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# Risk Sharing and Asset Prices: Evidence From a Natural Experiment

by

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## 1. Introduction

Asset pricing theory predicts that capital will be allocated in such a way that risk-adjusted returns are equalized across assets. The level of expected stock returns should vary cross-sectionally according to the degree of firms' exposure to systematic risks. Research from the last several years provides little empirical evidence to support this prediction. Systematic risk factors show little indication that they are priced cross-sectionally, and many firm characteristics that are priced cross-sectionally do not resemble systematic risk.[1]

This paper adopts a different approach. Instead of testing the implications of the theory in levels, it focuses on changes in levels. It does so by examining a natural experiment— stock market liberalization. A stock market liberalization is a decision by a country's government to allow foreigners to purchase shares in that country's stock market. Liberalization changes the source of systematic risk for the representative investor by switching the relevant benchmark for pricing stocks from the local stock market index to a world stock market index. Consequently, expected returns should adjust when liberalizations occur.

The direction of the adjustment of expected returns to the change in systematic risk will be firm-specific. Theory predicts that expected returns will fall for firms whose exposure to systematic risk decreases and rise for firms whose exposure increases. The change in expected returns will be reflected in stock prices. For example, a fall in expected returns will induce a revaluation. More precisely, the greater the covariance of a firm's stock returns with the local market relative to the covariance of its returns with the world market, the larger will be the firm-specific component of that firm's stock price

[1] See Campbell (2000), Cochrane (1999), and Fama (1991) for surveys.

revaluation. In addition to the firm-specific changes, liberalization will also induce a common shock to expected returns that is uniform across all firms: a fall in the risk-free rate as the country moves from financial autarky to financial integration with the rest of the world.

Estimations in this paper using firm-level, cross-country data show that changes in risk are significantly related to the stock price revaluations that occur during liberalization. We define risk sharing as the historical covariance of a firm's returns with the local market minus its historical covariance with the world market (DIFCOV). The sample average of DIFCOV for firms that become eligible for foreign ownership is 0.018. We estimate that such a firm will experience a firm-specific revaluation of 6.8 percent during liberalization. In contrast, there is no firm-specific revaluation for firms that remain off limits to foreign investors.

One concern with the results is that the repricing of stocks during liberalization may not reflect risk sharing, but price pressure. In the context of liberalization, price pressure would manifest itself in the following way. A country liberalizes. Foreigners are permitted to invest in a subset of that country's firms. This subset of firms gets included in an emerging market index, which increases demand and drives up prices a la Shleifer (1986) and Harris and Guerel (1986).

There is an additional feature of our natural experiment that addresses the price pressure concern. When countries liberalize, some publicly listed firms become eligible for foreign ownership (investible firms), while others remain off limits (non-investible firms). To see why the investible/non-investible distinction helps confront the issue of price pressure, recall that theory points to two sources of repricing. The first is a change

in the firm-specific risk premium driven by the change in exposure to systematic risk. The second is a fall in the risk-free rate.

Importantly, the fall in the risk-free rate is a common shock that should be the same across all firms in a rational asset pricing world. Empirically, this means that the common shock experienced by investible firms should be statistically indistinguishable from the common shock experienced by the non-investible firms. On the other hand, if price pressure is operative, then investible firms will experience a common shock that is larger than that of the non-investible firms— a combination of the fall in the risk-free rate and price pressure.

The intercept term in our regressions measures the common shock to investible and non-investible firms. To test for price pressure, all of the regressions also include a dummy variable for investible firms. The estimations confirm that the common shock is indeed the same for investible and non-investible firms. The intercept term ranges from 5.9 percent to 9.1 percent in alternative specifications, and the investible dummy is statistically insignificant in all specifications.

We also conduct a second test of the price pressure hypothesis within the class of investible firms. Large and liquid firms are more likely to be candidates for index inclusion than small illiquid ones. Therefore, large and liquid firms may experience more price pressure. To the extent that DIFCOV is positively correlated with size or liquidity, our risk-sharing results may be biased. Therefore, the empirical estimations also control for size and liquidity. DIFCOV remains a statistically significant driver of the repricing of investible firms, after controlling for size and liquidity.

The use of firm-level data in this paper departs from studies that use aggregate data to document the stock market revaluations that occur when emerging economies liberalize.[2] The evidence in these papers suggests that liberalizations reduce the cost of capital. However, these papers are silent about whether the reduction stems from increased risk sharing. In principle, the observed revaluations could be driven entirely by changes in the risk-free rate. The problem is that we observe only one aggregate stock price revaluation per country when liberalizations occur. This means that analyses of aggregate data do not provide sufficient degrees of freedom to disentangle the contribution of changes in the risk-free rate from those of risk sharing. In contrast, firm-level data provide more than sufficient degrees of freedom with which to disentangle the common shock from that of the risk-sharing effect, thereby enabling the data to speak to the issue of whether diversification drives the revaluation of domestic securities.

The liberalization experiment also delivers power to detect cross sectional relationships between expected returns and covariances that are hard to detect in general. Covariances are measured with error. Measurement error reduces the statistical power of any regression. One way of circumventing the measurement problem is to focus on a setting where the true variation is large relative to any noise in the data. Liberalizations provide just such a setting. In principle, the impact on ex-ante expected returns of opening an emerging economy to foreign capital flows is enormous (Stulz 1999a,b,c). Therefore, the magnitude of the liberalization-induced changes in expected returns may simply dominate the attenuating effects of measurement error that usually plague efforts to find cross-sectional pricing relationships.

Despite the advantages of firm-level data, there are at least two reasons why the

[2] See Henry (2000a) and the references therein.

results need to be interpreted with caution. First, the decision to liberalize may be endogenous— policy makers may choose to open up when the stock market is doing well. Endogeneity may bias estimates of the mean liberalization effect in aggregate studies, but with cross-country, firm-level data, the bias will be picked up by the country-specific fixed effects. However, if the bias also has a component that is correlated with the firm-specific covariance structure of returns, then the point estimates may overstate the fraction of the revaluation that is due to increased risk sharing. On the other hand, the results may understate the full impact of liberalization, because the revaluation is measured as the stock price change that occurs on the implementation date. The market may anticipate liberalizations, and prices may have adjusted prior to that date.

Second, stock price revaluations may be driven by changes in expected returns or future cash flows. Unexpected stock price changes are a reasonable proxy for changes in expected returns only if earnings growth is unaltered by liberalization. The analysis uses firm-level data on the actual growth rate of real earnings per share to control for changes in expected future cash flows. Studies that focus on aggregate data use variables such as GDP growth rates to proxy for expected future cash flows. In comparison, firm-level data on actual earnings growth outcomes would seem to provide a more direct, albeit imperfect, measure of future earnings prospects.

Despite these limitations, the stock market evidence is useful for evaluating whether theories of risk sharing have any empirical relevance. It is important to understand whether stock prices respond to changes in systematic risk, because stock prices provide public signals of real investment opportunities (Fischer and Merton, 1984; Morck, Yeung and Yu, 2000; Tobin and Brainard, 1977; Summers, 1985). If

liberalization decreases the riskiness of a firm, then, all else equal, its stock price should increase. The price increase signals to managers that they can increase shareholder welfare by investing in physical capital. On the other hand, if liberalizations are associated with stock price increases that are unrelated to changes in risk, then the optimal investment response is less clear (Blanchard, Rhee and Summers, 1993; Morck, Shleifer, and Vishny, 1990). Therefore, analyzing whether stock prices move in line with changes in systematic risk also provides a first step towards understanding whether physical investment is efficiently reallocated when countries liberalize the capital account.

**2. Theoretical Motivation and Descriptive Findings**

The analysis builds on Stulz (1999c). Assume a small country whose equity market is completely segmented from world equity markets. Also assume that all investors in the world are risk averse and care only about the expected return and variance of their investment. Since domestic investors care only about the expected return and volatility of their portfolio, it follows that the capital asset pricing model (CAPM) will hold. For any individual stock in the segmented equity market we have:

$$E[\tilde{R}_i] = r_f + \beta_{iM}(E[\tilde{R}_M] - r_f) \quad (1)$$

Where $E[\tilde{R}_i]$ is the required rate of return on firm $i's$ stock, $r_f$ is the risk-free rate in the domestic market, $\beta_{iM}$ is the beta coefficient of firm $i$ with the domestic market portfolio before liberalization, and $E[\tilde{R}_M]$ is the expected return on the domestic market.

The aggregate risk premium on the small country's equity market before stock

market liberalization, $(E[\tilde{R}_M]-r_f)$, can be written as $E[\tilde{R}_M]-r_f=\gamma(W)\sigma_M^2$, where $\gamma(W)$ is the coefficient of relative risk aversion and $\sigma_M^2$ is the variance of the return on the small country's market portfolio. Assume that all investors have constant relative risk aversion, so that $\gamma(W)=\gamma$. It follows that the risk premium for firm $i$ before liberalization is $\beta_{iM}\gamma\sigma_M^2$. Therefore, we may write:

$$E[\tilde{R}_i]=r_f+\beta_{iM}\gamma\sigma_M^2 \qquad (2)$$

**2A. Complete Liberalization**

Now consider the impact on firm $i's$ required rate of return when the country opens its stock market to the rest of the world and also allows its residents to invest abroad. Assume also that the expected value and variance of the profits from domestic production activities are unaltered by the liberalization.

After liberalization, the small country's equity market becomes part of the global equity market and expands the diversification opportunities for foreign investors. Since foreign investors can invest in the country's stock market and domestic investors can invest abroad, the risks associated with domestic production are now borne by both foreign and domestic investors. Note that adding a small country to the world portfolio has a negligible effect on the risk premium of the world market portfolio.

