International cross-listing and stock market development in emerging economies

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Abstract

Why have emerging equity markets grown so rapidly since 1990? First, it is shown how international cross-listings can transform a segmented local equity market from an equilibrium of low liquidity and market capitalization to an integrated market with high liquidity and market capitalization by altering the incentives of companies and individuals to participate in the market. Second, benefits of international cross-listings for domestic stock market development and welfare across emerging equity markets are found to be negatively related to both the degree of correlation between the domestic and world equity market and the relative size of the domestic equity market. Third, the price impact of international listing is shown to depend on the liquidity conditions in the domestic market prior to listing.

JEL classification: F3; O1

Keywords: ADRs; Emerging markets; Stock market development

1. Introduction

International cross-listings have become increasingly popular for Latin American companies in recent years, with the number of cross-listings increasing from just 2 in 1989 to 106 by January 1999. Companies perceive that listing their stock in foreign markets will increase the value of the firm and enhance the liquidity of the underlying stock. Foerster and Karolyi (1998) find empirical support for these perceptions, namely that cross-listing increases firm value by expanding the shareholder base and improving liquidity.

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Policy makers, however, fear that globalization of trading and issuance of equity from emerging economies will inhibit domestic stock market development. Cross-listing could divert order flow to the foreign market, reducing domestic market liquidity. In contrast to these fears, the expansion of cross-listings in Latin America has been paralleled by their rapid development, with market capitalization increasing from $66 billion to $434 billion between 1990 and 1996 (See Table 1). The growing participation by foreign investors in these markets is reflected in the explosive growth of private portfolio equity flows to emerging markets which reached $45.7 billion in 1996, surpassing the previous record of $45.0 billion in 1993 and up from $3.2 billion in 1990.2

The internationalization of emerging stock markets has occurred as a result of various forms of foreign investment liberalization. Investment liberalizations have taken the form of closed-end country funds, American Depositary Receipts (ADRs)
and the elimination of foreign investment restrictions for domestic stocks. Before 1991, closed-end country and regional funds were the main vehicle for participation by foreigners in Latin American stock markets. Between 1991 and 1993, international share offerings, usually in the form of ADRs, became the major source of equity flows. Since 1993, the importance of flows into the domestic equity market has increased.

The extent of foreign participation in Latin American stock markets is illustrated by the fact that by March 1995, over 87%, 54%, 62% and 71% of the Mexican, Argentine, Chilean, and Brazilian local market indices, respectively, were available for trading in the United States in the form of ADRs. The value of Mexican, Argentine, and Chilean ADRs traded in the United States were each greater than the total value traded for all stocks in their respective domestic markets during 1995, with all four countries ranked in the top nine on the New York Stock Exchange in terms of value traded of foreign equities for 1996.

This article claims that international cross-listings have been instrumental in the development of stock markets in Latin America since 1989, increasing stock prices and issuance of equity and enhancing liquidity. The article has four contributions. First, it examines the impact of participation externalities on financial market development and demonstrates how international cross-listing can increase the market capitalization and liquidity of a local equity market by reducing the segmentation of markets due to investment barriers. Internationalization improves the allocation of investment by lowering the required rate of return on equity and reducing volatility due to lack of liquidity in the market. Second, the benefits of internationalization for domestic stock market development and welfare across emerging equity markets are shown to be negatively related to the both the degree of correlation between the domestic and international equity market and the relative size of the domestic equity market. Prior studies have investigated the impact of integration on welfare (Errunza & Losq, 1989) and asset pricing. The focus here is the impact of integration on domestic equity market development. Third, the price impact of international listing is shown to depend on the liquidity of the domestic market prior to listing, extending previous models (Alexander, Eun, & Janakiramanan, 1986; Eun, Claessens, & Jun, 1995).

The article is organized as follows. First, the role of participation externalities in stock market development is discussed along with the benefits of international cross-listing. Second, the proposed model for the impact of cross-listing on the development of the local stock exchange is presented. Third, empirical evidence in support the model is given for Latin American equity markets since 1990.

2. Participation externalities and financial market development

Many influential economists have argued that the evolution of financial markets is an important dimension of economic growth and have documented a positive correlation between growth and indicators of financial development. Recent work by King and Levine (1993) also finds evidence of causation from financial development to growth by demonstrating that financial development is not only associated with
current growth, but also influences future growth, investment, and the efficiency of these investments. To benefit from the roles played by liquid secondary markets, however, these markets must exist and be active, a condition met in few emerging economies until very recently. Therefore, understanding what determines the emergence and development of equity markets is as important as examining their effect on economic growth.

Stock markets in emerging economies often have a small number of listed companies and market participants, in part because they lack developed local pension and mutual funds and the float of closely held companies is often limited. These characteristics of emerging stock markets can reduce the risk sharing opportunities and liquidity of the stock market, inhibiting domestic stock market development. International cross-listings can increase the revenue received by entrepreneurs going public by accessing investors who are able to diversify away a larger portion of the company’s risk and increase the number of market participants who buy and trade equity, improving liquidity. These factors can stimulate market development and encourage entry by more companies and investors.

In attempting to explain the fact that the relative size of equity markets differs significantly for countries at comparable levels of economic development, Pagano (1989, 1993) argues that participation externalities in equity markets may lead to multiple equilibria. A market may be in equilibrium with few companies listed and few investors. An entrepreneur’s choice to go public depends on the tradeoff between the revenue received from listing and the costs of going public. An externality arises, however, because when one entrepreneur lists its shares, this improves the risk-sharing opportunities for other entrepreneurs. Therefore, the attractiveness of floating their shares depends on the behavior of other entrepreneurs. If few (many) entrepreneurs list, the revenue received from the listing will be low (high). Thus, the incentives to go public depend on the number of entrepreneurs expected to go public. Equilibria with different number of companies traded depend on the expected number of companies in the market.

