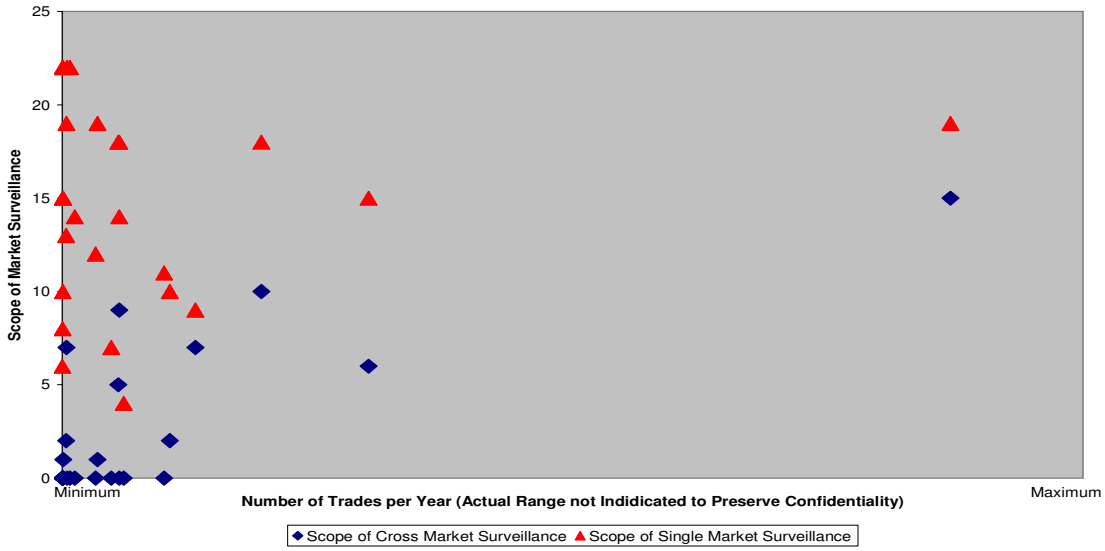

Figure 3 plots the scope of single- and cross-market surveillance (the sum of dummy variables equal to 1 for each type of manipulation in Table 1 for each jurisdiction) against the annual number of trades in the jurisdiction. The minimum and maximum values for trading activity are not indicated to maintain the confidentiality of the exchanges.

Figure 4. Median Number of Manipulations (All Types of Manipulations) / Trades Detected (Domestic and Cross Market)

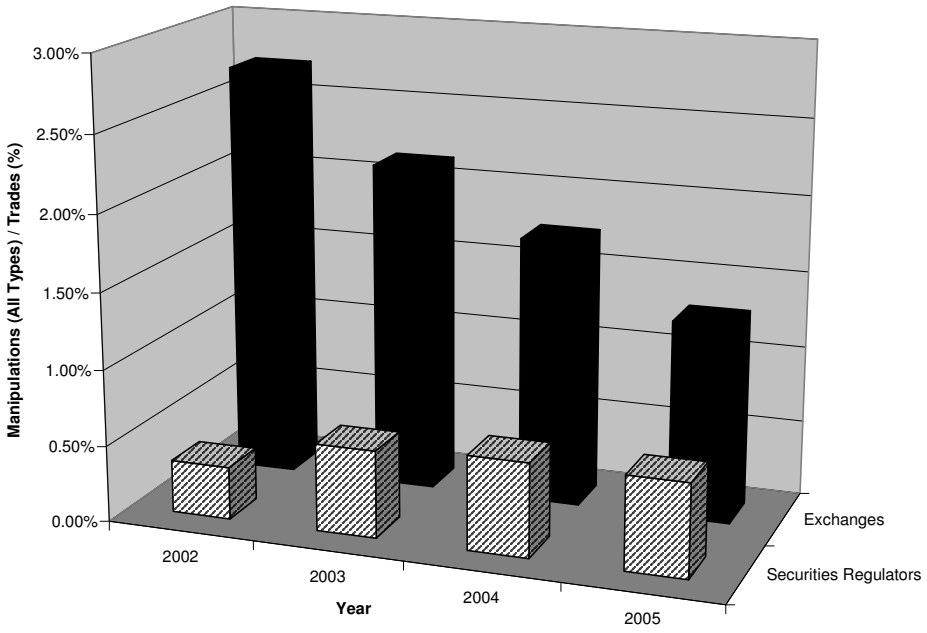

Figure 4 indicates the median number of manipulations detected in each jurisdiction as a percentage of the number of trades in the jurisdiction for each year 2002-2005. The data were provided by 7 exchanges (2 Americas, 2 Asia and 3 European) and 6 securities commissions (3 Asian and 3 European).

