

The Role of American Depositary Receipts in the Development of Emerging Markets

ADRs bring to emerging markets the advantages of liquidity, transparency, and ease of trade that characterize the U.S. markets. When foreign and local investors choose ADRs over local share issues, it places pressure on local exchanges, brokers, and regulatory authorities to modernize operations, enhance disclosure standards, and strengthen enforcement in order to make the local market more liquid, transparent, and efficient. Because these activities help develop the local market, ADR programs might be expected not only to increase participation by local companies and investors, but also to eventually lead the more sophisticated U.S. investors to buy and sell foreign shares in the firms' home markets rather than through ADRs. Thus many foreign companies would use the U.S. markets as a temporary mechanism to access U.S. funds and gain international investor credibility and visibility. The development of the ADR market would then result in the further development of the local market, as more local investors and firms enter this increasingly efficient market.

This dynamic product-development interaction between intermediaries and markets can be interpreted as part of a financial innovation spiral pushing the financial system toward an idealized target of full efficiency.¹ As products such as ADRs become commonplace, the proliferation of new trading markets in these instruments makes feasible the introduction of competing products by local intermediaries. Trade and volume in these

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1. Merton (1993).

new products expand, driving down marginal transactions costs. This makes possible further implementation of additional new products and trading strategies by intermediaries, which in turn leads to still more volume. The success of these trading markets encourages investment in creating additional markets and products, thus spiraling toward the theoretically limiting case of zero marginal transactions costs.

Under this model, the migration of local companies to the ADR market represents the first step in the competitive dynamic between a deep market, namely, the U.S. market, and the local financial intermediaries, including the local stock and bond markets. Local firms, which are used to dealing with opaque financial intermediaries (such as banks or private equity investors) as their sources of capital and which have previously bypassed or neglected the local stock market, will now turn to the ADR market for capital. As firms are able to access foreign equity capital, they might also be able to exploit foreign debt capital, putting the foreign debt markets in direct competition with both the local debt market and local financial intermediaries.

The second step in the innovation spiral predicts that the ADR market will serve as a catalyst for the local intermediaries to develop in order to compete effectively with the ADR market. This would lead to growth in both the ADR and local markets, as well as to continued financial innovation by local intermediaries.

An alternate hypothesis, however, is that the diversion of activity away from the local market might lead to the opposite effect. As local firms look abroad to the U.S. market, local market participants become less appealing to investors and, hence, their trading volume, liquidity, and incentive to innovate are all reduced, leading to a downward spiral for local market development. The end result is that the local market contracts and becomes less relevant.

Such market atrophy has negative implications for the real economy. As summarized by Beck, Levine, and Loayza, financial development can accelerate economic growth through enhanced savings and the efficient channeling of these savings into real investment and the accumulation of capital.² Wurgler finds that financially developed countries allocate investment across industries more in line with growth opportunities in these

2. Beck, Levine, and Loayza (2000).

industries than do the financially undeveloped countries.³ This research suggests that financial development improves resource allocation in the real economy. Additional evidence shows that stock market development is robustly correlated with future economic growth, that capital flow liberalizations encourage stock market development, and that stock market integration is correlated with economic growth.⁴ Thus a reduction in stock market activity could have a negative impact on a country's level of economic development. This effect is likely to be particularly serious if the stock market's ability to serve as a source of capital for new and emerging companies is reduced.⁵

In this exploratory paper, I use a sample of twenty-eight stock markets to empirically explore the effect of ADRs on emerging market development and to determine whether the ADR market has helped or hindered the development of local markets. I study the role of ADRs with regard to three aspects of market development: liquidity, which is a measure of market activity; growth, which attempts to measure the market's ability to foster the formation of new enterprises and encourage stock market expansion; and openness, which is a proxy for the degree of market transparency and investability.

The preliminary evidence from this study is mixed. Using a set of proxies for these measures of market development, I find that ADRs appear to negatively affect investability, liquidity, and the ability of the local market to foster growth, but they appear to be instrumental in increasing accounting standards and disclosure-related openness. I also find that the effect of ADR issuance on local markets is different depending on the region, with the effect being most deleterious and economically significant for African and Latin American markets, and that ADRs with higher trading volume in the United States tend to have a bigger impact on the development of the local market. I also study the related question of causality, that is, whether increasing numbers of ADR listings are a response by firms to reduced market activity and growth, or whether ADRs are

3. Wurgler (2000).

4. Rajan and Zingales (1998); Levine and Zervos (1995a, 1995b); Henry (2000); Bekaert and Harvey (1995a).

5. For example, at the industry level, Rajan and Zingales (1998) show that industries that are externally financed in the United States (perhaps industries with a technological need for external finance) grow faster in financially developed countries.

precursors to such market shrinkage. The evidence indicates that increasing ADR listings are leading indicators of reduced liquidity and growth in the local market, and not vice versa.

Background

By early 1998, 429 out of 3,104 companies listed on the New York Stock Exchange (NYSE), 437 of 6,008 listed on Nasdaq, and 61 out of 690 on the American Stock Exchange (AMEX) were foreign companies from over fifty countries. In addition, 412 out of about 6,200 equity securities that were traded in the OTC Bulletin Board (OTCBB) were from foreign issuers.⁶ Clearly, foreign firms must find it advantageous to list in the United States (or, more generally, outside their home market), but why is the cost-benefit tradeoff a positive one? Listing in the United States can take many forms. Foreign firms can list their stock directly or through an American depository receipt (ADR) program.⁷ This listing can take place on an organized exchange (such as the NYSE, AMEX, or Nasdaq), in an over-the-counter (OTC) market, or as a private placement.⁸ The listing can be accompanied by an initial public offering (IPO) or a seasoned equity offering.

Some survey work has been undertaken to understand the managerial motivations behind a U.S. listing. In an early study, Choi and Stonehill find that among Japanese and Korean firms, the most common reason for an interest in listing on a foreign exchange is enhanced international corporate prestige and visibility.⁹ Mittoo conducts a focused study of the cost-benefit trade-off, in which she surveys seventy-eight chief executive officers (CEOs) of Canadian firms that are listed on stock exchanges in the

6. The OTCBB is a regulated quotation service that displays real-time quotes, last-sale prices, and volume information for over-the-counter (OTC) equity securities. An OTC equity security generally is any equity that is not listed or traded on the NYSE, AMEX, or Nasdaq. OTCBB securities can include national, regional, and foreign equity issues, warrants, and units.