With completely open capital markets, the relevant source of systematic risk becomes the world market. Therefore, the CAPM holds for the world market and the risk premium on any risky asset is proportional to its world beta. Let $E[\tilde{R}_i^*]$ be the required rate of return on firm $i$ in the integrated capital market equilibrium. It follows that

$$E[\tilde{R}_i^*]=r_f^*+\beta_{iW}(E[\tilde{R}_W]-r_f^*) \qquad (3)$$

Where $\beta_{iW}$ denotes firm $i$'s beta with the world market, $E[\tilde{R}_W]$ denotes the required rate of return on the world equity market portfolio and $r_f^*$ the world risk-free rate. Under our assumptions, the aggregate risk premium on the world market portfolio is $\gamma\sigma_W^2$, where $\sigma_W^2$ is the variance of the return on the world portfolio. Therefore, the required rate of return on firm $i$ after liberalization is

$$E[\tilde{R}_i^*] = r_f^* + \beta_{iW}\gamma\sigma_W^2 \qquad (4)$$

The link between the liberalization-induced change in the required rate of return on firm $i$ and its diversification properties can now be made transparent. Subtracting equation (4) from equation (2) and performing a step of algebra using the definitions of local and world betas yields the following result:

$$\Delta E[\tilde{R}_i] = E[\tilde{R}_i] - E[\tilde{R}_i^*] = (r_f - r_f^*) + \gamma DIFCOV \qquad (5)$$

Where $\Delta E[\tilde{R}_i]$ is the change in the required rate of return on impact and $DIFCOV = [Cov(\tilde{R}_i, \tilde{R}_M) - Cov(\tilde{R}_i, \tilde{R}_W)]$. Equation (5) highlights the two channels through which liberalization affects firm-level required rates of return. The first effect, a change in the risk-free rate, is common to all firms.[3] The second effect of liberalization is idiosyncratic to firm $i$ and depends on the covariance of firm $i$'s stock return with the local market minus the covariance of firm $i$'s stock return with the world market.

**2B. Partial Liberalization**

[3] A priori, the impact of the common shock may be ambiguous. If countries are capital scarce in autarky, the average cost of capital may fall if liberalization results in a net capital inflow. On the other hand, if countries have followed policies of financial repression and interest rates were kept artificially low, the average cost of capital may increase if the stock market liberalization is accompanied by domestic financial deregulation. See Henry (2000b) for a more detailed discussion of these issues.

In practice, we do not always see complete liberalizations. So it is useful to examine the theoretical predictions that emerge due to two commonly observed departures from complete liberalization.

**2B.1 Departure I: Mild Segmentation**

The first departure is mild segmentation. Mild segmentation occurs when governments introduce one restriction to the benchmark case of complete liberalization: While domestic investors are permitted to invest in the world market portfolio, foreign investors can hold only a subset of domestic securities.

When a country moves from autarky to mild segmentation, the representative foreign investor becomes the marginal investor that determines the pricing of investible securities. Since the world market portfolio is the relevant source of systematic risk for the foreign investors, the pricing of investible securities under mild segmentation will be identical to that under complete integration. It follows that the revaluation of investible securities under mild segmentation will continue to be given by: $\Delta E[\tilde{R}_i] = E[\tilde{R}_i] - E[\tilde{R}_i^*] = (r_f - r_f^*) + \gamma DIFCOV$ .

What determines the revaluation of the non-investible securities? Errunza and Losq (1985) consider this question in an environment where unrestricted domestic investors have a coefficient of risk aversion $\gamma_U$ and restricted foreign investors have a coefficient of risk aversion $\gamma$. So long as the unrestricted domestic investors share the same coefficient of risk aversion as the restricted foreign investors, DIFCOV will continue to explain the repricing of non-investible securities. In other words, when

$\gamma = \gamma_U$ , the repricing of non-investible securities under mild segmentation is given by:

$\Delta E[\tilde{R}_i] = E[\tilde{R}_i] - E[\tilde{R}_i^*] = (r_f - r_f^*) + \gamma DIFCOV$ .

In the case where the coefficient of risk aversion differs across domestic and foreign investors, the revaluation of the non-investible securities is given by:

$$\Delta E[\tilde{R}_i] = E[\tilde{R}_i] - E[\tilde{R}_i^*] = (r_f - r_f^*) + \gamma(W) DIFCOV + [\gamma(W) - \gamma_U(W)] Cov(\tilde{R}_i, \tilde{R}_N \left| \tilde{R}_I \right.) \quad (6).$$

Where $\tilde{R}_N$ and $\tilde{R}_I$ are the returns on the portfolio of non-investible and investible securities, respectively. $Cov(\tilde{R}_i, \tilde{R}_N \left| \tilde{R}_I \right.)$ is the covariance of firm $i$'s return with the return on the portfolio of non-investible stocks, taking the return on the investible securities as given.

The last term on the right-hand-side of (6) is a "super risk premium," which arises because of differing domestic and foreign risk aversion. Intuitively, the super risk premium compensates domestic investors for bearing the risk associated with holding all of the non-investible stocks. Since this paper seeks to explain repricing without resorting to heterogeneity in risk aversion, we do not pursue the empirical implications of the super risk premium. Instead, we now turn to the theoretical implications of the second departure from the benchmark case of complete liberalization.

**2.B.2 Departure II: Strong Segmentation**

Strong segmentation occurs when, in addition to mild segmentation, domestic investors are not allowed to invest in the world market portfolio. In the move from autarky to strong segmentation, the revaluation of investible securities continues to be given by equation (5). The reason is the same as under the move from autarky to mild

segmentation. Following liberalization, the marginal investor is the foreigner whose relevant source of systematic risk is the world market portfolio.

What drives the change in the required rate of return for the non-investible securities? Here we get a different repricing relationship than under mild segmentation, even when unrestricted domestic investors have the same coefficient of risk aversion as the restricted foreign investors.

By the definition of strong segmentation, domestic investors hold only domestic securities following the liberalization. Hietala (1989) shows that under strong segmentation the required rate of return on any security held by a domestic investor in equilibrium is $E[\tilde{R}_i^*] = r_f^* + \gamma Cov(\tilde{R}_i, \tilde{R}_D)$, where $\tilde{R}_D$ is the return on the post-liberalization portfolio of securities held by the representative domestic investor.

It follows that the revaluation of any one of the securities in the domestic investor's portfolio will be given by:

$$\Delta E[\tilde{R}_i] = E[\tilde{R}_i] - E[\tilde{R}_i^*] = (r_f - r_f^*) + \gamma DIFCOV1 \quad (8)$$

where $DIFCOV1 = [Cov(\tilde{R}_i, \tilde{R}_M) - Cov(\tilde{R}_i, \tilde{R}_D)]$. The domestic investor's portfolio will be heavily tilted towards non-investible securities after liberalization (Hietala, 1989). If the set of securities in the domestic investor's portfolio is the same as the set of non-investible securities post liberalization, then equation (8) also yields the repricing relationship for the non-investible securities.

In other words, the repricing of the non-investible securities should be positively correlated with DIFCOV1, all else being equal. This result has the following intuition. Since the domestic investor cannot hold any foreign stocks, the post-liberalization portfolio of domestic securities constitutes the only relevant source of systematic risk.

Therefore, the lower the covariance of a given stock with the post-liberalization domestic portfolio, the more its required rate of return will tend to fall with the liberalization.[4]

**2C. Mapping Theory to Data: Descriptive Findings**

Table 1 presents a decomposition of DIFCOV for the typical firm in the sample. The table makes two central points. First, Panel A shows that investible firms present the representative foreign investor with considerable scope for diversification. Columns 4 and 5 show that the covariance of the average investible firm's stock return with the local market is roughly 185 times larger than its covariance with the world market. In contrast, the magnitudes for the non-investible firms in Panel B are less striking. Columns 4 and 5 of Panel B show that the covariance of the average non-investible firm's stock return with the local market is only 10 times larger than its covariance with the world market.

Second, Columns 6 through 10 in both panels demonstrate the second point. There are two key factors that drive the difference between local and world covariances: 1) The average firm's correlation with the local market is roughly 10 times larger than its correlation with the world market— 0.620 versus 0.060 for investible and 0.425 versus 0.048 for non-investible firms; 2) The average standard deviation of the local market, 0.142, is roughly 3 times as large as the standard deviation of the world market, 0.047, for both sets of firms.

Under the assumption that firms' expected future cash flows are unaffected by liberalization, the unexpected response of firm $i's$ stock price to news of the

[4] When the representative domestic investor's portfolio consists of only non-investible securities, then $\tilde{R}_D$ is the rate of return on the portfolio on non-investible securities. Consequently, our empirical analysis calculates DIFCOV1 using the covariance of each security with the return on the portfolio of non-investible securities.

liberalization will mirror the change in the required rate of return on firm $i's$ stock. The stock price will increase if liberalization lowers the required rate of return, and conversely, the stock price will decrease if liberalization raises the required rate of return.

Accordingly, the unexpected stock price response to liberalization can be used to confront the theory with data. Equation (5) predicts that the revaluation will have an intercept effect and a slope effect. The intercept term should be the same across investible and non-investible firms within a given country. Equation (5) also predicts that the revaluation should be an increasing function of DIFCOV.[5]

Figure 1 reveals that the stock price revaluation for investible firms is an increasing function of DIFCOV, as theory predicts. It plots the unexpected stock price change for investible firms on the y-axis and DIFCOV on the x-axis. The statistical relationship between the revaluation of investible firms and DIFCOV is given by the following equation (robust t-statistics in parentheses, R-Squared= 0.27, N=248):

$$\Delta \ln(StockPrice_{ij}^{Investible}[0]) = \underset{(-1.3)}{-0.05} + \underset{(4.0)}{9.20} * DIFCOV_{ij} \qquad (9)$$

where $\Delta \ln(StockPrice_{ij}^{Investible}[0])$ is the liberalization-month stock price change for investible firm $i$ in country $j$.

Figure 2 presents the scatter plot for non-investible firms. The statistical relationship between the revaluation of non-investible firms and DIFCOV is given by the following equation (robust t-statistics in parentheses, R-Squared= 0.06, N=181):

$$\Delta \ln(StockPrice_{ij}^{Non-Investible}[0]) = 0.053 + 3.69 * DIFCOV_{ij} \qquad (10)$$

[5] Since the coefficient of relative risk aversion is assumed to be the same across countries, the slope coefficient is also implicitly the same and therefore does not require a country-specific adjustment.

(3.2) (2.3)

where $\Delta \ln(StockPrice_{ij}^{Investible}[0])$ is the liberalization-month stock price change for non-investible firm $i$ in country $j$. Like Figure 1, this graph also reveals a positive statistical relationship between the revaluation of non-investible firms and DIFCOV.

However, there are also some distinct differences between Figure 1 and Figure 2. First, the positive relationship between the revaluation and DIFCOV is more pronounced for investible firms (Figure 1) than non-investible firms (Figure 2). The slope of the line in equation (5) is 9.20 whereas the slope of the line in equation (6) is 3.69. Second, the difference in covariance explains almost 30 percent of the cross-sectional variation in investible firms' stock price revaluations, but only 6 percent for non-investible firms. Thus, a first pass at the data indicates that DIFCOV has more predictive power for the revaluation of investible firms than non-investible firms.