Figure 5. Information Sharing Arrangements Across Jurisdictions

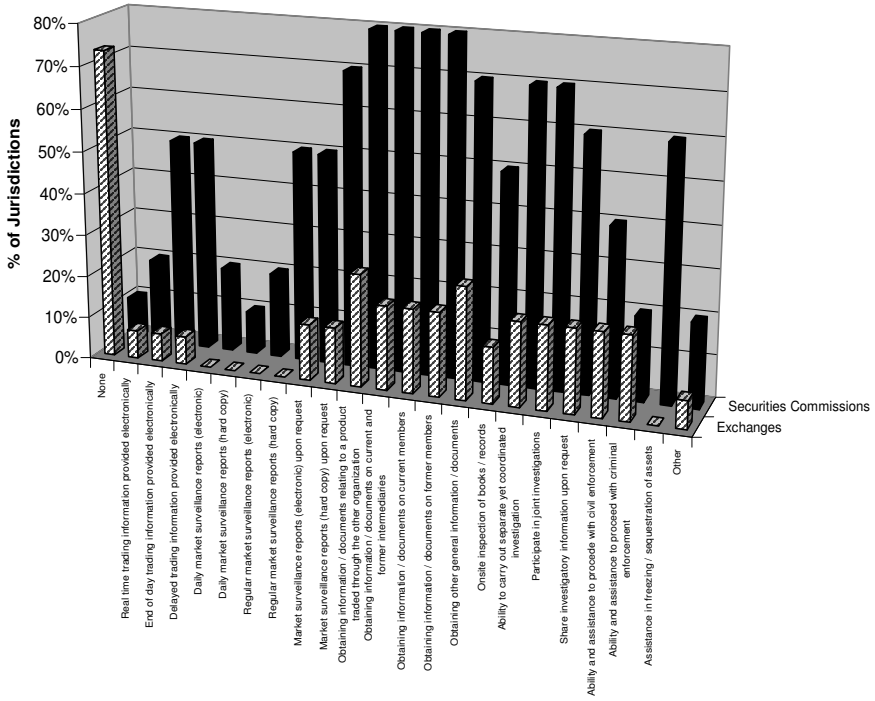

Figure 5 summarizes the types of information sharing arrangements for each of the 25 jurisdictions in the data. The data are expressed as a percentage of the number of exchanges (16 in the data) and securities commissions (9 in the data).

Table 1. Indicators of Market Manipulation

This table summarizes primary different types of market manipulation that is considered by market surveillance authorities (stock exchanges in the case of SROs or securities commissions / regulatory authorities for other exchanges) for both single-and cross-market surveillance.