Similarly, the liquidity of a market can be related to market participation. Investors at times face shocks that force the liquidation of their investment holdings for cash. If these liquidity demands are independent and the number of traders is large, the variance induced by liquidity traders should be low. In a market with a limited number of market participants, however, an abnormally large demand for a stock may effect the price substantially, as the random demands for liquidity do not cancel each other out in the short term. This may increase the volatility of asset prices. Thus, greater (less) market participation can make a market more (less) liquid and reduce (increase) the volatility of asset prices. This encourages the entry of more investors, whose orders do not have as large an impact on prices, and companies, who now receive a higher price for their asset, given the lower volatility for risk-averse investors.

3. Benefits of international cross-listing

International cross-listing should increase domestic stock prices and market liquidity. The benefits of cross-listing reflect their ability to reduce investment barriers,
adjust to foreign demand and provide competition for domestic market makers (see Karolyi, 1998a, for a comprehensive survey of the international cross-listing literature). Investment barriers are reduced for U.S. exchange-listed ADRs because they provide greater disclosure of information, avoid the need for often inadequate foreign custodial arrangements and overcome restrictions for many institutional investors on the purchase of foreign stocks. Information transparency across markets and competing market makers in the foreign market can improve domestic market liquidity.

International asset pricing models (Alexander, Eun, & Janakiramanan, 1986; Errunza & Losq, 1985) show how a shift from market segmentation toward integration reduces the systematic risk of a stock, lowering the required rate of return and increasing the price of the stock. Under market segmentation, investment barriers such as legal restrictions, discriminatory taxation, and lack of information restrict the ability of foreign investors from purchasing domestic stocks. In completely segmented markets, the expected return of the local market is determined by the variance of the return in that market times the price of that variance. In integrated markets, the expected return of the local market is determined by the covariance of the return in that market with the world market portfolio times the time of that covariance risk.

Because correlations between individual firms are higher in emerging equity markets than in developed markets (Divecha, Drach, & Stefek, 1992), this lack of diversifiable risk in the domestic market, in part reflecting the skewed industrial structure of these markets, magnifies the international diversification benefits of integration (see Griffin & Karolyi, 1998, for an analysis of the relative importance of industry and country factors for international diversification strategies). Foerster and Karolyi (1998a,b) find evidence of these effects in developed markets, while Urias (1995) provides results for emerging markets.

Integration should also improve domestic market liquidity. With market segmentation, only domestic investors trade domestic stocks. Under integration all global investors can trade the stock. Increasing participation improves domestic market liquidity by reducing the sensitivity of prices to order flow in the domestic market, as discussed above. Both Domowitz, Glen, and Madhavan (1998) and Hargis and Ramanlal (1998) show how moving from market fragmentation or segmentation to integration improves domestic market liquidity for cross-listed equities. Hargis (1998a,b) and Smith and Sofianos (1997) find that cross-listing has resulted in a “win-win” situation with volume and liquidity improving in the domestic market even though the foreign market dominates trading.

4. Model: Market segmentation

The model will be presented for the case of internationally segmented markets prior to liberalization, followed by the model with internationally traded equities. In both models, two countries exist in the world: the domestic country (D) and the foreign country (F). The notation of the model is defined in Table 2. It is assumed initially that there are no internationally tradable assets for either the domestic or foreign country and that capital markets are completely segmented. The model is then modified to allow foreign investors to enter the domestic market.
Table 2
Model notation

\[ k_{a}^{D}, K_{D} = \text{vector of the number of shares of pure domestic equities held by domestic entrepreneur } a, \]
\[ a \in D \text{ and the vector of number of shares outstanding for each domestic equity.} \]

\[ K_{a}^{D}, K_{oD} = \text{vector of initial endowments of pure domestic equities for each entrepreneur } a, a \in D \text{ and} \]
\[ \text{the vector of initial endowment of equities.} \]

\[ k_{b}^{F}, K_{F} = \text{vector of number of shares of pure foreign equities held by foreign investor } b, b \in F \text{ and} \]
\[ \text{the vector of number of shares outstanding for each foreign equity.} \]

\[ k_{a}^{I}, K_{I} = \text{vector of number of shares of internationally traded equities held by investor } a, a \in D, F \text{ and} \]
\[ \text{the vector of number of shares outstanding for each internationally traded equity.} \]

\[ K_{W} = W \times 1 \text{ vector of the number of shares outstanding for each domestic, foreign and internationally traded equity.} \]

\[ K_{a}^{G} = H \times 1 \text{ and } W \times 1 \text{ vector of zeros and the number of shares of individual } a \text{ outstanding} \]
\[ \text{under segmentation and liberalization, respectively.} \]

\[ \mu_{D}, \mu_{F}, \mu_{I} = \text{vectors of the expected end of period values for pure domestic, pure foreign and internationally traded equities.} \]

\[ \mu_{a}^{G} = H \times 1 \text{ and } W \times 1 \text{ vector of zeros and the expected end of period value for shares of } \]
\[ \text{individual } a \text{ under segmentation and liberalization respectively.} \]

\[ e_{a}^{D}, e_{F}, e_{I} = \text{vectors of endowment shocks of pure domestic, pure foreign and internationally traded equities.} \]

\[ e_{a}^{G} = H \times 1 \text{ and } W \times 1 \text{ vector of zeros and endowment shock of individual } a \text{ under segmentation} \]
\[ \text{and liberalization respectively.} \]

\[ P_{D}, P_{F}, P_{I} = \text{vectors of current values of pure domestic, pure foreign and internationally traded equities.} \]

\[ P_{a}^{G} = H \times 1 \text{ and } W \times 1 \text{ the vector of zeros and price of the equity of individual } a \text{ are } D \times D \]
\[ \text{covariance matrix of the end of period values of pure domestic equities, } F \times F \text{ covariance matrix of values of} \]
\[ \text{pure foreign equities, } I \times I \text{ covariance matrix of values of internationally traded equities, and } W \times W \]
\[ \text{covariance matrix of values of all domestic, foreign, and internationally traded equities.} \]

\[ \Gamma_{DD}, \Gamma_{FI} = D \times I \text{ covariance matrix of values of pure domestic and internationally traded equities, } F \times \]
\[ I \text{ covariance matrix of values of pure foreign and internationally traded equities.} \]

The following points are assumed:

1. No taxes or costs-to-trade equity exist in either country after the fixed cost to enter the market is paid.
2. No restrictions exist for short sales by domestic or foreign investors in either the domestic or foreign country after entry into the market.
3. A fixed exchange rate is assumed and the risk-free interest rate in both currencies is the same.
4. Investors have homogeneous expectations in the domestic and foreign market for return and risk of all assets.
5. The security prices have a joint-normal Gaussian distribution with finite first and second moments.

