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Comments welcome

Insider Trading and Corporate Governance in Latin America: A Sequential Trade Model Approach*

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Abstract

Unlike outside investors, controlling groups have the option to trade on inside information, and can exercise it at the expense of the former. A simple theoretical model rationalizes the relationship between corporate governance and insider trading decisions through reputational arguments. We compute probabilities of private information-based trading (PIN) for the universe of liquid stocks from seven Latin American countries, trading both at home and as ADRs, and apply them to address corporate governance questions. We find substantial heterogeneity of PIN within a given institutional environment. Nevertheless, we can identify significant differences in mean PIN across volume ranges, countries, and security types. PIN has an intuitively appealing correlation with some (but not all) of the country-wide investor protection variables used in the literature. PIN is priced in the market: companies with higher PINs fetch lower Tobin's *q*s. We conclude that the private information-based trading probability proxies for unobservable corporate governance quality as the heterogeneity of firm behavior seems to be recognized by the market and priced accordingly.

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1. Introduction

There is a suspicious scarcity of insider trading prosecutions in Latin America.[1] In Mexico, for example, no one was formally accused of insider trading until 2002, although the practice had been outlawed since 1975. This lack of prosecution could in theory be explained by completely lawful conduct on the part of insiders. An alternative explanation is that insider trading laws go unenforced. The formal evidence for the case of Mexico presented in Bhattacharya, Daouk, Jorgenson, and Kehr (2000) —and the casual market talk for all countries in the region— suggest the existence of widespread and unpunished insider trading. The evidence on the paucity of prosecutions shown in Table 1 may thus indicate a lack of enforcement rather than the rectitude of controlling groups.

When illegal insider trading goes unpunished, controlling groups can periodically confiscate minority shareholders in a politically low-cost way by using their privileged access to information to trade on it (Maug, 2002, Beny,1999). The perceived probability that outside investors will be confiscated through cheap governance and informed trading is a crucial determinant of their portfolio allocation and the ensuing cost of capital for the corporations trying to raise it.

In studying insider trading in this context, one faces the challenge that the received literature assumes that the mere existence of laws banning insider trading guarantees their enforcement. The evidence in Table 1 highlights that such models may be inadequate for the Latin American environment. So, before we set off to interpret our empirical results, we need to understand the theoretical connection between unprosecuted insider trading and corporate governance. To do this, we present an infinitely repeated version of the model in Bhattacharya and Nicodano (2001). We show that, under certain conditions, the controlling group will choose to maintain its reputation by disclosing information. Under a different set of parameters, the controlling group will choose not to disclose and will trade on information. Fortunately, the parameters guiding the choice of strategy have a natural interpretation as proxies of corporate governance quality.

But, how prevalent truly is insider trading in Latin America, and to what extent is it empirically connected to corporate governance? All the questionnaires that form the basis of the known corporate governance ratings include sections related to fair and timely disclosure of information to the market.[2] But aside from the analyst's judgement of the corporation's common practice, we lack an independent, objective, quantitative, and theory-based assessment of the extent to which informed trading effectively takes place. This paper provides such estimates for the universe of liquid stocks from Latin America. It then uses them both as an explained and as an explanatory variables in regression analysis.

Could estimated informed trading intensity help explain corporate valuations above and beyond country-wide institutional variables used in the literature? Would it also be a better

[1] See Bhattacharya and Daouk (2002) and Table 1 of this paper.
[2] E.g. questions 14, 15, 17, and 18 in CLSA (2001); questions 1 and 3 in the Information Disclosure section the Deutsche Bank (2001); and the section on Financial Transparency and Information Disclosure in Standard and Poor's (2001).

measure, in this sense, than analyst-based rankings intended to measure governance quality? From Klapper and Love (2002) and La Porta, López de Silanes, Shleifer and Vishny (2002) we know that the market "prices" the quality of corporate governance. However, do markets charge a premium for informed trading above and beyond the punishment for other determinants of bad governance?

We address these questions using high-quality, ultra-high-frequency data comprising over 80 million records of individual transactions and best offer quotes from October 2, 2003, until September 30, 2004. We use the framework of Easley, Kiefer and O'Hara (1996a, 1997a, 1997b), and jointly with Paperman (1996b) to estimate the probability of information-based trading (PIN hereafter) for each individual stock at various points throughout the sample. To our knowledge, this is the only method that allows direct estimation of how likely it is that each observed transaction comes from a privately informed party. It is noteworthy that the method that we adopt estimates the intensity of *privately informed* trading, a category that includes but is not limited to *illegal insider* trading. Legal private information trading includes acting on the basis of analysts' reports, proprietary industry or macro forecasts, etc.

An important early literature pioneered by La Porta, López de Silanes, Shleifer, and Vishny, among others, has estimated how the quality of the nationwide investor protection environment affects the cost and availability of outside financing for corporate investment. A more recent literature has attempted to compute corporation-specific measures of governance quality. We intend to take this literature one step further by following the lead of La Porta et al. (2002), Klapper and Love (2002), and Grishchenko et al. (2002) in analyzing whether there is significant heterogeneity of controlling group behavior within a given institutional environment, and to what extent does the market recognize this.

Klapper and Love (2002) find that individual corporate governance quality is priced above and beyond country-wide controls. However their estimates rely on CLSA's governance quality ratings, an analyst-based and therefore potentially subjective or endogenous measure. Moreover, since these ratings are fixed over time, they cannot compute the market valuation response to a given corporation's change in governance quality.

Grishchenko et al. (2002) also precedes our paper. They use a test based on the theoretical model of Llorente, Michaely, Saar, and Wang (2002) to estimate informed trading in 19 Emerging markets from almost seven years of daily closing price and volume data. We use a richer data set but a smaller set of countries. We do not know of a formal way to evaluate whether the Easley et al. or the Llorente et al. method provides a better measure of private information trading, though the one we use has been more widely applied in empirical work. Moreover, they do not compute to what extent market valuations respond to different governance quality measures, like Klapper and Love (2002) and we do.

To our knowledge, this paper is the first study to provide objective, quantitative, and theory-based assessments of the probability of informed trading using ultra high frequency data and to use these to address corporate governance questions for Latin America.[3]

[3] We recently learned that a Jackson, Dutta, and Nitani (2005) study related questions for Canadian stocks.

Key findings are as follows: there is substantial heterogeneity of PIN across stocks and this dispersion occurs mainly within groups (such as countries, volume quintiles, industrial sectors, security types, and ADR classifications) and not between them. In spite of this, some effects are apparent: PIN is much higher the lower the liquidity of stocks, Brazil and Mexico have lower mean PIN, while Colombia and Venezuela have higher mean PIN than the average stock. Importantly, the stocks of firms with ADR programs have less PIN than those without, and countries with better information-related investor protection legal variables tend to have lower PIN. Our main valuation result is that the market partly recognizes the heterogeneity of PIN across firms and over time: a fall of one standard deviation in PIN raises Tobin's q by about one to two percentage points, a value of about ten billion dollars for the region as a whole.

To check the robustness of PIN as a measure of private information trading, we analyze if it peaks just before material corporate announcements are disclosed to the market, and find that this is true in general, although the magnitude and the lead of the anticipation seems higher for acquisition and divestiture announcements than for earnings and cash-dividend announcements.

The rest of the paper is organized as follows. Section 2 presents the model, and section 3 describes the informed trading estimation method. Section 4 describes the data sources and sample construction, and section 5 discusses the empirical results. Section 6 concludes, analyzes the implications of our findings, and highlights directions for future research.

2. The model

Preliminaries

Although the literature on insider trading is extensive (see Maug, 2002, and Bainbridge, 1998, for references), only Maug (2002) attempts to connect it with the corporate governance literature. His main goal is to study the welfare implications of insider trading regulation from a corporate governance perspective, without regard for insider trading as a measure of governance quality, which is the goal of our model.

In fact, the insider trading literature has focused mostly on the impact of insider trading regulations on welfare (assuming perfect enforcement), usually based on models with *noise* traders that decide to trade in an exogenously random way. However, both Medrano and Vives (2003) and Bhattacharya and Nicodano (2001) have recently provided important critiques of such noise trader models, substituting them by utility-maximizing consumers subject to preference shocks. They show that outsiders may be better off with insider trading than without it.

The intuition is as follows. Insider trading implies partial revelation of information to the market. Given no disclosure, outsiders would ex-ante prefer some insider trading to none. Needless to say, outsiders are better off with full disclosure than with both of the above. If insiders choose to fully disclose information, they forego a privileged information rent. Our model can be viewed as an infinitely repeated extension of Bhattacharya and Nicodano (2001) with endogenous investment. So in every period, insiders face a trade off between the short run gain resulting from trading on information under no disclosure, and a better long run access to capital markets ensuing from the better reputation built by full disclosure.

As far as we know, this is the first attempt to study reputation in insider trading models, although most of the intuition is borrowed from the macroeconomics literature, which in turn is also rooted in the traditional reputation game theoretic literature.

The setup

Consider an economy with infinite discrete time periods ($t = 1,2,\ldots$) each of which can be thought of as a trading period. In this economy there is a continuum of atomistic investors, called *outsiders*, with names in the [0,1] interval and a big major shareholder of a firm (whose Lebesgue measure is normalized to one), called the *insider*. The insider has an endowment of K dollars at the beginning of each trading period, and each outsider has an endowment of ω_0 dollars also at the beginning of each trading period.

At the beginning of each trading period we assume that the insider can either collect funds in a market by issuing shares (see the timing below) and invest the resulting funds in a project with a random end-of-period per-dollar return θ. The random variable θ can only take two vales, either θ_H with probability η or θ_L with probability 1-η, with $0< \eta < 1$. The distribution is assumed to be common knowledge, i.i.d. across time and also assume that $E(\theta) > 1$. This project needs a minimum amount of investment equal to $K + \varepsilon$, where ε is assumed to be strictly positive and small. The total payoff given initial investment equal to $K + k$ (with $k \geq \varepsilon$) is equal to $\theta(K + k)$. The insider can otherwise invest his K dollars in a storage technology whose end-of-period payoff is deterministically equal to rK, with $0 < r < 1$.

On the other hand, each outsider has the option of investing in the market described here or in the world market. We assume that there exists an indivisibility such that these two options are exclusive. If the outsider invests in this market she can buy a certain amount of shares, called z, at a price p_0, and the rest is kept in liquid dollars. Each share promises a dividend of $\delta(\theta)$ at the end of the trading period (note that θ is random). Also, each outsider is subject to a preference shock: with probability π the outsider needs cash before the end of the trading period (in which case we call this outsider an *early* agent) and with probability 1-π she consumes at the end of the trading period (in which case this outsider is called a *late* agent). Following closely Battacharya and Nicodano (2001), we assume that at the beginning of each period the value of π is unknown, but it is common knowledge that it can only take on two values, either π_h with probability α, or π_l, with probability 1-α, with $0 < \alpha < 1$. This random variable is assumed to be independent of the project shocks. There is a second trading session in the middle of the trading period where late agents purchase stocks and early agents sell their shares to consume. If the outsider did not participate in this market, she invests her entire endowment ω_0 in the world market, obtaining an ex ante expected utility of V_O^{world} .

Figure 1 illustrates the unfolding of events within the trading period. At the beginning the period the insider decides whether to issue stocks and finance the project or to invest his K

dollars in the outside investment opportunity. Each outsider, having decided to participate in this market, decides her initial portfolio, composed by z shares bought at price p_0 and of y liquid dollars. Then, the insider observes the realized return θ and chooses to publicly disclose the information[4] or to keep it as private information. The preference shock at the aggregate level and for each outsider is also realized. Then, the interim stock market session opens at this stage, where trading occurs at some price p_1. In this interim trading session, as noted above, early outsiders sell shares and late outsiders purchase them. Insiders also must decide whether to stay out of this market session or to sell some amount $\hat{z} > 0$ of shares (to be specified below). At the end of each period the project is liquidated (if investment occurred) and the insider pays the corresponding dividend to outside shareholders.

The insider chooses a strategy, such that for each possible history, it specifies whether in each subsequent trading period investment in the project is made and whether the information about the realization of its return is disclosed to the public. The insider is assumed to be risk neutral and the per-trading-period ex-ante payoff is equal to the beginning-of-period expected return on the corresponding portfolio. The objective for the insider is to maximize the total expected discounted return. Let β be the discount factor of the insider, where $0 < \beta < 1$.

Each outsider is assumed to be risk averse, with logarithmic preferences depending upon dollar consumption (details below).

The period-*t* market equilibrium

Within each period, the outsider's problem can be written as:

$$\begin{aligned} & max\ \alpha\eta[\pi_h \ln c_1(h,H)+(1-\pi_h)E[\ln(c_2(h,H))]]+ \\ & \alpha(1-\eta)[\pi_h \ln c_1(h,L)+(1-\pi_h)E[\ln(c_2(h,L))]]+ \\ & (1-\alpha)\eta[\pi_l \ln c_1(l,H)+(1-\pi_l)E[\ln(c_2(l,H))]]+ \\ & (1-\alpha)(1-\eta)[\pi_l \ln c_1(l,L)+(1-\pi_l)E[\ln(c_2(l,L))]] \end{aligned} \quad (1)$$

subject to

$$p_0 z + y = \omega_0 \quad (2)$$

and

$$\begin{aligned} & c_1(i.j) = y + p_1(i,j)z \\ & p_1(i,j)z_1 \le y \\ & c_2(i,j) = (z+z_1)\delta(\theta_j) + y - p_1(i,j)z_1 \end{aligned} \quad (3)$$

with i and j being the subindices of π and θ respectively. Note that the dependence of p_1 on (i,j) will depend on whether disclosure takes place or, otherwise, on how much prices reveal about

[4] We assume that this information is publicly verifiable. We are not interested in discussing the relationship between verifiability of information and corporate governance in this paper.

the insider's private information. Let V_O^{ND} and V_O^{D} be the derived indirect expected utilities of the outsider without and with disclosure respectively. Appendix A shows that there exist conditions under which $V_O^{D} > V_O{}^{ND}$. We assume such conditions from here on. Assume also that the world (outside) option for the outsider is such that $V_O{}^{ND} < V_O^{world} < V_O^{D}$. This implies that the outsider will only want to invest in this market as long as the insider discloses the information. Otherwise it is more profitable to invest the entire endowment in the world market.

The appendix shows that the period *t* expected utility for the insider in an equilibrium can be written as:

$$V_I^{eq} = \begin{cases} E(\theta)K \text{ with full disclosure and no insider trading} \\ \mathrm{E}(\theta)K + (1-\eta)(1-\alpha)\hat{z}(p_1 - \theta_L p_0) \text{ with no disclosure and insider trading} \end{cases} \tag{4}$$

where p_1 denotes the price at the interim session that investors face with no disclosure in states (h,H) and (l,L). It can be shown that there are conditions such that $p_1 > \theta_L p_0{}^{ND}$, where $p_0{}^{ND}$ denotes the price at which shares are issued at the beginning of the trading period. This inequality implies that the per-period expected utility for the insider without disclosure (with insider's selling-of-shares in the interim session) is strictly greater than with disclosure (where no shares are sold by the insider in the interim session). This implies that, within a trading period (in a static sense) the insider finds the "no disclosure" strategy to be strictly dominant.

Moreover, suppose that until period *t*-1 disclosure took place in each of the periods. Suppose that in period *t* all outsiders believe that the insider will disclose the private information when revealed to him. However, after revelation of θ, the insider may *cheat* outsiders by not disclosing information. Thus, the expected utility for the insider after cheating is:

$$V_I{}^{cheat} = E(\theta)K + (1-\eta)(1-\alpha)\hat{z}\left(p_1 - \theta_L p_0{}^{D}\right) \tag{5}$$

Appendix A shows an example of parameter values under which $p_0^{D} > p_0^{ND}$, which we assume here. This inequality has a simple intuition. When the insider does not disclose the information, risk-averse late outsiders face risk in their final utility levels. Therefore, when purchasing z_1 shares risk sharing is obviously poorer than with disclosure. Anticipating this behavior one step ahead, outsiders then are willing to pay less for shares of an insider who will not disclose the information.

Thus the periodic expected utility for the insider to cheat is greater than that of not cheating (if outsiders purchase in period 1 at a price consistent with disclosure of private information). That is, $V_I^{cheat} > V_I{}^{D}$. On the other hand, as the total payoff for the insider of investing in the storage technology is $V_I{}^{stor} = rK$, clearly $V_I^{cheat} > V_I^{D} > V_I^{stor}$.

Perfect Bayesian Equilibrium

However, there is another possible situation that may occur under certain conditions. This situation corresponds to a **Perfect (Symmetric) Bayesian Equilibrium** (similar to that presented in the macroeconomics literature, see for example Chari and Kehoe, 1990) that allows to sustain a "disclosure" strategy by the insider in every trading period, under a "threat" of punishing by outsiders. The following proposition formalizes this idea:

Proposition 1. *If β is at least equal to $\frac{V_I^{cheat} - V_I^D}{V_I^{cheat} - V_I^{stor}}$ and if $V_O^{ND} < V_O^{world} < V_O^D$ then there exists a Perfect Bayesian Equilibrium where, along the equilibrium path, the insider discloses the true value of θ in every trading period, and the price vector of shares in each period is equal to* $\left(p_0^D, p_1^D\right)$

Proof: Consider the following strategy for each outsider in period *t*. If the insider disclosed the information in every period before *t*, purchase shares so that the price at the issuing session is p_0^D. If in period *t*-1 the insider cheated, each outsider switches to believe that the others, if participating in this market, would decide to purchase an amount of shares consistent with the price p_0^{ND}. (That is, each outsider believes that the other outsiders are willing to pay a lower price for each share). In such case, though, each outsider prefers *not* to purchase any shares from the insider. The reason is that the insider's dominant strategy in each period is not disclosing the information and trading on it. Thus, the outsider finds more profitable to invest her entire endowment ω_0 in the world market, given that $V_O^{ND} < V_O^{world}$ according to the statement of this proposition. This implies that the insider does not get enough funds for the productive project and so he must invest his *K* dollars in his alternative investment option. Given this threat, β satisfying the inequality in the statement of the proposition is equivalent to

$$\frac{V_I^D}{1-\beta} \geq V_I^{cheat} + \frac{\beta}{1-\beta} V_I^{stor} \qquad (6)$$

This means that the total expected discounted returns for the insider of disclosing every period is greater than cheating and receiving the punishment thereafter. This shows the existence of an equilibrium with perfect disclosure. ►

Clearly we cannot state that this is the only equilibrium. However, the objective of this model is just to argue that full disclosure and no insider trading can be rationalized as an equilibrium in which the firm wants to keep its "reputation." However, this same model can be used to generate the following second equilibrium when the conditions are changed:

Proposition 2. *Suppose that $V_O^{world} < V_O^{ND} < V_O^D$, and that β is low enough. Then, there is a Perfect Bayesian equilibrium where the insider never discloses the information about θ but where each* *outsider still purchases the shares issued by this insider. Along the equilibrium path the price vector for each share in each period is equal to* $\left(p_0^{ND}, p_1^{ND}\right)$.