Advancing the bid	Increasing the bid for a security or derivative to increase its price
Capping [Pegging]	Effecting transactions of instrument underlying an option shortly before the options expiration date to prevent a rise/decline in price of the instrument so previously written call/ put options will expire worthless, protecting premiums previously received.
Churning	Frequent and excessive trading of a clients account
Commodity flows to delivery points (1)	Large shipments of the commodity flow to the delivery point immediately prior to and during the delivery period. Moreover, shipments *from* the delivery point are abnormally small during the delivery period as traders amass stocks to make delivery.
Commodity flows to delivery points (2)	Delivery point receipts are abnormally small *after* the delivery period because of the glut of the commodity at the delivery point that results from the artificially large receipts during the delivery period. Shipments from the delivery point increase after the end of a corner as some of the excess shipments are returned to their original sources and delayed shipments are released.
Contract Prices at Different Expirations	The price of the manipulated contract is abnormally high relative to the price of the contracts expiring later (that is, the price of the "front month" contract is artificially high relative to the deferred or "back month" contracts).
Corner	Securing control of the bid/demand-side of both the derivative and the underlying asset. Dominant position can be exploited to manipulate the price of the derivative and/or the asset.
Dissemination	Dissemination of false or misleading market information
Front running	A transaction to the detriment of the order giver on the basis of and ahead of an order which he is to carry out for another
Insider trading	When a trade has been influenced by the privileged possession of corporate information or price sensitive market order that has not yet been made public
Marking the close	Buying or selling securities or derivatives contracts at the close of the market in an effort to alter the closing price of the security or derivatives contract
Marking the open	The placing of purchase orders at slightly higher prices/sale orders at lower prices to drive up/suppress the price of the securities when the market opens
Matched orders	Transactions where both buy and sell orders are entered at the same time with the same price and quantity by different but colluding parties.
Mini Manipulation	Trading in the underlying security of an option in order to manipulate its price so that the options will become in-the-money
Money laundering	Creating the appearance that money value obtained from serious crimes, such as drug trafficking or terrorist activity, originated from a illegitimate source
Option Expiration Date	Stock Price or Volume Changes at Option *Expiration* Date: unusual changes in the stock price and/or trading volume around the date of expiration of the option
Option Introduction Date	Stock Price or Volume Changes at Option *Introduction* Date: unusual changes in the stock price and/or trading volume around the date of introduction of the option
Parking or warehousing	Hiding the true ownership of securities / underlying by creating a set of fictitious transactions and trades.
Pre-arranged trade	Transactions in which the price, terms or contra-side have been pre-arranged.
Prices of Related Products at Delivery Locations	The expiring futures price and the spot price at the delivery market are abnormally high relative to prices at other, non-deliverable locations; the prices of related products; and prices of non-deliverable grades of the same commodity.
Pump & dump/Ramping	Buying at increasingly higher prices. Securities are sold in the market (often to retail customers) at the higher prices
Short Sales	A market transaction in which an investor sells stock he does not have or he has borrowed in anticipation of a price decline. This is not per se manipulative but is considered manipulative in some jurisdictions in conjunction with other types of actions; for example, in Canada, under UMIR Rule 6.2(viii)(ix), a short sale cannot be at a price that is less than the last sale price.
Spoofing/Painting the tape	Engaging in a series of transactions reported on a public display facility to give the impression of activity or price movement in a security (e.g. misleading trading, switches, giving up priority, layering bid/asks, fictitious orders for the case of spoofing, etc.)
Spot and Futures Prices at Different Delivery Points	The spot price in the delivery market declines both absolutely and relative to deferred month futures prices and spot prices at other locations around the end of futures trading or the delivery period.
Squeeze	Taking advantage of a shortage in an asset by controlling the demand-side and exploiting market congestion during such shortages in a way as to create artificial prices.
Strike Price and Stock Price at Expiration	Option Strike Price equals (or is close to) Underlying Stock Price at Option Expiration
Trade through	The completion of a client's order at a price inferior to the best posted bid or ask. This is not per se considered manipulative, but many commentators (and the surveillance authorities themselves) did consider it manipulative because the market maker who received the order is unable or unwilling to fill it at the best posted bid or ask price, and hence the trade is instead executed at the market maker's price.
Wash sale	Improper transaction in which there is no genuine change in actual ownership of the security or derivative contract
Year End /As Of Trades	Transactions executed at a particular date to establish gains or losses or conceal portfolio losses or true positions.

Table 2. Comparison Tests for Market Capitalization of Jurisdictions Included versus Excluded from Data

This table presents the means and medians of the equity market capitalization of the exchanges included versus excluded from the sample. Values expressed in millions of 2005 US dollars. Means and median tests are based on procedures at http://www.fon.hum.uva.nl/Service/Statistics.html Market capitalization data are from the World Federation of Exchanges http://www.world-exchanges.org/ There are 5 exchanges in the data from the Americas, 8 exchanges from Asia, and 12 Exchanges from Europe/Africa. The difference tests are provided for each category, but statistical significance is difficult to interpret given the small number of observations in each category. Median values and other more precise details or categories are not provided in order to maintain the confidentiality on the exchanges that provided the surveillance data used in the subsequent tables.

		(1) Included in Data	(2) Excluded from Data	Ratio Values (1) / (2)	P-Value for Difference Tests for Means and Medians
Americas	Mean	449,992.06	1,726,331.01	0.26	p <= 0.52
	Median	---	---	4.98	p <= 0.36
Asia	Mean	419,236.59	505,181.51	0.83	p <= 0.85
	Median	---	---	4.06	p <= 0.30
Europe/Africa	Mean	253,935.18	145,153.08	1.75	p <= 0.25
	Median	---	---	0.56	p <= 1.00
Total Sample	Mean	339,430.95	477,033.61	0.71	p <= 0.88
	Median	---	---	3.98	p <= 0.16

Table 3. Definitions of Variables

This table defines the variables used in the empirical analyses. Data were provided by 16 stock exchanges and 9 securities commissions from North, Central and South America, Western and Eastern Europe, Africa and Asia (see Figure 1).