In the model, there are \( H \) entrepreneurs’ (individuals’) endowments (equities) listed on the domestic equity market, \( T \) entrepreneurs’ endowments listed on the foreign equity market and \( W = H + T \) total entrepreneurs’ endowments listed on either market. There are three categories of equities: \( D \) pure domestic equities, \( F \) pure
foreign equities, and \( I_D, I_F \) dual listed equities from the domestic and foreign markets where \( I_D + I_F = I \). When no internationally listed securities exist under the case of segmentation, \( H = D \). These entrepreneurs endowed with equity are the only individuals in the economy. Thus, the only potential investors in the stock market are the entrepreneurs who have the choice to list their endowment.

All entrepreneurs have identical Arrow-Pratt measures of risk aversion (\( b \)). This measure is held constant during the entrepreneurs’ investment horizon. Each individual maximizes a mean-variance utility function in final period wealth (\( \bar{w}^* \)) and has constant absolute risk aversion. Therefore, the utility function affects the scale of portfolio demand but not the composition of the optimal portfolio. It is assumed that individuals are not able to borrow to purchase equities without listing the endowment. Therefore, the entrepreneur can invest in other equities only if he decides to list his endowment. Each entrepreneur is endowed with equity in a risky project. All endowments are assumed to be of equal size \( K_a \), with equities indexed by \( a = 1, \ldots, H \) in the domestic market and \( b = 1, \ldots, T \) in the foreign market.

Entrepreneurs live for two periods. In period 0, they decide whether to list their endowment of equity on the stock market or keep their endowment. Each individual’s information includes the size of his fixed cost to enter the market and all publicly available information.

In period 1, each entrepreneur receives an endowment shock \( e \) with mean zero and variance \( \sigma_e^2 \). If the entrepreneur lists his endowment in the market, he pays a fixed cost to list the endowment on the domestic market (\( f_D \)) or the foreign market (\( f_F \)) and purchases the optimal portfolio of shares (\( k_D \)) to maximize his certainty equivalent of wealth. The supply vector of endowments is \( K_D = K_{oD} + e_D \) with \( K_a = K_o^a + e^a \) being the supply of the endowment of individual \( a \). At the end of period 1, all endowments pay a liquidating value. The expected value \( \mu_D, \mu_F, \mu_I \) and variance \( \sigma^2 \) of individuals’ endowments at the end of period one are equal for all risky projects.

Entrepreneurs have a two-stage choice problem. First, they calculate the expected optimal portfolio of shares demanded in period one if they list in the market. Second, individuals compare the expected utility from the optimal portfolio demand in stage one with the expected utility of not listing. If the increase in expected utility from listing is greater than the costs of listing, the entrepreneur floats his endowment on the market.

When the entrepreneur decides whether to participate in the market, the uncertainty of end of period 1 wealth stems from three factors. First, the end of period 1 liquidating value of the endowment is not known in period zero. Second, all individuals receive an endowment shock in period one, before purchasing the optimal portfolio of shares but after deciding whether to participate. Third, it is uncertain how many individuals will also list their endowment in the market. The individual expects \( H \) individuals to list in the market regardless of his decision as he assumes that his choice to go public will not affect the decisions of other individuals. Even though the individuals do not know these three values in period 0, they can calculate the expected utility of going public and not going public based on the expected distribution of endowment shocks and liquidating values.
The expected utility of the individual is Eq. (1):

$$E[U(\tilde{w}^a)] = E[-Ae^{-b\tilde{w}^a}]$$  \hspace{1cm} (1)$$

If we assume normally distributed returns, this problem can be restated as Eq. (2):

$$\max_{k_D} E[U(\tilde{w}^a)] = E(\tilde{w}^a) - \frac{b}{2} \text{Var}(\tilde{w}^a)$$

$$\text{s.t.}\  \tilde{w}^a = [k^a_D(\mu_D - RP_D) + \bar{K}^a_R P^a - f_i]^p + \bar{K}^a_R \mu^a (1 - I^a)$$

$$\text{for } a = 1, \ldots, H$$  \hspace{1cm} (2)$$

where $I^a = 1$ if individual $a$ decides to float his endowment and 0 otherwise. $R$ is the return on a risk-free bond. Prior to liberalization the individual can only list and invest the proceeds in the domestic market. Substituting into the above equation yields:

$$\max_{k_D} E[U(\tilde{w}^a)] = \left[ k^a_D (\mu_D - RP_D) + \bar{K}^a_R P^a - \frac{b}{2} (k^a_D \Gamma^a_R k^a_D) - f_i \right]^p$$

$$+ \left[ \bar{K}^a_R \mu^a - \frac{b}{2} \bar{K}^a_R \bar{K}^a_R \sigma^2 \right] (1 - I^a) \text{ for } a = 1, \ldots, H$$  \hspace{1cm} (3)$$

Therefore, if the entrepreneur decides not to float the endowment, his expected utility is:

$$E[U(\tilde{w}^a)] = (K^a_R + e^a) \mu^a - \frac{b}{2} (K^a_R + e^a) (K^a_R + e^a) \sigma^2$$  \hspace{1cm} (4)$$

If he decides to float the endowment on the domestic market, the expected utility is the first line in Eq. (3). The individual floats the endowment if this is greater than Eq. (4). The first line of Eq. (3) represents the income from holding the vector of shares $(k^a_D)$ and the revenue received from listing his endowment on the market less the variance of end of period 1 wealth from investments in the market and the fixed cost of floating the endowment.