Figure 3 examines whether the repricing of non-investible firms is related to the difference between their covariance with the local market portfolio and their covariances with the entire portfolio of non-investible securities. The graph plots the unexpected stock price change for non-investible firms on the y-axis and *DIFCOV*1 on the x-axis. The statistical relationship between the revaluation of non-investible firms and *DIFCOV*1 is given by the following equation (robust t-statistics in parentheses, R-Squared= 0.01, N=181):

$$\Delta \ln(StockPrice_{ij}^{Non-Investible}[0]) = 0.07 + 1.44 * DIFCOV1_{ij} \quad (11)$$
(3.6) (1.5)

It appears that *DIFCOV1* has no explanatory power for the repricing of non-investible securities.

This initial perusal of the data suggests that there are differences between investible and non-investible firms, but only so much can be inferred from pictures. For example, the unexpected stock price change is a reasonable proxy for the change in required return if earnings growth is unchanged by liberalization. If this assumption is not reasonable, then it may be important to control for changes in the expected growth rate of earnings.

Additionally, there is a more general concern. The goal is to estimate the impact of liberalization on a randomly selected firm from the population of all firms. If the investible firms are not randomly selected, then they may have unobservable characteristics that cause them to respond differently to liberalization than non-investible firms. These issues can be explored more transparently once the data have been described in more detail. This data description takes place in the next section of the paper.

## 3. Data

The analysis requires three types of data: stock returns for the liberalizing countries in question; stock market liberalization dates; a means of discriminating between those firms that become eligible for foreign ownership when the market is liberalized and those that do not. Section 3A describes the basic stock returns data. Section 3B gives the stock market liberalization dates. Section 3C explains the procedure for discriminating between investible and non-investible firms. Section 3D presents descriptive statistics for the two sets of firms. Section 3E discusses the potential importance of selection bias issues in examining investible versus non-investible firms.

### 3A. The Basic Stock Returns Series

The principal source of stock market data is the International Finance Corporation's (IFC) Emerging Markets Data Base (EMDB).[6] Stock price indices for individual firms are the dividend-inclusive, U.S. dollar-denominated, IFC Global Index (IFCG). The IFC selects stocks for inclusion in the IFCG index by reviewing a stock's trading activity. Any share selected must be among the most actively traded shares in terms of value traded during the annual review period; it must have traded frequently during the review period (i.e., preventing one large block trade from skewing the value traded statistics); and it must have reasonable prospects for a continued trading presence in the stock exchange (e.g., it must not be in imminent danger of being suspended or delisted). Stocks are selected in order of trading criteria until the market capitalization coverage target of 60 percent to 75 percent of total market capitalization is met. Once the actively traded and market capitalization requirements are met, IFC analysts may suggest substituting one company's shares for another on the list if the suggested shares have reasonably similar trading characteristics, but represent an industry group which may be underrepresented in the current composition of the IFCG index (IFC, 1999).

In order to be included in the sample, a firm must have been actively traded for at least five years prior to the liberalization date. This ensures that there are at least five years worth of data with which to calculate historical covariances. Each country's U.S. dollar-denominated total return index is deflated by the U.S. consumer price index (CPI),

[6] IFC data is used instead of Morgan Stanley Capital Index (MSCI) data, because MSCI company-level coverage for emerging markets begins only in January 1992 and therefore post-dates almost all of the liberalizations. Worldscope coverage begins even later than MSCI coverage.

which comes from the IFS. All of the data are monthly. Returns are calculated as the first difference of the natural logarithm of the real stock total return index.

Calculation of the covariance of firm-level stock returns with the local and world markets requires data on market returns as well as firm-level returns. For each country, the real, dollar-denominated IFCG Total Return Index is used as the benchmark local market index. The world benchmark market index is the real, dollar-denominated MSCI World Total Return Index.

### 3B. Identifying Stock Market Liberalization Dates

A stock market liberalization is a decision by a country's government to open its stock market to foreign investors. When a stock market liberalization occurs, some of the firms in the domestic economy become eligible for purchase by foreigners, while others remain off-limits. Establishing the liberalization date is the first step in the process of distinguishing between these two types of firms. These dates are listed in Table 2. The entire sample consists of 410 firms in 11 countries. The 11 countries are: Argentina, Brazil, Chile, Colombia, India, Korea, Mexico, Pakistan, Taiwan, Turkey, and Venezuela.

### 3C. Discriminating Between Investible and Non-Investible Firms

Investible firms are defined to be that subset of firms in the IFCG that are also in the IFC Investible Index (IFCI). The IFCI's determination of investibility is a three-step process. First, the IFC determines which securities foreigners may legally hold. Next, the IFC applies two further screening criteria for practicality of investment. Both screens

must be passed for IFCI index eligibility. The first criterion screens for a minimum investible market capitalization of $50 million or more over the 12 months prior to a stock's addition to an IFCI index. This investible market capitalization is determined after applying the foreign investment rules and after any adjustments because of cross-holdings or government ownership.

The second criterion screens firms for liquidity. A stock must trade at least $20 million over the prior year for inclusion in an IFCI index. It must also have traded on at least half the local exchange's trading days. Thus, the IFC Investible indexes are designed to measure the returns that foreign portfolio investors might receive from investing in emerging market securities that are legally and practically available to them.

The IFCI was initiated in December of 1988. This fact implies that for stock market liberalizations that occurred prior to December of 1988, it is not possible to discriminate between those firms that became investible and those that did not. The countries and dates in Table 2 reflect this constraint. Specifically, Table 2 lists the earliest stock liberalization date occurring after December of 1988 for every country that implemented at least one countrywide stock market liberalization after this date.

### 3D. Descriptive Statistics on Investible and Non-Investible Firms

The average size of *DIFCOV* is 0.018 for investible firms and 0.0096 for non-investible firms. This feature of the data suggests that investible firms should experience larger revaluations than non-investible firms, given the common shock. Table 3 explores whether the raw differences in the stock price revaluations of investible and non-investible firms are roughly consistent with this prediction. The table shows that the

average stock price revaluation is 15.1 percent in real dollar terms for investible firms and 9.9 percent for non-investible firms. The last column of the table reports that the 5.2 percentage-point difference between these two means is statistically significant. There are two possible concerns with these numbers.

First, they are reported in dollar terms. This choice of unit may lead to an overstatement of the revaluations if liberalizations are accompanied by large appreciations of the domestic currency vis-à-vis the dollar. In order to see if the dollar-denominated revaluations are driven by domestic currency gains, the behavior of exchange rates in the sample countries was examined. On average, countries actually experience a 1.2 percent depreciation of their exchange rates during the liberalization month. The average depreciation during the month after liberalization is 1.5 percent. This suggests that the dollar-denominated numbers may actually understate the true size of the revaluation in local currency terms. Second, the numbers may understate the true revaluations if the liberalization events are anticipated.[7] Analysis of returns during the months preceding the liberalization revealed no evidence of significant stock price appreciation in anticipation of the liberalizations.

Turning to comparisons of medians, the median revaluation for investible firms is 12.1 percent. Forty-three of the 248 investible firms in the sample had liberalization-month stock price changes below their median monthly stock price change. The p-value is 0.00 for observing at most this many investible firms with liberalization-month stock price responses below their median monthly stock price change for non-liberalization

[7]Anticipated events bias the analysis against finding any revaluation effect.

months.[8] The median revaluation for non-investible firms is 8.6 percent. Eighty-three of the 181 non-investible firms experienced liberalization-month stock price changes below their median monthly stock price change. The p-value is 0.15 for observing at most this many stock price responses below the median. Hence, sign tests confirm that the stock price revaluations for investible firms are more uniformly positive than for non-investible firms.

### 3E. Is There a Sample Selection Problem?

Those firms that become investible may not represent a random sampling from the distribution of all firms in the IFCG, which are themselves not randomly selected. To explore whether selection bias may prejudice the results, this section systematically examines the structural differences between investible and non-investible firms.

Table 4 provides a comparison of ex-ante observable differences in investible and non-investible firms, as a second step in exploring the extent to which selection bias may prejudice inferences about the differential impact of liberalization on the two sets of firms. Summary statistics on six variables are provided for investible and non-investible firms in the pre-liberalization period: SIZE, market capitalization as a fraction of total market capitalization; LIQUIDITY, the turnover rate; EARNINGS, the growth rate of real earnings per share; MARKET TO BOOK, the ratio of the market value of equity to the book value of equity; RETURN, the average real return in dollars; and DIFCOV, the difference in covariance between the local and world markets. There is no significant

[8] The null hypothesis is that liberalization-month stock price responses come from the same distribution as non-liberalization-month stock price changes.

difference between the size of investible and non-investible firms. Investible firms are significantly more liquid than non-investible firms.

The average growth rate of real earnings per share for investible firms is significantly higher than that of non-investible firms. Investible firms also have significantly higher market-to-book ratios than non-investible firms. This may indicate that investible firms have higher expected future profitability than non-investible firms. If higher market to book ratios and historical growth rates of real earnings per share rationally forecast that investible firms have higher expected profitability than non-investible firms, then we should see differences in ex-post earnings growth outcomes, on average.

Hence, Table 5 reports a comparison of the actual growth rate of real earnings per share for investible and non-investible firms in each of the three years following liberalization ([+1], [+2], [+3]), as a further means of exploring selection bias. In the second and third years after liberalization, there are no significant differences. In the year after liberalization, the growth rate of earnings per share for non-investible firms is significantly lower than for investible firms. Although there are no dramatic differences in ex-post profitability of investible and non-investible firms, overall the data do suggest that there are some differences between these two types of firms. The empirical analysis in Section 4 controls directly for the influence of earnings on the revaluations, so some of these differences will be accounted for. However, it is possible that these differences could be correlated with characteristics that influence the way in which investible and non-investible stock prices respond to liberalization.

Another possible concern is the process by which firms become legally investible. If decisions concerning the permissibility of foreign ownership are made at the country level (by government officials), then stock market liberalization may be an exogenous event from the perspective of any given firm. On the other hand, if legal investibility is determined on a firm-by-firm basis, then sample selection may be an issue. For example, if a firm must lobby the government to allow foreign institutions to buy its shares, then those firms that are most attractive to foreigners will be most likely to engage in the lobbying process. This discussion suggests that those firms that are "investible" may not represent a random sampling from the distribution of all firms in the IFCG.

The extent to which liberalization may be regarded as exogenous was investigated. The variation in the "degree open factor" across firms for each country was examined. For 10 of the 11 countries in the sample, the degree open factor was identical across all firms at the time of the stock market liberalization.[9] The uniformity of the degree of openness across firms within a given country suggests that either the liberalization decision is exogenous to any given firm, or all firms within a given country uniformly prefer the same degree of permissible foreign ownership. However, the government's decision about which firms to make investible may be a function of firm-specific characteristics that determine the likely impact of liberalization on that firm, even if the liberalization decision is exogenous from the firm's perspective.