Proof: given that β is low enough then it is impossible to sustain as an equilibrium strategy for the insider the "disclosure" of information in every period. On the other hand, outsiders, knowing this, still prefer to purchase shares at price p_0^{ND} given that, by investing in the world (outside) market, the expected utility for the outsider is strictly lower than by purchasing shares issued by the insider without disclosure. This proves this result. ►

Parameters and corporate governance quality: an interpretation

This model is a useful tool to see more explicitly the relationship between insider trading, disclosure decisions and governance quality. The first obvious parameter is the insider's discount factor β, which can be interpreted as a measure of the value that the major shareholder gives to long-horizon payoffs. A company with a high β is one whose major shareholder cares about long term reputation much more than a low β firm. We interpret those firms that care more about long term reputation as those with better corporate governance quality. This interpretation is also consistent with that provided in the literature on policy making and institutions introduced by Spiller and Tommasi (2003), in which "myopic" institutional environments are unable to implement "efficient" policies. In our interpretation, "myopia" (low β) by shareholders is one of the determinants of "bad" corporate governance that may lead to insider trading and no disclosure of private information.

However, other parameters of the model can also be read in its relationship with corporate governance quality. The investment project that the insider has available may also be related to the quality of governance. More precisely, firms with better governance may be able to "find" better project opportunities, which in our model means a better "probability distribution" for θ (for example, higher θ_H or higher η). For example, Klapper and Love (2002) present evidence that firms with better governance quality ratings are more profitable. This in turn affects $E(\theta)$ and thus the payoff for the insider. Of course it also affects the outsider's expected utilities. Therefore, better governance may affect payoffs such that the equilibrium in proposition 1 may be more likely than that of proposition 2, in the sense that, for example, $V_I^{cheat} - V_I^D$ is small.

3. Estimation of the Informed Trading Probability

Our measure of informed trading intensity is the private information-based trading probability (PIN) developed by Easley, Kiefer, O'Hara and co-authors (1996a, 1996b, 1997a, 1997b). Here we sketch the basic elements of the model, which is described in detail in Appendix B. The PIN is a function of abnormal order imbalances. This probability is derived from a sequential microstructure model (mainly from Glosten and Milgrom, 1985, and Easley and O'Hara, 1987 and 1992). This framework assumes a trading day at the beginning of which Nature chooses whether a new information about the end-of-day value of the asset arrives (which occurs with probability α). Nature also chooses whether this information is either "bad" (with probability δ) or "good" (remaining probability). When this information arrives it is revealed to the so-called *informed* traders (a subgroup of the whole set of investors in the market). Then the market opens for trade. Trading that occurs through a very large number of discrete time periods within the day.[5] In each of them Nature randomly chooses one trader, either informed (chosen with probability μ) or uninformed (remaining probability). The uninformed agents are noise traders who trade with probability ε (selling one unit of the asset with probability ρ, buying with the remaining probability). The model solves for the exact likelihood of observing a given pattern of buys, sells, and no trade periods within a day as a function of the parameters $\alpha, \delta, \mu, \varepsilon$ and ρ. The input for estimation are the daily vectors of buys, sells, and no trade periods observed during a number of days which are assumed to be a random sample from a stationary distribution. This framework allows computing the probability that each observed trade comes from an informed party, equal to $PIN = \frac{\alpha\mu}{\alpha\mu + \varepsilon(1-\alpha\mu)}$ (see Appendix B for further details).

4. Data Sources and Sample Construction

This section briefly describes the main sources of data and the methodology of the sample construction. Appendix C gives specific details. We use intra day stock data on transaction prices and traded shares and ask and bid quotes (when available) from October 2, 2003 until September 30, 2004, corresponding to the fourth quarter of 2003 and to the first, second and third quarter of year 2004, obtained from Bloomberg. Appendix section C.1 provides details on the liquidity-based criterion used in order to select the tickers. This criterion gives 288 stocks, traded both at home and in the ADR market, pertaining to 207 corporations from Argentina, Brazil, Chile, Colombia, Mexico, Peru, and Venezuela. The sample accounts for 80 percent of the trading volume in Latin American securities during that year.

For each of these stocks, we use the well-known Lee and Ready (1991) algorithm to classify each trade as either buyer-initiated or seller-initiated. This allows to compute the total observed number of buys, sells and no-trade periods for each day (the latter are defined as the number of continuous five-minute long intervals without trade during the day). We group this daily buy, sell, and no-trade data by quarter, and we estimate by maximum likelihood a quarterly PIN by maximizing by numerical methods equation (B3) in Appendix B.

We also obtain data on several measures of the quality of nationwide investor protection environment. We use the shareholder protection variables from La Porta et al. (1998). For some of them, we also obtain updated values from ICRG (2004). We use data on enforcement of Insider Trading regulations from Bhattacharya and Daouk (2002). These variables are described in detail in Appendix section C.2 and Tables C1 and C2.

[5] Easley, Kiefer, O'Hara and Paperman (1996b) and Easley, Kiefer and O'Hara (1996a) use a continuous-time version of the same model. We chose the discrete time version of Easley and O'Hara (1992) given that for several Latin American stocks the frequency of trading is lower than for US stocks.

We use firm and stock specific variables such as country of headquarters, industrial sector, whether the stock is classified as common or preferred and ADR status from Bloomberg. We also use balance sheet data from Economatica in order to estimate a proxy measure of Tobin's *q*, defined as the ratio of the market value of assets to book value of assets, a definition similar to that used in the related literature.[6] This measure of equity value is assessed from the point of view of outside shareholders, consistent with the perspective taken in the theoretical model of section 2. Another firm-specific relevant variable is growth opportunities, proxied by the geometric annual average growth rate of sales of the last three years. Given lack of data for some of the companies we are able to compute these variables only for 175 firms. We also obtain individual corporate governance analyst-based ratings and indices for a subset of the companies in our sample from the Credit Lyonnais South Asia (2001) report. Appendix section C.3 shows further details on the firm specific data.

For the event study Bloomberg provides a comprehensive list of corporate announcement for all included companies. We consider the four main types of announcements: acquisitions, divestitures, cash dividends, and earnings announcements. Appendix section C.4 describes these announcements in detail.

5. Results

5.1. Distribution of Probability of information-based trading

Table 2 presents summary statistics of the distribution of PIN by ticker-quarter. The top panel of Table 2.A reports the breakdown by country of corporate headquarters. For example, the mean of PIN over time across Brazilian stocks was 16 percent.[7] The Brazilian stock with the smallest average PIN gauged 2.9 while that with the largest PIN gauged 76.2. This means that there was a 76.2 chance that any randomly selected trade in that stock-quarter was initiated by a privately informed agent.

(TABLE 2.A ABOUT HERE)

The ranking of countries from lowest to highest median PIN is made of Brazil, Mexico, Peru, Argentina, Chile, Venezuela, and Colombia. One should be cautious about inferring that the degree of PIN across the universe of Colombian and Venezuelan firms is large given that we have only three stocks from each of those countries in the sample. The big picture from the top panel is that there is substantial heterogeneity of PIN across stocks, but that this variability occurs mainly within countries and not across them. For example, while the distribution of PIN for Brazil is shifted to the left relative to that of the other countries, the maximum PIN in the sample is also from Brazil.

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[6] This is exactly the definition in Klapper and Love (2002) and similar to that in La Porta et al. (2002), although without subtracting deferred taxes given the lack of data on this variable.

[7] PIN figures in the tables in the text are reported in percentage points. For simplicity, we subsequently try to avoid repeating the word percent after each number.

For comparison, the last line of the top panel reports statistics based on the PINs of American stocks estimated with data from 13 years before that in our sample by Easley et al. (1996a and 1996b). Although the US distribution tends to be shifted to the left relative to that of the Latin American countries, the gap is much lower than we would have anticipated. This prior expectation is based on the relative degree of investor protection and enforcement of insider trading bans and on the evidence in Bhattacharya et al. (2000) that Mexican corporate announcement news have already been fully incorporated into prices by the time they are officially disclosed to the market. However, Easley et al. (1996b) and our Table 2.B show that the distribution of PIN depends critically on the liquidity of each security, so that ignoring that dependence can significantly bias comparisons. Moreover, the substantial discrepancy in sample periods can underlie differences in the worldwide systematic component of α in the equation (B1). In general, an appropriate comparison of PIN across markets should be based on a matched sample of firms as in Easley et al. (1996b). We leave this careful comparison for future research, but still report the US statistics to place our results in the context of the previous literature.

The second panel groups stocks by industrial sector. While communications has the lowest median PIN (14.6) and cyclical consumer products has the highest median PIN (19.9) there seems to be even lower variability in median PIN across industrial sectors than there is across countries. The third panel reports that preferred stocks have a much lower PIN than common stocks. Given that all preferred stocks in the sample are from Brazil, and that these make up three fourths of stocks from that country, this finding is related to the lower PIN of Brazilian stocks and will be addressed in detail in discussing Table 3.A.

Assuming that the US Securities and Exchange Commission scrutinizes ADR transactions as well it does US domestic stocks, one can expect a higher punishment for trading with private information in the US relative to Latin American exchanges. Alternatively, if one assumes that firms listing ADRs are thereby signaling their commitment to better corporate governance practices, one could also expect a lower PIN for ADRs. The fourth panel of Table 2.A shows that this is the case on average. ADRs and ADR underlying stocks have lower PINs than stocks that just trade at home. In line with the results from other partitions of the PIN set, we find that although ADRs have lower PINs, these are also more disperse than for the other categories.

(TABLE 2.B ABOUT HERE)

Table 2.B looks at the distribution of PIN by volume quintiles, defined for each quarter. We use two measures of volume: quintiles defined relative to the amount of trading in each of the eight exchanges (intra-exchange quintiles), and quintiles defined relative to the amount of trading in all exchanges combined (inter-exchange quintiles). Whatever the measure, the findings confirm the finding of Easley et al. (1996b) for the US, that less liquid stocks are prone to substantially higher PIN: the figure for the lowest volume quintile (23 points) is about twice as large as that for the highest volume quintile (12 points). The econometric exercises below show that volume is one of the most robust determinants of differences in PIN. But Table 2.B shows that even this partitioning of the sample leaves much within group variance: the top 5 percent of stocks in the most liquid quintile have a higher PIN than the median stock from the lowest volume quintile.

Finally, Table 2.C shows the that there is variation of PIN across quarters, and that that time pattern is different across the different categories (some are higher at the beginning, while others are higher near the end of the sample).

(TABLE 2.C ABOUT HERE)

The main message so far is that there is a substantial heterogeneity of PIN within categories commonly controlled for in the literature. This underscores the importance of computing company-specific proxies of governance quality as we do in this paper.

5.2. Cross-Sectional Determinants of Informed Trading

5.2.A. Categorical Decomposition of Informed Trading

We first attempt to identify categorical covariates of PIN using the pooled OLS regression,

$$\begin{aligned} PIN_{it} &= \alpha + \boldsymbol{\beta}^{\mathbf{V}\,\prime}\,\mathbf{I}(\text{Vol. Quintile}_{it}) + \boldsymbol{\beta}^{\mathbf{C}\,\prime}\,\mathbf{I}(\text{Country}_i) + \boldsymbol{\beta}^{\mathbf{S}\,\prime}\,\mathbf{I}(\text{Sector}_i) + \\ &\quad + \boldsymbol{\beta}^{\mathbf{P}\,\prime}\,\mathbf{I}(\text{Common/Preferred}_i) + \boldsymbol{\beta}^{\mathbf{A}\,\prime}\,\mathbf{I}(\text{ADR status}_i) + \boldsymbol{\beta}^{\mathbf{t}\,\prime}\,\mathbf{I}(t) + \varepsilon_{it} \qquad (7) \\ i &= 1,..,288; \quad t = 1, 2, 3, 4. \end{aligned}$$

where every **I**(.) is a matrix of dummy variables for each classification. Since we include several sets of dummy variables, to facilitate the interpretation of the results, we depart from the standard procedure of reporting the results for each group as a difference relative to a control group. That is, we use dummies that span the full set of possibilities of a given partition of the sample, so that the coefficient on each dummy reflects to what extent behavior for that category deviates from the global average (Suits, 1984).[8] The *t*-ratios assess whether the difference is statistically significant.[9] The coefficient on the global intercept is the mean of PIN for the average stock. Given the evidence in Tables 2.B and 2.C, we control for time fixed effects and for volume effects in all regressions. Table 3.A reports the results.

(TABLE 3.A ABOUT HERE)

The first important result is that volume is inversely related to PIN: while PIN for the average stock is 21.6 (model 1), the estimate is 17.2 for the most liquid stocks, and it rises to about 26.8

[8] When using a control group, one imposes the constraint that the coefficient on that group's dummy is zero. Here we impose that the sum of the coefficients of all group dummies is zero. The problem is mathematically identical, but the results are easier to interpret in this way, especially when more than one set of dummy variables is used. The test that all the coefficients on the dummies are jointly equal to zero is a test of equality of the group means.

[9] Given the strong indication from Tables 1.A and 1.B that the volatility of PIN differs substantially across groups of stocks, we use White (1980) heteroskedasticity-consistent standard errors.

for the least liquid stocks from the average country. The result is robust to the different specifications and is consistent with those in the received literature (e.g. Easley et al., 1996b, among others).

Model 1 also shows that Brazilian, Mexican, and Peruvian companies have a statistically significantly lower PIN than the average stock. The (few) firms from Venezuela and Colombia in the sample, instead, have systematically higher average PINs, while Argentine, and Chilean companies' PINs are not significantly different from the overall mean.

Model 2 analyzes economic sector effects and shows that the PINs of financial and cyclical consumer products firms are higher than average, while communications firms have a lower PIN.[10] Model 3 shows that common stocks have higher PINs than preferred stocks. The Brazilian coefficient in model 1 can be low because informed trading is not as prevalent there, or because 75 percent of Brazilian stocks in the sample are preferred which are themselves characterized by low PIN as model 3 shows. Model 5 checks for this possibility by including all controls simultaneously.[11]

It may seem puzzling that the estimate for Brazil is 5 percentage points lower than that for Chile, while Chile scores better in several corporate governance quality measures.[12] Various authors argue that there is an extraordinary concentration of voting power in Brazilian companies, represented in common shares that are usually not traded in public stock markets, while 90 percent of what is traded there are non-voting or preferred shares that do not pay material dividends (Leal et al., 2005, Carvalho, 2000, etc.). If this is true, the value of such "preferred" shares may be disentangled from corporate outcomes. Insiders may therefore not participate in public markets, and potentially chose to profit from their informational advantage in private transactions.[13] This situation notably contrasts with that in Chile, where firms rarely issue non-voting shares (Lefort and Walker, 2005). Moreover, about 15 percent of issued stocks are actively traded in the local market, whereas about 8 percent of such stocks are kept in custody for depositary receipts traded in foreign markets. These numbers suggest that, for Chilean companies, a much higher proportion of the voting power is traded in public stock markets, compared to Brazilian firms. Then, it may be perfectly possible that insiders from Chilean firms trade in public stock markets more actively than in the Brazilian case.

Our country ranking differs from that of Grishchenko et al. (2002) as they find that Brazil and Argentina have much higher prevalence of informed trading than Chile. This contrast may result from the difference in the sample periods and from the alternative methods used to infer informed trading. Note, however, that although they document a positive relation between return autocorrelation and volume, which can be interpreted as evidence of informed trading, they do

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[10] One possible justification for these results is that it is harder for outsiders to properly assess the value of financial firms (whose expertise is precisely the handling of critical information about their borrowers) as opposed to heavily regulated communications firms.

[11] The industrial sector effects are jointly insignificant in the combined regression and so are dropped in model 5.

[12] E.g. Investor Protection in La Porta et al. (1998), Legality in Berkowitz et al. (2003), etc., see Table C2 in the Appendix for the actual figures.

[13] One caveat to this explanation is that the Brazil effect in model 5 is much stronger than the Preferred effect. One possibility for this result is that the common Brazilian shares, representing a negligible fraction of voting power, are also not the means of choice of insiders to trade on information.

not perform the test in Llorente et al. (2002) to show that the correlation coefficient effectively depends on informed trading measures. Our approach is more direct, since the PIN is directly the probability that each trade comes from an informed trader.

Another very important result from Table 3.A is that the gap between ADRs and stocks that just trade at home is a significant amount (2.7 percentage points), relative to an overall PIN average of about 21.1. This is consistent both with the hypothesis of better enforcement of insider trading rules in the US and with the signaling hypothesis discussed above, and it also confirms the results in Von Furstenberg and Tabora (2004). These authors use price data for Telmex and Televisa stocks trading both at the Bolsa de Mexico and in New York as ADRs. They find that price discovery mainly takes place in Mexico, which conforms to a higher presence of informed traders in the home market. In model 5, we find that ADRs have an average PIN that is 1.3 points lower than that of their underlying securities.[14]

5.2.B. Informed Trading and Corporate Governance Measures Used in the Literature

We next analyze the dependence between privately informed trading and governance quality variables used in the literature. The maintained hypothesis is that our measure contains more information than previously used metrics. Table 3.B reports the results of estimating the panel regression,

$$\begin{aligned} &PIN_{ijt} = \alpha + \beta^{G}\ \ Governance\ \ Quality_{ij} + \boldsymbol{\beta}^{\mathbf{t}\,\prime}\ \mathbf{I}(t) + \boldsymbol{\beta}^{\mathbf{V}\,\prime}\ \mathbf{I}(\text{Vol. Quintile}_{it}) + \varepsilon_{ijt} \\ &i = 1,..,288; \quad j = \text{Arg., Bra., Chi., Col., Per., Mex., Ven.}; \quad t = 1,...,4 \end{aligned} \tag{8}$$

with one *Governance Quality$_{ij}$* variable at a time, including volume quintile and time dummies, and using exchange-stock random effects. In most cases, *Governance Quality$_{ij}$* uses only the country subscript (*j*) since it is a nationwide measure. So we only have seven effective observations of the quality variable in those regressions and thus the results should be interpreted with care.[15] We include the individual corporation subscript (*i*) because four lines in the table use the individual corporation ratings from CLSA.[16] The first four columns of the table report the coefficients and standard errors using intra-exchange and inter-exchange volume quintiles respectively. The last two columns report the effect on PIN of either a one standard deviation increase in *Governance Quality$_{ij}$* or a change in it from zero to one when it is binary. For most explanatory variables, a higher value implies a better investor protection or corporate governance

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[14] Many Latin corporations are controlled by foreign owners. In follow-up research, we are working to see if the nationality of the controlling groups is correlated with PIN. We thank Sebastian Galiani for this suggestion.