The first order condition with the respect to $k^a_D$ gives the individual’s demand for the vector of shares

$$k^a_D = \frac{1}{b} (\Gamma^a_R)^{-1}(\mu_D - RP_D), \text{ for } a = 1, \ldots, H$$  \hspace{1cm} (5)$$

The supply of each equity and corresponding vector of equilibrium prices in period 1 for each endowment from aggregating the demands across all investors and equating with this supply are:

$$K_D = K_{oD} + e_D$$  \hspace{1cm} (6)$$

$$P_D = \frac{1}{R} \left[ \mu_D - \frac{b}{H} (\Gamma^a_R K_{oD} + \Gamma^a_R e_D) \right]$$  \hspace{1cm} (7)$$
Therefore, the component of the variance-covariance matrix due to endowment shocks is:

$$\Gamma_{\theta} = \frac{b^2}{H^2} [\Gamma_\theta e_\theta e'_\theta \Gamma_{\theta}]$$  (8)

This component of the variance is a decreasing function of the number of individuals participating in the market for a given variability of individual endowment shocks. The variance is an increasing function of the variance of endowment shocks ($e_\theta e'_\theta$) and the variance of end-of-period values for each endowment $\Gamma_{\theta}$. As a result, the impact on variance of a given variability of endowment shocks is greater for stock markets with highly correlated values of end-of-period endowments because of the inability to diversify the risk of holding the endowment. In the case of no endowment shocks, volatility would approach zero for a large number of traders. The only remaining uncertainty would be the variance in the end-of-period values of the endowment.

Expected volume traded is Eq. (9):

$$V = E[k_{\theta} - k_{\theta}'] = \frac{2}{\pi} e_\theta e'_\theta$$  

(9)

from normal distribution theory and substituting Eq. (7) into Eq. (5). Substituting back in to Eq. (8) the variance of prices is:

$$\Gamma_{\theta} = \frac{\pi}{2} \frac{b^2}{H^2} [\Gamma_\theta V^2 \Gamma_{\theta}]$$  

(10)

Eq. (10) shows that the sensitivity of price variability to volume traded falls as the number of market participants $H$ increases. This reduced sensitivity shows how market liquidity improves as the number of market participants increases.

The motivation for the inclusion of this externality, as discussed previously, is that in thin secondary markets, the absence of a market to absorb the shocks of random liquidity traders increases the volatility and uncertainty of future realizable asset prices. This term therefore captures the effect that a low number of individuals or lack of liquid capital in the market is hypothesized to represent. Volatility due to a lack of liquidity arises endogenously and is a decreasing function of the number of individuals in the market.

Inserting the equilibrium price [Eq. (7)] and demand for equity [Eq. (5)] into Eq. (3) gives the expected utility of floating the endowment on the market

$$E[U(\tilde{w}^e)] = (K_{\theta}^e + e^e)\mu_\theta + \frac{b}{2} \left( \frac{K_{\theta} e_\theta + e'_\theta}{H^2} \right) \Gamma_{\theta} (K_{\theta} + e_\theta - f_1)$$

(11)

The gain in expected utility is the difference between Eqs. (11) and (4)
The benefits of going public are analyzed under 2 possible cases, with perfectly uncorrelated and perfectly correlated returns for all domestic equities, to illustrate the intuition behind Eq. (12). When returns of all equities are perfectly uncorrelated, the gain in expected utility in scalar notation is:

\[
\Delta E[U(\tilde{w}^a)] = \frac{b}{2} \left( \frac{K_{oD}^d + e_D}{H^2} \right) \Gamma_D(K_{oD} + e_D) - \frac{b}{H} (K_{o} + e^a) \Gamma_D(K_{o} + e^a)
\]

\[+ \frac{b}{2} (K_{o} + e^a)(K_{o} + e^a) \sigma^2 - f_i \]  

(12)

The benefits of listing also depend on the size of the endowment of units of real capital \((K)\) and the size of the variance of the end of period value of the endowment \(\sigma^2\). This indicates that entrepreneurs with larger endowments (larger companies) and riskier payoffs will be more likely to pay the fixed cost to list their shares than smaller companies, as the benefits to entrepreneurs of doing so are higher. If the riskiest projects are the most productive, the existence of the equity market will increase the productivity of capital.

Proposition 1. With perfectly uncorrelated domestic market returns and internationally segmented markets, the expected utility of the entrepreneur will increase by listing his endowment in the domestic market if the benefits from (i) the diversification of end of period values of investment in domestic equities, (ii) reduction in variance of prices due to endowment shocks and (iii) the increase in price received on the individual’s equity from listing are greater than the fixed cost of listing domestically.

The gain in utility is increasing in the number of entrepreneurs \(H\) participating in the market. The first term in brackets in Eq. (13) shows that with uncorrelated end of period values, the firm can diversify away nearly all of the risk of the asset for a sufficiently large \(H\). The second term demonstrates that as the number of individuals participating in the market increases, the volatility of period 1 prices due to uncorrelated endowment shocks approaches zero for a sufficiently large \(H\).\(^{12}\)

The benefits of listing also depend on the size of the endowment of units of real capital \((K)\) and the size of the variance of the end of period value of the endowment \(\sigma^2\). This indicates that entrepreneurs with larger endowments (larger companies) and riskier payoffs will be more likely to pay the fixed cost to list their shares than smaller companies, as the benefits to entrepreneurs of doing so are higher. If the riskiest projects are the most productive, the existence of the equity market will increase the productivity of capital.

Eq. (13) indicates that most of the benefits of diversification may be obtained with a relatively small number of entrepreneurs’ endowments listed in the market. However, the number of uncorrelated equities can also be interpreted as the number of uncorrelated sectors of the domestic equity market. A sector can be another industry that is not highly correlated with other industries because of the industry factor driving returns (for example, oil companies and retail companies may not be highly correlated). If \(H\) sectors that are uncorrelated with each other exist in the equity market while individual equities within each sector are highly correlated, the addition of a new sector to the market will show substantial diversification benefits even if a large number of individual equities are already in the market.
When the returns to all equities are perfectly correlated, the change in expected utility of going public is:

$$\Delta E[U(\tilde{\omega}_d)] = -f_i$$  \hspace{1cm} (14)

Proposition 2. With perfectly correlated domestic market returns and internationally segmented markets, the expected utility of the entrepreneur will decline after listing the endowment.