## 4. Methodology and Empirical Results

This section of the paper addresses the following question. Do diversification fundamentals help predict the unexpected stock price change in response to the news of

[9] The exception is Brazil where the investible weights range from 5 percent to 56 percent across firms.

stock market liberalization? The benchmark regression specification is as follows:

$$\Delta \ln(StockPrice_{ij}[0]) = \alpha + \beta_1 INVEST_{ij} + \gamma_1 DIFCOV_{ij} + \gamma_2 (DIFCOV * INVEST)_{ij} + CNTRY_j + \varepsilon_{ij} \quad (12)$$

The left-hand-side variable is the Month "0" unexpected stock price change. Month 0 is defined as the implementation month of a given liberalization. The IFC records the value of a country's stock market index at the end of the month, and the data on liberalization events do not provide the day of the month on which programs are implemented. These two facts imply that the implementation of a given liberalization may occur after the day of the month on which the IFC recorded prices. In such cases, the change in the stock market index in month [0] may not reflect the news of the liberalization event. Accordingly, the analysis looks at the cumulative unexpected change in the real dollar value of the stock market index in months [0, +1] as well as the change in month [0]. The unexpected stock price change for a given firm, $i$, is computed as the real dollar return for firm $i$ in the liberalization month minus firm $i$'s average, pre-liberalization, monthly return.

The symbol DIFCOV is an abbreviation for $[Cov(R_i, R_M) - Cov(R_i, R_W)]$, the difference between the historical covariance of firm $i$'s stock return with the local market and its covariance with the MSCI world stock market index. INVEST is a dummy variable that takes on a value of one for investible firms and zero for non-investible firms. The coefficient on DIFCOV gives the effect of risk sharing conditional on being non-investible. The coefficient on DIFCOV*INVEST gives the marginal effect of risk sharing conditional on being investible. The sum of the coefficients on DIFCOV and

DIFCOV*INVEST gives the total effect of risk sharing conditional on being investible. CNTRY is a set of country-specific dummies to account for country-fixed effects.

The regression specification in equation (12) facilitates examination of the revaluation effect for a pooled group of 410 investible and non-investible firms. The joint estimation procedure allows testing of the view that risk sharing drives the stock price revaluations that accompany stock market liberalizations for both investible and non-investible firms. The constant intercept term, $\alpha$, imposes the assumption that the change in the risk-free rate is the same across all countries, after controlling for country-fixed effects. If the theory is correct, $\alpha$ should be the same for investible and non-investible firms. The coefficient on the dummy variable INVEST measures the marginal effect on $\alpha$ of being investible. If the theory is correct, the coefficient on INVEST should not be significantly different from zero.

In principle, estimating equation (12) without country-fixed effects would yield an estimate of the average change in the risk-free rate across all 11 countries. In practice, an estimate of $\alpha$ without fixed effects could pick up other level effects related to country-specific differences that are not addressed by the theory. Without a clear framework for interpreting such differences, it seems preferable not to try to interpret the country-fixed effects as country-specific changes in the risk-free rate. Rather, the empirical analysis simply asks whether the common shock is the same across all firms after controlling for country-fixed effects.

The usual assumption that the error term is random and uncorrelated across firms requires further discussion. Equation (12) is estimated using a panel regression with country-fixed effects. When aggregating abnormal returns, typical event studies assume

that abnormal returns are not correlated across firms. Assuming no correlation across firms means that the covariance between individual firm abnormal returns is zero. Therefore, standard distributional results may be used to calculate the variance of aggregated abnormal returns. The assumption is reasonable if the event dates for individual firms do not overlap in calendar time.

However, in the case of a liberalization event, all firms in a country share an identical event date. Therefore, the covariances between individual firm abnormal returns may not be zero, in which case the standard distributional results no longer obtain. We address this problem of clustering in the standard fashion— by relaxing the assumption that abnormal returns are not correlated across firms. Specifically, we allow the off-diagonal (covariance) elements in the variance-covariance matrix, to be different from zero. In short, the clustering procedure produces standard errors that are appropriately adjusted to reflect the cross-firm correlation of abnormal returns. The estimation procedure also corrects for potential heteroscedasticity across firms.

**4A. Benchmark Regression Results**

Table 6 shows the results. Panel A presents the estimates for the month [0] windows. Column (1a) shows the results for the benchmark specification given by equation (12). The estimate of the constant captures the common shock for both the investible and the non-investible firms. The magnitude of this coefficient is 0.059 and is significant at the 1 percent confidence level. The INVEST dummy is statistically insignificant. This suggests that the common shock is in fact the same for both sets of firms, as theory would predict.

The coefficient on DIFCOV gives the effect of risk sharing conditional on being non-investible. The estimate is 0.331 and is statistically insignificant. Risk sharing does not explain the repricing for the non-investible firms. On the other hand, conditional on being investible, the marginal effect of risk sharing conditional is an important determinant of repricing. The estimate of the coefficients on DIFCOV*INVEST is 2.41 and significant at the 1-percent level. The sum of the coefficients on DIFCOV and DIFCOV*INVEST gives the total effect of risk sharing on the repricing of investible firms, 2.74. This means that if DIFCOV equals 0.01, then an investible firm can expect a stock price revaluation of 0.0274 or 2.74 percent in the month that the liberalization takes place.

Panel B presents the estimates for the month [0, +1] window. Column (1b) presents the estimates from the benchmark specification. Consistent with the results in Panel A, risk sharing is not a significant predictor of repricing for the non-investible firms. The estimate of DIFCOV is –0.4 statistically insignificant. In contrast, the conditional effect for the investible firms is significant. The point estimate of DIFCOV*INVEST is 4.42 and significant at the 1-percent level. The total effect of risk sharing for the investible firms, the sum of DIFCOV and DIFCOV*INVEST is 4.02. Therefore, if DIFCOV equals 0.01, an investible firm can expect a total stock price revaluation of 4.02 percent over the two-month window.

It is important to reiterate that the marginal effect of DIFCOV conditional on being an investible firm is captured by the coefficient on DIFCOV*INVEST. Therefore, the point estimates in the benchmark specifications (1a and 1b) also indicate that the marginal effect of DIFCOV for investible firms is significantly different from that of the

non-investible firms. Overall, the benchmark estimates suggest that the stock price revaluation of investible firms is positively and significantly related to risk sharing. There is no significant statistical relationship between the stock price revaluation of non-investible firms and diversification fundamentals.

**4B. Controlling for Earnings Growth**

Stock price revaluations may be driven by changes in earnings or discount rates. If liberalization coincides with good news about earnings, then firms may experience stock price revaluations that are unrelated to liberalization-induced changes in the discount rate. Specifications (2a) and (2b) of Table 6 explore whether the differences in the effect of risk sharing on the stock price revaluation of investible and non-investible firms reported in specifications (1a) and (1b) are driven by shocks to the growth rate of earnings. The deviation of the growth rate of earnings from its pre-liberalization mean in year [+1] is added to the right-hand side of equation (12) as a proxy for changes in expected future profitability.[10]

After controlling for earnings in Panel A, the sum of the coefficients on DIFCOV and DIFCOV*INVEST is 2.67 and statistically significant at the 5-percent level. After controlling for earnings in Panel B, the sum of the coefficients on DIFCOV and DIFCOV*INVEST is 3.54 and significant at the 5 percent level. Therefore, risk sharing continues to explain the repricing of investible firms even after controlling for earnings growth. The point estimate on DIFCOV, the risk-sharing effect for non-investible firms, remains statistically insignificant in both Panel A and Panel B.

[10] Estimations were also performed using years [0], [+1], [+2], and [+3]. These results are not reported because earnings in [0], [+2], and [+3] have no explanatory power.

**4C. Can Index Inclusion Effects Explain the Results?**

Regulatory guidelines within asset management companies often restrict portfolio managers to holding stocks that are included in investible indices such as IFCI. In order to be included in the IFCI, firms must pass minimum size and liquidity screens, in addition to being legally investible. Furthermore, becoming included in an index can have significant effects on a firm's stock price, absent any changes in its fundamentals (Shleifer, 1986; Harris and Guerel, 1986). Therefore, the results may overstate the effects of diversification because DIFCOV proxies for omitted structural characteristics such as size and liquidity that are important practical determinants of asset demands.

In order to account for the potential impact that size and liquidity considerations may have on the results, this subsection adds size and turnover measures to the right-hand side of equation (12). The following regression examines the effect of risk sharing on revaluation after controlling for size:

$$\Delta \ln(StockPrice_{ij}[0]) = \alpha + \beta_1 Invest_{ij} + \gamma_1 DIFCOV_{ij} + \gamma_2 (DIFCOV * INVEST)_{ij} + \gamma_3 Earn_{ij} + \gamma_4 (SIZE * INVEST)_{ij} + \gamma_5 (SIZE * NONINVEST)_{ij} + CNTRY_j + \varepsilon_{ij} \quad (13)$$

For a given firm, SIZE is defined as the ratio of that firm's market capitalization to the total domestic market capitalization as of one year prior to the liberalization date.

Regression (3a) in Panel A of Table 6 shows that risk sharing remains an important determinant of the repricing of investible firms, after controlling for size. The coefficient on DIFCOV*INVEST is 2.38 and significant at the 5-percent level. The sum of the coefficients on DIFCOV and DIFCOV*INVEST is 2.61. Similarly, in Panel B, the coefficient on DIFCOV*INVEST is 3.71 and significant at the 5-percent level. The coefficients on DIFCOV and DIFCOV*INVEST is 3.45. In both Panels A and B, risk

sharing has no explanatory power for the repricing of non-investible firms remains. The coefficient on DIFCOV remains statistically insignificant. The coefficient on the SIZE variable is not significant in any of the specifications.

The following regression explores whether the positive relationship between the unexpected stock price change and risk sharing persists after controlling for liquidity, as measured by turnover:

$$\Delta \ln(StockPrice_{ij}[0]) = \alpha + \beta_1 Invest_{ij} + \gamma_1 DIFCOV_{ij} + \gamma_2 (DIFCOV * INVEST)_{ij} + \gamma_3 Earn_{ij} + \gamma_4 (TURNOVER * INVEST)_{ij} + \gamma_5 (TURNOVER * NONINVEST)_{ij} + CNTRY_{ij} + \varepsilon_{ij} \quad (14)$$

For a given firm, the variable TURNOVER is defined as the sum of the dollar value of all shares traded over a 12-month period before the liberalization ($t$= -24 to $t$= -12) divided by that firm's total market capitalization. The total market capitalization number for the firm is taken at $t$=-12.