7. ADRs are negotiable certificates that are traded in the United States and that indirectly represent ownership of shares in a foreign company. See the appendix for a detailed description of ADR programs.

8. For more detail, the reviews by McConnell and others (1996), Gande (1997), and Karolyi (1998) provide excellent coverage.

9. Choi and Stonehill (1982).

United States or the United Kingdom.¹⁰ She finds that the major benefits of listing shares abroad, as perceived by the CEOs, are the increased access to foreign capital markets and the increased ability to raise equity (39 percent of managers surveyed mentioned this point), the potential growth of the shareholder base (32 percent), the increased interest and visibility of the company (27 percent), and the expected increase in trading liquidity (28 percent).

When managers indicate that they choose to list in the United States to broaden the shareholder base and attract international investors, the implied assumption is that such an activity increases firm value. One measure of this value enhancement is the effect on share prices around the listing date. In general, the empirical evidence indicates that companies experience an increase in market value in the month around listing.¹¹ The theoretical literature on market segmentation and home bias has been used to explain this empirical evidence, with the implication that listing in the United States reduces market segmentation.¹² Reduced market segmentation leads to a diversification of the company's global market risk exposure and thus to an overall reduction in the cost of equity.

Information incompleteness, specifically the Merton investor recognition hypothesis, has been used by Foerster and Karolyi to explain the behavior of foreign share prices around U.S. listing dates and by Kadlec and McConnell to study U.S. stocks that switch exchanges.¹³ The managerial intuition that increasing the shareholder base and attracting international investors are beneficial is thus well represented both by theory and empirical evidence.

While cross-border listing is beneficial to the listing firm, the effect on the local market as a whole is less clear. Does ADR listing lead to increased volume, lower transactions costs, and increased market capitalization? What is the effect of ADR listings on subsequent equity offerings by other firms in the local market? Anecdotal evidence indicates that

10. Mittoo (1992).

11. See Karolyi (1998) for a review of the evidence and Miller (1999) for recent work on the subject.

12. Seminal contributions to the theory of international capital market integration include Black (1974), Stapleton and Subrahmanyam (1977), Stulz (1981), Errunza and Losq (1985), and Alexander, Eun, and Janakiramanan (1987). For a multiperiod model of segmentation, see Sellin and Werner (1993). Empirical evidence of the home bias has been extensively documented (see French and Poterba, 1991).

13. Merton (1987); Foerster and Karolyi (1999); Kadlec and McConnell (1994).

policymakers in emerging markets are concerned that globalization of trading will lead to fragmented markets, diverting order flow to foreign markets in New York and London, reducing liquidity in the domestic market, and inhibiting domestic market development. For example, a recent cover story in *Latin Finance* addresses the concern of market participants that ADRs could be a factor in the current lack of interest in Latin American stock markets.¹⁴ The case of Latin America is of particular interest because ADRs play an important role there as a source of equity capital: the amount of aggregate capital raised by Latin American firms in the ADR market is a substantial fraction of—and in some years exceeds—the amount of capital raised in local stock markets (see figure 1).

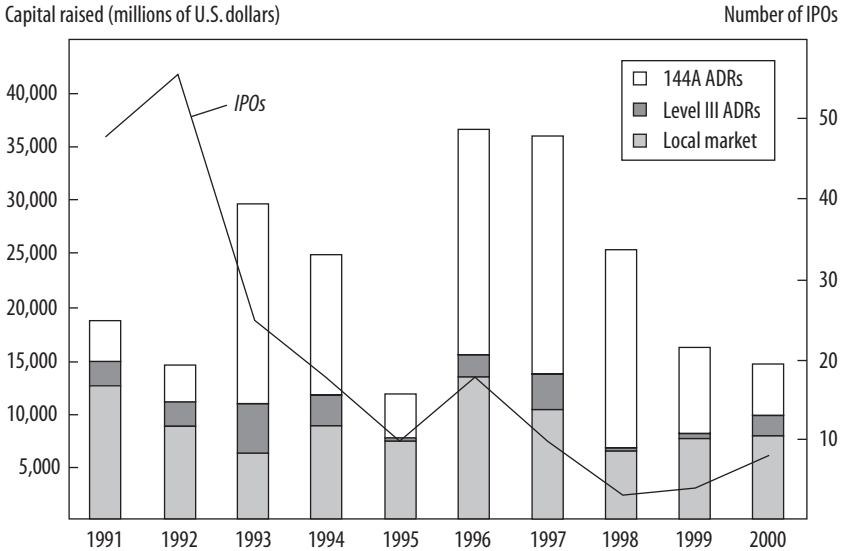
Existing empirical research on whether ADR listing should benefit or harm the domestic market centers primarily on the effect of cross-listing on liquidity. The results are mixed. The theoretical models and empirical evidence show that the impact of ADR listing on domestic market liquidity and volume can be either positive or negative, depending on the ability of cross-listing to expand the shareholder base, the extent of domestic market restrictions and domestic market liquidity prior to listing, and the intermarket information transparency and order flow after cross-listing.¹⁵

The current paper expands and elaborates on this literature by analyzing the role of ADRs in the development of emerging markets. To this purpose, I use a sample of twenty-eight emerging country stock markets to study the effect of a particular market-opening measure, namely, ADR listings, on the development of the local market. In particular, I analyze three measures of stock market development: liquidity, growth, and openness.

14. "The Incredible Shrinking Markets," *Latin Finance*, September 1999. A quote from this article is telling: "If large-cap companies are . . . migrating north to raise capital through ADR programs, shouldn't medium- and small-cap companies benefit from the remaining liquidity in the local markets? The answer, some say, is 'not necessarily.' The more mature large-cap companies usually act as a beacon light to attract capital to other opportunities within the country, said [David] Chon of Bear Stearns. The fact that the number of beacon lights is being reduced means that the remaining larger companies are drawing much more attention to themselves. They are crowding out medium and small companies." See also "Nova York Ataca e os Mercados Reagem," *Revista Bovespa*, May 1996.