[15] We use all pertinent variables in La Porta et al. (1998), the legality index in Berkowitz et al. (2003), the insider trading enforcement dummy in Bhattacharya et al. (2002), and the Investment Profile measure in ICRG (2004). When country attributes are measured periodically, we include the original values in La Porta et al. (1998) and the 2004 readings using the more current ICRG data. See section 4 for further details. Table C1 in the Appendix defines the country-wide variables, while Table C2 shows the observations by country.

[16] These are management transparency, management discipline, management independence, and the average rating.

environment (e.g. a higher value of Risk of Expropriation index means less risk). The exceptions are Percentage of Share Capital to Call an Extraordinary Shareholders' Meeting (a higher value means that it is more difficult for minorities to accomplish this), the Median Shares of the Three Largest Shareholders (a higher value implies more concentrated ownership), and Mandatory Dividend (the fraction of net income that a corporation is forced to pay out as dividends, which may be ambiguous for governance quality). To facilitate interpretation, we report regression results ranked from the lowest to the highest coefficients.

(TABLE 3.B ABOUT HERE)

Several variables yield the expected results: higher values of Risk of Expropriation, Accounting Standards, CLSA Management Transparency,[17] Corruption in 1998, or the introduction of the One Share-One Vote or Mandatory Dividends clauses imply a lower PIN. A one standard deviation increase or a change in each of these variables from zero to one leads to a fall between 0.6 and 2.3 percentage points in PIN. When controlling for inter-exchange quintiles, Insider Trading Enforcement is also relevant, with a substantial 2.4 percentage-point fall in PIN in those markets. Some of these variables are directly related to informational issues so these results seem reasonable.

However, there are other variables that yield the opposite result: Shareholder Rights, a better representation of minorities (i.e. the existence of Cumulative Voting or Proportional Representation rules), Judicial Efficiency, Preemptive Rights to New Issues, Ownership Concentration, as well as the 2004 scores of Rule of Law, Corruption, and Legality. These variables seem to be unrelated to private information.

The finding that higher Ownership Concentration leads to lower PIN is the Brazil vs. Chile result in a new disguise. Table C2 shows that Brazil is at the top of the concentration scale while Chile is at the bottom --in fact the latter is about two standard deviations below the sample mean.

The sign change of the coefficients on Rule of Law and Corruption between their 1998 and their 2004 observations merits an explanation. Table C2 shows that Brazil was about one half a standard deviation above the cross country mean in 1998 and it went down to about one half a standard deviation below the mean in 2004 in both of these variables. This fact, given that Brazil has the lowest mean PIN in the sample, helps explain the sign reversal of these variables in equation (5). As noted above, this is essentially a regression with seven observations in the $Governance\ Quality_j$ dimension, so this big reversal in the score of Brazil can cause the unexpected sign change.

The findings of Grishchenko et al. (2002) and ours agree on some important points, but they also disagree on others. On the one hand, the enforcement of insider trading bans, better accounting standards and less risk of expropriation, and the existence of One Share-One Vote legislation imply less prevalence of asymmetric information trading in both papers. There are also some counterintuitive results that coincide: existence of Cumulative Voting or Proportional Representation rules imply higher informed trading intensity in both papers.

[17] These two variables are statistically significant only when using intra-exchange volume quintiles.

On the other hand, the effect of Percentage of Shares needed to call an Extraordinary Meeting has a counterintuitive effect in Grishchenko et al. (2002) while we find no effect on PIN. On the other hand, countries with more concentrated ownership structures have asymmetric information trading according to Grishchenko et al. (2002) while they have a lower PIN in our exercise. Of course, this comparison is limited by the fact that, having 19 countries in their sample, they have more degrees of freedom to identify the effect of country-wide variables than we do.

Although the regressions involving CLSA ratings are exempt from the degrees of freedom problem that pervades those using nationwide controls, using those variables gives mixed results. Management Independence and Average rating from CLSA have the "wrong" sign in at least one of the specifications though, as mentioned above, Management Transparency did have the right sign in one of the specifications.

In summary, while some of the often used measures of corporate governance quality are associated with informed trading probabilities, in general, there seems be an important degree of heterogeneity in PIN that is not captured by the variables used in the literature.

5.3. The Market Value of Informed Trading

So far, we have documented that there is substantial heterogeneity of PIN both within and between categories that have been controlled for in regression analysis. To complete the previous findings, we now assess whether the market does indeed recognize both this heterogeneity and that informed trading is harmful to outside investors as reflected in the prices of the securities that those investors trade. La Porta et al. (2002) focus on nationwide controls and on corporation-specific cash-flow rights measured at one point in time. Klapper et al. (2002) use corporation specific measures of governance that are analyst-based (and so potentially subjective and endogenous), and are also fixed over time. Our contribution is to postulate the PIN measured during each quarter in the sample as a corporate governance quality indicator at the firm-quarter level. To do this, we estimate the panel regression,

$$q_{ijt} = \alpha + \beta^{I}\ PIN_{ijt} + \beta^{G}\ Governance\ Quality_{ij} + \beta^{S}\ Sales\,Growth_{ijt} + \mathbf{\beta^{t'}}\mathbf{I}(t) + \varepsilon_{it} \tag{9}$$

$$i = 1,..,175;\quad j = \text{Arg., Bra., Chi., Col., Per., Mex., Ven.}\quad t = 1,...,4.$$

where Tobin's q_{ijt} proxies for the value of the firm *i* in country *j* during quarter *t*, and *Sales* $Growth_{ijt}$ attempts to capture the value of the firm's growth opportunities. We run several regressions using all the governance quality or investor protection variables used in Table 3.B, both alone and interacted with PIN, with time fixed effects. Very few of these variables turned out to be significant so the tables focus on those cases in which they were significant. Following

La Porta et al. (2002), Table 4.A presents the results using raw data while, for robustness, Table 4.B uses *q* and *Sales Growth* in deviation from industrial sector medians. Following the suggestion in Antweiler (2001, ft. 1) we control for the potentially nested error structure of the residuals by using fixed effects for the top level category (countries) and random effects for the low level category (firms). Also, since PIN is an estimated variable, we have the well known estimated regressor problem. This will imply that the estimated slope coefficient will be attenuated towards zero and that its estimated standard error will be wrong. We correct for the latter problem by bootstrapping the sample.[18]

The key result is that PIN has a negative contemporaneous effect on market value in all benchmark specifications: a one standard deviation fall in PIN is accompanied by a rise in Tobin's *q* of between 0.99 and 1.5 percentage points depending on the model. The effect is significant economically and statistically, and it is stronger with industry-adjusted data.

The two first columns of each table report the benchmark specifications, in which PIN is used alongside *Sales Growth* and a constant.[19] The first column uses country fixed effects and firm random effects while the second one uses firm fixed effects. In all of the four cases, PIN is significant at the 10 percent level or better.

The regressions in the last three columns use governance quality variables that are fixed over time. Therefore, fixed effects are not feasible and we use random effects. When using Rule of Law and Legality (both assessed during 2004) the PIN coefficients are in the ballpark of the benchmark specifications and are statistically significant. Therefore, probability of information-based trading is priced above and beyond the measures of nationwide investor protection in this seven-country sample.

The last column of each table reports the results of a regression using the CLSA average rating for each corporation. We only have these data for 60 firms out of the 175 used in the previous regression. Although the point estimate of the coefficient on PIN remains negative, it is no longer statistically significant. A similar result obtains using other CLSA measures of governance quality. This may result in part from the correlation between the average rating and PIN documented in Table 3.B, a fact that has interesting policy implications discussed in the conclusions.[20]

5.4. Does PIN measure informed trading intensity? A robustness check using an event study around Corporate Announcements

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[18] We use 100 replications of samples of 175 firms from this same set such that, if a firm is chosen, all its time series observations are included in the replication sample. We then use the empirical distribution of the slope coefficients estimated in the replications to assess the standard error of the slope coefficients in (9), see Efron and Tibshirani (1993) for details.

[19] Naturally, using firm effects reduces the importance of *Sales Growth* in all specifications in these panel regressions.

[20] Note that Klapper and Love (2002) also regress Tobin's *q* on CLSA governance ratings and find a coefficient between 0.02 and 0.025, quite similar to our own point estimates of 0.03 and 0.027.

At this point the reader may wonder if PIN really measures the intensity of informed trading in stock markets, or if it just reflects some other spurious effects. To check this, one can remember that, in the time series dimension, inside information is most valuable just prior to its public release. Thus, we run an event study attempting to analyze if PIN indeed rises during the 20 trading days before a public announcement relative to a control and a post-announcement period.[21] If this happens we may state that PIN is consistent with the behavior of a true measure of informed trading. We further assess if this time pattern differs across categories (e.g. volume quintiles, countries, industries, common/preferred, and ADR status). As usual in these types of experiments, this is a test of the joint hypothesis that PIN is a good measure of insider trading and that insiders do take advantage of their privileged access to information. Having computed PIN for the three periods around each announcement, we estimate the following equation,

$$
\begin{aligned}
PIN_{ikt} = \alpha_0 + \boldsymbol{\alpha}'\mathbf{Z}_i + \left(\beta_0 + \boldsymbol{\beta}'\mathbf{Z}_i\right) I_{it}^{PERIODIC-PRE} + \left(\gamma_0 + \boldsymbol{\gamma}'\mathbf{Z}_i\right) I_{it}^{PERIODIC-POST} \\
+ \left(\delta_0 + \boldsymbol{\delta}'\mathbf{Z}_i\right) I_{it}^{APERIODIC-PRE} + \left(\phi_0 + \boldsymbol{\varphi}'\mathbf{Z}_i\right) I_{it}^{APERIODIC-POST} + v_{ikt}
\end{aligned} \tag{10}
$$

i=1,...,264; k=1,...,K_i ; t = 1, …, T_i

where K_i is the number of announcements for firm i during the sample, and t indicates calendar time measured in days.[22] I_{it} represents an indicator function that equals 1 when day t during which the PIN of the kth announcement of stock i is estimated corresponds to I's superscript.[23]

In some cases, two announcements of a given firm are not sufficiently spaced apart so that the data for a given day are used to estimate two different PINs. For example, if there are less than 40 trading days between two consecutive announcements, some days will fall in the post-announcement period relative to the first statement and in the pre-announcement period relative the second. Therefore the underlying PIN-generating process will be affected by these confounding effects. In order to handle this problem, we multiply each of the three PINs pertaining to each announcement by a 20 by 1 unit vector, where each entry pertains to the calendar day from which the number of buys, sells, and no-trade periods are taken to estimate that PIN. This is why the dependent variable in (6) has 60 different values of the t subscript for the kth announcement of firm i. On the right-hand side of the regression, we take care of the potentially different data generating processes by turning on *both* indicator functions since day t falls in the range that activates I^{POST} relative to the first announcement and I^{PRE} relative to the second announcement. Moreover, there will be two observations for that day t. In one of them the dependent variable will be the PIN of the post-announcement period relative to the first statement, while on the other one the dependent variable will be the PIN of the pre-announcement period relative to the second announcement. We think that this procedure addresses the potentially confounding information in the data generating process without

[21] As a robustness check, we perform the same exercise using a window length of only 10 trading days.
[22] Naturally, only the calendar days in the 60 trading days around each announcement are used.
[23] Periodic announcements comprise earnings and cash dividends news, while aperiodic ones consist of acquisitions and divestiture reports. See data section for details.

resorting to dropping announcements. Whenever announcements by a firm are spaced more than 40 days apart only one indicator function will be turned on for each day.[24]

Table 5 reports the results of estimating (10). Here α_0 reflects the mean value of PIN during the control period, and all other coefficients in the table report the incremental value of PIN either during a pre- or a post-announcement period or for stocks in a specific category or both. The vector $\mathbf{Z}_i$ contains dummies for each and every possible category within a classification: intra-exchange volume quintile, country of domicile, industrial sector, security type, and ADR status. So, in each column, the coefficient on each line shows how different is the behavior of stocks in that category from that of the overall average stock during the corresponding event period.

(TABLE 5 ABOUT HERE)

While Table 5 reports the incremental coefficients of a category or announcement type relative to the control period, to facilitate interpretation, Figure 2 reports the *total* PIN during each period for each volume category. Each figure has four graphs. Those on the left correspond to periodic announcements and those on the right correspond to aperiodic ones. These graphs report the results of adding the coefficients from Table 5, so they measure *partial* effects of a given category when $\mathbf{Z}_i$ includes dummies for all classifications simultaneously.

(FIGURE 2 ABOUT HERE)

Figure 2 confirms that periodic announcements are subject to private information trading in all quintiles but the third. For aperiodic announcements, only stocks in the two lowest quintiles are subject to speculative trading.[25]

In summary: the event study set to analyze if the time pattern of PIN around material corporate announcements was consistent with the hypothesis that privately informed parties exploit this information when it is most valuable. Decomposing PIN during these three periods we found notable differences across volume ranges. The overall evidence is consistent with our hypothesis.

[24] Naturally, the 20 trading day width of the event window is arbitrary. Vega (2004) estimates PIN using data corresponding to the 40 days prior to each earnings announcement made during 15 years. Aktas et al. (2004) compute the PIN in four different windows, each of them lasting 60 days, around announcements made during five years. Since we only have data for one year, we chose a smaller window width.
[25] More figures showing estimated PIN in each period divided by country, economic sector, ADR status and common/preferred status are available from the authors on request.

6. Conclusions and Implications

For all practical purposes, illegal insider trading goes unpunished in Latin America. The theme of this paper is that, given the unobservability of illegal insider trading from the viewpoint of outside investors, its detrimental effect on minority shareholders' returns, and the history of impunity of this fraud in Latin America, controlling groups actually choose by how much they will exploit their informational advantage in securities trading. Therefore corporate governance and insider trading are intimately related.

While controlling group discretionary powers could hurt minority shareholders, they could also benefit them. For instance, a more powerful controlling group may internalize benefits of monitoring that are beneficial to all shareholders. However, insider trading is an explicit use of the discretion option that is harmful to outside investors. Nationwide regulations that permit this discretion give controlling groups options to harm. Insider trading proxies indicate to what extent controlling groups actually exercise these options at the expense of outsiders.

A simple theoretical model rationalizes the relationship between corporate governance and insider trading decisions through reputational arguments. This model is essentially an infitely repeated version of Bhattacharya and Nicodano (2001) with endogenus investment.

We use a well established method to estimate the probability of informed trading (PIN) for each of 288 Latin American stocks. We analyze its behavior in the cross-section and around corporate announcements, and we assess whether the market prices this risk. One caveat to all of our findings is that PIN estimates *privately* informed trading, which is more general and not necessarily restricted to illegal insider trading.

We find that there is substantial heterogeneity of PIN across stocks and that this dispersion occurs mainly within groups (such as countries, volume quintiles, industrial sectors, security types, and ADR classifications) and not between them. The new information that we generate may thus be valuable in assessing individual corporate behavior, which we show that is not easily captured by groupings usually controlled for in the literature.

In spite of this, we are able to estimate the effects of some control variables: PIN varies greatly across volume categories, with the least liquid stocks having about twice the median rate (20 percent) of the most liquid stocks (11 percent). Brazil and Mexico have lower mean PIN, while Colombia and Venezuela have higher mean PIN than the average stock. The stocks of firms with ADR programs have less PIN than those without, just like preferred stocks have lower amounts than common stocks. Also, countries with better information-related investor protection legal variables tend to have lower PIN.

Last, we check whether the market value of firms responds to changes in PIN, and find that a fall of one standard deviation in this variable raises corporate value by about one to one and half percentage points. This pricing seems low compared with the expected loss to an outsider from trading with a privately informed agent. We attribute this gap to the fact that the market may not be sufficiently aware of the distribution of informational asymmetries among the different stocks.

We conclude that the probability of information-based trading does indeed proxy for unobservable corporate governance quality and that there is substantial heterogeneity of firm behavior within a given institutional environment. Part of this heterogeneity seems to be recognized by the market and priced accordingly.

Our findings have important implications. While the received literature emphasizes the benefits of *macro* (legal) reforms, this paper shows that the *micro* components of our corporate governance measure are far from trivial. From the traditional adverse selection literature (e.g. Leland and Pyle, 1977) we know that, with asymmetric information, the absence of signaling technologies induces uninformed investors to charge higher financing rates to all firms, precluding funding for some otherwise profitable projects. Moreover, a signal variable may be sufficient for investors to correctly discriminate across firms and projects, restoring the Pareto-efficiency of the market equilibrium. We propose to create a corporate integrity score to fill the role of such a signal variable. By publicly disclosing the score of different companies, we would rely on spontaneous market separation mechanisms to improve on the corporate investment funding role of public securities markets.[26]

Although PIN would be an ingredient of this score, other asymmetric-information measures such as the bid-ask spread, its adverse selection component, or the price impact of trades, etc. should also be contemplated. Moreover, one could conduct the same event study of PIN around corporate announcements that we do but using two or three years of data and compute the mean increase of PIN during the pre-announcement period for each individual corporation. Furthermore, it would be interesting to counterpart these trade- and offer-based data with price impact of announcements data. While Bhattacharya et al. (2000) show that Mexican stock prices are on average unresponsive to corporate announcements, we surmise that the distribution of these responses is heterogeneous within countries, just like the distribution of PIN.

Because controlling groups may evolve over time in the management of inside information, in part due to the pressure caused by the integrity score, the latter could be updated periodically to reflect this change in behavior. These measures have the advantage of being objective, quantitative, theory-based proxies of corporate behavior.

This score might provide palpable benefits by encouraging investor interest in those companies that are making a real effort to improve the quality and access to information. Moreover, it would induce companies that have problems with inside information management to be more proactive in this area.

[26] Bhattacharya et al. (2000) propose creating a nationwide market integrity score. Aitken and Siow (2004) show one implementation of that idea. Again, our results show that there is wide variation of informed trading *within* countries, hence the benefit of the individual corporation ratings that we propose.

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Appendix A: Calculations of the theoretical model at every trading period *t*

The insiders' payoffs

First of all, the per-share dividend $\delta(\theta)$ needs to satisfy the equation $\theta(K+k)=\delta(\theta)\bar{z}$,
where $K+k=p_0\bar{z}$, and where we normalize the funds provided by the outside shareholders k as $k=p_0 1$ (that is, the per-capita amount of shares bought by outsiders s normalized to 1). Thus the above equality is just $\theta p_0\bar{z}=\delta(\theta)\bar{z}$, which yields $\delta(\theta)=\theta p_0$. This allows writing the ex - post payoff for the insider

$$\theta(K+k)-\delta(\theta)1+(p_1-\theta p_0)\hat{z}=\theta K+\theta p_0-\theta p_0+(p_1-\theta p_0)\hat{z}=\theta K+(p_1-\theta p_0)\hat{z} \tag{A.1}$$

if the insider sells $\hat{z}$ shares in the interim session. Otherwise is just equal to θK. This yields the expressions for the insider's expected utility in the main body of the text.