Surveillance Variables	
Scope of Single-market Surveillance	The sum of dummy variables equal to 1 where surveillance is carried out over each of the market manipulative practices identified (e.g., spoofing, painting the tape, wash sales, etc.) on a single-market basis. The manipulative practices are as defined in Table 1.
Scope of Cross-market Surveillance	The sum of dummy variables equal to 1 where surveillance is carried out over each of the market manipulative practices identified in the jurisdiction (e.g., spoofing, painting the tape, wash sales, etc.) on a cross-market basis (including cross-product, cross-exchange and international). The manipulative practices are as defined in Table 1. Any type of single-market manipulation can also be a cross market manipulation (e.g., for a security that is listed on more than 1 exchange.)
Exchange vs Commission Surveillance -- Establish Rules	The average ranking (5=exchange, 1=securities commission) for establishing listing standards, establishing market trading rules, establishing rules on cross-product trading, establishing rules on cross-market trading, and establishing rules on cross-border trading. Where appropriate, the subcomponent of the ranking is used.
Exchange vs Commission Surveillance -- Monitoring	The average ranking (5=exchange, 1=securities commission) for monitoring listing standards, real time surveillance, post trade surveillance, monitoring of rules on cross-product trading, monitoring of rules on cross-market trading, and monitoring of rules on cross-border trading. Where appropriate, the subcomponent of the ranking is used.
Exchange vs Commission Surveillance -- Enforcement	The average ranking (5=exchange, 1=securities commission) for enforcing listing standards, enforcement market trading rules, enforcement of rules on cross-product trading, enforcement of rules on cross-market trading, and enforcement of rules on cross-border trading. Where appropriate, the subcomponent of the ranking is used.
Exchange vs Commission Real Time Surveillance	Ranking of exchange's role (5=exchange 1=securities commission) in carrying out real time surveillance
Exchange vs Commission Post Trade Surveillance	Ranking of exchange's role (5=exchange 1=securities commission) in carrying out post trade surveillance
Exchange	A dummy variable equal to 1 where the exchange was responsible for primary market surveillance in the jurisdiction as an SRO.
Number of Surveillance Departments	The number of departments deemed to have at least some responsibility for carrying out market surveillance.
Effectiveness of Surveillance	Ranking of ability (1=unable 5=excellent) to carry out surveillance on the following matters: real time surveillance, cross-product trading surveillance, cross-market trading surveillance, cross-border trading surveillance, OTC trading surveillance, ability to replay the market, ability to track changes in price or volume of a particular security or derivatives and underlying, ability to track changes in price or volume of a related scurrility or derivatives and underlying, identify concentration of ownership, provide alerts and information concerning suspicious transactions, provide alerts and information concerning suspicious cross-market transactions, provide alerts and information concerning cross-border transactions, identify potentially large market losses / gains incurred by members or large market participants, ability to share data with other markets, ability to share system with other markets, identify parties to the transaction, provide analysis or relations between parties to the suspicious transactions, ability to analyze/study alerts and reports with other markets.
Information Sharing Arrangements	Sum of dummy variables equal to 1 for types of information contained in information sharing arrangements: (1) identity of the member/intermediary, (2) identity of the dealer, (3) identities of the member/intermediary, (4) trading activity, (5) positions held by the member/intermediary, (6) details of investigation of the member/intermediary, (7) details of investigation of dealers or clients of the member/intermediary, (8) details of disciplinary action against the member/intermediary, (9) details of disciplinary action against the dealers or clients of the member/intermediary.
Specifics in Information Sharing Arrangements	Dummy variables equal to one where the jurisdiction has information sharing arrangements on each of the following categories: real time trading information provided electronically, end of day trading information provided electronically, delayed trading information provided electronically, daily market surveillance reports (electronic), daily market surveillance reports (hard copy), regular market surveillance reports (electronic), regular market surveillance reports (hard copy), market surveillance reports (electronic) upon request, market surveillance reports (hard copy) upon request, obtaining information / documents relating to a product traded through the other organization, obtaining information / documents on current and former intermediaries, obtaining information / documents on current members, obtaining information / documents on former members, obtaining other general information / documents, onsite inspection of books / records, ability to carry out separate yet coordinated investigation, participate in joint investigations, share investigatory information upon request, ability and assistance to proceed with civil enforcement, ability and assistance to proceed with criminal enforcement, assistance in freezing / sequestration of assets, and other.