15. Hargis (1997); Hargis and Ramanlal (1997); Domowitz, Glen, and Madhavan (1997)

FIGURE 1. Latin American ADR Market, 1991 to 2000^a



Source: Author's calculations, based on data from the Securities Data Corporation.

a. Aggregate amount of capital raised by Latin American firms through local markets (including Level I and Level II ADR listings), through Level III ADRs, and through 144A placements. The aggregate number of local market IPOs is also shown.

Liquidity

Hargis makes a strong case for the positive impact of liquidity on market development, concentrating on the effect of cross-listing on the listed shares and on the liquidity of the underlying shares.¹⁶ A different segment of the literature examines the effect of liquidity on asset prices, with higher liquidity resulting in lower transaction costs, lower cost of capital, and higher asset prices.¹⁷ In this paper, I test the effect of ADR issuance on residual market liquidity, as proxied by share turnover in the country's stock exchange of firms that do not list ADRs. This measure demonstrates the effect of ADRs on the liquidity of firms that do not have ADR listings.

16. Hargis (1997). See also the references therein.

17. For example, Amihud and Mendelson (1986).

Growth

Existing firms' past retained earnings and future growth prospects are embodied in the stock market's capitalization ratio, defined as market capitalization divided by gross domestic product (GDP). A higher capitalization ratio implies better growth prospects and a more developed market. In the paper, I analyze the effect of ADRs on the number of new firms listed and on the market's capitalization ratio. To make the measure more relevant, I measure the effect of ADR listing on the capitalization ratio of the firms that do not list ADRs. This gives an indication of the effect of ADR listings on the growth prospects of the remaining firms in a country's stock market.

As previously discussed, the link between stock market development and economic growth is robust. One manifestation of this link is the ability of the stock market to provide access to capital to new, small firms with promising growth prospects. If these firms are innovators, they facilitate Schumpeterian waves of creative destruction, which generate future economic growth. Thus the number of new firms listing on the stock market might be viewed as a measure of the market's ability to aid economic growth.

Openness

I define openness as a measure of a stock market's accounting disclosure quality, information transparency, and accessibility to foreign investors. The positive association between disclosure quality and transparency, on the one hand, and market development, on the other, has been made a number of times.¹⁸ In this paper, I proxy openness by an accounting disclosure standards index for the countries in the sample and by the accessibility to foreign investors, according to a modified version of the International Finance Corporation's Global Investable (IFCGI) Index.

The Data

To test the effect of ADR issuance on domestic market development, I constructed a database of foreign firms and foreign stock markets for the years

18. See Moel (2000) and the references therein.

1988–97. Firm-level data on firm size and market value were obtained from Standard & Poor's Global Vantage and Compustat databases. The Global Vantage database contains sufficient firm-level data on 5,858 firms from fifty-five countries, while the Compustat database contains information on 1,267 firms from fifty countries. Of the total firms covered, 357 have entries in both Compustat and Global Vantage. Balance sheet and income statement entries were compared for these 357 companies. If any of the major balance sheet entries (namely, total assets, current assets, current liabilities, and net worth) from Compustat and Global Vantage differed by more than 10 percent of its mean value, the firm was removed from the sample. If the two databases matched, Global Vantage data were used, since, in general, more entries without missing data are available from Global Vantage than from Compustat for the firms involved.

Country-level economic, market, and index data were obtained from the International Finance Corporation (IFC), specifically from the 1997 editions of the Emerging Markets Data Base (EMDB) and the *Stock Market Factbook*. Stock market size, number of companies listed, and market turnover measures were extracted for sixty-eight countries for the period 1988–97. In addition, GDP and population data for sixty-two countries was obtained from the International Monetary Fund's *International Financial Statistics* database (May 1998 version). The GDP data in local currency were converted to U.S. dollars using IMF year-end exchange rate data.

Listing information for 858 ADR issues from 754 different firms was obtained from the Bank of New York's ADR database (July 1998 edition).¹⁹ This information was augmented and cross-checked with data obtained from the NYSE and Nasdaq on listings by foreign firms. Data on capital-raising operations were obtained from the Securities Data Corporation. I identified 347 exchange capital-raising operations (from both direct-listed firms and Level III listings) and 478 144A placements for the years 1988–97. The majority of the U.S. listings took place in the later years in the sample.

Financial firms (one-digit International Standard Industrial Classification, or ISIC, code of 6) were deleted from the sample. The firm and country information was merged; firms in countries with no stock market

19. The Bank of New York's ADR database can be downloaded from their website (www.bankofny.com/adr).

information were dropped. After application of all data screens, the final stock market database contains information on stock markets from twenty-eight emerging market countries. Table 1 shows descriptive statistics for the stock markets and ADR listings in the database.

Empirical Proxies: Dependent Variables

To empirically test the effect of ADR listings on stock market development along the three proposed dimensions of openness, liquidity, and growth, I develop a set of preliminary proxies for each of these measures. Table 2 shows the summary statistics of the proxies for each measure for all the countries in the sample.

I use two measures as proxies for liquidity, both obtained from the IFC's *Stock Market Factbook* and Emerging Markets Data Base. The first measure, TURNOVER, is the year-end number of traded shares divided by the number of shares available from the firms in the stock exchange that did not list ADRs. The second variable, VALTURN, is defined as the same firms' ratio of year-end value traded in dollars to year-end market capitalization in dollars. The higher these numbers, the higher are the trading activity and volume in a given market, which is a function of liquidity.

As proxies for the growth prospects and relevance of a stock market in a country's economy, and as a potential engine of economic development, I analyze two measures: NEWCOS and CAPGDP. The data for both were obtained from the 1997 editions of the IFC's Emerging Markets Data Base and *Stock Market Factbook*. NEWCOS is the ratio of net listings per year divided by the number of listed companies at the beginning of the year in a given stock market. I define net listings as the difference between new listings from IPOs and delistings not related to merger activity. This number can be negative if delistings exceeded new listings. CAPGDP, the capitalization ratio, is defined as the year-end stock market capitalization (in dollars) divided by the year-end GDP (in dollars) of the firms in an exchange that did not list ADRs. CAPGDP can thus be viewed as a measure of the importance of the stock market in a country's economy.