Regression (4a) in Panel A of Table 6 shows that after controlling for the effect of liquidity on the stock price revaluation for investible firms, the sum of the coefficients on DIFCOV and DIFCOV*INVEST is 2.95 and significant at the 5-percent level. Regression (4b) in Panel B of Table 6 shows that the sum of the coefficients on DIFCOV and DIFCOV*INVEST is 3.69 and significant at the 1-percent level. In both Panels A and B, the conditional effect of DIFCOV for non-investible firms remains statistically insignificant. The coefficient on DIFCOV*INVEST indicates that the marginal effect of DIFCOV for investible firms continues to be significantly larger than that of the non-investible firms. The variable TURNOVER is statistically insignificant for the investible firms and enters negatively and significantly for the non-investible firms. Specifications (5a) and (5b) indicate that risk sharing remains a significant explanatory variable for the

repricing of investible firms, when simultaneously controlling for size, liquidity, and earnings.

**4D. Alternative Measures of Abnormal Returns**

The specifications in Table 6 control for country-fixed effects and firm-specific shocks such as earnings, size and liquidity. However, there may be common world shocks, for which we have not yet accounted. For example, suppose that liberalizations occur when times are good for international products, so that during liberalization periods, firms that produce international products experience abnormally high returns. Since firms whose output has a large proportion of international products are likely to be correlated with the world market, the coefficient estimates of DIFCOV*INVEST in Table 6 may not reflect risk sharing but rather the exposure of domestic firms to the international product shock. The controls on future earnings help somewhat with this problem, but the proxy for expected future earnings is noisy and cannot entirely eliminate the concern.

In order to account for common global shocks we construct two additional measures of abnormal returns that are adjusted for world market exposure. First, we calculate the abnormal return as a firm's return in the liberalization month minus the return on the MSCI world index in the liberalization month. Second, we calculate a risk-adjusted return using historical world market exposure. Specifically, abnormal returns are estimated using a world market return model, which is estimated in the pre-liberalization window using the MSCI world index. The pre-liberalization window consists of returns in the t= -72 to t=0 window.

Table 7 presents the results obtained from estimating specifications (1a and 1b) through (5a and 5b) using the first additional measure of abnormal returns as the left-hand-side variable. Table 8 presents the results obtained from estimating specifications (1a and 1b) through (5a and 5b) using the second additional measure of abnormal returns. Both sets of estimates corroborate the evidence from the baseline estimates in Table 6. After controlling for size, liquidity and earnings, the point estimate of DIFCOV*INVEST remains statistically significant at the 5-percent level.

**4E. Summary**

On balance, the evidence suggests that risk sharing helps explain the revaluation effect for investible firms only. The marginal effect of risk sharing for investible firms, the coefficient on DIFCOV*INVEST, is statistically significant in all specifications. In contrast, the effect of risk sharing on non-investible firms is never significant. The hypothesis that the impact of risk sharing on the stock price revaluation is the same for investible and non-investible firms is rejected in the benchmark specification as well as those that include controls for earnings, size, and liquidity. The common shock, as measured by the coefficient on the constant term, is positive and significant in all specifications. Importantly, the marginal effect of INVEST on the constant term is statistically insignificant in all but one specification. This suggests that the intercept term is in fact the same for investible and non-investible firms. This second piece of evidence provides further confirming evidence in support of the theory.

It is useful to check the plausibility of the results by performing some crude calculations. For investible firms, the sample average of DIFCOV is 0.018. Multiplying

this number by 3.59, the total effect of risk sharing on investible firms after controlling for other factors (specification (5b) in Table 6), gives 0.065. This number is the total repricing effect due to risk sharing for the average investible firm. The average revaluation in the raw data for investible firms is 15 percent (Table 3). In other words, roughly two fifths of the typical investible firm's revaluation can be explained by risk sharing.

## 5. Conclusion

Typical analyses of the gains from trade in risky assets calibrate the hypothetical welfare losses associated with the lack of international risk sharing.[11] This paper takes a different approach. It measures the extent to which risk sharing drives the revaluation of stock prices that actually occurs when countries open their stock markets to foreign investors. Strictly speaking, revaluations measure the changes in real wealth that accrue to domestic shareholders, not utility gains per se. But revaluations have an important advantage in that they provide a direct empirical test of the view that there are gains to international risk sharing.

The data show that firm-specific risk sharing characteristics (DIFCOV) account for roughly two fifths of the revaluation of the typical investible stock. In contrast, Morck et al. (2000) find that in general stock returns in emerging economies contain little firm-specific information. These two seemingly contrary findings need not be mutually inconsistent. Changes in emerging market stock prices may convey little firm-specific information in general, but the evidence in this paper shows that they do convey information about firm-specific changes in risk sharing during liberalization episodes.

[11] See Lewis (1999) and chapter 5 of Obstfeld and Rogoff (1996) for surveys of this literature.

While asset prices move in response to changes in systematic risk, an important question for future research is whether firm-specific risk sharing also matters for physical investment. Optimal smoothing of production risk in an open-capital-market world also requires the reallocation of physical capital in accordance with changes in systematic risk. In the aftermath of liberalizations, we should observe relatively more investment by firms whose systematic risk falls and relatively less by those whose systematic risk rises. Consequently, high DIFCOV firms should experience faster capital stock growth than low DIFCOV firms following liberalization, all else equal.

However, it is important to remember that the data also show the common shock, or the fall in the risk-free rate, to be an equally important source of stock price revaluation. It is natural to ask which is the more important driver of the allocation of physical capital following liberalizations, risk sharing or the common shock? Previous work shows that aggregate investment rises following liberalizations (Henry, 2000b). But again, aggregate data cannot speak to the relative importance of risk sharing versus the common shock. The firm-level identification strategy applied to asset prices in this paper may provide a useful empirical approach for disentangling the relative importance of firm-versus country-specific effects for the reallocation of physical capital when countries remove barriers to international capital movements (Chari and Henry, 2002).

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**Figure 1. Differences Between Covariances with the Market and World Portfolio Help Explain the Repricing of Investible Firms**

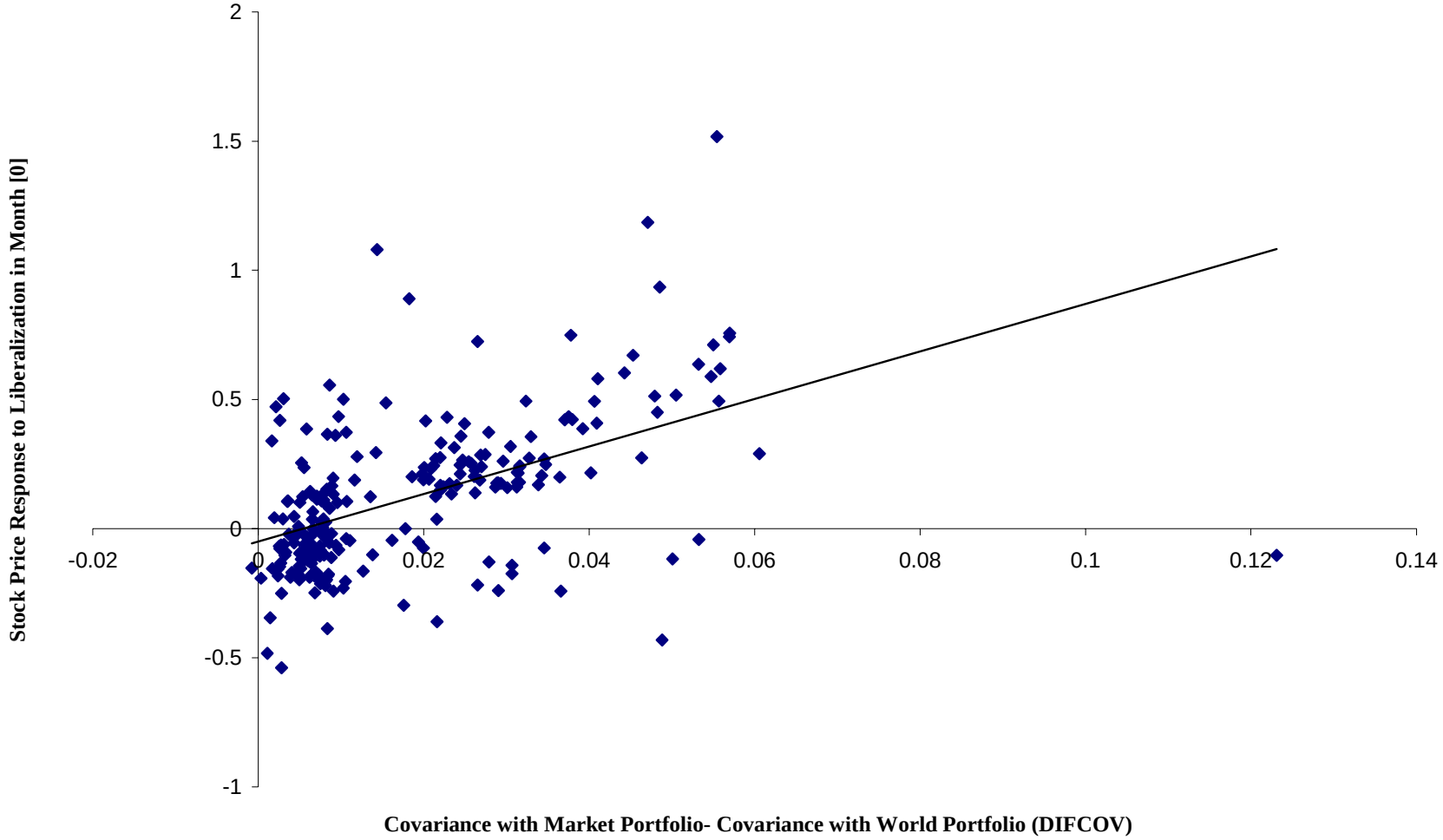

**Figure 2. Differences Between Covariances with the Market and World Portfolio Do Not Help Explain the Repricing of Non-Investible Firms**