A1. Disclosure equilibrium

We start by solving the outsider's problem backwards given that θ was disclosed. We will consider an equilibrium in which p_1 depends only on the realization of θ, not of π. For a late outsider the problem is to choose a non-negative z_1 such that it maximizes $\ln(\theta p_0(z+z_1)+y-p_1(\theta)z_1)$ subject to $p_1(\theta)z_1\leq y$. This is a basic linear programming problem whose solution is equal to:

$$z_1(\theta,p_1(\theta))\begin{cases} =\dfrac{y}{p_1(\theta)}\ if\ \theta p_0<p_1(\theta) \\ \in\left[0,\dfrac{y}{p_1(\theta)}\right]\ if\ p_1(\theta)=\theta p_0 \end{cases} \tag{A.2}$$

This implies an ex post utility for a later outsider equal to $\ln\left(\theta p_0\left(z+\dfrac{y}{p_1(\theta)}\right)\right)$. The ex post utility for an early outsider is equal to $\ln(y+p_1(\theta)z)$. Thus, the ex ante expected utility for an outsider at the beginning of each trading period is equal to

$$
\begin{aligned}
&\eta\alpha\left[\pi_h \,\mathbf{ln}\left(y+p_1(\theta_H)z\right)+(1-\pi_h)\mathbf{ln}\left[\frac{\theta_H p_0}{p_1(\theta_H)}\left(zp_1(\theta_H)+y\right)\right]\right] \\
&+\eta(1-\alpha)\left[\pi_l \,\mathbf{ln}\left(y+p_1(\theta_H)z\right)+(1-\pi_l)\mathbf{ln}\left[\frac{\theta_H p_0}{p_1(\theta_H)}\left(zp_1(\theta_H)+y\right)\right]\right] \\
&+(1-\eta)\alpha\left[\pi_h \,\mathbf{ln}\left(y+p_1(\theta_L)z\right)+(1-\pi_h)\mathbf{ln}\left[\frac{\theta_L p_0}{p_1(\theta_L)}\left(zp_1(\theta_L)+y\right)\right]\right] \\
&(1-\eta)(1-\alpha)\left[\pi_l \,\mathbf{ln}\left(y+p_1(\theta_L)z\right)+(1-\pi_l)\mathbf{ln}\left[\frac{\theta_L p_0}{p_1(\theta_L)}\left(zp_1(\theta_L)+y\right)\right]\right]
\end{aligned}
\tag{A.3}
$$

which can be rewritten as:

$$
\begin{aligned}
&\eta\,\mathbf{ln}\left(y+p_1(\theta_H)z\right)+(1-\eta)\mathbf{ln}\left(y+p_1(\theta_L)z\right)+ \\
&\left[\eta\left(\alpha(1-\pi_h)+(1-\alpha)(1-\pi_l)\right)\mathbf{ln}\left(\frac{\theta_H p_0}{p_1(\theta_H)}\right)+(1-\eta)\left(\alpha(1-\pi_h)+(1-\alpha)(1-\pi_l)\right)\mathbf{ln}\left(\frac{\theta_L p_0}{p_1(\theta_L)}\right)\right]
\end{aligned}
\tag{A.4}
$$

Given that at the beginning of every trading period it must happen that $y=\omega_0-p_0 z$ then the problem of each outsider at the beginning of the period is to choose a non-negative *z* tat maximizes $\eta\,\mathbf{ln}\left(\omega_0+\left(p_1(\theta_H)-p_0\right)z\right)+(1-\eta)\mathbf{ln}\left(\omega_0+\left(p_1(\theta_L)-p_0\right)z\right)$. The first order condition is

$$
\frac{(1-\eta)\left(p_0-p_1(\theta_L)\right)}{z\left(p_1(\theta_L)-p_0\right)+\omega_0}=\frac{\eta\left(p_1(\theta_H)-p_0\right)}{z\left(p_1(\theta_H)-p_0\right)+\omega_0} \tag{A.5}
$$

The insider would prefer to sell $\hat{z}$ shares in the interim session only if $p_1(\theta)>\theta p_0$. Now, in order to get $p_1(\theta)$ in equilibrium as a function of p_0 we need to see the market clearing condition. The supply curve for shares in the interim session has the form:

$$
\begin{aligned}
&\pi z \;\; if \;\; p_1(\theta)\le\theta p_0 \\
&\theta\pi z+\hat{z} \;\; otherwise
\end{aligned}
\tag{A.6}
$$

From here and from the form of the demand for shares by late outsiders, it should be clear that $p_1(\theta)$ cannot be above θp_0 since in this case there would be an excess supply of shares. Thus the expression of $p_1(\theta)$ that clears the interim stock market is

$$
p_1(\theta)=min\left\{\theta p_0,\frac{(1-\pi)y}{\pi z}\right\} \tag{A.7}
$$

In equilibrium, we know that $z=1$ and $y=\omega_0-p_0$. As stated above, we search for an equilibrium where interim stock prices in equilibrium do not depend on the realization of the liquidity shock, thus $p_1(\theta)=\theta p_0$. Replacing all these equalities in the outsider's ex ante first order condition yields:

$$\frac{(1-\eta)(p_0-\theta_L p_0)}{(\theta_L p_0 - p_0)+\omega_0} = \frac{\eta(\theta_H p_0 - p_0)}{(\theta_H p_0 - p_0)+\omega_0} \qquad \text{(A.8)}$$

After rearranging we solve for p_0, which is equal to

$$p_0{}^D = \frac{\omega_0 [E(\theta)-1]}{(\theta_H - 1)(1-\theta_L)} \qquad \text{(A.9)}$$

For this to be an equilibrium we need to check that $\theta_H p_0{}^D \le \frac{1-\pi_h}{\pi_h}\left(\omega_0 - p_0{}^D\right)$, which is equivalent to have

$$(E(\theta)-1)(\pi_h\theta_H + (1-\pi_h)) \le (1-\pi_h)(\theta_H - 1)(1-\theta_L) \qquad \text{(A.10)}$$

Thus, if this condition is true, the equilibrium prices are those given above. The expected utility for the outsider can then be obtained by replacing these prices and equilibrium conditions in the ex ante expected utility above:

$$\begin{aligned} &\eta\,\mathbf{ln}\left(\omega_0 + (\theta_H - 1)p_0{}^D\right) + (1-\eta)\mathbf{ln}\left(\omega_0 + (\theta_L - 1)p_0{}^D\right) + 0 \\ &= \eta\,\mathbf{ln}[(1-\theta_L)(\theta_H - E(\theta))] + (1-\eta)\mathbf{ln}[(\theta_H - 1)(E(\theta)-\theta_L)] \end{aligned} \qquad \text{(A.11)}$$

provided that $p_0{}^D = \frac{\omega_0[E(\theta)-1]}{(\theta_H - 1)(1-\theta_L)} > \varepsilon$, a condition that we assume here.

A.2 Non-disclosure equilibrium with insider trading

In this case, we start by solving backwards the late outsider's problem given that the insider does not disclose. Bhattacharya and Nicodano (2001) showed that (for a suitable value of $\hat{z}$), even without disclosure, outsiders are able to infer correctly two out of the four aggregate states: (l,H) and (h,L). Thus, the interim stock prices for such states are the same as in the case of perfect disclosure, and so we can search for an equilibrium such that, even without disclosure, $p_1(l,H) = \theta_H p_0$ and $p_1(h,L) = \theta_L p_0$.

For the other two states, (l,L) and (h,H), p_1 is the same in each of those two states. We search for an equilibrium with no disclosure such that the constraint $p_1 z_1 \le y$ is not necessarily binding. The interim problem for a late outsider is to choose z_1 that maximizes:

$$\frac{\eta\alpha}{\eta\alpha + (1-\eta)(1-\alpha)}\mathbf{ln}[\theta_H p_0 z + y + (\theta_H p_0 - p_1)z_1] + \frac{(1-\eta)(1-\alpha)}{\alpha\eta + (1-\eta)(1-\alpha)}\mathbf{ln}[\theta_L p_0 z + y + (\theta_L p_0 - p_1)z_1] \qquad \text{(A.12)}$$

The first order condition is equal to

$$\eta\alpha l \frac{\theta_H p_0 - p_1}{[\theta_H p_0 z + y + (\theta_H p_0 - p_1) z_1]} = (1-\eta)(1-\alpha) \frac{p_1 - \theta_L p_0}{[\theta_L p_0 z + y + (\theta_L p_0 - p_1) z_1]} \quad (A.13)$$

By solving for z_1 we get:

$$z_1 = \frac{\eta\alpha(\theta_L p_0 z + y)(\theta_H p_0 - p_1) - (1-\eta)(1-\alpha)(p_1 - \theta_L p_0)(\theta_H p_0 z + y)}{(\eta\alpha + (1-\eta)(1-\alpha))(p_1 - \theta_L p_0)(\theta_H p_0 - p_1)} \quad (A.14)$$

The reader can check that, if $\theta_L p_0 < p_1 < \theta_H p_0$ then this solution satisfies $p_1 z_1 \le y$. Of course, for this to be strictly positive we need to impose constraints such that the numerator is strictly positive, which will be assumed in the numerical exercises. Tedious algebra shows that the expected interim utility for a late outsider, after replacing this expression in the objective function, can be written as

$$\begin{aligned} &\frac{\eta\alpha}{\eta\alpha + (1-\eta)(1-\alpha)} \mathbf{ln}\left[\eta\alpha\left(\frac{(\theta_H p_0 z + y)(p_1 - \theta_L p_0) + (\theta_L p_0 z + y)(\theta_H p_0 - p_1)}{(\eta\alpha + (1-\eta)(1-\alpha))(p_1 - \theta_L p_0)}\right)\right] \\ &+ \frac{(1-\eta)(1-\alpha)}{\alpha\eta + (1-\eta)(1-\alpha)} \mathbf{ln}\left[(1-\eta)(1-\alpha)\left(\frac{(\theta_H p_0 z + y)(p_1 - \theta_L p_0) + (\theta_L p_0 z + y)(\theta_H p_0 - p_1)}{(\eta\alpha + (1-\eta)(1-\alpha))(\theta_H p_0 - p_1)}\right)\right] \end{aligned} \quad (A.15)$$

which is equal to

$$\begin{aligned} &\mathbf{ln}[(p_1 z + y)(\theta_H - \theta_L) p_0] \\ &+ \frac{\eta\alpha}{\eta\alpha + (1-\eta)(1-\alpha)} \mathbf{ln}\left[\left(\frac{\eta\alpha}{(\eta\alpha + (1-\eta)(1-\alpha))(p_1 - \theta_L p_0)}\right)\right] \\ &+ \frac{(1-\eta)(1-\alpha)}{\alpha\eta + (1-\eta)(1-\alpha)} \mathbf{ln}\left[\left(\frac{(1-\eta)(1-\alpha)}{(\eta\alpha + (1-\eta)(1-\alpha))(\theta_H p_0 - p_1)}\right)\right] \end{aligned} \quad (A.16)$$

For an early outsider, the utility is just $\mathbf{ln}(y + p_1 z)$. Thus, the expected ex ante utility for an outsider is:

$$\begin{aligned} &[\eta\alpha + (1-\eta)(1-\alpha)]\mathbf{ln}(z p_1 + y) + [\eta\alpha + (1-\eta)(1-\alpha)]\mathbf{ln}[(\theta_H - \theta_L) p_0] \\ &+ \eta\alpha(1-\pi_h)\mathbf{ln}\left[\left(\frac{\eta\alpha}{(\eta\alpha + (1-\eta)(1-\alpha))(p_1 - \theta_L p_0)}\right)\right] + (1-\eta)(1-\alpha)(1-\pi_l)\mathbf{ln}\left[\left(\frac{(1-\eta)(1-\alpha)}{(\eta\alpha + (1-\eta)(1-\alpha))(\theta_H p_0 - p_1)}\right)\right] \\ &+ (1-\eta)\alpha\left[\mathbf{ln}(z p_1(h, L) + y) + (1-\pi_h)\mathbf{ln}\left(\frac{\theta_L p_0}{p_1(h, L)}\right)\right] + (1-\alpha)\eta\left[\mathbf{ln}(z p_1(l, H) + y) + (1-\pi_l)\mathbf{ln}\left(\frac{\theta_H p_0}{p_1(l, H)}\right)\right] \end{aligned}$$

(A.17)

In an equilibrium where $p_1(l, H) = \theta_H p_0$ and $p_1(h, L) = \theta_L p_0$ the first order condition with respect to z can be written as:

$$\frac{(\eta\alpha+(1-\eta)(1-\alpha))(p_1-p_0)}{(p_1-p_0)z+\omega_0}+\frac{\eta(1-\alpha)(\theta_H-1)p_0}{(\theta_H-1)p_0z+\omega_0}=\frac{(1-\eta)\alpha(1-\theta_L)p_0}{(1-\theta_L)p_0z+\omega_0} \quad \text{(A.18)}$$

In equilibrium z = 1, and

$$\begin{aligned}(1-\pi_h)z_1 &= \pi_h z\\ (1-\pi_l)z_1 &= \pi_l z+\hat{z}\end{aligned} \quad \text{(A.19)}$$

which implies that

$$\hat{z}=\left(\frac{1-\pi_l}{1-\pi_h}\right)(\pi_h-\pi_l)z \quad \text{(A.20)}$$

and so we must have that

$$z_1^{eq,ND}=\frac{\eta\alpha(\theta_L p_0+\omega_0-p_0)(\theta_H p_0-p_1)-(1-\eta)(1-\alpha)(p_1-\theta_L p_0)(\theta_H p_0+\omega_0-p_0)}{(\eta\alpha+(1-\eta)(1-\alpha))(p_1-\theta_L p_0)(\theta_H p_0-p_1)}=\left(\frac{\pi_h}{1-\pi_h}\right) \quad \text{(A.21)}$$

which rearranged yields

$$\begin{aligned}&[\eta\alpha(\theta_L-1)\theta_H+(1-\eta)(1-\alpha)(\theta_H-1)\theta_L](1-\pi_h)p_0^2\\ &-(\eta\alpha(\theta_L-1)+(1-\eta)(1-\alpha)(\theta_H-1))(1-\pi_h)p_0p_1\\ &+(1-\pi_h)(\eta\alpha\theta_H+(1-\eta)(1-\alpha)\theta_L)p_0\omega_0-(1-\pi_h)(\eta\alpha+(1-\eta)(1-\alpha))\omega_0p_1\\ &=\pi_h(\eta\alpha+(1-\eta)(1-\alpha))(p_1-\theta_L p_0)(\theta_H p_0-p_1)\end{aligned} \quad \text{(A.22)}$$

As for p_0 the condition comes from the FOC with respect to z evaluated at z = 1:

$$\frac{(\eta\alpha+(1-\eta)(1-\alpha))(p_1-p_0)}{(p_1-p_0)+\omega_0}+\frac{\eta(1-\alpha)(\theta_H-1)p_0}{(\theta_H-1)p_0+\omega_0}=\frac{(1-\eta)\alpha(1-\theta_L)p_0}{(1-\theta_L)p_0+\omega_0} \quad \text{(A.23)}$$

This is a non-linear system in prices p_0, p_1 which we solve numerically following Bhattacharya and Nicodano (2001). The following table shows the parameter values used in this exercise:

θ_H	θ_L	π_h	π_l	η	α	ω_0
2.5	0.1	0.7	0.3	0.45	0.50	1

The next table shows the prices and expected utilities obtained in each equilibrium.

p_0^D	V_O^D	p_0^{ND}	V_O^{ND}	$V_I^{cheat}-V_I^D$
0.133	0.312	0.085	-0.356	0.0585

This illustration clearly shows an example of parameter values that allow values for the expected utilities such that Propositions 1 and 2 can be obtained.

Appendix B: Estimation of the Probability of private information-based trading

B.1. Methodological Review

We estimate the probability of private information-based trading (PIN) using the discrete time theoretical framework developed by Easley and O'Hara (1987, 1992) and implemented in several applications for US markets by Easley, O'Hara, and co-authors (1996a, 1996b, 1997a, 1997b, 2002). To the best of our knowledge, this is the only theoretical model that generates a structural equation that allows direct estimation of the probability of privately informed trading. This method contrasts with others in the literature (Keown and Pinkerton, 1981, John and Lang, 1991, Meulbroek, 1992, Cornell and Sirri, 1992, and Estrada and Peña, 2002) that only provide an indirect methodology to infer informed trading and is better suited for countries where insider trading prosecutions are rare. This section briefly surveys the basic elements of the above-mentioned methodology.

The basic intuition behind the model is that sudden increases in the gap between buy and sell orders (i.e. order imbalance) may be associated with more active participation by informed parties resulting from the arrival of private information. In the model, once informed parties observe a signal, they always trade as long as they can extract a rent. If trading is not caused by private information, one would expect a more stable and balanced flow of buy and sell orders.

More formally, the model considers that a signal that is perfectly correlated with the value of the asset may be realized before the beginning of the trading day. The true value of the asset will be publicly known only at the end of the day. Both the signal and the value of the firm may take only two realizations, either high or low. However there may be days with no signal realization at all. The trading day is divided into many discrete time periods. The asset is traded in a market with competitive market makers. Agents execute all buying and selling orders from investors at prices quoted by the market makers. There are two types of investors. Privately informed traders (or *insiders*) know the realization of the signal. Liquidity or *noise* traders may buy or sell for reasons other than information. Investors and market makers are assumed to be risk neutral.[27] There may also be no trade in some periods.

Transactions take place sequentially, over the many time periods comprised in one day, as illustrated in Figure B1. In every period, nature chooses only one trader to place an order. If nature chooses an informed trader (which happens with probability μ), this agent buys (if the

[27] Most Latin American exchanges are organized as auction markets, not as dealer markets, so the price setting mechanisms are not exactly the same as in the model (and in the NYSE). For a comparison between both types of markets see, for example, Heidle and Huang (2002)

signal indicated a high value) or sells (if the signal indicated a low value) one unit of the asset.[28] Nature chooses a noise trader with the remaining probability (1-μ). This agent may either trade with probability ε, or not trade. If she trades, she sells one unit with probability ρ and buys with the remaining probability 1- ρ.

In equilibrium, given perfect competition across market makers, they set bid and ask quotes equal to the expected value of the asset conditional on either a sell or a buy, respectively. Glosten and Milgrom (1985) have shown that these are, indeed, the optimal quote policies by these market makers. Thus, each market maker extracts information from the order flow. Both Glosten and Milgrom (1985) and Easley and O'Hara (1992) have shown that, if all probabilities are bounded in (0,1), the effective market price converges almost surely to the true value of the firm by the end of the trading day.