Openness, as defined above, is a measure of a stock market's accounting disclosure quality, information transparency, and accessibility to

TABLE 1. Description of the ADR Database

Country	1988 data		1997 data					
	Total listed firms	Listed firms in database ^a	Total listed firms	Listed firms in database ^a	Listed firms in database with ADRs			
					Level I	Level II	Level III	144A
Argentina	186	1	136	15	2	3	5	3
Botswana	n.a.	0	12	1	0	0	0	0
Brazil	589	40	536	63	15	3	3	1
Chile	205	11	295	30	1	2	16	0
China	n.a.	0	764	10	0	0	8	0
Colombia	86	5	189	7	1	0	0	1
Ghana	n.a.	0	21	1	0	1	0	0
Greece	119	8	230	10	0	1	0	0
Hong Kong	282	42	658	83	17	0	7	1
Hungary	n.a.	0	49	2	0	0	1	0
India	2,238	65	5,843	95	18	0	0	11
Indonesia	24	59	282	68	1	1	3	0
Israel	n.a.	0	640	105	0	1	6	0
Kenya	n.a.	0	58	1	0	0	0	0
Korea	502	11	776	21	7	1	2	0
Malaysia	238	203	708	211	11	0	0	0
Mexico	203	24	198	59	8	5	20	3
Pakistan	404	4	781	5	1	0	0	0
Peru	236	4	248	7	0	0	2	1
Philippines	141	17	221	24	2	0	1	1
Portugal	171	20	148	22	0	0	2	0
Russia	n.a.	0	208	2	0	1	1	0
Singapore	132	117	303	128	8	0	1	0
South Africa	n.a.	0	642	17	3	8	0	0
Taiwan	163	19	404	27	1	0	2	3
Thailand	141	133	431	146	7	0	0	1
Turkey	50	15	257	16	0	0	0	1
Venezuela	47	1	91	5	1	2	1	0
Total	6,157	799	15,129	1,181	104	29	81	27

Source: Author's compilation, based on data from the Bank of New York's ADR database (July 1998 edition), the NYSE, Nasdaq, and the Securities Data Corporation.

n.a. Not available.

a. The only countries in the database with ADRs in 1988 were Hong Kong (1 Level III listing); Malaysia (4 Level I listings); Mexico (3 Level I listings); and Singapore (4 Level I listings).

foreign investors. I proxy openness by the quality of a country's accounting standards, OPEN. The first *Survey of the Use and Application of International Accounting Standards*, completed in 1988 by the London-based International Accounting Standards Committee (IASC), analyzes companies' annual reports for conformity to the international accounting standards and ranks countries' level of compliance on a scale of 0 to

TABLE 2. Descriptive Statistics of Regressors, Dependent Variables^a

Country	Dependent variable					
	TURNOVER	VALTURN	NEWCOS	CAPGDP	OPEN	OPENI
Argentina	26.015	0.289	-0.051	0.167	0.959	0.274
Botswana	0.360	0.096	0.000	0.099	n.a.	n.a.
Brazil	47.649	0.545	-0.012	0.206	0.623	0.428
Chile	10.182	0.097	0.036	0.867	0.462	0.218
China	207.862	1.575	0.376	0.101	0.104	0.072
Colombia	9.623	0.086	0.096	0.159	0.799	0.329
Ghana	3.815	0.027	0.000	0.203	n.a.	n.a.
Greece	34.023	0.266	0.061	0.150	0.842	0.762
Hong Kong	n.a.	0.497	0.089	2.054	n.a.	n.a.
Hungary	20.593	0.224	0.127	0.084	0.739	0.625
India	35.237	0.328	0.119	0.285	0.229	0.212
Indonesia	54.921	0.487	0.162	0.212	0.614	0.425
Israel	0.990	0.230	-0.023	0.420	0.994	0.428
Kenya	0.370	0.047	0.034	0.191	n.a.	n.a.
Korea	122.288	1.682	0.039	0.352	0.249	0.221
Malaysia	36.254	0.473	0.114	1.871	0.778	0.632
Mexico	35.327	0.393	-0.001	0.325	0.819	0.327
Pakistan	29.468	0.282	0.070	0.154	0.530	0.423
Peru	26.944	0.237	0.000	0.142	0.916	0.713
Philippines	36.274	0.321	0.051	0.688	0.497	0.328
Portugal	36.102	0.296	-0.018	0.189	0.741	0.654
Russia	24.400	0.104	0.649	0.186	0.633	0.322
Singapore	n.a.	0.444	0.078	1.464	n.a.	n.a.
South Africa	12.480	0.098	-0.013	1.667	0.982	0.781
Taiwan	378.005	3.161	0.092	0.898	0.201	0.192
Thailand	79.678	0.730	0.113	0.523	0.296	0.198
Turkey	86.525	0.818	0.149	0.136	0.874	0.732
Venezuela	26.254	0.206	0.052	0.120	0.714	0.231
Mean	53.140	0.501	0.085	0.497	0.635	0.414
Standard deviation	78.122	0.644	0.136	0.565	0.264	0.210

Source: Author's calculations.

n.a. Not available.

a. Mean value of the regressors for the years 1988-97 for each country in the sample. The dependent variables are defined as follows: TURNOVER, the share turnover; VALTURN, market value turnover; NEWCOS, number of net new listings/total listings; CAPGDP, the capitalization ratio of non-ADR companies; OPEN, the quality of accounting standards (0-1); and OPENI, the degree of market openness (0-1).

100.²⁰ To obtain a more up-to-date measure, I apply the methodology used to create that index to 1998 conformity data, obtained from the IASC web page.²¹ I then calculate an implied conformity index for the missing years of 1989 to 1997, by linearly interpolating the 1988 index value with the 1998 index for each country in the sample for which data are available. I also normalize the IASC scale from 0–100 to 0–1. A problem with this measure is that regulator-mandated improvement in accounting disclosure standards might be a precursor to firms' listing ADRs, and not a regulatory response to firms having listed ADRs.²² In addition, because I perform an interpolation between two independent data points, the implied conformity index between these data points carries no additional information.