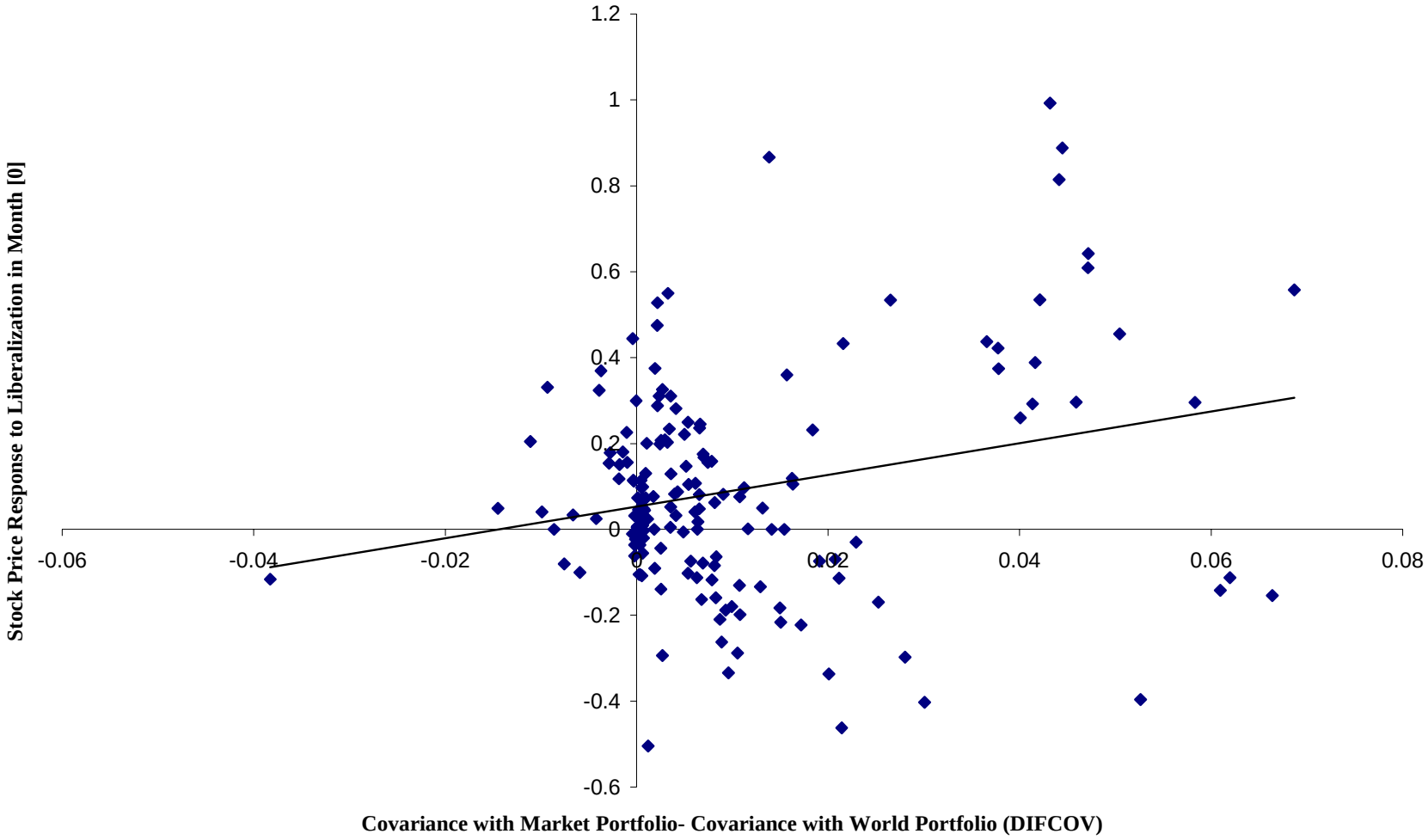

**Figure 3. Differences Between Covariances with the Market and Non-Investible Portfolio Do Not Help Explain the Repricing of Non-Investible Securities**

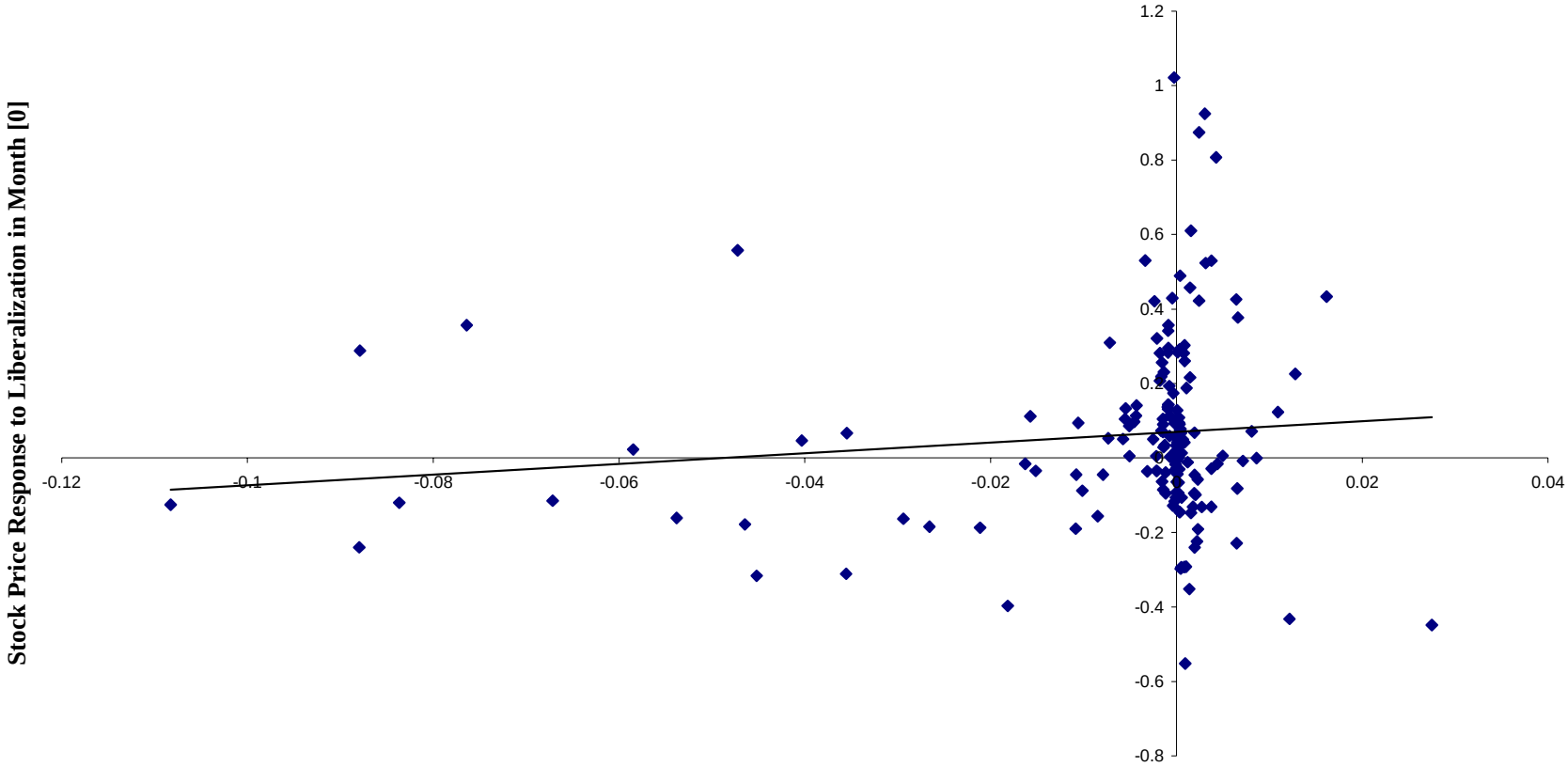

Table 1. Decomposition of DIFCOV. Panel A: Means, Investible firms

| | Number of Firms | *DIFCOV* | $COV(R_i, R_M)$ | $COV(R_i, R_W)$ | $\rho_{iM}$ | $\rho_{iW}$ | $\sigma_i$ | $\sigma_M$ | $\sigma_W$ |
|---|---|---|---|---|---|---|---|---|---|
| Sample | 238 | 0.0183 | 0.0185 | 0.0001 | 0.6202 | 0.0602 | 0.1955 | 0.142 | 0.047 |
| Argentina | 14 | 0.0476 | 0.0473 | -0.0003 | 0.9048 | -0.0171 | 0.3486 | 0.295 | 0.045 |
| Brazil | 21 | 0.0283 | 0.0289 | 0.0005 | -0.0924 | 0.0107 | 0.2906 | 0.205 | 0.044 |
| Chile | 9 | 0.0065 | 0.0070 | 0.0005 | 0.6787 | 0.0905 | 0.1252 | 0.079 | 0.047 |
| Colombia | 5 | 0.0025 | 0.0029 | 0.0004 | 0.6613 | 0.0210 | 0.1079 | 0.077 | 0.048 |
| India | 39 | 0.0097 | 0.0097 | 0.0000 | 0.6382 | 0.0017 | 0.1411 | 0.099 | 0.045 |
| Korea | 66 | 0.0059 | 0.0061 | 0.0002 | 0.5934 | 0.1326 | 0.1613 | 0.086 | 0.047 |
| Mexico | 4 | 0.0053 | 0.0055 | 0.0001 | 0.1587 | -0.0093 | 0.1584 | 0.292 | 0.044 |
| Pakistan | 3 | 0.0002 | 0.0010 | 0.0008 | 0.5868 | 0.0127 | 0.0941 | 0.058 | 0.048 |
| Taiwan | 63 | 0.0281 | 0.0283 | 0.0002 | 0.8094 | 0.0854 | 0.2146 | 0.158 | 0.049 |
| Turkey | 9 | 0.0425 | 0.0414 | -0.0010 | 0.7305 | -0.0312 | 0.2503 | 0.205 | 0.053 |
| Venezuela | 5 | 0.0174 | 0.0177 | 0.0003 | 0.6893 | -0.1003 | 0.2115 | 0.145 | 0.049 |

This table decomposes DIFCOV into its constituent parts. Number of firms is the number of firms in the specified country. All other numbers are the average value of the given variable across all of the firms in the specified country. All variables are computed at a monthly frequency. $COV(R_i, R_M)$ is the covariance of firm i with the local market. $COV(R_i, R_M)$ is the covariance of firm i with the world market. $\rho_{iM}$ is the correlation of firm i with the local market. $\rho_{iW}$ is the correlation of firm i with the world market. $\sigma_i$ is the standard deviation of firm i's stock return. $\sigma_M$ is the standard deviation of the market. $\sigma_W$ is the standard deviation of the world market.