Table 3 continues on the next page…

Table 3 (Continued)	
Market Variables	
Number of Trades	The number of equity trades in 2005.
Number of Shares Traded	The number of shares traded in 2005.
Average Turnover	The average daily turnover in 2005.
Average Value of Trades	The average value of trades in 2005, expressed in US dollars.
Total Value of Trades	The total value of trades in 2005, expressed in US dollars.
Number of Companies	The number of companies listed on the stock exchange as at December 2005.
Market Capitalization	The market capitalization of the stock exchange as at December 2005, expressed in US dollars.
Proportion of Foreign Companies	The proportion of foreign companies listed on the domestic stock exchange as at December 2005.
Proportion of Foreign Trades	The proportion of trades of foreign listed firms on the domestic stock exchange in 2005.
Proportion of US Cross Listings	Proportion of companies cross-listed in the US.
Number of Products	The number of products offered by the exchange (including derivatives, bonds, etc.).
Country Variables	
Civil Law	A dummy variable equal to 1 for civil law jurisdictions and 0 for common law jurisdictions.
GDP / Capita	The GDP per capita in 2005 of the country in which the exchange is based, expressed in 2005 US dollars.

Table 4. Panel A. Summary Statistics for Full Sample

This table presents the mean, median, standard deviation, minimum and maximum value for variables as defined in Table 3. Data were provided on a confidential basis from 25 jurisdictions around the world. To maintain this confidentiality, medians, minimums and maximums are not indicated for selected variables. For certain variables data are only available for 24 of the 25 jurisdictions. Variables are as defined in Tables 1 and 3.

Variable	Mean	Median	Standard Deviation	Minimum	Maximum	Number of Jurisdictions
Surveillance Characteristics						
Scope of Single-market Surveillance	14.48	15	5.39	4	22	25
Scope of Cross-market Surveillance	2.60	0	4.11	0	15	25
Exchange vs Commission Surveillance -- Establish Rules	2.59	2.67	0.87	1.17	4.17	25
Exchange vs Commission Surveillance – Monitoring	2.68	2.86	0.89	0.71	4.71	25
Exchange vs Commission Surveillance – Enforcement	2.49	2.60	1.19	0.53	5	25
Exchange vs Commission -- Real Time Surveillance	3.96	4	1.06	1	5	25
Exchange vs Commission Post Trade Surveillance	3.56	4	1.23	1	5	25
Information Sharing Arrangements	4.16	4	3.29	0	9	25
Number of Surveillance Departments	1.60	1	1.32	1	7	25
Average Effectiveness Ratings for Surveillance	2.15	2.38	1.25	0	3.75	24
Market Variables						
Number of Trades (Thousands)	37367.95		80527.01			25
Number of Shares Traded (Millions)	367558.79		1146934.03			25
Average Daily Turnover (Millions)	2286.20		4661.17			25
Average Value of Trades (Thousands)	32.82		84.31			25
Total Value of Trades (Millions)	337568.13		516366.54			25
Number of Listed Companies	565.96		773.54			25
Market Capitalization (Millions USD)	339430.95		429486.28			25
Proportion of Foreign Shares	0.05	0.00	0.12			25
Proportion of Foreign Shares Traded	0.03	0.00	0.05			25
Proportion of Companies Cross Listed in the US	0.02	0.02	0.03			25
Number of Products Traded on the Exchange	7.36	8.00	2.72			25
Country Variables						
Civil Law	0.68	1.00	0.48			25
GDP / Capita	17568.00		11852.77			25

Table 4. Panel B. Summary Statistics for Exchanges versus Securities Commissions

This table presents the mean and median values for variables as defined in Table 3 for the 16 exchange based jurisdictions and 9 securities commission based jurisdictions. To maintain confidentiality, medians are not indicated for certain variables. There is no overlap of exchanges and securities commissions in the same jurisdiction. Variables are as defined in Tables 1 and 3.