As a more satisfactory (but still imperfect) alternative measure of openness, I construct OPENI, defined as the ratio of the market capitalizations of the IFC's Global Investable (IFCGI) Index (minus the market capitalization of ADR issues) to the IFC's Global (IFCG) Index for each country in the sample. The calculations are done using year-end values. The IFCG Index is computed daily by the IFC; it is intended to include the most actively traded stocks for a given market and to be the broadest possible indicator of market movements. The target aggregate market capitalization of IFCG Index components is 60 to 75 percent of the total capitalization of all exchange-listed shares.²³ The IFCGI Index, in turn, is

20. Whether the IAS rules closely match the Financial Accounting Standards Board (FASB) rules in use in the United States, and thus whether OPEN is a good proxy for disclosure quality relative to U.S. standards, is open to question. However, a quote from Patricia A. McConnell, an analyst at Bear, Stearns, & Company and the IASC chairwoman, is revealing. She holds that the IAS standards "look and smell like the American rules . . . They are far superior to most things you would get outside the U.S." (*New York Times*, January 4, 1999, p. 26).

21. The home page (www.iasc.org.uk/) contains a wealth of information on country-level conformity to IAS standards.

22. An additional concern is the endogeneity present from listing decisions made in expectation of more stringent future disclosure standards in an emerging market. This would reduce the benefits of lower disclosure. One might therefore expect the ADR listing to serve as a substitute for the local market, leading to migration of trading of the local firm's shares to the United States. This substitution effect ought to be strongest in markets where the law of one price and arbitrage would be possible, that is, in Latin American markets, which are in the same time zone as the United States and have contemporaneous trading. Smith and Sofianos (1997) present some empirical evidence of such an effect. To account for this, I present region-dependent results below.

23. For more information on the Emerging Markets Data Base and the IFC indexes, see IFC (1998).

a subset of the IFCG for each country. It includes only so-called investable securities. The IFC defines investable securities as stocks that are available to foreign institutional investors and that pass screens for minimum size and liquidity.²⁴ Subtracting the year-end ADR market capitalization serves to adjust the investable index downward to account for the component of the market that is open to foreign investors by virtue of their ADR listing. Any residual variation in OPENI (which will vary between zero, or no investability, and one, full investability) thus reflects additional measures taken by market participants to reduce cross-shareholdings, government ownership (for example, privatizations), or illiquidity through large shareholdings.

Independent Variables

The independent variables in the regressions are a number of ADR-related variables obtained from the country-level ADR database described above. Table 3 shows summary statistics for each of the independent variables.

LISTNUM is the total number of ADRs per country-year divided by the number of firms listed at the beginning of the year. An important concern with this variable is that the act of listing an ADR on a U.S. exchange does not reflect the vitality of the ADR program. Some ADR programs exhibit a brief surge of activity around the initial listing and then enter a phase of decline, in which trading shifts to the local market and the U.S. investor base shrinks. Other ADR programs experience the opposite: trading migrates to the U.S. market, and U.S. ownership becomes a substantial fraction of the firm's total ownership over the long run. The causes and dynamic behavior of such flowback are complex, and they have been studied both empirically and theoretically by a number of researchers.²⁵ To account for the effect of this flowback on the strength of an ADR listing, I separate LISTNUM into quartiles (for some specifications) according to the fraction of total trading activity that takes place in the United States.

24. The IFC calculates investability by weighting the market value of each firm in the IFCG index by a variable called the degree open factor, with a value from 0 to 1, which indicates the amount of the security foreigners may legally own. This factor is adjusted downward to account for government restrictions, cross-shareholdings, government ownership, and other large illiquid shareholdings. To be included in the IFCGI index, the firm's investable market capitalization (market capitalization times the degree open factor) must be over \$50 million, and the firm must trade at least \$20 million per year, with trading on at least half the local exchange's trading days. All ADR issues are part of the investable index.

25. For example, Domowitz, Glen, and Madhavan (1997); Smith and Sofianos (1997).

TABLE 3. Descriptive Statistics of Regressors, Independent Variables^a

Country	Independent variable					
	LISTNUM	ADRSHARE	CONCENT	GDPOP	Legal origin	Region
Argentina	0.054	0.353	0.057	10,887	French	Latin America
Botswana	0.000	0.000	0.000	2,738	English	Africa
Brazil	0.017	0.025	0.001	3,768	French	Latin America
Chile	0.034	0.201	0.012	3,878	French	Latin America
China	0.008	0.061	0.002	478	German	Asia
Colombia	0.007	0.012	0.000	1,687	French	Latin America
Ghana	0.048	0.827	0.688	370	English	Africa
Greece	0.000	0.000	0.000	9,186	French	Europe
Hong Kong	0.021	0.136	0.008	19,488	English	Asia
Hungary	0.003	0.000	0.000	3,648	French	Europe
India	0.002	0.091	0.002	342	English	Asia
Indonesia	0.011	0.102	0.013	906	French	Asia
Israel	0.010	0.123	0.006	13,128	English	Europe
Kenya	0.000	0.000	0.000	301	English	Africa
Korea	0.008	0.205	0.024	8,432	German	Asia
Malaysia	0.007	0.050	0.003	3,291	English	Asia
Mexico	0.095	0.328	0.033	3,644	French	Latin America
Pakistan	0.001	0.078	0.027	395	English	Asia
Peru	0.005	0.154	0.043	2,147	French	Latin America
Philippines	0.017	0.186	0.021	1,006	French	Asia
Portugal	0.003	0.064	0.014	8,021	French	Europe
Russia	0.009	0.012	0.000	1,700	German	Europe
Singapore	0.026	0.169	0.028	20,141	English	Asia
South Africa	0.009	0.065	0.002	2,909	English	Africa
Taiwan	0.007	0.053	0.003	10,825	German	Asia
Thailand	0.009	0.075	0.005	2,003	English	Asia
Turkey	0.002	0.002	0.000	2,576	French	Europe
Venezuela	0.012	0.014	0.001	3,066	French	Latin America
Mean	0.015	0.121	0.035	5,034		
Std.Dev.	0.020	0.165	0.126	5,409		

Source: Author's calculations.

a. Mean value of the regressors for the years 1988–97 for each country in the sample. The independent variables are defined as follows: LISTNUM, number of ADR listings/total number of companies; ADRSHARE, market value share of ADR-listed companies; CONCENT, Herfindahl concentration of ADR-listed companies; GDPOP, GDP per capita in U.S. dollars; the legal origin of the instrument; and world region.

This provides a measure of the vitality of the ADR program, as well as the impact of such U.S. activity on the remaining non-ADR issues.