With perfectly correlated returns, the benefits of diversification disappear. In addition, there is no reduction in the variability of wealth due to endowment shocks. The variability in the value of the endowment is the same whether the entrepreneur goes public or stays private. Therefore, with perfectly correlated returns, the benefits of listing are negative because of the positive fixed cost of floating the endowment $f_i$.

If expected

$$H > \frac{K^2\sigma^2 + \sigma_z^2\sigma^2}{K^2\sigma^2 + \sigma_z^2\sigma^2 - 2\frac{f_i}{b}}$$

when returns are perfectly uncorrelated, each entrepreneur will go public. If all entrepreneurs expect $H$ to be less, each individual will not enter the market. Thus, the model shows how a small number of expected participants in the market reduces the expected diversification benefits and increases the expected volatility due to liquidity shocks, resulting in few entrepreneurs going public. The expectations of individuals are consistent with the actual outcome. If entrepreneurs expect few (many) entrepreneurs to go public, small (large) diversification benefits and low (high) liquidity, their expectations will be self-fulfilling. This results from the complimentarity of individual decisions, with the participation of each additional individual in the market affecting the benefits of entering the market for other individuals.

5. Model: After international listing

With the option to list internationally, the benefit to the domestic entrepreneur of going public is changed.\textsuperscript{13} The choice for domestic entrepreneurs with the option of international listing following from Eq. (3) is Eq. (15):

$$\max_{k_i_D}\ E[U(\tilde{\omega}^a)] = \left[k^a_{DP}(\mu_D - RP_D) + k^a_{D}(\mu_D - RP_D) + K^a_RP^a - f\right]I^a$$

$$- \frac{b}{2}\left[k^a_{DP}\Gamma_D k^a_{D} + k^a_{D}\Gamma_D k^a_{D} + 2k^a_{DP}\Gamma_D k^a_{D}\right]I^a$$

$$+ \left[K^a\mu^a - \frac{b}{2}K^a\sigma^a(1 - I^a)\right]I^a \text{ for } a = 1, \ldots, H$$  \hspace{1cm} (15)

where $I^a = 1$ if the individual decides to float his endowment and zero otherwise.
Therefore, the expected utility of the entrepreneur by listing internationally is Eq. (16):

$$
\max_{k_i, D_j} \mathbb{E}[U(\tilde{w}^*)] = \left[ k_p^a (\mu_D - R_P^D) + k_i^a (\mu_I - R_P^I) \right] + K^a R_P^a - f
$$

$$
- \frac{b}{2} \left[ k_p^a \Gamma_D k_p^a + k_i^a \Gamma_I k_i^a + 2k_p^a \Gamma_D k_i^a \right]
$$

(16)

where the entrepreneur pays fixed cost $f = f_1$ to list domestically and $f = f_1 + f_2$ to list domestically and internationally. The first term shows that the entrepreneur may now choose the optimal portfolio of both domestic and internationally traded equities after listing. Before, the entrepreneur could only purchase domestically traded equities. The revenue received for going public will also increase from a higher price received for the endowment [see Eq. (20a)–(20c)].

The problem facing the foreign entrepreneur changes as the additional fixed costs associated with trading the internationally listed equity are eliminated. Dually listed equities are available in the market in which the foreign entrepreneur is already participating. Therefore, all the individuals in the foreign market will optimize their portfolios to include the equity of entrepreneurs formerly available only in the domestic market.

The choice facing the foreign entrepreneur is:

$$
\max_{k_i, F_j} \mathbb{E}[U(\tilde{w}^*)] = \left[ k_p^a (\mu_F - R_P^F) + k_i^a (\mu_I - R_P^I) \right] + K^a R_P^b
$$

$$
- \frac{b}{2} \left[ k_p^a \Gamma_F k_p^a + k_i^a \Gamma_I k_i^a + 2k_p^a \Gamma_F k_i^a \right] \text{ for } b = 1, \ldots, T
$$

(17)

The first order conditions for the optimal portfolio yield the demands for each security by foreign and domestic investors.

$$
k_p^b = \frac{1}{b} \left[ (\Gamma_D)^{-1}(\mu_D - R_P^D) + (\Gamma_{DF})^{-1}(\mu_I - R_P^I) \right]
$$

$$
k_i^b = \frac{1}{b} \left[ (\Gamma_{DF})^{-1}(\mu_D - R_P^D) + (\Gamma_I)^{-1}(\mu_I - R_P^I) \right]
$$

$$
k_p^b = \frac{1}{b} \left[ (\Gamma_F)^{-1}(\mu_F - R_P^F) + (\Gamma_{FI})^{-1}(\mu_I - R_P^I) \right]
$$

$$
k_i^b = \frac{1}{b} \left[ (\Gamma_{FI})^{-1}(\mu_F - R_P^F) + (\Gamma_I)^{-1}(\mu_I - R_P^I) \right]
$$

(18)

The supply of each asset is Eq. (19):

$$
K_D = K_{oD} + e_{D,K} = K_{oI} + e_{I,K} = K_{oF} + e_F
$$

(19)

Solving these equations for the prices of domestic, foreign and internationally listed assets gives:
where $K_{DI}$ is the supply vector of pure domestic and domestic internationally traded shares and $K_{FI}$ is the supply vector of pure foreign and foreign internationally traded shares. $\Gamma_{ID}^*$ and $\Gamma_{IF}^*$ are the covariance matrices of the values of domestic and foreign market portfolios respectively including the internationally listed shares.