(FIGURE B1 ABOUT HERE)

While μ is the probability of information-based trading conditional on the existence of private information, our object of interest is the probability that a given observed trade is generated by an informed investor, i.e., the probability that, conditional on a trade, that trade comes from an informed investor, regardless of the knowledge about the existence of private information. This equals the probability of observing an informed trade divided by the total probability of observing a trade, be it informed or uninformed,

$$PIN = \frac{\alpha\mu}{\alpha\mu + (1-\alpha\mu)\varepsilon} \qquad \text{(B1)}$$

This probability depends on α (the probability that an information event takes place), on μ (the joint probability of a trade and that the trade comes from an informed investor, given that an information occurs), and on ε (the probability that an uninformed investor decides to trade when nature chooses him). For given α and μ, the greater is the propensity of the uninformed investor to trade ε, the lower should be the probability that a given trade comes from an informed investor.[29]

In the model, the number of trades is ex-ante random. For illustration, the last column of Figure B1 shows the probability that we observe 5 buys, 4 sells, and 1 no-trade period in one day given three different scenarios: there is bad (private) information, there is good (private)

[28] A more general model (e.g. Easley and O'Hara, 1987) would consider two different trade sizes. However, the empirical evidence on the relevance of trade size in US stock markets is somewhat ambiguous. Therefore we estimate the simplest version of the model ignoring size information.

[29] As stated in the main text, we estimate PIN on the 288 most liquid Latin American stocks out of a universe of over 1,000 listed stocks. Even within this relatively very liquid sample, there is substantial heterogeneity of trading activity: 100 stocks traded more than 300 times per day on average during the sample period, while 94 stocks traded less than 75 times per day (Tables with details on trading data are available upon request from the authors). Therefore, it is crucial to take into account the different trading frequency in assessing the prevalence of informed trading among Latin American stocks.

information, or there is no new (private) information. The unconditional probability of observing 5 buys, 4 sells and 1 no-trade period during that day is just the weighted average of these three probabilities, the weights being the probabilities of observing bad information ($\alpha\delta$), good information (α(1-δ)), and no information (1-α). Generalizing this allows us to write the probability of observing a given amount of *B* buys, *S* sells, and *N* no trades as,

$$\begin{aligned} L[\theta \mid B,S,N] = P[B,S,N \mid \theta] = \alpha\delta\ P[B,S,N \mid \text{low signal}] \\ +\alpha(1-\delta)\ P[B,S,N \mid \text{high signal}] \\ +(1-\alpha)\ P[B,S,N \mid \text{no signal}] \end{aligned} \tag{B2}$$

where

$$\theta = (\alpha,\delta,\mu,\varepsilon,\rho),$$

$$P[B,S,N \mid \text{low signal}] = [\mu + (1-\mu)\varepsilon\rho]^S\ [(1-\mu)(1-\varepsilon)]^N\ [(1-\mu)\varepsilon(1-\rho)]^B,$$

$$P[B,S,N \mid \text{high signal}] = [(1-\mu)\varepsilon\rho]^S\ [(1-\mu)(1-\varepsilon)]^N\ [\mu + (1-\mu)(1-\rho)]^B, \text{ and}$$

$$P[B,S,N \mid \text{no signal}] = [\varepsilon\rho]^S\ [(1-\varepsilon)]^N\ [\varepsilon(1-\rho)]^B.$$

Equation (B2) shows the likelihood of observing a trade pattern during a given day. In order to estimate the model's parameters, the literature assumes that these are fixed during a period of time, and that the number of daily buys, sells, and no-trades observed during that period are a random sample from this distribution.[30] With these assumptions, the problem reduces to maximizing the log likelihood,

$$l = \sum_{t=1}^{T} \ln L(\theta \mid B_t, S_t, N_t) \tag{B3}$$

The solution to this maximization problem provides the parameter estimates used to compute PIN in (B1).

B.2 The Probability of Information-Based Trading (PIN) as Proxy for the Insider Trading Probability: A Discussion

As described above, the PIN estimation procedure relies exclusively on the observed pattern of buys, sells, and no-trades. Such pattern, however, may result from factors other than private information, such as market humor, pure heterogeneous beliefs, etc. In this section, we argue why we think that PIN is a good measure of the intensity of privately informed trading by

[30] Easley et al. (2002) is the only paper that explicitly estimates time-varying PIN.

surveying several results in the literature that indirectly validate it. Alternative measures of asymmetric information in stock markets include the bid-ask spread, the adverse selection component of the spread, the price impact of trades and volume.

A vast brand of the literature relies on the bid-ask spread to proxy for the degree of asymmetric information, including the framework we use here (see Glosten and Milgrom, 1985, Kyle, 1985, Easley and O'Hara, 1987, for a theoretical analysis of this relationship). The idea is that the higher the degree of asymmetric information, the higher is the adverse selection cost both for uninformed investors and dealers and so the larger is the spread. A number of recent empirical papers show a positive correlation between the spread and PIN. For example, Odders-White and Ready (2004) use the 3,000 largest capitalization firms listed on NYSE, AMEX and NASDAQ during 24 calendar quarters between January 1995 and December 2000 and find a correlation between the relative quoted spread (spread divided by price) and PIN of 0.35. Using a sample of 5,500 firms listed on NYSE, AMEX and NASDAQ from the fourth quarter of 1997 and the fourth quarter of 1998, Dennis and Weston (2001) estimate this coefficient to be 0.33. Finally, Vega (2004) estimates both spreads and PINs for 1,461 stocks listed on the NYSE between January 1986 and December 2001, and finds a correlation of 0.19. In all the cases, the correlation coefficients are statistically significant at a 5 percent level or better.

On the other hand, Hasbrouck (1991) postulates that a higher price change (controlling for volume) reflects the presence of more private information. Both Odders-White and Ready (2004) and Dennis and Weston (2001) found this correlation to be strictly positive and statistically significant. Finally, Wang (1994), among others, argues theoretically that information asymmetry and volume are negatively correlated. Brown, Finn and Hillegeist (2001) find a correlation of -0.45 between PIN and share volume using data from more than 230 firms listed on the NYSE, while Straser's (2002) coefficient is almost identical (-0.46).

While PIN is not free from some criticisms, the above results suggest that PIN points in the same direction as other asymmetric information measures commonly used in the literature.[31] Moreover, it has the advantage that it explicitly attempts to measure our object of interest.

It is noteworthy that not all privately informed trading is insider trading, as it could be based on carefully processed public information (e.g. analysts' reports). Aslan (2004) studies the behavior of PIN before and after the introduction of the Fair Disclosure Regulation in 2000 for a sample of more than 1,500 NYSE stocks. She finds that, for medium and large size stocks, the PIN fell after the regulation, which is what should occur if PIN really measures informed trading intensity. However she also finds that PIN increased for small-size stocks after the regulation. To solve this puzzle, she uses Wang's (1998) model to discriminate informed trading between pure information asymmetry and heterogeneity of beliefs. She concludes that the increase in PIN for

[31] To the best of our knowledge, Aktas et al. (2004) provide the strongest criticism of the Easley and O'Hara (1987, 1992) measure of informed trading. These authors compute PIN for a sample of 87 French companies listed on the Paris Bourse around merger and acquisition announcements that took place between 1995 and 2000, and find that that PIN drops in periods previous to the public announcement date relative to a control and post-announcement window. (Here the control window comprises the period of between 270 and 181 days previous to each announcement, the remote pre-announcement period includes the period of between 180 and 66 days before the announcement, the near pre-announcement period goes from 65 to 6 days previous to the announcement, while the post-announcement period goes from 3 to 63 days after the announcement).

small-size stocks can be explained by an increase in diversity of beliefs. This suggests that informed trading (measured by PIN but also by the other proxies) is also related to investors and analysts who can better interpret publicly available information than other traders.[32]

This broader interpretation of informed trading actually states that not only the quantity of public information matters, but also its quality. Aslan's (2004) result suggests that, for small-size stocks, the publicly available information after the regulatory change lacked enough precision to be rightly interpreted by *all* market participants. Moreover, Brown et al. (2001) find that PIN is negatively correlated with the AIMR Score, a proxy for the quality of publicly disclosed information. Despite the caveats of using only one proxy of the disclosure quality, this illustrates the idea that firms with better corporate governance practices (that include better publicly disclosed information) should have a lower PIN.

Appendix C: Data Sources and Sample Construction

C.1. Stock Data

We take the universe of stocks and ADRs from Argentina, Brazil, Chile, Colombia, Peru, Mexico, and Venezuela, a total of more than 1,400 tickers from about 1,000 corporations.[33] For each ticker we multiply the total volume traded in US dollars by the fraction of days during which it traded, both using data from the 43 weekdays between October 2, and November 29, 2003. We rank all stocks in decreasing order of this liquidity index and we obtain intraday data from Bloomberg for the top 602 ranked tickers for the period between October 2, 2003, until September 30, 2004. The specific variables are ticker, exchange, time (hour, minute, and second), price, and volume of each transaction. For most markets we also obtain data on the best offers and their changes prevailing at each point in time during the course of trading: time, highest bid price, total volume offered at highest bid price, lowest ask price, and total volume offered at lowest ask price.[34] In total, we process about 80 million records of individual transactions and offers. We focus on all non-condition-coded transactions that take place between one half hour after the official opening of each market and the close of that market.[35]

About one half of the 602 stocks traded during less than three out of five days during the sample period. So we focus on a subset composed of the 288 most liquid tickers pertaining to

[32] Note that analysts can in principle study a wide cross section of firms, but insiders will only know about their own. In the empirical analysis, we use sector, country or stock-specific controls to remove some of the informed analyst effects that are constant across stocks or over time.
[33] Hereafter, we will use stock and ticker as synonyms: both refer to a unique security-exchange combination. Note that an ADR and its underlying stock have different tickers, just like the preferred and common stock of the same corporation.
[34] The bid and ask prices are used to facilitate identifying transactions as buyer-initiated or seller-initiated. The bid and ask volumes are helpful to identify possible measurement error of transaction volume. We lack offer data for Colombia and for ADRs.
[35] Transaction records flagged with condition codes are unusual in some sense (e.g. they pertain to the official closing price of a market (which is not a real trade), or they pertain to a trade that is subject to non-standard delivery terms).

207 corporations.[36] We restrict the sample in this way in order to reduce the possibility of making faulty inferences induced by imprecisely estimated PINs. Most of the stocks in this sample are from Brazil and Mexico, which account for almost 87 percent of the trading in the region. Chile, Argentina, and Peru account for about 12 percent of trading, while Colombia and Venezuela make up the remaining one percent. For the region as a whole, there is about as much trading in the ADR market as there is at home.[37]

While every transaction involves a purchase by one party and a sale by another party, we focus on which action actually triggered the transaction in order to declare it as a buy or as a sell. To do this, we follow Lee and Ready (1991) to classify each transaction as seller-initiated or buyer-initiated. For a trade observed at the ask (bid) price, this method classifies it as a buy (sell). For a trade above (below) the midpoint of the bid-ask spread the method classifies it as buyer-initiated (seller-initiated).[38] For each day in the sample, we compute the number of buys, sells, and no trade periods (B_t, S_t and N_t in equation (B3)). Following Easley et al. (1997a) we define the number of no trade periods between two subsequent trades as the maximum integer number of five-minute-long intervals between them.

With these data in hand, we estimate the parameters of the model by maximum likelihood using the Newton-Raphson algorithm on a fine grid.[39] Easley et al. (1996a, 1996b, 1997a, 1997b) proceed in this way to estimate the parameters using data from periods that range between six and twelve weeks. We estimate equation (B3) for each calendar quarter in the sample for these 288 tickers. With those estimates, we use equation (B1) to compute the PINs, which provide the basis for all our empirical tests except for the event study.[40]

C.2. Country Data

We follow the literature in using several measures of the quality of the nationwide investor protection environment. Table C1 in the Appendix defines precisely each of the variables used,

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[36] It is available upon request from the authors several tables that provide details on the industrial sector breakdown of the tickers by country, the distribution of liquidity in this sample and the distribution of traded volume by quintiles.

[37] The exceptions are Peru and Venezuela for which there is about 5.5 and 1.8 times as much trading in the US as there is at home.

[38] When offer data are unavailable, Lee and Ready propose to use the 'tick test.' This test declares a given trade to be buyer-initiated (seller-initiated) when its price is higher (lower) than that of the last preceding trade with a price that was different from that given trade's price. Since this criterion proves to be very precise relative to the case with offer data, we just rely on transaction data for Colombia and the US. When offer data are available but the trade price is exactly at the midpoint of the spread Lee and Ready suggest using the tick test.

[39] The estimation procedure comprises a possibly non-concave optimization problem because the expression inside the logs is of the form $f(\psi)^X$, where X is greater than one (X is the number of buys, sells, or no trade periods). These functions are strictly convex for $X>1$. Even if applying the natural log to these functions, the convexity may still remain. As standard in this literature, we take care of possible multiple local maxima using each grid point as the initial value of the algorithm, and then choosing the highest among the local maxima attained from each starting point.

[40] The model could not be estimated for some ticker-quarters. This may be due to sudden drops in the liquidity of a security (including outright delisting), or to convergence failure of the algorithm. Therefore, the number of ticker-quarters (N) in the first column of Table 2.A is not necessarily a multiple of four.

while Table C2 shows their values for the countries in the sample and how their mean and standard deviation compare with those of the other countries in the La Porta et al. (1998) sample. Besides the original La Porta et al. (1998) variables, we use the March, 2004, reading of the International Country Risk Guide's Law and Order and Corruption indices, to which we add Investment Profile, also from ICRG. In addition to these variables we use the legality index of Berkowitz, Pistor, and Richard (2003), a linear combination of Judicial Efficiency, Law and Order, Corruption, Risk of Expropriation, and Risk of Contract Repudiation from La Porta et al. (1998) and ICRG. We also use a second reading of this index using the updated arguments from ICRG (2004). The seven countries in our sample have regulations banning illegal insider trading according to Bhattacharya and Daouk (2002), from whom we borrow the Insider Trading Enforcement dummy. This variable equals one if at least one person had been prosecuted under these laws as of March, 1999, and it is zero otherwise. Mexico stands out as a paradigmatic case of non-enforcement: although it banned illegal insider trading in 1975, nobody had ever been prosecuted by the end of the century.

C.3. Firm-Specific Variables

Country, industrial sector, whether the stock is classified as common or preferred, and its ADR status are from Bloomberg. Some researchers (e.g. Leal and Carvalhal-da-Silva, 2005) argue that Brazilian preferred stocks (e.g. PN, PA, or PB shares) are in fact non-voting common stocks with no material dividend payments. They and others (e.g. Carvalho, 2000) find that control in Brazilian corporations is so concentrated that controlling groups can easily divert net income away from outside shareholders. While we stick to the Bloomberg classification, we use the terms "preferred" and "non-voting" shares as synonyms since the only such stocks in the 288 ticker sample are from Brazil. Note that ADR and Common/Preferred status are independent groupings. ADR tickers were classified as common or preferred stocks based on what was the case for each ADR's underlying security. The ADR classification admits four mutually excluding and exhausting categories: either the ticker corresponds to an ADR, or it corresponds to an ADR underlying security, or it corresponds to a company that has an ADR program, although this ticker itself is neither the ADR nor the underlying, or finally the ticker is from a company that does not have an ADR program.[41]

Individual corporate governance ratings are from Credit Lyonnais South Asia (2001). We use the average rating for each firm and some of its subindices: management transparency, management discipline, and management independence.

Since our market value regression expands that in La Porta et al. (2002), we follow their steps in measuring Tobin's q and average sales growth for the four quarters in the sample, for which we use balance sheet data from Economatica. We define a proxy measure of q as the ratio of market value of assets to book value of assets.[42] Most firms release their quarterly accounting

[41] International Depository Receipts (IDRs) and Global Depository Receipts (GDRs) trading in the US are coded as ADRs. A few stocks labeled as 'Unit' in Bloomberg (instead of 'Common' or 'Preferred') are coded as common stocks. Tenaris and Quilmes of Argentina, which are legally headquartered in Luxembourg, are coded as Argentine corporations. Also, Southern Peru Copper Co. and Credicorp Ltd. are two Peruvian-coded firms that Bloomberg shows as headquartered in the US and Bermuda respectively.
[42] The market value of assets results from summing the book value of liabilities and the market value of equity. From an accounting identity, the book value of liabilities equals the book value of assets minus the book value of

data before the eighth week into the next quarter, so we assume that the quarterly balance sheet data has been fully incorporated into market prices two months after the closing of the quarter.[43] Therefore, our first quarterly measure of Tobin's *q* corresponds to accounting data for the third quarter of 2003, matched with the market value of equity as of December 1, 2003. In the market value regressions, these measures of *q* are aligned with PINs estimated from trades taking place during the fourth quarter of 2003. Similarly, the fourth reading of Tobin's *q* uses accounting data from the second quarter of 2004, matched with the market value of equity as of September 1, 2004, and with PINs estimated with transaction data from the third quarter of 2004.[44] As pointed out by La Porta et al. (2002, p. 1158, last paragraph) this measure of equity value is assessed from the point of view of outside shareholders, so it is from the perspective of investors who do not necessarily have access to the firm's control or inside information. To reduce the weight of outliers, we censor Tobin's *q* at the 5th and 95th percentiles, by setting extreme values to the 5th and 95th percentiles respectively.

To proxy for the value of growth opportunities, for each quarter and firm in the sample we compute the annual US dollar sales growth rate for the three years ending 11 months before the reading of the market value of equity. So, the first observation of the sales growth rate is an average of annual sales growth from January, 1999, until December, 2002, and that is matched with Tobin's *q* as of December 1, 2003. We actually use the geometric annual average growth rate from up to three years.[45] Again, we cap sales growth at the 5th and 95th percentiles to avoid problems with outliers.

The 288 tickers used in the rest of this study correspond to 207 unique firms, and the market value regression is ran at the firm (not at the ticker) level. After dropping firms with missing data, we are left with 175 firms which are the basis for this estimation.

Along with La Porta et al. (2002), we also run the market value regression expressing sales growth and *q* in deviation from the industry medians (see results in Table 4.B and section 4). Following their procedure, we take all firms in Economatica, excluding the 205 firms in our sample, and we compute *q* and average sales growth for the 1,135 remaining firms for which data are available.[46] These firms are from 19 different industries according to the Economatica classification, and all sectors have at least five remaining firms in them. We find the median *q*

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equity. This is used as a proxy for the market value of liabilities, which is not easily observable. Data on deferred taxes are unavailable for the firms in our sample, so we cannot replicate exactly the La Porta et al. (2002, p. 1158) definition of *q*. Our measure mimics that in Klapper et al. (2002).