	Exchanges			Securities Commissions		
Variable	Mean	Median	Number of Jurisdictions	Mean	Median	Number of Jurisdictions
Surveillance Characteristics						
Scope of Single-market Surveillance	15.00	15.00	16	13.70	12.00	9
Scope of Cross-market Surveillance	2.80	0.00	16	2.30	0.00	9
Exchange vs Commission Surveillance -- Establish Rules	2.78	3.00	16	2.32	2.42	9
Exchange vs Commission Surveillance – Monitoring	2.99	2.86	16	2.21	2.50	9
Exchange vs Commission Surveillance – Enforcement	2.73	2.80	16	2.12	2.10	9
Exchange vs Commission -- Real Time Surveillance	4.40	4.00	16	3.30	3.00	9
Exchange vs Commission -- Post Trade Surveillance	4.00	4.00	16	2.90	3.00	9
Information Sharing Arrangements	3.80	4.00	16	4.70	4.50	9
Number of Surveillance Departments	1.93	1.00	16	1.10	1.00	9
Average Effectiveness Ratings for Surveillance	2.45	2.65	16	1.66	1.85	8
Market Variables						
Number of Trades (Thousands)	51777.78		16	15753.22		9
Number of Shares Traded (Millions)	170425.72		16	663258.40		9
Average Daily Turnover (Millions)	3305.53		16	757.20		9
Average Value of Trades (Thousands)	50.69		16	7.82		9
Total Value of Trades (Millions)	446803.15		16	173715.60		9
Number of Listed Companies	520.60		16	634.00		9
Market Capitalization (Millions USD)	370038.70		16	293519.31		9
Proportion of Foreign Shares	0.07	0.01	16	0.03	0.00	9
Proportion of Foreign Shares Traded	0.04	0.00	16	0.01	0.00	9
Proportion of Companies Cross Listed in the US	0.03	0.02	16	0.02	0.00	9
Number of Products Traded on the Exchange	8.53	9.00	16	5.60	5.50	9
Country Variables						
Civil Law	0.80	1.00	16	0.50	0.50	9
GDP / Capita	19493.33		16	14680.00		9

Table 4. Correlation Matrix

This table presents correlation coefficients across selected variables defined in Tables 1 and 3. Correlations statistically significant at the 5% level of significance are highlighted in underline font.

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
	Surveillance Characteristics																						
(1)	Scope of Single-market Surveillance	1.00																					
(2)	Scope of Cross-market Surveillance	0.22	1.00																				
(3)	Average Effectiveness Ratings for Surveillance	0.02	-0.03	1.00																			
(4)	Exchange vs Commission Surveillance -- Establish Rules	-0.07	0.02	0.48	1.00																		
(5)	Exchange vs Commission Surveillance -- Monitoring	0.20	0.10	0.55	0.80	1.00																	
(6)	Exchange vs Commission Surveillance -- Enforcement	0.09	0.03	0.54	0.80	0.91	1.00																
(7)	Exchange vs Commission Real Time Surveillance	0.25	-0.01	0.23	0.54	0.74	0.60	1.00															
(8)	Exchange vs Commission Post Trade Surveillance	0.46	0.11	0.23	0.36	0.63	0.44	0.82	1.00														
(9)	Information Sharing	-.022	-0.15	0.09	-0.18	0.12	0.10	0.02	0.02	1.00													
(10)	Number of Surveillance Departments	0.23	0.47	0.16	0.12	0.07	0.06	0.12	0.18	-0.24	1.00												
	Market Characteristics																						
(11)	Civil Law	0.11	-0.01	0.26	0.21	0.45	0.31	0.37	0.29	0.19	-0.08	1.00											
(12)	GDP / Capita	-0.29	0.27	0.28	0.52	0.42	0.27	0.09	0.11	0.13	-0.05	0.31	1.00										
(13)	Number of Trades (Thousands)	0.13	0.77	0.14	0.15	0.17	0.14	0.04	0.13	-0.12	0.75	0.13	0.26	1.00									
(14)	Number of Shares Traded (Millions)	0.04	0.30	-0.02	0.04	0.08	0.04	0.34	0.37	0.01	0.18	-0.31	-0.02	0.19	1.00								
(15)	Average Daily Turnover (Millions)	0.24	0.14	-0.20	-0.04	0.09	-0.05	0.07	0.14	-0.25	-0.02	0.20	0.37	0.15	-0.10	1.00							
(16)	Average Value of Trades (Thousands)	0.20	-0.10	0.23	-0.02	0.02	0.05	0.03	0.09	-0.24	0.02	0.20	-0.02	-0.10	-0.11	0.11	1.00						
(17)	Total Value of Trades (Millions)	-0.13	0.62	0.36	0.39	0.49	0.42	0.16	0.19	0.00	0.18	0.17	0.65	0.58	0.06	0.29	-0.04	1.00					
(18)	Number of Listed Companies	-0.22	0.51	-0.24	-0.04	-0.25	-0.24	-0.48	-0.35	-0.19	0.22	-0.38	0.39	0.43	0.07	0.09	-0.06	0.46	1.00				
(19)	Market Capitalization (Millions USD)	-0.21	0.58	0.18	0.25	0.23	0.19	-0.11	-0.04	-0.07	0.09	-0.01	0.66	0.44	0.05	0.22	0.11	0.88	0.76	1.00			
(20)	Proportion of Foreign Shares	0.16	0.25	0.13	0.06	0.14	-0.01	0.03	-0.09	0.02	-0.03	0.24	0.11	-0.12	-0.19	-0.07	-0.01	0.02	-0.10	0.05	1.00		
(21)	Proportion of Foreign Shares Traded	-0.01	0.03	0.48	0.60	0.58	0.38	0.32	0.30	0.17	-0.09	0.29	0.64	-0.09	-0.19	0.03	-0.02	0.34	-0.12	0.23	0.47	1.00	
(22)	Proportion of Companies Cross Listed in the US	0.04	0.42	0.15	0.12	0.11	-0.06	0.01	0.00	-0.05	0.04	0.13	0.32	0.09	0.13	-0.05	0.16	0.26	0.23	0.39	0.79	0.38	1.00
(23)	Number of Products Traded on the Exchange	0.11	0.40	0.50	0.61	0.58	0.43	0.39	0.42	-0.37	0.32	0.41	0.46	0.42	-0.01	0.01	0.17	0.57	0.15	0.47	0.28	0.49	0.41