Eq. (20c) shows that the internationally listed equities are priced according to world systematic risk. The pricing of pure domestic and pure foreign equities depends on the ability of the internationally listed equities to replicate the pure domestic and pure foreign market portfolios. If internationally listed equities are able to replicate the pure domestic market portfolio, these equities will be priced as if markets were perfectly integrated.

To demonstrate the maximum benefits of internationalization, I analyze the case when the internationally listed equities allow foreign investors to replicate the domestic portfolio. For exposition, I examine the case when all equity returns are perfectly correlated with all equities from their respective countries (including internationally tradable equities) but are perfectly uncorrelated with all equities from the foreign country (including internationally tradable equities). Nevertheless, the results derived for the expected utility from international listing depend only on the less restrictive assumption that foreign investors are able to replicate the domestic portfolio. The assumption of perfect correlation of domestic returns allows comparability to Eq. (14) and allows for some simplification of the results but any situation when correlations between countries are lower than correlations within a country show benefits from
integration. Empirical evidence supporting these assumptions will be given in the next section.

If the internationally traded equities can replicate the domestic portfolio, the variance-covariance matrix of period 1 prices of world equities due to endowment shocks is Eq. (22):

\[
\Gamma_{pw} = \frac{b^2}{(H + T)^2}[\Gamma_w e_w e'_w \Gamma_{Ww}] \tag{22}
\]

This component of the variance is an increasing function of the variance of endowment shocks \(e_w\) and the variance of end of period values of each endowment \(\Gamma_w\). The variance is a decreasing function of the number of individuals \(H + T\) participating in the market. With no endowment shocks, the volatility of the equity again would reduce to the component due to the variance of end of period values of the assets.

Expected volume traded is Eq. (23):

\[
V = E[|k^a_w - k^u_w|] = \sqrt{\frac{2}{\pi}} e_w e'_w \tag{23}
\]

Substituting back in to Eq. (21), the variance of prices is:

\[
\Gamma_{Ww} = \frac{\pi}{2} b^2 \left[\Gamma_w V^2 \Gamma_{Ww}\right] \tag{24}
\]

Eq. (24) shows that the sensitivity of price variability to volume traded falls as the number of market participants \(H + T\) increases. By accessing a larger number of foreign participants in integrated markets, liquidity improves compared to Eq. (10) under market segmentation.

The entrepreneur deciding to list will hold the world market portfolio by purchasing shares in the internationally listed securities of the foreign market with value equal to the proportion of the foreign market in the world market portfolio. Therefore, if the entrepreneur floats the endowment on the market, the expected utility by inserting the equilibrium price [Eq. (20c)] and demand from Eq. (18) into Eq. (17) is Eq. (25):

\[
E[U(\hat{w}^o)] = \frac{b}{2} \left(\frac{K'_D}{(H + T)^2}(\Gamma_{IDw}K_{ID} + \Gamma_{IFw}K_{IF}) + \frac{K'_I}{(H + T)^2}(\Gamma_{IDw}K_{ID} + \Gamma_{IFw}K_{IF})\right) + \frac{K^a M^a}{H + T} \left[(K'_D(\Gamma_{IDw}K_{ID} + \Gamma_{IFw}K_{IF})) - f\right] \tag{25}
\]

The first line represents the income from holding equities from the domestic and foreign country reduced by the variance of holding the world market portfolio. The second line gives the revenue received from listing the endowment of shares internationally minus the cost of listing.

This can be simplified to:
This result can now demonstrate the benefits of international listing by entrepreneurs originating from different emerging equity markets. The gain in expected utility by listing internationally can be given by subtracting Eq. (4) from Eq. (26). In the two-country case with an equal number of equities from each market, the gain in expected utility from floating the endowment on both markets is:

\[
\Delta E[U(\tilde{w}^*)] = \frac{b}{H + \frac{T}{2}}(K_{ow} + e_w)\Gamma_w(K_{ow} + e_w) - f
\]

Proposition 3. With perfectly correlated domestic returns and the option to list internationally or domestically, the expected utility of the entrepreneur will increase by listing in both markets if the benefits from (i) the diversification effect of investments in foreign equities, (ii) the reduction of variance due to liquidity shocks, and (iii) the increase in price received on the individual’s equity from listing internationally and domestically are greater than the fixed cost of listing domestically and internationally.

Comparing Eqs. (27) and (14) illustrates the different decisions faced by the individual with and without the option to list internationally. In both equations, all of the domestic equities are perfectly correlated and the pure domestic equities contain an increase in price volatility induced by endowment shocks. In the case of segmentation, however, the benefits of domestic listing are negative. With the option to list internationally, three different factors increase the benefits of listing.

First, for the two country case, systematic risk of the portfolio of investments available to the individual is reduced substantially as holding \( T \) foreign equities helps to diversify away one-half of the risk of the individual’s endowment [see Eq. (27)]. Second, the price received by floating the endowment on the market has increased due to the greater ability to diversify the risk of the endowment. Finally, the individual can now reduce the transactions induced variance of domestically traded equity by purchasing foreign and internationally listed shares. The individual lists internationally if these benefits are greater than \( f_1 + f_2 \).

If the variance of endowment shocks is zero, the impact on welfare of the domestic firm reduces to the diversification benefit, which is the first term in Eq. (27). In the more general \( N \)-country case, this becomes Eq. (28):

\[
\Delta E[U(\tilde{w}^*)] = \frac{b}{2} \left[ \frac{(N - 1)}{N} K^2\sigma^2 + \frac{(N - 1)}{N} \sigma^2\sigma^2 \right] - f_1 - f_2
\]

where \( N \) is the number of countries in the world.
Proposition 4. With perfectly correlated domestic returns and the option to list internationally or domestically, the benefit of international listing for entrepreneurs is negatively related to (i) the correlation of the domestic market with the world equity market and the (ii) size of the domestic equity market relative to the world equity market.