[43] The details on this data are available upon request from the authors.

[44] Economatica only reports the sum of total shares outstanding: the result of adding all classes of common shares with different voting rights and preferred shares. Given the inability to discriminate within the different classes of common and preferred shares and across both categories of stocks, in order to compute the market value of equity, we multiply the total number of shares by the price of the issue that was most heavily traded during the full sample period. Note that, for the majority of companies with liquid common and preferred shares to be included in the 288 ticker sample (all of them from Brazil), the traded volume of preferred shares exceeded that of common shares by a factor of between 10 and 40. The 288 tickers correspond to 207 corporations. Two were dropped for lack of data: Embratel (Brazil) and La Polar (Chile).

[45] This computation and alignment procedure for sales growth and *q* mimics that in La Porta et al. (2002).

[46] Although we technically take both active and cancelled firms in Economatica, which total 1,135, in practice the cancelled firms lack data. The count of the active-firm subset was 815.

and average sales growth for each of the 19 sectors and so compute the industry-adjusted variables thereof for the firms in our sample.

C.4. Corporate Announcements Data

The comprehensive list of corporate announcements used for the event study in section 5.4 is from Bloomberg. We consider four types of announcements: acquisitions, divestitures, cash dividends, and earnings announcements, which make up the majority of public statements by firms.

It is possible to find different patterns of informed trading before periodic announcements than before non-periodic or aperiodic announcements. On the one hand, the market knows that a corporation will announce earnings about six weeks after the end of the quarter. While in an ideal world the magnitude of the earnings figure is secret, the frequency of the release is approximately common knowledge. The situation differs for aperiodic announcements. In an ideal world, not only their content is secret, but also the frequency of their public release. So we conjecture that the ratio of illegally over legally privately informed trades is higher before aperiodic announcements than before periodic announcements. Therefore, we classify Earnings and Cash Dividends announcements as periodic, and Acquisition and Divestiture announcements as aperiodic, and compute potentially different event effects for each type.

For each announcement in the sample, we estimate three PINs during adjacent periods, each being 20 trading-days long: a control period from $\tau = -40$ to $\tau = -21$, a pre-announcement period from $\tau = -20$ until $\tau = -1$, and a post-announcement period from $\tau = 1$ to $\tau = 20$.[47] Given the requirement of 40 trading days before the first announcement and 20 trading days after the last one, announcements in the event study sample run from November 24, 2003, until September 10, 2004.

The total number of announcements during this period for all the exchanges in the sample is 1,310. About 90 percent of announcements pertain to Earnings and Cash Dividends with the remaining percentage corresponding to Acquisitions and Divestitures. The average ticker made about 4.7 announcements during the sample period.[48] There are eight stocks in the 288-ticker sample that did not release any announcements during the announcement sample. There are 14

[47] Here τ indicates time measured in trading days. Note that transactions taking place in the day of the announcement are discarded since we do not know whether the announcement was made before or after the opening of trading. We also performed a robustness check using event windows that are 10 trading-days long. The results on this exercise are available upon request.

[48] More details on the breakdown of these announcements by type and exchange, industrial sector, security type, ADR status and volume quintiles and the frequency over time by type of announcement and by country are available in tables from the authors upon request.

stocks from Peru, Venezuela, and Colombia, which made 58 announcements in total; we exclude them to avoid making inference about country effects based on too small a sample. We are left with 266 tickers, which made a total of 1,252 announcements. Further, the algorithm did not converge in estimating equation (B3) for two other stocks that had made a total of five announcements. Therefore, we run the event study on 1,247 announcements from 264 stocks.

Table 1: Record of Insider Trading Prosecutions in Latin America

Panel A: Existence and Enforcement of Insider Trading laws until 1999?

	Argentina	Brazil	Chile	Colombia	Mexico	Peru	Venezuela
Year when IT laws were established in country:	1991	1976	1981	1990	1975	1991	1998
Year of first prosecution under these laws:	1995	1978	1996	Never	Never	1994	Never

Source: Table I in Bhattacharya and Daouk (2002).

Panel B: Number of Insider Trading Prosecutions by the National Securities Commission of Each Country Since 2000

Year	USA	Total Lat. Am.	Argentina	Brazil	Chile	Colombia	Mexico	Peru	Venezuela
2000	40	0	0	0	n.a.	n.a.	n.a.	n.a.	n.a.
2001	57	0	0	0	n.a.	n.a.	0	n.a.	n.a.
2002	59	2	1	1	0	n.a.	0	n.a.	n.a.
2003	50	2	0	0	0	n.a.	2	0	n.a.
2004	42	11	0	1	4	1	4	1	n.a.

Source: The number of insider trading (IT) prosecutions in each country was obtained by scanning the list of actions initiated by each securities commission in each year as reported on its web site. When no IT actions were reported for a given year, we asked the respective commission by email. A lack of response or a "we do not know answer" are coded as n.a., whereas 0 indicates that no actions were initiated in that year according to these two sources. The URLs are: www.cnv.gov.ar/ResDisciplinarias (Argentina), www.cvm.gov.br/port/inqueritos/index2.asp (Brazil), www.svs.cl/sitio/html/novedades/sanciones_cursadas/sanciones.html (Chile), www.supervalores.gov.co/sanciones_reporte (Colombia), www.cnbv.gob.mx/seccion.asp?sec_id=545&com_id=0 (Mexico), www.conasev.gob.pe/normas/Resoluciones_Sancionadoras.asp (Peru), www.cnv.gov.ve (Venezuela), and www.sec.gov/about/secpar/secpar04stats.pdf (USA).

Table 2.A: Distribution of Private Information Trading by Groups of Stocks

This table shows summary statistics of the distribution by stock groups of the private information-based trading probability (PIN), expressed in percentage points. PIN is computed for each of 288 tickers during each quarter from October 2, 2003, until September 30, 2004. The algorithm based on the discrete time model did not converge for a few ticker-quarters. Note that in the top panel, ADRs are pooled with the other stocks from their home country. For comparison, the last line of the top panel reports figures based on the PINs shown in Easley et al. (1996a and 1996b). ADRs were classified as common or preferred stock based on the relevant category for their underlying securities. In the ADR classification (bottom panel) a ticker can either be an ADR, an ADR underlying security, the stock of a company that has an ADR program, although this is not the underlying stock, or the stock of a company that only trades at home. The figures show that PINs are fairly diverse within countries, industrial sectors, and security types.

Country	**N**	**Mean**	**Std.Dev.**	**Min.**	**5th pctl.**	**Median**	**95th pctl.**	**Max.**
Argentina	165	20.5	10.5	3.3	10.5	18.3	42.4	68.4
Brazil	540	16.0	7.8	2.9	7.1	14.6	27.7	76.2
Chile	174	22.3	7.9	6.6	11.9	20.6	37.9	53.0
Colombia	12	28.7	8.4	16.5	16.5	30.6	45.9	45.9
Mexico	186	17.0	6.0	5.8	7.9	17.0	27.5	35.4
Peru	33	19.3	7.1	6.7	7.1	18.2	31.2	37.2
Venezuela	12	23.8	9.3	13.1	13.1	23.2	45.1	45.1
USA (Easley et al.)	*150*	*17.7*	*8.8*	*0.0*	*2.3*	*17.6*	*29.6*	*68.4*
Total	1122							

Industrial Sector	**N**	**Mean**	**Std.Dev.**	**Min.**	**5th pctl.**	**Median**	**95th pctl.**	**Max.**
Basic Materials	203	16.6	6.8	4.7	7.7	16.2	27.7	46.9
Communications	239	16.1	8.7	2.9	6.7	14.6	30.1	76.2
Consumer, Cyclical	98	20.5	6.1	6.2	10.9	19.9	29.0	41.5
Consumer, Non-cyclial	123	19.3	9.2	3.3	8.7	17.5	35.1	60.1
Diversified	48	20.0	7.9	3.5	9.9	19.0	31.6	52.7
Energy	40	16.6	5.8	4.8	7.8	15.9	26.4	28.8
Financial	129	19.9	11.0	3.9	8.5	17.2	38.2	68.4
Industrial	102	19.1	8.6	7.0	8.0	18.1	35.6	55.3
Utilities	140	18.4	8.0	4.4	8.8	16.7	34.4	48.4
Total	1122							

Security Type	**N**	**Mean**	**Std.Dev.**	**Min.**	**5th pctl.**	**Median**	**95th pctl.**	**Max.**
Prefered	405	15.3	7.8	2.9	7.0	14.0	26.4	76.2
Common	717	19.7	8.4	3.3	9.1	18.5	35.4	68.4
Total	1122							

ADR Status	**N**	**Mean**	**Std.Dev.**	**Min.**	**5th pctl.**	**Median**	**95th pctl.**	**Max.**
ADR	306	16.8	10.2	3.3	7.2	14.9	33.0	76.2
ADR Underlying	255	16.1	7.6	5.8	7.1	14.7	30.4	52.7
Co. has ADR, but this is not the underlying	137	18.5	6.0	6.2	9.7	18.2	30.5	38.6
Co. just trades at home (no ADR program)	424	20.1	7.8	2.9	10.3	19.1	36.9	55.3
Total	1122							

Table 2.B: Distribution of Private Information Trading by Volume

This table shows statistics of the distribution of private information-based trading probability (PIN) by volume quintiles. Quintiles are defined for each calendar quarter based on the volume traded in each security during that time. In the top panel, quintiles are exchange-specific, so that volume classification thresholds differ across the eight exchanges (i.e. the seven countries in the sample plus the ADR market). In the bottom panel, a uniform volume classification is used across all exchanges. Daily volumes in local currency are converted in US dollars at each day's closing exchange rate from Economatica. So a security that is relatively liquid in a low volume exchange may be in the top quintile in the top panel but in a lower quintile in the bottom panel. The number of tickers is not constant across quintile bins because it was impossible to estimate PIN during some ticker-quarters. Regardless of the classification used, these figures confirm the finding of Easley et al. (1996b) that PIN is substantially higher for lower volume stocks (e.g. it is about twice as high in the lowest than in the highest volume quintile).

Quintiles Defined Within Each Exchange-Quarter

Intra-Exchange	N	Mean	Std.Dev.	Min.	5th pctl.	Median	95th pctl.	Max.
5th Quintile (Highest Vol.)	230	13.7	6.9	4.4	6.7	11.4	27.7	45.9
4th Quintile	226	14.6	5.6	3.3	7.7	13.6	25.2	37.0
3rd Quintile	232	19.3	8.3	7.2	10.4	17.8	31.6	68.4
2nd Quintile	227	20.5	7.0	9.2	12.5	19.3	33.0	60.1
1st Quintile (Lowest Vol.)	207	22.9	10.3	2.9	9.5	20.6	44.6	76.2
Total	1122							

Quintiles Defined For All Exchanges Within Each Quarter

Inter-Exchange	N	Mean	Std.Dev.	Min.	5th pctl.	Median	95th pctl.	Max.
5th Quintile (Highest Vol.)	222	11.7	4.8	4.4	6.6	10.6	21.7	30.8
4th Quintile	230	15.6	8.0	3.3	7.9	14.1	26.4	68.4
3rd Quintile	227	19.6	6.8	7.4	11.3	18.7	30.7	60.1
2nd Quintile	230	21.2	6.5	9.2	12.8	20.6	34.5	52.7
1st Quintile (Lowest Vol.)	213	22.6	10.4	2.9	9.5	20.1	45.0	76.2
Total	1122							

Table 2.C: Distribution of Private Information Trading by Quarters

This table shows the mean for stocks in each category of the private information-based trading probability (PIN) estimated using data from that quarter. Note that in the top panel, ADRs are pooled with the other stocks from their home country. See notes to Table 2.A for details on security type and ADR classifications. The figures show that PIN displays some variation over time (e.g. they were 17 percent higher on average during the second than during the first quarter of 2004 looking at country grouped data).

Country	2003-IV	2004-I	2004-II	2004-III
Argentina	18.7	18.5	22.0	22.6
Brazil	14.9	15.7	15.9	17.5
Chile	20.9	22.7	23.3	22.2
Colombia	27.3	27.5	32.6	27.5
Mexico	17.0	15.2	16.8	19.2
Peru	22.5	17.5	18.3	19.0
Venezuela	22.9	18.9	30.5	22.9
Regional Average	20.6	19.4	22.8	21.6

Industrial Sector	2003-IV	2004-I	2004-II	2004-III
Basic Materials	16.6	16.2	17.0	16.6
Communications	15.6	15.1	15.5	18.2
Consumer, Cyclical	19.0	18.9	22.3	21.7
Consumer, Non-cyclial	17.0	18.0	20.8	21.5
Diversified	18.8	17.8	21.6	22.0
Energy	14.5	16.9	16.4	18.6
Financial	19.9	19.8	18.8	21.0
Industrial	17.9	19.8	19.9	18.7
Utilities	16.9	16.9	19.2	20.7
Average Across Industries	17.4	17.7	19.1	19.9

Security Type	2003-IV	2004-I	2004-II	2004-III
Prefered	14.7	15.1	15.3	16.2
Common	18.6	18.6	20.3	21.3
Average Across Security Types	16.7	16.9	17.8	18.8

ADR Status	2003-IV	2004-I	2004-II	2004-III
ADR	16.4	16.2	16.4	18.4
ADR Underlying	15.2	14.6	17.4	17.5
Co. has ADR, but this is not the underlying	17.7	17.5	18.3	20.9
Co. just trades at home (no ADR program)	18.8	19.7	20.8	20.9
Average Across ADR Status	17.0	17.0	18.2	19.4

Table 3.A: Categorical Decomposition of Private Information Trading

$$PIN_{it} = \alpha + \boldsymbol{\beta}^{\mathbf{V}\,\prime}\,\mathbf{I}(\text{Vol. Quintile}_{it}) + \boldsymbol{\beta}^{\mathbf{C}\,\prime}\,\mathbf{I}(\text{Country}_i) + \boldsymbol{\beta}^{\mathbf{S}\,\prime}\,\mathbf{I}(\text{Sector}_i) + \boldsymbol{\beta}^{\mathbf{P}\,\prime}\,\mathbf{I}(\text{Common/Preferred}_i) + $$
$$+ \boldsymbol{\beta}^{\mathbf{A}\,\prime}\,\mathbf{I}(\text{ADR status}_i) + \boldsymbol{\beta}^{\mathbf{t}\,\prime}\,\mathbf{I}(t) + \varepsilon_{it} \quad ; \quad i = 1,..,288; \quad t = 1,2,3,4.$$

This table shows the output of pooled OLS regressions controlling for time fixed effects. The dependent variable is the private information-based trading probability (PIN) in percentage points. Dummies are used for each and every possible category within a classification, so the coefficient on a dummy shows how different is the average stock in that category from the overall average stock (Suits, 1984). See note to Table 2.A for details on the security type and ADR classifications. Volume quintiles are defined by exchange-quarter (intra-exchange classification). The industry effects are dropped in model 5 for they are jointly insignificant. The time fixed effects are jointly significant in all specifications and are not reported. White (1980) heteroskedasticity-consistent standard errors are in parenthesis. * indicates significance at 10% level, ** at 5% and *** at 1%.

Model	1	2	3	4	5
Intercept	**21.6** ***	**18.5** ***	**17.8** ***	**18.1** ***	**21.1** ***
	(0.6)	(0.3)	(0.2)	(0.2)	(0.6)
5th Quintile (Highest Vol.)	**-4.4** ***	**-4.5** ***	**-4.5** ***	**-4.4** ***	**-4.1** ***
	(0.4)	(0.4)	(0.4)	(0.4)	(0.4)
4th Quintile	**-3.5** ***	**-3.6** ***	**-3.3** ***	**-3.6** ***	**-3.3** ***
	(0.4)	(0.4)	(0.4)	(0.4)	(0.3)
3rd Quintile	**0.6**	**0.8**	**1.1** **	**0.9** *	**0.5**
	(0.5)	(0.5)	(0.5)	(0.5)	(0.5)
2nd Quintile	**2.1** ***	**2.1** ***	**2.0** ***	**2.1** ***	**2.0** ***
	(0.4)	(0.4)	(0.4)	(0.4)	(0.4)
1st Quintile (Lowest Vol.)	**5.2** ***	**5.3** ***	**4.7** ***	**4.9** ***	**4.9** ***
	(0.7)	(0.7)	(0.7)	(0.7)	(0.7)
Argentina	**-0.9**				**-1.2**
	(0.96)				(0.96)
Brazil	**-5.3** ***				**-4.6** ***
	(0.7)				(0.7)
Chile	**0.4**				**0.4**
	(0.8)				(0.7)
Colombia	**8.0** ***				**7.7** ***
	(2.5)				(2.3)
Mexico	**-4.6** ***				**-4.7** ***
	(0.7)				(0.6)

Table 3.A (cont.)

Model	1	2	3	4	5
Peru	**-2.1** *				**-2.4** **
	(1.2)				(1.1)
Venezuela	**4.6** **				**4.7** **
	(2.3)				(2.2)
Basic Materials		**-0.2**			
		(0.6)			
Communications		**-2.1** ***			
		(0.5)			
Consumer, cyclical		**1.0** *			
		(0.6)			
Consumer, non-cyclical		**0.3**			
		(0.7)			
Diversified		**0.4**			
		(0.9)			
Energy		**-0.6**			
		(0.9)			
Financial		**2.3** ***			
		(0.8)			
Industrial		**-0.5**			
		(0.7)			
Utilities		**-0.6**			
		(0.6)			
Common Stock			**1.8** ***		**0.6** **
			(0.2)		(0.3)
Preferred Stock			**-1.8** ***		**-0.6** **
			(0.2)		(0.3)
ADR				**-1.2** ***	**-1.5** ***
				(0.4)	(0.4)
ADR Underlying				**0.1**	**-0.2**
				(0.4)	(0.3)
Co. has ADR, but this is not the underlying				**-0.2**	**0.5**
				(0.4)	(0.4)
Co. just trades at home (no ADR program)				**1.3** ***	**1.2** ***
				(0.4)	(0.4)
R-squared	**0.27**	**0.20**	**0.22**	**0.19**	**0.29**
No. of ticker-quarters	**1123**	**1123**	**1123**	**1123**	**1123**

Table 3.B: Private Information Trading and Investor Protection Environment

$$PIN_{ijt} = \alpha + \beta^{G}\ Governance\ Quality_{ij} + \boldsymbol{\beta}^{\mathbf{t}\,\prime}\, \mathbf{I}(t) + \boldsymbol{\beta}^{\mathbf{V}\,\prime}\, \mathbf{I}(\text{Vol. Quintile}_{it}) + \varepsilon_{ijt}$$

$$i = 1,..,288; \quad j = \text{Arg., Bra., Chi., Col., Per., Mex., Ven.}; \quad t = 1,...,4$$

This table shows the output of panel regressions using exchange-ticker random effects and controlling for time and volume fixed-effects. The first two columns use intra-exchange volume quintiles, while the second two columns use inter-exchange quintiles. Each line corresponds to a regression that uses only that investor protection variable. All variables except the CLSA individual corporation (i) ratings are fixed within a country (j). See appendix Tables C1 and C2 for a definition of the explanatory variables and their sample moments. For most explanatory variables, a higher value implies a better investor protection or corporate governance environment (e.g. a higher value of Risk of Expropriation index means less risk). The exceptions are: percentage of share capital to call an extraordinary shareholders' meeting (a higher value means that it is more difficult for minorities to accomplish this), the median shares of the three largest shareholders (a higher value implies more ownership concentration), and mandatory dividend (the fraction of net income that a corporation is forced to pay out as dividends, which may be ambiguous for governance quality). The last two columns report the effect on PIN (in percentage points) of either a one standard deviation rise in the explanatory variable or, if it is binary, the effect of it changing from 0 to 1. The time fixed effects are jointly significant in all specifications and are not reported. Likewise for the volume effects. Standard errors are in parenthesis beside each coefficient. * indicates significance at 10% level, ** at 5% and *** at 1%.