Table 5. 3SLS Regression Evidence of Market Surveillance, Trading Volume, Listings and Market Capitalization

This table presents 3SLS regression analyses of the determinants of the scope of single- and cross-market surveillance activities, in conjunction with trading volume (Model 1), number of listed companies (Model 2) and market capitalization (Models 3a and 3b). Variables are as defined in Tables 1 and 3. t-statistics are in parentheses. *, **, *** Statistically significant at the 10%, 5% and 1% levels, respectively. White's (1980) heterockedasticity consistent covariance matrix estimator is used in all regressions.

	Model (1)			Model (2)			Model (3a)			Model (3b)		
	Scope of Single-market Surveillance	Scope of Cross-market Surveillance	Number of Trades	Scope of Single-market Surveillance	Scope of Cross-market Surveillance	Number of Listed Companies	Scope of Single-market Surveillance	Scope of Cross-market Surveillance	Market Capitalization	Scope of Single-market Surveillance	Scope of Cross-market Surveillance	Market Capitalization
Constant	3.144 (0.715)	-0.914 (-0.403)	46211.474 (0.651)	5.448 (1.090)	-3.344 (0.819)	1365.391 (2.032)**	6.541 (1.356)	0.275 (0.046)	359171.179 (1.036)	7.707 (1.673)*	-1.204 (-1.111)	246846.058 (0.742)
Surveillance Characteristics												
Exchange vs Commission -- Post Trade Surveillance	2.942 (2.660)***	0.407 (1.005)		2.560 (2.188)**	0.995 (1.368)		2.395 (2.136)**	0.476 (0.604)		2.214 (1.993)**		
Information Sharing		-0.026 (-0.219)			-0.065 (-0.297)			-0.200 (-0.636)				
Scope of Single-market Surveillance			-3802.281 (-0.970)			-86.802 (-1.975)**			-27960.839 (-1.324)			-20636.407 (-1.031)
Scope of Cross-market Surveillance			25130.403 (7.376)***			196.179 (5.338)***			62603.243 (3.003)***			53155.849 (2.645)***
Market Characteristics												
Number of Trades	0.111E-04 (0.684)	0.414E-04 (7.874)***										
Number of Companies				-0.739E-03 (-0.390)	0.004 (2.567)***							
Market Capitalization							-0.244E-05 (-0.754)	0.524E-05 (1.657)*		-0.0286E-05 (-0.888)	0.453E-05 (2.248)**	
Civil Law			4908.685 (0.402)			-187.002 (-0.951)			-67439.870 (0.617)			-76513.763 (-0.718)
GDP per Capita			-0.140 (-0.216)			0.008 (0.804)			14.847 (2.354)**			17.267 (2.890)***
Number of Products		-0.115 (-0.443)	1936.579 (0.364)		-0.003 (0.008)			-0.104 (-0.186)				
Number of Surveillance Departments											1.052 (2.642)***	
Proportion of US Cross-Listings		56.207 (3.383)***	-1347926.10 (-3.363)***		28.882 (1.163)	-4940.392 (-1.158)		21.794 (0.800)	253023.033 (0.122)		24.587 (1.195)	
Diagnostics												
Number of Observations	25	25	25	25	25	25	25	25	25	25	25	25
Adjusted R^2	0.039	0.634	0.428	0.082	0.270	0.059	0.102	0.243	0.483	0.105	0.479	0.548
F Statistic	1.49	9.33***	3.99***	2.07	2.78**	1.30	2.36	2.54*	5.48***	2.41**	8.38***	8.29***
Loglikelihood	-73.871	-51.386	-302.692	-73.309	-60.030	-194.126	-73.028	-60.488	-344.637	-72.983	-58.298	-344.210
Akaike Information Statistic	6.150	4.591	24.775	6.105	5.282	16.010	6.082	5.319	28.051	6.079	4.984	27.937