ADRSHARE is the year-end market value of all ADR-linked share capital, divided by total year-end market capitalization. This number, which varies from 0 to 1, is a measure of the importance of ADR-listed companies in the local stock market.

ADRCONCENT is a Herfindahl-type concentration index, defined as

$$(1) \quad \text{ADRCONCENT}_i = \sum_j \frac{\text{ADRCAP}_{ij}^2}{\text{MKTCAP}_i^2},$$

where MKTCAP_i is the year-end market capitalization in dollars for country i and ADRCAP_{ij} is the year-end market capitalization in dollars of the j th firm in country i with an ADR listing. The sum is over all firms, j , that have an ADR listing. The closer this number is to one, the more ADR listings are concentrated among large companies. This measure thus provides an indicator of whether the crowding out of investor interest and capital by large firms affects the development of the rest of the local stock market.

Any analysis of the effect of ADR issuance on stock market development must adjust for the many other factors that contribute to this development, such as technological infrastructure, the existing efficiency of the financial system, government policies, and the efficiency of the legal system. I use two proxies, which are somewhat correlated but independent, to roughly measure these influences. First, GDP per capita in dollars, called GDPOP, is included as a control variable in most regressions to pick up a country's exogenous technological infrastructure development and the operational efficiency of the financial system. Second, I use the well-known measures of financial market development defined by La Porta and others to measure the efficiency of a country's legal system.²⁶ To simplify the analysis, I introduce a dummy, LEGORIG, to indicate whether the country's legal system is of English origin (LEGORIG equals 1) or not (LEGORIG equals 0). I use this dummy as a measure of a country's exogenous financial development in a two-stage instrumental variables (IV) estimation.²⁷

26. La Porta and others (1997, 1998).

27. In reality, there is a discrete qualitative ordering among all four legal origins discussed by La Porta and others (1997, 1998), with the English origin being the so-called best, the French legal origin being the worst, and the German and Scandinavian systems falling somewhere in between. I also ran the analysis using an ordered probit approach; the results were qualitatively similar, so I do not present them. La Porta and others also provide other, finer measures of legal efficiency, such as the efficiency and integrity of the legal environment as it affects business and the law and order tradition in the country. The results using these different measures are qualitatively similar and so are not presented.

Empirical Tests and Results

This section reports on the results of the empirical analysis carried out to determine the effect of ADR issuance on liquidity, growth, and openness. Table 4 shows the correlation coefficients between all the relevant dependent and independent variables. Increasing ADR influence (through either an increasing number of listings or greater influence in the local market) is clearly correlated with a reduction in trading volume and the number of new listings.

To extend the simple correlation analysis, I carry out multivariate two-stage least squares regressions, using the LEGORIG dummy as the instrument for the first stage to capture the residual effect of ADR issuance net of the effect of legal origin on a country's financial development. Results are presented for contemporaneous and one-year-lagged specifications, since the impact of ADR listing might not be simultaneous with the listing. This is consistent with testing the hypothesis that ADR listing prompts the local regulators, exchange officials, and market participants to develop the local market in order to compete effectively with the new ADR market. This competitive response might take time to formulate and execute, and the effects of this response might not be immediate. I present a number of specifications to overcome the structural correlation between some of the independent variables, in particular, LISTNUM, ADRSHARE, and ADRCONCENT. I also disaggregate LISTNUM by trading activity quartile to determine the parallel effect of ADR program strength and trading volume on the non-ADR local market. The results for this split variable are presented for some of the specifications. Finally, I use country and year fixed effects in most specifications to control for country-specific or year-specific effects, such as hot markets or regional crises.²⁸

By estimating the regression coefficients in a pooled data set (even with country and year fixed effects), I am making the implicit assumption that

28. An additional effect on stock market liquidity and growth (and, to a lesser degree, openness) is the increase (or decrease) in market activity and trading resulting from prior good (or bad) overall market performance. To explore this effect, I ran the regressions using yearly market index returns instead of country and year fixed effects, as well as GDP growth rates instead of market returns. The results, which are qualitatively similar, are not shown.

TABLE 4. Correlation between Empirical Proxies

<i>Dependent or independent variable</i>	<i>Dependent variable</i>					<i>Independent variable</i>				
	<i>OPEN</i>	<i>OPENI</i>	<i>TURNOVER</i>	<i>VALTURN</i>	<i>NEWCOS</i>	<i>CAPGDP</i>	<i>LISTNUM</i>	<i>ADRSHARE</i>	<i>CONCENT</i>	<i>GDPDP</i>
<i>OPEN</i>	1									
<i>OPENI</i>	0.71*	1								
<i>TURNOVER</i>	-0.62*	-0.38*	1							
<i>VALTURN</i>	-0.67*	-0.25*	0.98*	1						
<i>NEWCOS</i>	-0.34*	0.19*	0.22**	0.14**	1					
<i>CAPGDP</i>	0.05	-0.27*	0.12**	0.10	-0.09	1				
<i>LISTNUM</i>	0.19**	-0.27*	-0.12**	-0.12**	-0.23*	0.07	1			
<i>ADRSHARE</i>	0.06	-0.31*	-0.13**	-0.11**	-0.28*	0.00	0.68*	1		
<i>CONCENT</i>	0.21**	-0.06	-0.14**	-0.15**	-0.16**	-0.11	0.37*	0.88*	1	
<i>GDPDP</i>	0.24**	0.06	0.27*	0.21**	-0.22**	0.50*	0.14**	0.04	-0.14**	1

Source: Author's calculations.

* Significant at the 1 percent level.

** Significant at the 5 percent level.

each country-year observation is an independent observation. However, ADR activity, like other financial innovations, occurs in waves, and these waves have regional components. ADR activity can further be influenced by hot markets and regional crises, both in time series and in cross-section. The assumption of independent observations is thus debatable.

In the time series, pooling may inappropriately underestimate standard errors and overstate t statistics if each firm-year is not an independent observation. I therefore analyze each year's observations separately, reporting the means and t statistics on the mean of this time series of coefficient estimates as in Fama and MacBeth.²⁹ This method incorporates the potential nonindependence of the annual observations, and it produces more conservative (lower bound) estimates of the significance levels of the coefficient estimates.