Table 1. Decomposition of DIFCOV. Panel B: Means, non-investible firms

| | Number of Firms | *DIFCOV* | $COV(R_i, R_M)$ | $COV(R_i, R_W)$ | $\rho_{iM}$ | $\rho_{iW}$ | $\sigma_i$ | $\sigma_M$ | $\sigma_W$ |
|---|---|---|---|---|---|---|---|---|---|
| Sample | 172 | 0.0096 | 0.0105 | 0.0010 | 0.4250 | 0.0479 | 0.1921 | 0.142 | 0.047 |
| Argentina | 10 | 0.0382 | 0.0384 | 0.0002 | 0.7983 | -0.0127 | 0.3683 | 0.295 | 0.045 |
| Brazil | 23 | 0.0214 | 0.0225 | 0.0011 | -0.0963 | 0.0472 | 0.3061 | 0.205 | 0.044 |
| Chile | 17 | 0.0059 | 0.0067 | 0.0008 | 0.5459 | 0.1145 | 0.1366 | 0.079 | 0.047 |
| Colombia | 15 | 0.0024 | 0.0028 | 0.0004 | 0.5079 | 0.0464 | 0.1412 | 0.077 | 0.048 |
| India | 23 | 0.0126 | 0.0127 | 0.0001 | 0.6641 | -0.0145 | 0.1752 | 0.099 | 0.045 |
| Korea | 6 | 0.0059 | 0.0064 | 0.0004 | 0.5877 | 0.0402 | 0.1878 | 0.086 | 0.047 |
| Mexico | 27 | -0.0025 | 0.0014 | 0.0039 | 0.1025 | 0.3089 | 0.2375 | 0.292 | 0.044 |
| Pakistan | 38 | 0.0004 | 0.0007 | 0.0003 | 0.5196 | -0.0701 | 0.0930 | 0.058 | 0.048 |
| Taiwan | 0 | NA | NA | NA | NA | NA | NA | 0.158 | 0.049 |
| Turkey | 5 | 0.0462 | 0.0456 | -0.0006 | 0.7453 | 0.0127 | 0.2580 | 0.205 | 0.053 |
| Venezuela | 8 | 0.0162 | 0.0160 | -0.0002 | 0.6746 | -0.1259 | 0.1858 | 0.145 | 0.049 |

This table decomposes DIFCOV into its constituent parts. Number of firms is the number of firms in the specified country. All other numbers are the average value of the given variable across all of the firms in the specified country. All variables are computed at a monthly frequency. $COV(R_i, R_M)$ is the covariance of firm i with the local market. $COV(R_i, R_M)$ is the covariance of firm i with the world market. $\rho_{iM}$ is the correlation of firm i with the local market. $\rho_{iW}$ is the correlation of firm i with the world market. $\sigma_i$ is the standard deviation of firm i's stock return. $\sigma_M$ is the standard deviation of the market. $\sigma_W$ is the standard deviation of the world market.

Table 2. Stock Market Liberalization Dates

| Country | Date of Stock Market Liberalization |
|---|---|
| Argentina | September 1989 |
| Brazil | May 1991 |
| Chile | October 1989 |
| Colombia | December 1991 |
| India | November 1992 |
| Korea | January 1992 |
| Mexico | May 1989 |
| Pakistan | February 1991 |
| Taiwan | January 1991 |
| Turkey | August 1989 |
| Venezuela | January 1990 |

Note: Each date corresponds to the earliest stock market liberalization that occurs after 12/88, which is the month when the IFC introduced its IFCI index.

Table 3. Comparison of Mean and Median Stock Price Responses to Liberalization for Investible and Non-Investible Firms

| | Panel A Investible Firms | | | | Panel B Non-Investible Firms | | | | T-test of difference in means |
|---|---|---|---|---|---|---|---|---|---|
| | Number Firms | Mean Lib Return | Median Lib Return | Number Negative | Number Firms | Mean Lib Return | Median Lib Return | Number Negative | Investible vs. Non-Investible |
| Entire Sample | 248 | 0.151 | 0.121 | 43 (0.00) | 181 | 0.099 | 0.086 | 83 (0.149) | Yes* |
| Argentina | 14 | 0.639 (8.466) | 0.609 | 0 (0.5) | 10 | 0.391 (5.07) | 0.302 | 0 (0.000) | Yes** |
| Brazil | 21 | -0.052 (-1.029) | -0.048 | 10 (0.00) | 23 | -0.198 (-3.802) | -0.048 | 11 (0.5) | Yes* |
| Chile | 9 | 0.048 (1.20) | 0.071 | 4 (0.5) | 17 | 0.141 (5.023) | 0.177 | 8 (0.5) | Yes** |
| Colombia | 5 | 0.354 (4.223) | 0.419 | 2 (0.5) | 15 | 0.287 (6.312) | 0.310 | 7 (0.5) | No |
| India | 39 | 0.208 (4.663) | 0.172 | 7 (0.00) | 23 | -0.024 (-0.435) | -0.054 | 17 (0.994) | Yes*** |
| Korea | 66 | 0.551 (11.37) | 0.584 | 7 (0.00) | 6 | 0.069 (0.406) | -0.047 | 3 (0.656) | Yes*** |
| Mexico | 5 | 0.288 (5.48) | 0.319 | 2 (0.5) | 36 | 0.247 (8.813) | 0.223 | 12 (0.033) | No |
| Pakistan | 5 | -0.239 (–2.154) | -0.136 | 1 (0.188) | 38 | -.01 (-0.478) | 0.004 | 19 (0.564) | Yes*** |
| Taiwan | 69 | 0.329 (11.899) | 0.332 | 4 (0.00) | 0 | N/A | N/A | N/A | N/A |
| Turkey | 10 | 0.654 (8.532) | 0.577 | 4 (0.00) | 5 | 0.509 (10.01) | 0.577 | 2 (0.5) | Yes*** |
| Venezuela | 5 | 0.446 (4.223) | 0.451 | 2 (0.5) | 8 | 0.478 (4.723) | 0.451 | 4 (0.637) | No |

Notes: The mean liberalization return is the average stock price change in Month [0]. T-statistics are given in parentheses. The median liberalization return is the median stock price change in Month [0]. Column 4 in Panels A and B reports the number of firms that experienced liberalization month returns that were below their own historical median return. P-values for sign tests for the median returns are shown in parentheses. The final column reports results from a T-test of the difference in mean returns across investible and non-investible firms in Month [0]. (*), (**) and (***) refer to 10 percent, 5 percent and 1 percent levels of significance, respectively.

Table 4 Comparison of Investible and Non-Investible Firms Before Stock Market Liberalization

| | Investible Firms | | | | | Non-InvestibleFirms | | | | | Significant Difference? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Mean | Median | Min | Max | St. Dev | Mean | Median | Min | Max | St. Dev | (t-test Mean) |
| Size | 0.015 | 0.006 | 0.0004 | 0.129 | 0.023 | 0.014 | 0.006 | 0.0002 | 0.135 | 0.019 | No |
| Liquidity | 2.66 | 0.43 | 0.003 | 26.9 | 5.11 | 0.249 | 0.083 | 0 | 2.35 | 0.364 | Yes*** |
| Earnings Growth | 0.18 | 0.08 | -4.20 | 5.80 | 1.02 | 0.10 | 0.05 | -4.01 | 6.50 | 1.11 | Yes** |
| Market to Book | 3.30 | 1.72 | -1.27 | 78.0 | 6.12 | 1.48 | 1.03 | -3.30 | 7.75 | 1.50 | Yes*** |
| DIFCOV | 0.018 | 0.01 | -0.001 | 0.123 | 0.017 | 0.01 | 0.004 | -0.038 | 0.069 | 0.016 | Yes*** |

Notes: Size=market capitalization as a fraction of total market capitalization, liquidity =annual turnover, earnings growth=annual growth rate of real earnings, market to book = market value of equity to book of equity, and DIFCOV = difference in covariance between the local and world markets. The final column reports results from a t-test of statistical difference of the means of the two sub-samples. (*), (**) and (***) refer to 10 percent, 5 percent and 1 percent levels of significance, respectively.

Table 5. Average Annual Growth Rate of Real Earnings Per Share Around Liberalization

| | Investible | Non-Investible | Significant difference? (F-Test) |
|---|---|---|---|
| [+1] | -0.217*** | -0.393*** | Yes** |
| | (0.066) | (0.090) | |
| [+2] | -0.230*** | -0.113 | No |
| | (0.068) | (0.099) | |
| [+3] | -0.106 | -0.014 | No |
| | (0.068 ) | (0.101) | |
| Constant | 0.027 | -0.036 | |
| | (0.024) | (0.035) | |

Notes: [+1], [+2] and [+3] report growth rates of real earnings in the first, second and third year following the liberalization. Country-fixed effects are included in all regressions but are not reported. The F-test reports results about the statistical significance of the difference in the mean growth rates for investible and non-investible firms. (*), (**) and (***) refer to 10 percent, 5 percent and 1 percent levels of significance, repectively.

Table 6. Does Diversification Drive Stock Price Revaluations?

| | Panel A: Month [0] Window | | | | | Panel B: Month [0,+1]Window | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | (1a) | (2a) | (3a) | (4a) | (5a) | (1b) | (2b) | (3b) | (4b) | (5b) |
| DIFCOV | 0.331 | 0.267 | 0.235 | 0.335 | 0.313 | -0.403 | -0.210 | -0.258 | -0.180 | -0.222 |
| | (1.01) | (1.104) | (1.103) | (1.098) | (1.099) | (1.231) | (1.340) | (1.336) | (1.341) | (1.339) |
| DIFCOV* INVEST | 2.41*** | 2.407** | 2.384** | 2.612** | 2.590** | 4.42*** | 3.747** | 3.708** | 3.865*** | 3.812*** |
| | (0.897) | (1.196) | (1.195) | (1.192) | (1.194) | (1.09) | (1.452) | (1.447) | (1.456) | (1.454) |
| Earnings Surprise [+1] | | 0.011 | 0.011 | 0.016 | 0.016 | | 0.025 | 0.025 | 0.029 | 0.028 |
| | | (0.013) | (0.013) | (0.013) | (0.013) | | (0.016) | (0.016) | (0.016) | (0.016) |
| SIZE*INVEST | | | -0.791 | | -0.630 | | | -1.183* | | -1.081 |
| | | | (0.578) | | (0.587) | | | (0.700) | | (0.715) |
| SIZE* NONINVEST | | | 0.528 | | 0.238 | | | 0.931 | | 0.772 |
| | | | (0.759) | | (0.765) | | | (0.919) | | (0.932) |
| TURNOVER* INVEST | | | | -0.001 | -0.002 | | | | 0.001 | -0.0003 |
| | | | | (0.003) | (0.003) | | | | (0.004) | (0.004) |
| TURNOVER* NONINVEST | | | | -0.104*** | -0.094** | | | | -0.072 | -0.052 |
| | | | | (0.040) | (0.041) | | | | (0.048) | (0.050) |
| Constant | 0.059*** | 0.061*** | 0.049** | 0.091*** | 0.082*** | 0.073*** | 0.063** | 0.044 | 0.083*** | 0.061* |
| | (0.015) | (0.022) | (0.024) | (0.024) | (0.028) | (0.018) | (0.026) | (0.029) | (0.030) | (0.034) |
| Invest | 0.006 | 0.003 | 0.032 | -0.030 | -0.007 | 0.039 | 0.033 | 0.078* | 0.010 | 0.056 |
| | (0.029) | (0.030) | (0.034) | (0.032) | (0.038) | (0.036) | (0.036) | (0.042) | (0.039) | (0.047) |
| Adjusted R-Squared | 0.176 | 0.172 | 0.117 | 0.196 | 0.155 | 0.16 | 0.137 | 0.101 | 0.155 | 0.115 |
| Number Obs. | 410 | 410 | 410 | 410 | 410 | 410 | 410 | 410 | 410 | 410 |