Table 6. OLS and Ordered Logit Regression Analyses of Effectiveness of Market Surveillance

This table presents OLS and ordered logit regression analyses of the determinants of the scope of the effectiveness of single- and cross-market surveillance activities. Variables are as defined in Tables 1 and 3. *, **, *** Statistically significant at the 10%, 5% and 1% levels, respectively. White's (1980) heterockedasticity consistent covariance matrix estimator is used in all regressions.

	Model (4): OLS, Average of All Effectiveness Measures	Model (5): OLS, Average of All Effectiveness Measures	Model (6): OLS, Average of All Effectiveness Measures	Model (7): Ordered Logit, Real Time Surveillance	Model (8): Ordered Logit, Cross-Product Surveillance	Model (9): Ordered Logit, Cross-Market Surveillance	Model (10): Ordered Logit, Cross-Border Surveillance
Constant	-0.229 (-0.240)	-0.019 (-0.027)	-1.019 (-1.282)	-0.141 (-0.144)	-2.562 (-2.660)***	-1.415 (-1.425)	-1.476 (-1.448)
Surveillance Characteristics							
Exchange vs Commission -- Establish Trading Rules	0.739 (3.952)***	0.714 (3.997)***	0.417 (2.234)**	0.711 (2.490)**	0.620 (1.626)	-0.020 (-0.058)	-0.365 (-1.032)
Information Sharing Arrangements	0.072 (0.963)	0.071 (0.933)	0.135 (2.215)**			0.151 (1.940)*	0.209 (2.582)***
Scope of Single-market Surveillance	0.015 (0.319)			-0.063 (-1.403)			
Scope of Cross-market Surveillance	-0.011 (-0.204)				-0.054 (-0.709)	-0.063 (0.868)	-0.117 (-1.417)
Number of Departments				0.311 (1.364)	1.008 (2.610)***	0.107 (0.536)	0.133 (0.590)
Exchange			-0.177 (-0.332)				
Market Characteristics							
Number of Trades (Thousands)		0.119E-05 (0.928)	-0.275 (-0.182)				
Average Value of Trades (Thousands)			0.004 (4.059)***				
Proportion of US Cross Listings							-8.008 (-0.771)
Number of Products Traded on the Exchange			0.211 (1.948)*		0.165 (1.294)	0.280 (2.227)**	0.431 (3.089)***
Ordered Logit Parameters							
Mu(1)				0.679 (2.688)***	1.877 (5.423)***	1.431 (4.738)***	2.158 (6.415)***
Mu(2)				1.127 (4.224)***	2.893 (7.061)***	1.956 (6.374)***	2.496 (7.302)***
Mu(3)				1.845 (5.614)***	5.986 (2.877)***	2.228 (6.739)***	3.117 (7.222)***
Diagnostics							
Number of Observations	24	24	24	24	24	24	24
Adjusted R^2 (Pseudo R^2 for Ordered Logits)	0.117	0.163	0.235	0.136	0.340	0.115	0.186
F Statistic (Chi-Square for Ordered Logits)	1.76	2.49*	2.12*	10.127**	23.203***	8.293	11.638***
Loglikelihood	-35.057	-35.030	-30.859	-32.141	-22.509	-31.828	-25.497
Akaike Information Statistic	3.338	3.253	3.292				