In the cross-section, regional clustering leads to dependence in the observations. To take this dependence into account, I form regional portfolios and employ Zellner's seemingly unrelated regression (SUR) model as popularized by Schipper and Thompson.³⁰ Because the regressors for each region are identical, the use of the stacked SUR approach breaks the regional dependence while retaining the constraint that the equations be linked by their error terms. An added benefit of the SUR technique is that it allows for calculating region-specific coefficients while retaining the higher efficiency of the pooled regression.³¹

At the end of the analysis, I carry out a series of Granger causality tests to disentangle the direction of causality between ADR activity and market measures.³²

Liquidity Regressions

Panel A of table 5 shows the results of regressions for TURNOVER, the ratio of the number of shares traded to shares available of the firms in the local stock market that did not have ADR activity. Panel B shows the results for the dependent variable VALTURN, the dollar value of shares

29. Fama and MacBeth (1973).

30. Zellner (1962); Schipper and Thompson (1983).

31. An alternative specification would view country-specific constant terms as randomly distributed across cross-sectional units. Hausman (1978) specification tests reject a random-effects approach, but they do not reject an IV with fixed effects or an SUR specification as carried out in this paper.

32. Granger (1969).

TABLE 5. Panel Regression Results: Measures of Liquidity, 1988–97*

Explanatory variable	Contemporaneous		Panel A: TURNOVER		One-year lag			
Intercept	47.387* (8.948)	44.736* (5.494)	60.338* (7.987)	74.390* (4.039)	56.393* (4.039)	52.093* (5.489)	50.338* (4.338)	47.944* (19.209)
LISTNUM	-459.403* (-2.092)	-345.855 (-1.283)	-89.309* (-3.229)	-488.583* (-2.224)	-309.383* (-2.293)	-232.838 (-1.564)	-232.838 (-1.564)	-279.039 (-0.983)
ADPSHARE								
CONCENT		-103.392 (-1.543)						
GDPOP	4.329E-03* (4.303)	2.001E-03 (0.203)	3.498E-03* (4.322)	1.430E-04 (0.983)	3.982E-03* (3.472)	4.398E-02 (0.347)	3.394E-03* (2.983)	9.493E-06 (0.007)
Country dummies	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Year dummies	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Adjusted R ²	0.06	0.72	0.72	0.78	0.04	0.75	0.75	0.80
No. observations	260	260	260	260	234	234	234	234

Panel B: VALTURN

Intercept	0.439* (14.039)	0.654* (10.372)	0.409* (12.938)	1.893* (6.328)	0.847* (10.283)	0.387* (10.337)	0.310* (4.398)
LISTNUM	-1.873* (-2.293)	-1.328* (-2.182)		-2.567* (-3.283)	-1.783* (-2.389)		-2.383* (-3.484)
ADRSHARE			-0.765 (-0.098)			-0.929 (-1.283)	
CONCENT		-0.834 (-1.428)			-0.040 (-0.198)		
GDPOP	2.766E-06 (0.383)	4.392E-07 (0.648)	3.282E-06 (0.983)	4.393E-06 (0.093)	1.300E-07 (0.938)	2.300E-08 (0.635)	2.383E-06 (0.109)
Country dummies	No	Yes	Yes	Yes	No	Yes	Yes
Year dummies	No	Yes	Yes	Yes	No	Yes	Yes
Adjusted R ²	0.02	0.72	0.74	0.76	0.02	0.68	0.70
No. observations	280	280	280	280	252	252	252

Source: Author's calculations.

* Significantly different from zero at the 10 percent level or better.

a. LEGORIG, the English legal origin dummy, is used as an instrument for an exogenous financial development measure in a two-stage least squares regression (first stage R² between 0.33 and 0.39; F statistics significant at 5 percent). In panel A, the dependent variable is TURNOVER, defined as shares traded over shares available of all non-ADR listed firms. In panel B the dependent variable is VALTURN, defined as value traded over year-end market value of non-ADR listed firms. Independent variables are LISTNUM, the number of listed ADRs at year-end divided by the total number of listed companies at the beginning of the year; ADRSHARE, the fraction of market value represented by ADRs; ADRCONCENT, the Herfindahl market-value concentration of ADR-listed shares; and GDPOP, the GDP per capita in U.S. dollars. t statistics for heteroskedastic robust standard errors are in parentheses.

traded divided by year-end market capitalization in dollars. The first four columns of each panel show the contemporaneous regressions, while the second four repeat the analysis using one-year-lagged independent variables, with and without country and year dummies.

For all specifications and for both proxies for liquidity, the listing of ADRs has a negative effect on market liquidity. For example, from the fourth column of panel A, a one percentage point increase in the fraction of firms listed with ADRs (LISTNUM) results in a reduction of TURNOVER by 4.88. With a mean turnover of 53.14, a one percentage point increase in LISTNUM leads to a 9 percent decrease in turnover from the sample mean. This effect is quite pronounced, especially in comparison with the effect of GDP per capita. A one percent increase from the mean in GDP per capita (\$50.34) results in an increase in TURNOVER of only 0.007, which is economically insignificant.

Carrying out a similar analysis for the market value measure of liquidity, VALTURN, a one percentage point increase in LISTNUM is correlated with a reduction in VALTURN of 0.0257, or a 5.1 percent reduction from its sample mean value of 0.501 (from the fourth column of panel B). This number is also economically meaningful.

The effect of ADR market value share (ADRSHARE) on the liquidity measures is substantially smaller. It is about an order of magnitude smaller than the impact of LISTNUM, but still far larger than that of GDP per capita.

The effect on liquidity of last year's listing, as evidenced by the last four columns of both panels, is also significant, although it is attenuated by about a 20–40 percent over the contemporaneous effect. The impact of the market concentration measure is not statistically significant.

Growth Regressions

Panel A of table 6 shows the results of regressions for NEWCOS, the net number of new companies listed in a given year divided by the number of listed companies at the beginning of the year. This number can be negative, if more delistings (excluding merger activity) occurred than listings in a given year. Panel B shows the results for CAPGDP, the capitalization ratio, defined as the year-end total market capitalization of non-ADR firms divided by GDP. The first four columns of each panel show the contemporaneous regressions, while the second four repeat the analysis using

one-year-lagged independent variables, with and without country and year dummies.