The benefits of internationalization are enhanced for countries that have low correlations with the world market (in terms of both endowment shocks and end-of-period values) and are a small proportion of the world market. The pricing Eq. (20) approaches the international asset pricing model of Urias (1995) and others for large values of $H + T$. In contrast to all previous models of the impact of international listing, the model presented here illustrates why the price impact is larger for companies originating in illiquid domestic equity markets with a low number of market participants. A highly correlated domestic equity market reduces the benefits of listing even with a large number of domestic companies. Listing internationally may be the only way to gain the benefits of diversification and liquidity not available in the domestic market.

Proposition 3 shows that the option to list internationally will induce more firms to issue equity in foreign markets and will lead to a larger demand for equity from emerging markets at a given price. However, this may not result in local capital mobilization or local equity market development. The link to domestic market development reflects the impact on liquidity and systematic risk of pure domestic equities.

The second option for the domestic entrepreneur is to list on the domestic market, saving the fixed cost $f_2$ of listing in the foreign market. If the return on the domestic market can be replicated by the internationally listed equities, expected utility of the entrepreneur would be the same by listing domestically or internationally (less the cost of listing internationally). The benefits of diversification and reduction in volatility of liquidity shocks would be identical. Entrepreneurs may still list internationally due to other factors not considered in the model such as enhancing visibility and avoiding higher transaction costs of trading in the domestic market.

In the case when there are no spillover effects from the internationally traded equities to the domestic market (no correlation), utility is higher when listing internationally [Eq. (21) – Eq. (7)] if the price differential is greater than the cost of international listing $f_2$.

Proposition 5. With the option to list domestically or both domestically and internationally, the benefits of listing in both markets declines with (i) the greater ability of the existing internationally traded equities to replicate the domestic market portfolio and (ii) the cost of listing internationally.

In summary, prior to the option to list internationally with highly correlated returns on domestic endowments and endowment shocks, the benefit of entering the market for domestic entrepreneurs was less than the cost because of the small number of market participants. The option to list internationally changes the incentives to list, while spillovers to the domestic market help to develop the market for pure domestic equities. Welfare improves unambiguously for the entrepreneur floating his endowment if the stated benefits are greater than the cost of listing.
6. Discussion of model assumptions

The model makes assumptions regarding market integration and correlations that deserve further discussion. First, the domestic and foreign price for the cross-listed equity are assumed to be perfectly integrated (perfect information transparency across markets), consistent with the claim of Chowdhry and Nanda (1991) that incentives exist which would lead to market integration. Under this assumption, the price of the cross-listed equity will be the same in both the domestic and the foreign market and the depth of the market will reflect the number of investors participating in either the domestic or foreign market.

Models for international cross-listing usually assume either perfect integration or fragmentation, consistent with this model. I illustrate the case of moving from segmentation to integration to highlight the impact of this change on domestic stock prices and its influence on incentives for issuers and investors to enter the market. This mechanism is central for market development and needs to be analyzed in the context of an international asset pricing model.

The international asset pricing model here builds on previous models (for example, Alexander, Eun, & Janakiramanan, 1986; Errunza & Losq, 1995) and complements models which focus on the market microstructure of cross-listed equities such as Hargis and Ramanlal (1998) and Domowitz, Glen and Madhavan (1998). The model here differs from these models by allowing the price impact of moving from market segmentation to market integration to impact the decisions of domestic companies. These microstructure models focus on varying degrees of information transparency, extent of order flow migration, and foreign ownership restrictions in the domestic market prior to listing. They do not address issues such as market segmentation in an asset pricing model context, as addressed in this article. Nevertheless, the conclusions of this paper and these microstructure models are similar for the case of perfect transparency in finding that cross-listing improves domestic market liquidity.

The second issue is the assumptions in the case presented for the benefits of integration. For purposes of illustrating the model, correlations between domestic companies were assumed to equal one, while correlations between domestic and foreign companies were assumed to be zero. These assumptions illustrate the maximum benefits of internationalization.

First, correlations between emerging equity markets and the world equity markets were quite low prior to liberalization (see Bekaert & Harvey, 1997; Errunza, Hogan, & Hung, 1998). For the five year period ending in 1992, 13 of the 20 emerging markets followed by the International Finance Corporation (IFC) had a correlation coefficient of less than 0.2 with the United States. Second, correlations among individual equities within each market were higher than in the developed world, averaging 70% for all Mexican stocks compared to 49% in the United States.

As a result, prior to liberalization, the benefits to domestic listing by companies may have been low even if all companies were expected to be in the market. In contrast, the benefits of listing domestically or internationally may be substantial after liberalization even if only a small sample of equities is listed in the international market.
7. Empirical implications of the model

This section examines the results of some of the empirical implications of the model. First, the share price and liquidity of cross-listed companies should increase following cross listing. This increase in price and liquidity should be greater for those firms from smaller markets, which show the greatest expansion of the shareholder base. Second, more equity should be issued in the domestic and international markets while the market capitalization and liquidity of the domestic market should increase.

The literature demonstrates support for the hypothesis that cross-listing increases share value, improves liquidity, and lowers cost of capital (Karolyi, 1998; Miller, 1999). Evidence also supports the hypothesis that this impact is positively related to the ability of the company to expand the shareholder base. Foerster and Karolyi (1998a) show that the increase in firm value around cross-listing is positively associated with the expansion of the shareholder base while Chaplinsky and Ramchand (1997) indicate that the negative share price reaction associated with equity issues is reduced when companies have a foreign tranche in their offer. Finally, Foerster and Karolyi (1998b) find that the post-issuance performance of global offerings is positively related to its ability to capture a larger trading volume share in the United States.

Recent evidence on the impact of international cross-listing shows that it is a "win-win" situation, with volume and liquidity improving in the domestic market [measured by the sensitivity of prices to order flow as in Eqs. (10) and (24)] following cross-listing even though the foreign market dominates trading (Hargis, 1998b; Smith & Sofianos, 1997). These conclusions are consistent with Karolyi's (1998a) extensive survey, which concludes that "liquidity . . . improves overall, . . . total post-listing trading volume increases on average, and, for many issues, home trading volume also increases" (p. 16). Hargis (1998b) also finds that, consistent with the model in this article, the improvement in domestic market liquidity is greater for markets which have greater foreign ownership restrictions prior to international listing. Domowitz, Glen, and Madhavan (1998) indicate that the decline in spreads for Mexican equities is greater for share series open to foreign investment than restricted share series, although they also find an increase in the adverse selection parameter for shares open to foreign investment, indicating an increase in that component of the spread.