Notes for Table 6: The LHS side variable in Panel A is the abnormal return in the liberalization month. The LHS variable in Panel B is the cumulative abnormal return in the liberalization month plus one month. The symbol DIFCOV is the difference between the historical covariance of firm i's stock return with the local market and its covariance with the Morgan Stanley Capital Market Index (MSCI) world stock market index. Country-fixed effects are included in all regressions but are not reported. INVEST is a dummy variable that takes on a value of one for investible firms and zero for non-investible firms. SIZE is defined as the ratio of that firm's market capitalization to the total domestic market capitalization as of one year prior to the liberalization date. TURNOVER is defined as the sum of the dollar value of all shares traded over a 12-month period before the liberalization (t= -24 to t= -12) divided by that firm's total market capitalization. Earnings Surprise [+1] is the deviation of the growth rate of earnings from its pre-liberalization mean in year [+1] following the liberalization. (*), (**) and (***) indicate significance at the 10 percent, 5 percent and 1 percent, respectively. Robust standard errors adjusted for clustering within parentheses.

Table 7. Does Diversification Drive Stock Price Revaluations? CARs with MSCI world return in liberalization month

| | Panel A: Month [0] Window | | | | | Panel B: Month [0,+1]Window | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | (1a) | (2a) | (3a) | (4a) | (5a) | (1b) | (2b) | (3b) | (4b) | (5b) |
| DIFCOV | 0.400 | 0.297 | 0.267 | 0.366 | 0.344 | 0.122 | -0.174 | -0.220 | -0.142 | -0.183 |
| | (1.061) | (1.076) | (1.075) | (1.070) | (1.071) | (1.313) | (1.329) | (1.326) | (1.330) | (1.328) |
| DIFCOV* INVEST | 2.041* | 2.145* | 2.117* | 2.352** | 2.321** | 3.111** | 3.410** | 3.368** | 3.535** | 3.478** |
| | (1.152) | (1.166) | (1.165) | (1.162) | (1.163) | (1.425) | (1.441) | (1.436) | (1.444) | (1.442) |
| Earnings Surprise [+1] | | 0.008 | 0.008 | 0.013 | 0.012 | | 0.022 | 0.022 | 0.026 | 0.025 |
| | | (0.013) | (0.013) | (0.013) | (0.013) | | (0.016) | (0.016) | (0.016) | (0.016) |
| SIZE*INVEST | | | -0.674 | | -0.513 | | | -1.089 | | -0.981 |
| | | | (0.563) | | (0.572) | | | (0.695) | | (0.709) |
| SIZE* NONINVEST | | | 0.791 | | 0.502 | | | 1.097 | | 0.930 |
| | | | (0.740) | | (0.746) | | | (0.912) | | (0.925) |
| TURNOVER* INVEST | | | | -0.001 | -0.001 | | | | 0.000 | 0.000 |
| | | | | (0.003) | (0.003) | | | | (0.004) | (0.004) |
| TURNOVER* NONINVEST | | | | -0.105** | -0.094** | | | | -0.075 | -0.055 |
| | | | | (0.039) | (0.040) | | | | (0.048) | (0.049) |
| Constant | 0.057*** | 0.06*** | 0.045* | 0.090*** | 0.078*** | 0.032 | 0.040 | 0.019 | 0.060** | 0.037 |
| | (0.021) | (0.021) | (0.024) | (0.024) | (0.027) | (0.025) | (0.026) | (0.029) | (0.030) | (0.034) |
| Invest | 0.016 | 0.014 | 0.043 | -0.020 | 0.004 | 0.049 | 0.044 | 0.088** | 0.019 | 0.065 |
| | (0.029) | (0.029) | (0.033) | (0.031) | (0.037) | (0.035) | (0.036) | (0.041) | (0.039) | (0.046) |
| Adjusted RSQ | 0.114 | 0.111 | 0.072 | 0.142 | 0.110 | 0.095 | 0.094 | 0.069 | 0.106 | 0.079 |
| Number Obs. | 410 | 410 | 410 | 410 | 410 | 410 | 410 | 410 | 410 | 410 |

Notes for Table 7: The LHS side variable in Panel A is the abnormal return in the liberalization month. The LHS variable in Panel B is the cumulative abnormal return in the liberalization month plus one month. The abnormal returns are calculated by subtracting the returns on the MSCI world index from the firm returns in the (a) liberalization month and (b) liberalization month plus one month. The symbol DIFCOV is the difference between the historical covariance of firm i's stock return with the local market and its covariance with the Morgan Stanley Capital Market Index (MSCI) world stock market index. Country-fixed effects are included in all regressions but are not reported. INVEST is a dummy variable that takes on a value of one for investible firms and zero for non-investible firms. SIZE is defined as the ratio of that firm's market capitalization to the total domestic market capitalization as of one year prior to the liberalization date. TURNOVER is defined as the sum of the dollar value of all shares traded over a 12-month period before the liberalization (t= -24 to t= -12) divided by that firm's total market capitalization. Earnings Surprise [+1] is the deviation of the growth rate of earnings from its pre-liberalization mean in year [+1] following the liberalization. (*), (**) and (***) indicate significance at the 10 percent, 5 percent and 1 percent, respectively. Robust standard errors adjusted for clustering within parentheses.

Table 8. Does Diversification Drive Stock Price Revaluations? CARs calculated using world market model estimated in the pre-liberalization window.

| | Panel A: Month [0] Window | | | | | Panel B: Month [0,+1]Window | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | (1a) | (2a) | (3a) | (4a) | (5a) | (1b) | (2b) | (3b) | (4b) | (5b) |
| DIFCOV | 0.016 | 0.297 | 0.267 | 0.366 | 0.344 | 0.115 | -0.180 | -0.226 | -0.149 | -0.191 |
| | (0.029) | (1.076) | (1.075) | (1.070) | (1.071) | (1.308) | (1.325) | (1.321) | (1.326) | (1.323) |
| DIFCOV* INVEST | 2.04* | 2.145* | 2.117* | 2.352** | 2.321** | 3.187** | 3.485** | 3.441** | 3.605** | 3.544** |
| | (1.061) | (1.166) | (1.165) | (1.162) | (1.163) | (1.420) | (1.436) | (1.431) | (1.439) | (1.437) |
| Earnings Surprise [+1] | | 0.008 | 0.008 | 0.013 | 0.012 | | 0.022 | 0.022 | 0.026 | 0.024 |
| | | (0.013) | (0.013) | (0.013) | (0.013) | | (0.016) | (0.016) | (0.016) | (0.016) |
| SIZE*INVEST | | | -0.674 | | -0.513 | | | -1.066 | | -0.964 |
| | | | (0.563) | | (0.572) | | | (0.692) | | (0.707) |
| SIZE* NONINVEST | | | 0.791 | | 0.502 | | | 1.194 | | 1.037 |
| | | | (0.740) | | (0.746) | | | (0.909) | | (0.922) |
| TURNOVER* INVEST | | | | -0.001 | -0.001 | | | | 0.000 | -0.0002 |
| | | | | (0.003) | (0.003) | | | | (0.004) | (0.004) |
| TURNOVER* NONINVEST | | | | -0.105*** | -0.094 | | | | -0.073 | -0.052 |
| | | | | (0.039) | (0.040) | | | | (0.048) | (0.049) |
| Constant | 0.018 | 0.021 | 0.006 | 0.051** | 0.038 | 0.002 | 0.010 | -0.013 | 0.030 | 0.005 |
| | (0.021) | (0.021) | (0.024) | (0.024) | (0.027) | 0.025 | (0.026) | (0.029) | (0.030) | (0.033) |
| Invest | 0.015 | 0.014 | 0.043 | -0.020 | 0.004 | 0.049 | 0.044 | 0.089** | 0.020 | 0.067 |
| | (0.029) | (0.029) | (0.033) | (0.031) | (0.037) | 0.035 | (0.035) | (0.041) | (0.039) | (0.046) |
| Adjusted RSQ | 0.103 | 0.105 | 0.078 | 0.127 | 0.106 | 0.077 | 0.084 | 0.065 | 0.098 | 0.075 |
| Number Obs. | 410 | 410 | 410 | 410 | 410 | 410 | 410 | 410 | 410 | 410 |

Notes for Table 8: The LHS side variable in Panel A is the abnormal return in the liberalization month. The LHS variable in Panel B is the cumulative abnormal return in the liberalization month plus one month. The abnormal returns are estimated using a world market return model, which is estimated, in the pre-liberalization window using the MSCI world index. The pre-liberalization window consists of returns in the t=-72 to t=0 window. The symbol DIFCOV is the difference between the historical covariance of firm i's stock return with the local market and its covariance with the Morgan Stanley Capital Market Index (MSCI) world stock market index. Country-fixed effects are included in all regressions but are not reported. INVEST is a dummy variable that takes on a value of one for investible firms and zero for non-investible firms. SIZE is defined as the ratio of that firm's market capitalization to the total domestic market capitalization as of one year prior to the liberalization date. TURNOVER is defined as the sum of the dollar value of all shares traded over a 12-month period before the liberalization (t= -24 to t= -12) divided by that firm's total market capitalization. Earnings Surprise [+1] is the deviation of the growth rate of earnings from its pre-liberalization mean in year [+1] following the liberalization. (*), (**) and (***) indicate significance at the 10 percent, 5 percent and 1 percent, respectively. Robust standard errors adjusted for clustering within parentheses.