Governance Quality/Investor Protection Variables	Definition of Volume Quintiles				Effect on PIN of Increase in Explanatory Variable	
	Intra-Exchange		Inter-Exchange			
Ownership Concentration (Median Shares of the Three Largest Shareholders in 10 Largest Privately Owned Non-Financial Firms)	**-21.1**	(3.7) ***	**-17.0**	(3.7) ***	**-2.26**	**-1.82**
Mandatory Dividend	**-5.0**	(1.6) ***	**-4.1**	(1.6) ***	**-1.20**	**-0.99**
Risk of Expropriation	**-2.0**	(0.6) ***	**-0.7**	(0.6)	**-1.58**	**-0.59**
Corruption in 1998 (from ICRG)	**-1.7**	(0.6) ***	**-2.2**	(0.5) ***	**-1.14**	**-1.45**
One Share One Vote (binary)	**-1.7**	(0.8) **	**-1.4**	(0.7) *	**-1.69**	**-1.36**
Shares Not Blocked Before Meeting (binary)	**-0.8**	(0.8)	**-0.8**	(0.8)	**-0.82**	**-0.75**

Table 3.B (cont.)

Governance Quality/Investor Protection Variables	Definition of Volume Quintiles				Effect on PIN of Increase in Explanatory Variable	
	Intra-Exchange		Inter-Exchange			
Insider Trading Enforcement (Bhattacharya et al., 2004, binary)	**-0.8**	(1.1)	**-2.4**	(1.1) **	**-0.81**	**-2.36**
Risk of Contract Repudiation	**-0.6**	(0.6)	**0.7**	(0.6)	**-0.58**	**0.68**
Legality in 1998 (Berkowitz et al. 2002)	**-0.5**	(0.4)	**-0.1**	(0.3)	**-0.77**	**-0.15**
Rule of Law in 1998 (Law and Order from ICRG)	**-0.4**	(0.4)	**-0.1**	(0.4)	**-0.80**	**-0.16**
Accounting Standards	**-0.3**	(0.1) ***	**-0.1**	(0.1)	**-2.29**	**-0.70**
Opressed Minorities Mechanism (binary)	**-0.1**	(0.9)	**-1.1**	(0.9)	**-0.09**	**-1.15**
CLSA Management Transparency	**-0.1**	(0.03) *	**0.0**	(0.03)	**-0.77**	**-0.60**
CLSA Management Discipline	**0.0**	(0.02)	**0.0**	(0.02)	**-0.29**	**-0.19**
Investment Profile (ICRG, 2004)	**0.0**	(0.2)	**0.5**	(0.2) ***	**0.03**	**1.22**
CLSA Management Independence	**0.1**	(0.02) ***	**0.1**	(0.02) ***	**1.08**	**0.90**
CLSA Average Rating	**0.1**	(0.1)	**0.1**	(0.1) *	**0.56**	**0.73**
Rule of Law in 2004 (Law and Order from ICRG)	**0.6**	(0.2) ***	**0.7**	(0.2) ***	**1.46**	**1.83**
Legality in 2004 (Berkowitz et al. 2002)	**0.8**	(0.2) ***	**1.0**	(0.2) ***	**1.36**	**1.76**
Percentage of Share Capital to Call an Extraordinary Shareholders' Meeting	**0.9**	(3.5)	**6.7**	(3.4) *	**0.10**	**0.71**
Shareholder Rights	**1.2**	(0.3) ***	**0.7**	(0.3) ***	**1.79**	**1.02**
Preemptive Rights to New Issues (binary)	**3.6**	(0.7) ***	**3.3**	(0.7) ***	**3.61**	**3.27**
Judicial Efficiency	**4.0**	(0.6) ***	**3.7**	(0.6) ***	**2.45**	**2.27**
Cummulative Voting or Proportional Representation of Minorities in the Board is Allowed (binary)	**4.9**	(0.7) ***	**3.5**	(0.7) ***	**4.93**	**3.47**
Corruption in 2004 (from ICRG)	**5.1**	(0.8) ***	**3.7**	(0.8) ***	**4.18**	**2.99**

Table 4.A: The Market Value of Private Information Trading -- Raw Data

$$q_{ijt} = \alpha + \beta^{I}\ PIN_{ijt} + \beta^{G}\ Governance\ Quality_{ij} + \beta^{S}\ Sales\ Growth_{ijt-3} + \boldsymbol{\beta}^{\mathbf{t}'}\mathbf{I}(t) + \varepsilon_{it}$$

$$i = 1,..,175;\ \ j = \text{Arg., Bra., Chi., Col., Per., Mex., Ven.}\ \ t = 1,...,4.$$

This table shows panel regression output for a sample of 175 firms from seven countries (except the CLSA column which uses 60 firms from five countries) measured once per quarter between October 2, 2003, and September 30, 2004. The dependent variable is Tobin's q for each quarter. The explanatory variables are: the private information-based trading probability (PIN) for the most liquid ticker of each company during each quarter, investor protection proxies as defined in La Porta et al. (1998) and Berkowitz et al. (2002) but updated using data from the March, 2004, International Country Risk Guide, and the average corporate governance quality rating from CLSA (2001). Berkowitz et al. define legality as 0.38 Efficiency of the Judiciary + 0.58 Rule of Law + 0.50 Corruption + 0.35 Risk of Expropriation + 0.38 Risk of Contract Repudiation. Sales growth is three-year geometric annual growth in US dollars lagged three quarters relative to the measure of Tobin's q. Bootstrap standard errors are in parentheses below each coefficient; *** indicates p-value<1% , **<5%, and *<10%.

Dependent Variable: Tobin's *q*

	Base Model		**Type of Investor Protection Variable in Each Specification (Firm Random Effects)**		
	Country Fixed Effects and Firm Random Eff.	**Firm Fixed Effects**	**Legality**	**Rule of Law**	**CLSA Average**
Private Info. Trading Prob. (PIN)	**-0.16** *	**-0.15** *	**-0.17** *	**-0.17** *	**-0.03**
	(0.087)	(0.089)	(0.087)	(0.087)	(0.177)
Investor Protection			**0.03**	**0.02** *	**0.03** ***
			(0.015)	(0.012)	(0.005)
Average Sales Growth	**0.06**	**0.01**	**0.07**	**0.07**	**0.16**
	(0.053)	(0.053)	(0.052)	(0.052)	(0.145)
Number of firm-quarters	687	687	687	687	232

Table 4.B: The Market Value of Private Information Trading -- Industry-Adjusted Data

$$q_{ijt} = \alpha + \beta^{I}\ PIN_{ijt} + \beta^{G}\ Governance\ Quality_{ij} + \beta^{S}\ Sales\ Growth_{ijt-3} + \boldsymbol{\beta}^{\mathbf{t}'}\mathbf{I}(t) + \varepsilon_{it}$$
$$i = 1,..,175;\ \ j = \text{Arg., Bra., Chi., Col., Per., Mex., Ven.}\ \ t = 1,...,4.$$

This table shows panel regression output for a sample of 175 firms from seven countries (except the CLSA column which uses 60 firms from five countries) measured once per quarter between October 2, 2003, and September 30, 2004. The dependent variable is industry-adjusted Tobin's q for each quarter. The explanatory variables are: the private information-based trading probability (PIN) for the most liquid ticker of each company during each quarter, investor protection proxies as defined in La Porta et al. (1998) and Berkowitz et al. (2002) but updated using data from the March, 2004, International Country Risk Guide, and the average corporate governance quality rating from CLSA (2001). Berkowitz et al. define legality as 0.38 Efficiency of the Judiciary + 0.58 Rule of Law + 0.50 Corruption + 0.35 Risk of Expropriation + 0.38 Risk of Contract Repudiation. Sales growth is industry-adjusted three-year geometric annual growth in US dollars lagged three quarters relative to the measure of Tobin's q. Bootstrap standard errors are in parentheses below each coefficient; *** indicates p-value<1% , **<5%, and *<10%.

Dependent Variable: Industry-Adjusted Tobin's *q*

	Base Model		Type of Investor Protection Variable in Each Specification (Firm Random Effects)		
	Country Fixed Effects and Firm Random Effects	**Firm Fixed Effects**	**Legality**	**Rule of Law**	**CLSA Average**
Private Info. Trading Prob. (PIN)	**-0.20** **	**-0.20** **	**-0.20** **	**-0.20** **	**-0.10**
	(0.09)	(0.092)	(0.09)	(0.09)	(0.217)
Investor Protection			**0.03** *	**0.03** *	**0.03** ***
			(0.016)	(0.013)	(0.006)
Average Sales Growth	**0.04**	**-0.03**	**0.04**	**0.04**	**0.08**
	(0.07)	(0.076)	(0.069)	(0.069)	(0.165)
Number of firm-quarters	687	687	687	687	232

Table 5: Private Information-Based Trading Probability Around Corporate Announcements

$$PIN_{ikt} = \alpha_0 + \boldsymbol{\alpha}'\mathbf{Z}_i + (\beta_0 + \boldsymbol{\beta}'\mathbf{Z}_i)\, I_{it}^{PERIODIC-PRE} + (\gamma_0 + \boldsymbol{\gamma}'\mathbf{Z}_i)\, I_{it}^{PERIODIC-POST}$$

$$+ (\delta_0 + \boldsymbol{\delta}'\mathbf{Z}_i)\, I_{it}^{APERIODIC-PRE} + (\phi_0 + \boldsymbol{\varphi}'\mathbf{Z}_i)\, I_{it}^{APERIODIC-POST} + v_{ikt}$$

$i = 1,...,264;\ k = 1,..., K_i;\ t = 1,...,T_i$

This table shows the results of an event study analyzing the behavior of the private information-based trading probability (PIN) around corporate announcements controlling for volume, country, industrial sector, security type, and ADR status of each stock. The dependent variable is PIN (in percentage points) estimated during a control, a pre-announcement and a post-announcement period relative to each announcement date. Each estimation period is 20 trading-days long. I_{it} is an indicator function that equals 1 on those days t (whose data are used to compute the PIN of the kth announcement of stock i) that fall in the range of I's superscript. Periodic announcements comprise earnings and cash dividends news, while aperiodic ones consist of acquisitions and divestiture reports. The top row reports the intercept coefficients: α_0 is the average PIN during the control period, β_0 shows how different is PIN during the pre-periodic announcement period relative to the control period, γ_0 shows the gap between PIN during post-periodic announcement days and control days, etc. The vector $\mathbf{Z}_i$ contains dummies for each and every possible category within a classification. So, in each column of the table, the coefficient on each line shows how different is the behavior of the average stock in that category from that of the overall average stock during the corresponding event period (Suits, 1984). The model is estimated by OLS, so the mean PIN during the sample of a top-volume Argentinean common stock from the non-cyclical consumer sector that just trades at home was 15.8 during the control period, it rose to 17.7 before a periodic announcement and it fell back to 15.5 after the announcement. We use the universe of announcements made between November 26, 2003, and September 8, 2004, as recorded in Bloomberg --a total of 1,247 announcements from 264 stocks. Venezuela, Colombia, and Peru are excluded to avoid small sample bias. Asymptotically valid standard errors are in parenthesis, * indicates significance at 10% level, ** at 5% and *** at 1%.

Explanatory Variable	CONTROL PERIOD	PERIODIC ANNOUNC.		APERIODIC ANNOUNC.	
		PRE	POST	PRE	POST
Intercept Effect in Each Window (α_0, β_0, γ_0, δ_0, ϕ_0)	**19.8** ***	**0.8** ***	**0.2**	**-0.2**	**-2.5** ***
	(0.1)	(0.1)	(0.1)	(0.3)	(0.3)
5th Quintile (Highest Vol.)	**-5.6** ***	**0.0**	**-0.4** ***	**-1.2** ***	**1.6** ***
	(0.1)	(0.1)	(0.1)	(0.2)	(0.2)
4th Quintile	**-3.2** ***	**-0.2** *	**-0.5** ***	**-2.4** ***	**-1.4** ***
	(0.1)	(0.1)	(0.1)	(0.3)	(0.3)
3rd Quintile	**0.5** ***	**-0.5** ***	**0.7** ***	**-0.2**	**-1.1** ***
	(0.1)	(0.1)	(0.1)	(0.3)	(0.3)
2nd Quintile	**2.5** ***	**0.4** ***	**0.6** ***	**1.6** ***	**-0.4**
	(0.1)	(0.1)	(0.1)	(0.3)	(0.3)
1st Quintile (Lowest Vol.)	**5.8** ***	**0.3** **	**-0.4** ***	**2.2** ***	**1.2** ***
	(0.1)	(0.2)	(0.2)	(0.3)	(0.3)

Table 5 (cont.)

Explanatory Variable	CONTROL PERIOD	PERIODIC ANNOUNC.		APERIODIC ANNOUNC.	
		PRE	POST	PRE	POST
Argentina	**1.5** ***	**-0.3**	**-1.7** ***	**-0.5**	**0.2**
	(0.2)	(0.2)	(0.2)	(0.5)	(0.5)
Brazil	**-2.6** ***	**-0.8** ***	**1.2** ***	**-1.3** ***	**2.8** ***
	(0.1)	(0.2)	(0.2)	(0.3)	(0.3)
Chile	**2.0** ***	**2.2** ***	**1.8** ***	**2.2** ***	**-3.2** ***
	(0.1)	(0.2)	(0.2)	(0.3)	(0.3)
Mexico	**-0.9** ***	**-1.2** ***	**-1.3** ***	**-0.4**	**0.3**
	(0.1)	(0.2)	(0.2)	(0.3)	(0.3)
Basic Materials	**1.4** ***	**-1.3** ***	**-2.2** ***	**0.2**	**0.4**
	(0.2)	(0.2)	(0.2)	(0.3)	(0.4)
Communications	**-0.7** ***	**-0.3** **	**-0.8** ***	**-0.6** **	**1.3** ***
	(0.1)	(0.2)	(0.2)	(0.3)	(0.3)
Consumer, Cyclical	**0.5** **	**-1.4** ***	**-1.5** ***	**-2.1** ***	**2.8** ***
	(0.2)	(0.2)	(0.2)	(0.5)	(0.5)
Consumer, Non-cyclical	**-1.4** ***	**2.3** ***	**1.3** ***	**5.1** ***	**-1.0** **
	(0.2)	(0.2)	(0.2)	(0.4)	(0.4)
Diversified	**0.6** **	**1.6** ***	**0.6** *	**-2.9** ***	**-1.6** ***
	(0.3)	(0.3)	(0.3)	(0.5)	(0.6)
Energy	**-0.2**	**-0.3**	**1.1** ***	**1.3** **	**-0.1**
	(0.3)	(0.4)	(0.4)	(0.5)	(0.5)
Financial	**0.8** ***	**-0.5** **	**0.2**	**-0.1**	**-1.0** **
	(0.2)	(0.2)	(0.2)	(0.4)	(0.4)
Industrial	**-0.5** **	**1.9** ***	**1.9** ***	**-2.9** ***	**-3.4** ***
	(0.2)	(0.2)	(0.2)	(1.1)	(1.3)
Utilities	**-0.4** **	**-2.1** ***	**-0.5** ***	**2.1** ***	**2.6** ***
	(0.2)	(0.2)	(0.2)	(0.4)	(0.4)
Common Stock	**0.3** ***	**-0.9** ***	**0.4** ***	**-0.2**	**1.1** ***
	(0.1)	(0.1)	(0.1)	(0.2)	(0.2)
Preferred Stock	**-0.3** ***	**0.9** ***	**-0.4** ***	**0.2**	**-1.1** ***
	(0.1)	(0.1)	(0.1)	(0.2)	(0.2)
ADR	**-1.5** ***	**-0.8** ***	**-0.4** ***	**2.0** ***	**0.8** ***
	(0.1)	(0.1)	(0.1)	(0.2)	(0.2)
ADR Underlying	**0.0**	**-0.8** ***	**-0.1**	**0.2**	**-1.8** ***
	0.1	0.1	0.1	0.2	0.2
Co has ADR not UDL	**0.3** **	**1.5** ***	**0.5** ***	**-1.9** ***	**-2.5** ***
	0.2	0.2	0.2	0.4	0.4
Just Home	**1.2** ***	**0.0**	**-0.1**	**-0.3**	**3.5** ***
	0.1	0.1	0.1	0.3	0.3

Figure 1: Within Trading-Period Timing of Events in Theoretical Model

This figure shows the timing of events within each trading period in the theoretical model of section 2. Time within the period runs from left to right. Boxes contain the description of the events that occur at each point in time.