With the altered choices for issuing equity, one should see the listing of a large number of companies following the internationalization of the market. After the listing of some of the larger firms, smaller firms should begin to raise more equity domestically and on international exchanges, which is what happened in the Mexican market. In both 1989 and 1990, less than $200 million in equity was raised in the stock market. The opening up of the stock market in May 1989 to foreign investors did not lead to an expansion in the placement of equity.

However, after changes in regulations in the United States in 1990 relaxing requirements for equities traded in the private placement market and the international listing of Telefonos de Mexico (Telmex) in 1991, the placement of equity expanded dramatically. In 1991, Mexican companies placed $5.1 billion of which $3.4 billion went to international markets. During 1992, 21 companies raised equity worth $4.7
billion, including 10 international offerings of $3.5 billion. The number and value of domestic equity issues by Brazilian companies surged in 1994 to $2.8 billion, more than double the value of any year since 1986, while the value of Argentine domestic equity issued during 1993 increased to $1.1 billion, up from $116 million in 1990 before liberalization. From 1991 to 1994, 79 Latin American companies (including 21 IPOs from Mexico) have placed equity in the United States worth $17.7 billion.\textsuperscript{18}

Many of the early offerings reflected the privatization of previously state owned companies such as Telmex (see Megginson et. al, 1994). Since 1992, however, many smaller firms have begun to list in the United States and domestically, with some issues being placed solely in the domestic market.

The market capitalization and liquidity of Latin American markets has improved since the expansion of international listings. The market capitalization of the Mexican, Brazilian, Argentine, and Chilean markets grew from $36 billion, $26 billion, $14 billion and $8 billion, respectively, at the time of liberalization to $106, $217, $44 and $66 billion, respectively, at the end of 1996 (see Table 1).\textsuperscript{19} The liquidity in Latin American equity markets, measured by the total value traded in each market, has improved since liberalization. While domestic value traded increased from $19 billion in 1990 to $168 billion in 1996, total volume (including U.S. trading) increased from $22 billion to $245 billion.\textsuperscript{20}

8. Conclusion

Policy makers are concerned that the globalization of trading and issuance of equities from emerging markets will inhibit the development of the domestic market. This article provides a theoretical model and provides supporting empirical evidence that integration of emerging stock markets is beneficial for domestic stock market development. Integration increases domestic prices by enhancing the ability of the domestic stock market to provide the diversification and liquidity roles of the market.

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Notes

1. Bank of New York. The two companies were Tamsa and Telmex from Mexico.
3. Many of the early offerings reflected the privatization of previously state owned companies, such as Telmex. Since 1992, however, many non-privatized firms have begun to list in the United States and domestically. For a discussion of the operating and share price performance of privatized firms see Megginson et al. (1994) and Nash, Netter, and Megginson (1997).

4. New York Stock Exchange and Bank of New York

5. A participation externality is present when one individual’s participation in a stock market makes it more attractive for others to participate, so that in equilibrium the decision to enter the market is correlated across individuals.

6. Investment barriers can take the form of legal restrictions, discriminatory taxation, or lack of information. In completely segmented markets, the expected return of the local market is determined by the variance of the return in that market times the price of that variance. In completely integrated markets, the expected return of the local market is determined by the covariance of the return in that market with the world market portfolio times the price of that covariance risk. There is no exchange rate risk in our framework.

7. Schumpeter (1911), Goldsmith (1969), McKinnon (1973), and Shaw (1973)

8. Attempting to explain these empirical findings, Levine (1991), Saint-Paul (1992), and Greenwood and Jovanovic (1990) show how liquid secondary capital markets may help to allocate savings to projects with the highest marginal product, thereby increasing the steady state of growth. Stock markets improve the productivity of capital by reducing investors’ liquidity risk, enabling portfolio diversification and gathering information on the profitability of risky assets.

9. Foreign market participants often cite the liquidity problems arising from smallness of markets as being more crucial in impeding investment than foreign investment restrictions.

10. Liquidity is defined as the sensitivity of asset prices to a given level of order flow.

11. The volatility of equity in Eq. (8) assumes that endowments are uncorrelated with the end of period value of the equity as in Pagano (1989b). The results of the model would be enhanced by the relaxation of this assumption, but add substantial additional notation.

12. In my model, this risk decreases to zero as $H$ becomes sufficiently large. Even with a large number of market participants, however, cash may not be available to offset a large selling pressure.

13. The altering of choices to list internationally is exogenous to the model. In practice, this has depended largely on the decisions of developing country governments to liberalize foreign investment restrictions.


15. Monthly stock returns over the five-year period ending in 1991 (Divecha, Drach, & Stefek, 1992)

16. The results are also consistent with Domowitz, Glen, and Madhavan (1998) who do not note a substantial increase in domestic trading volume of Mexican equities. They do not break their sample into capital raising and non-capital
raising ADRs; the increase in trading volume is more concentrated in those that raise capital internationally. Over the counter ADRs are often very illiquid and infrequently traded.

17. The number of domestically traded equities in Chile increased from 213 to 279 between 1987 and 1994. In the other countries, this number has not increased substantially because listing standards have become more strict, forcing the delisting of many companies which were no longer actively traded.

18. Bank of New York

19. The dates used for the liberalization of the Mexican, Brazilian, Argentine, and Chilean markets are May 1989, May 1991, October 1991 and October 1989, respectively. The date chosen for Argentina corresponds to the date when holding period restrictions and transaction taxes were removed. Also, the Argentina Fund was listed in November 1991.

20. The finding of Levine and Zervos (1995) that capital flow liberalization in emerging equity markets significantly increases their index for stock market development—is consistent with the surge in market capitalization in Latin America.

References