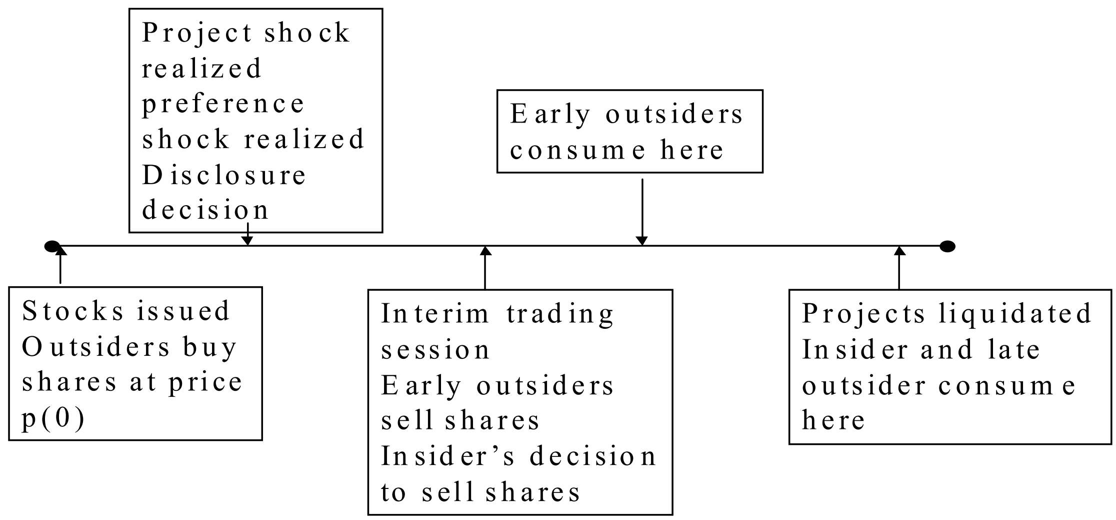
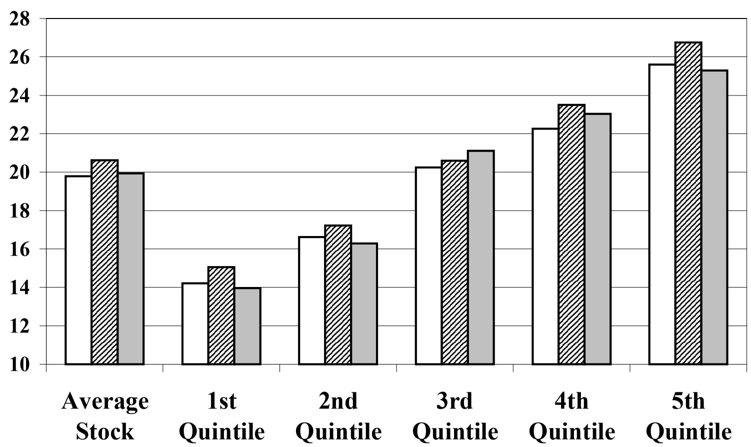


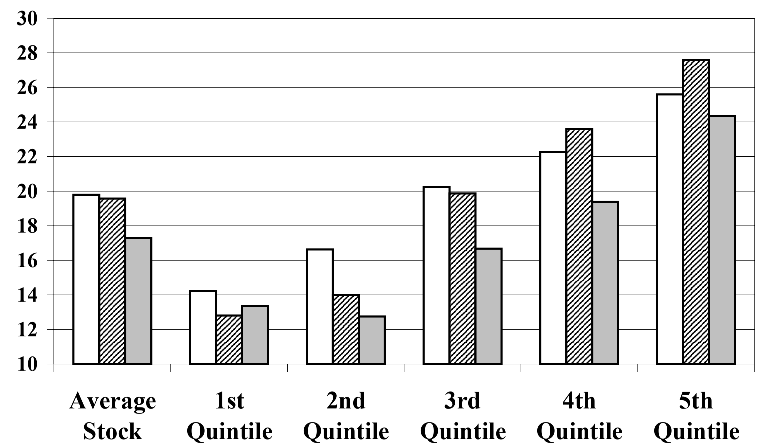
Figure 2: Private Information Trading Around Corporate Announcements by Volume Quintiles

These figures show the mean total private information-based trading probability estimated in the event study (for the control, pre-announcement, and post-announcement periods) for the average stock, and for stocks in different volume quintiles. The coefficients result from regressions that control for country, industrial sector, security type, and ADR status (i.e. they result from adding the coefficients in Table 5). So the PIN shown is purged of factors other than volume that could also have affected it. The graph on the left corresponds to periodic announcements (earnings and cash dividends), while that on the right pertains to aperiodic announcements (acquisitions and divestitures).

Periodic Announcements (Earnings and Cash Dividends)



Aperiodic Announcements (Acquisitions and Divestitures)



Control Pre-Announcement Post-Announcement

Figure B1: The Probability Structure of Trade

This figure shows the tree diagram of the trading process. α is the probability of new information (a signal) occurring. Conditional on the appearance of new information, δ denotes the probability of a bad signal. Given any signal, μ is the probability that nature chooses an informed trader to trade. If nature chooses an uninformed trader, the latter trades with probability ε. Given that an uninformed trader trades, she sells with probability ρ and buys with probability $(1-\rho)$. Nodes to the left of the vertical 'Trade Opens' line occur only at the beginning of the trading day, while nodes to the right occur in every possible trading period within the day. As an example, the rightmost column computes the probability, for a given trading day, of observing 4 sells, 5 buys, and 1 no trade period, conditional on the existence and type of signal at each trade-opening node. The likelihood for that day is equation (B.1) with the value of observed trades in this day in place of S, B and N.

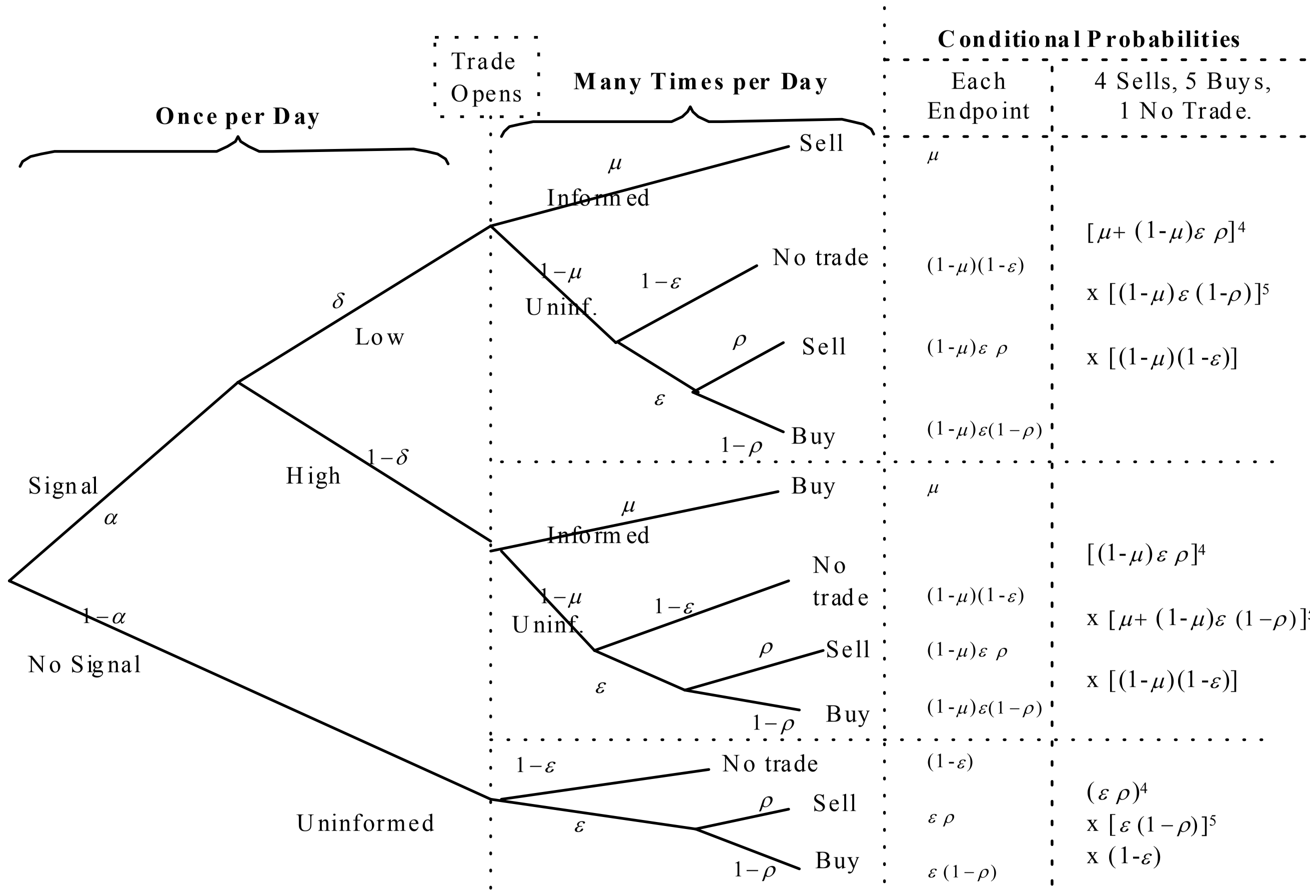


Table C1: Definition of Investor Protection Variables

All variables are taken from La Porta et al. (1998) except otherwise indicated.

Shareholder Rights Variables

Shares Not Blocked before Meeting: Equals one if the Company Law or Commercial Code does not allow firms to require that shareholders deposit their shares prior to a General Shareholders Meeting thus preventing them from selling those shares for a number of days, and zero otherwise.

Cumulative Voting or Proportional Representation: Equals one if the Company Law or Commercial Code allows shareholders to cast all of their votes for one candidate standing for election to the board of directors (cumulative voting) or if the Company Law or Commercial Code allows a mechanism of proportional representation in the board by which minority interests may name a proportional number of directors to the board, and zero otherwise.

Opressed Minorities Mechanism: Equals one if the Company Law or Commercial Code grants minority shareholders either a judicial venue to challenge the decisions of management or of the assembly or the right to step out of the company by requiring the company to purchase their shares when they object to certain fundamental changes, such as mergers, assets dispositions and changes in the articles of incorporation. The variable equals zero otherwise. Minority shareholders are defined as those shareholders who own 10 percent of share capital or less.

Preemptive Right to New Issues: Equals one when the Company Law or Commercial Code grants shareholders the first opportunity to buy new issues of stock and this right can only be waved by a shareholders' vote, and zero otherwise.

Mandatory Dividend: Equals the percentage of net income that the Company Law or Commercial Code requires firms to distribute as dividends among ordinary stockholders. It takes a value of zero for countries without such restriction.

Ownership Concentration: The median percentage of common shares owned by the three largest shareholders in the ten largest non-financial, privately-owned domestic firms in a given country. A firm is considered privately owned if the State is not a known shareholder in it.

One Share-One Vote: Equals one if the Company Law or Commercial Code of the country requires that ordinary shares carry one vote per share, and zero otherwise. Equivalently, this variable equals one when the law prohibits the existence of both multiple-voting and non-voting ordinary shares and does not allow firms to set a maximum number of votes per shareholder irrespective of the number of shares she owns, and zero otherwise.

Percentage of Share Capital to Call an Extraordinary Shareholder Meeting: It is the minimum percentage of ownership of share capital that entitles a shareholder to call for an Extraordinary Shareholders' Meeting. It ranges from one to 33 percent.

Shareholder Rights: Also referred to as "Antidirector Rights". The index is formed by adding 1 when (1) the country allows shareholders to mail their proxy vote to the firm, (2) shareholders are not required to deposit their shares prior to the general shareholders' meeting, (3) cumulative voting or proportional representation of minorities in the board of directors is allowed, (4) an oppressed minorities mechanism is in place, (5) the minimum percentage of share capital that entitles a shareholder to call for an extraordinary shareholders' meeting is less than or equal to 10 percent (the sample median in La Porta et al., 1998), or (6) shareholders have preemptive rights that can be waived only by a shareholders' vote. The index ranges from zero to six.

Rule of Law Variables

Efficiency of Judicial system: Assessment of the "efficiency and integrity of the legal environment as it affects business, particularly foreign firms" produced by the country-risk rating agency Business International Corporation. It "may be taken to represent investors' assessments of conditions in the country in question". Average between 1980-1983. Scale from 0 to 10, with lower scores lower efficiency levels.

Rule of Law (1998 and 2004): **Assessment of the law and order tradition in the country produced by the country-risk rating agency International Country Risk (ICR). For 1998, the average of the months of April**

and October of the monthly index between 1982 and 1995 is reported. For 2004, March data is reported from ICRG (2004). Scale from 0 to 10, with lower scores for less tradition for law and order. The original scale of this variable ranges from 0 to 6 but Laporta et al. (1998) changed it from 0 to 10. We follow suit and normalize all ICRG data to 0-10 scale in 2004 data.

Corruption (1998 and 2004): ICR's assessment of the corruption in government. Lower scores indicate "high government officials are likely to demand special payments" and "illegal payments are generally expected throughout lower levels of government" in the form of "bribes connected with import and export licenses, exchange controls, tax assessment, policy protection, or loans". For 1998, the average of the months of April and October of the monthly index between 1982 and 1995 is reported. For 2004, March data is reported from ICRG (2004). Lower scores for higher levels of corruption. The original scale of this variable ranges from 0 to 6 but La Porta et al. (1998) changed it from 0 to 10. We follow suit and normalize all ICRG data to 0-10 scale in 2004 data.

Investment Profile: This is an assessment of factors affecting the risk to investment that are not covered by other political, economic and financial risk components. The risk rating assigned is the sum of three subcomponents, Contract Viability/Expropriation, Profits Repatriation and Payment Delays. March data is reported, from ICRG (2004).

Risk of Expropiation: ICR's assessment of the risk of "outright confiscation" or "forced nationalization". Average of the months of April and October of the monthly index between 1982 and 1995. Scale from 0 to 10, with lower scores for higher risks. This variable was published from 1982 to 1997. At the end of 1997, the editor for ICRG changed the methodology and stopped including them.

Risk of Contract Repudiation: ICR's assessment of the "risk of a modification in a contract taking the form of a repudiation, postponement, or scaling down" due to "budget cutbacks, indigenization pressure, a change in government, or a change in government economic and social priorities." Average of the months of April and October of the monthly index between 1982 and 1995. Scale from 0 to 10, with lower scores for higher risks. This variable was published from 1982 to 1997. At the end of 1997, the editor for ICRG changed the methodology and stopped including them.

Rating on Accounting Standards: Index created by examining and rating companies' 1990 annual reports on their inclusion or omission of 90 items. These items fall into 7 categories (general information, income statements, balance sheets, funds flow statement, accounting standards, stock data and special items). A minimum of 3 companies in each country were studied. The companies represent a cross-section of various industry groups where industrial companies numbered 70 percent while financial companies represented the remaining 30 percent.

Legality in 1998 and in 2004: Index created by Berkowitz et al. (2003) combining ICRG Rule of Law variables. The index is defined as .381*(Efficiency of the Judiciary) + .5778* (Law and Order) + .5031* (Corruption) + .3468* (Risk of Expropriation) + .3842* (Risk of Contract Repudiation). Reported for 1998 using the La Porta et al. (1998) data. The value for 2004 updates Corruption, and Law and Order with the corresponding readings from ICRG (2004).

Enforcement of Insider Trading Regulations: Equals one if there are insider trading laws established in the exchange, and there was a prosecution under these laws. Equals zero otherwise. This variable came from the answer given by national regulators and officials of all stock markets in the world to a questionnaire sent in March 1999 by Bhattacharya and Daouk (2002, Table 1, Column 8).

Table C2: Summary of Investor Protection Variables in Sample Relative to the La Porta et al. (1998) Sample

Panel A: Shareholder Rights

	Our Sample (no USA)									USA	LLSV Sample		Mean by Origin for LLSV Sample			
	Arg	Bra	Chi	Col	Mex	Per	Ven	Mean	SD		Mean	SD	English	French	German	Scand.
Shares Not Blocked bef. Meeting	0	1	1	1	0	1	1	0.71	0.49	1	0.71	0.46	1	0.57	0.17	1
Cumul. Voting or Prop. Represent.	1	0	1	1	0	1	0	0.57	0.53	1	0.27	0.45	0.28	0.29	0.33	0
Opressed Minorities Mechanism	1	1	1	0	0	0	0	0.43	0.53	1	0.53	0.50	0.94	0.29	0.5	0
Preemptive Right to New Issues	1	0	1	1	1	1	0	0.71	0.49	0	0.53	0.50	0.44	0.62	0.33	0.75
Mandatory Dividend	0	0.50	0.30	0.50	0	0	0	0.19	0.24	0	0.05	0.14	0	0.11	0	0
Ownership Concentration	0.55	0.63	0.38	0.68	0.67	0.57	0.49	0.57	0.11	0.12	0.45	0.16	0.42	0.55	0.33	0.33
One Share- One Vote	0	1	1	0	0	1	0	0.43	0.53	0	0.22	0.42	0.17	0.29	0.33	0
Antidirector Rights	4	3	5	3	1	3	1	2.86	1.46	5	3.00	1.31	4	2.33	2.33	3
Perct. of Share Capital to Call an Extr. Shareholders' Meeting	0.05	0.05	0.10	0.25	0.33	0.20	0.20	0.17	0.11	0.10	0.11	0.07	0.09	0.15	0.05	0.1

Panel B: Rule of Law

	Our Sample (no USA)									USA	LLSV Sample		Mean by Origin for LLSV Sample			
	Arg	Bra	Chi	Col	Mex	Per	Ven	Mean	SD		Mean	SD	English	French	German	Scand.
Efficiency of Judicial system	6	5.75	7.25	7.25	6	6.75	6.50	6.50	0.61	10	7.67	2.05	8.15	6.56	8.54	10
Rule of Law in 1998 (From La Porta et al. 1998)	5.35	6.32	7.02	2.08	5.35	2.50	6.37	5	1.95	10	6.85	2.63	6.46	6.05	8.68	10
Rule of Law in 2004 (Law & Order from ICRG)	2.50	2.50	8.33	1.67	5	5	1.67	3.81	2.45	8.33	6.63	2.76				
Corrupt.-1998 (La Porta et al. 1998)	6.02	6.32	5.30	5	4.77	4.70	4.70	5.26	0.66	8.63	6.90	2.29	7.06	5.84	8.03	10
Corrupt.-2004 (from ICRG, 2004)	4.17	3.33	4.17	5	3.33	4.17	2.50	3.81	0.81	8.33	5.29	2.27				
Invest. Profile (from ICRG, 2004)	4.58	6.67	9.58	7.08	9.58	6.67	3.33	6.79	2.33	9.58						
Risk of Expropiation	5.91	7.62	7.50	6.95	7.29	5.54	6.89	6.81	0.80	9.98	8.05	1.59	7.91	7.46	9.45	9.66
Risk of Contract Repudiation	4.91	6.30	6.80	7.02	6.55	4.68	6.30	6.08	0.92	9	7.58	1.79	7.41	6.84	9.47	9.44
Rating on Accounting Standards	45	54	52	50	60	38	40	48.43	7.87	71	60.93	13.40	69.62	51.17	62.67	74
Legality in 1998	12.34	14.09	14.70	11.59	12.82	10.10	13.33	12.71	1.55	20.85	16.05	4.32	15.98	14.15	19.22	21.60
Legality in 2004	9.76	10.38	14.89	11.35	11.90	11.28	9.51	11.29	1.81	19.74						
Enforcmt. of Insider Trdg. Laws	1	1	1	0	0	1	0									