The effect of ADR listings is highly detrimental on the listing of new firms. The net number of listings (from table 2) grows about 8.5 percent a year, on average, for all the country-years in the sample. However, a one percentage point increase in LISTNUM causes the growth rate of listed companies to fall by 0.98 percent (see the fourth column of panel A in table 6). For every firm that lists its ADRs, the local stock market loses approximately one additional firm. The effect of last year's ADR listings on this year's delistings is even more dramatic. A one percentage point increase in ADR-listed firms results in a 4.3 percentage point reduction in the growth rate of the number of firms listed (see the last column of panel A). In other words, this year's ADR listing is correlated with over four firm delistings next year. This result corroborates the anecdotal evidence of the concern among policymakers in emerging markets with regard to the effect of ADR listings on the development of the local markets.

Panel B of table 6 presents results using the capitalization ratio of non-ADR firms, CAPGDP, as the dependent variable. ADR listings have a negative effect on CAPGDP. For example, a one percentage point increase in LISTNUM results in a 0.024 decrease of CAPGDP (see the fourth column of panel B). Relative to its sample mean of 0.497, this is a significant decrease ($0.024/0.497 = 4.7$ percent). The effect is even more pronounced for the lagged variables (last column of panel B).

Another relevant question is whether this drop in the capitalization ratio of non-ADR firms is more pronounced when large firms list ADRs. The evidence from table 6, panel B, indicates that it is. The ADRCONCENT measure is negative and significant. Take the example of a small emerging market with a hundred listed firms, no ADR listings, and one large firm that accounts for 20 percent of the total market capitalization (that is, a concentration measure of $0.2^2 = 0.04$). This stylized example is a reasonable starting point for many emerging stock markets. If this large firm decides to list in the United States using ADRs, the LISTNUM measure will increase by one percentage point and the ADRCONCENT measure will increase from zero to 0.04. An increase of 0.04 this year in the concentration measure results in a reduction of 0.15 next year of the capitalization ratio (sixth column of panel B). Relative to the sample mean of 0.497, this is a material decrease ($0.15/0.497 = 30$ percent). A quick analysis of the ADR data-

TABLE 6. Panel Regression Results: Measures of Growth, 1988–97^a

Explanatory variable	Contemporaneous			One-year lag				
Intercept	0.928* (3.289)	0.289* (3.298)	0.398 (1.273)	0.538* (4.366)	0.398* (3.201)	0.283* (2.732)	0.419 (1.093)	0.786* (7.490)
LISTNUM	-1.398* (-3.381)	-1.837* (-3.722)	-0.983* (-3.298)	-0.983* (-3.298)	-1.192* (-2.393)	-1.092* (-2.382)		-4.322* (-4.309)
ADRSHARE			0.092 (0.598)				0.021 (0.293)	
CONCENT		0.550 (0.837)				-0.121 (-0.293)		
GDPPOP	-1.830E-06 (-1.389)	-2.398E-06 (-0.983)	-3.220E-06* (-2.893)	-1.839E-06* (-6.589)	-3.211E-06 (-1.092)	-2.091E-06 (-0.938)	-3.000E-06* (-2.122)	-5.230E-06* (9.093)
Country dummies	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Year dummies	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Adjusted R ²	0.02	0.22	0.22	0.22	0.02	0.18	0.20	0.25
No. observations	280	280	280	280	252	252	252	252

Panel B: CAPGDP

Intercept	0.383* (9.021)	0.129* (10.019)	0.380* (8.273)	1.026* (12.333)	0.498* (8.332)	0.594* (7.383)	0.654* (8.301)	1.099* (11.309)
LISTNUM	-0.938* (-2.383)	-1.233* (-3.012)	-0.837 (-0.372)	-2.384* (-5.403)	-0.273* (-3.049)	-1.028* (-2.362)		-3.498* (-5.424)
ADRSHARE							-0.213 (-1.293)	
CONCENT		-2.391* (-4.076)				-3.751* (-2.398)		
GDPOP	1.498E-05* (8.498)	1.090E-05* (5.403)	1.280E-05* (8.371)	2.110E-06* (6.548)	1.110E-05* (7.000)	1.245E-05* (6.893)	1.098E-05* (4.399)	1.872E-06* (6.390)
Country dummies	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Year dummies	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Adjusted R ²	0.12	0.75	0.75	0.78	0.12	0.75	0.75	0.78
No. observations	280	280	280	280	252	252	252	252

Source: Author's calculations.

* Significantly different from zero at the 10 percent level or better.

a. LEGORIG, the English legal origin dummy, is used as an instrument for an exogenous financial development measure in a two-stage least squares regression (first stage R² between 0.44 and 0.62; F statistics significant at 5 percent). In panel A, the dependent variable is NEWCOS, the net new number of companies listed. In panel B, the dependent variable is CAPGDP, the year-end market capitalization over year-end GDP of non-ADR listed firms. Independent variables are LISTNUM, the number of listed ADRs at year-end divided by the total number of listed companies at the beginning of the year; ADRSHARE, the fraction of market value represented by ADRs; ADRCONCENT, the Herfindahl market-value concentration of ADR-listed shares; and GDPOP, the GDP per capita in U.S. dollars. t statistics for heteroskedastic robust standard errors are in parentheses.

base shows that larger firms tend to list ADRs. The impact of ADR listing on the capitalization ratio is thus negative, and this detrimental effect is more pronounced the bigger the ADR-listing firm relative to the local market.

Openness Regressions

Panel A of table 7 shows the results of regressions for OPEN, a measure of a country's accounting standards quality, for a number of specifications. The first four columns show the contemporaneous regressions, while the second four repeat the analysis using one-year-lagged independent variables.

For LISTNUM (the fraction of listed firms that have ADRs), the effect is consistent across all contemporaneous and lagged specifications. Higher fractions are correlated with higher openness measures. For example, a one percentage point increase in LISTNUM—that is, LISTNUM increases by 0.01—results in an increase in OPEN of 0.042 (fourth column). Relative to a mean value of OPEN of 0.635 (from table 2), a one percent increase in the fraction of listed firms with ADRs leads to a 6.6 percent increase in the mean measure of openness (equal to $0.042/0.635$). A one standard deviation increase in LISTNUM (0.020, from table 3) causes OPEN to increase by 0.084, or 13 percent relative to the mean. The economic significance of ADR issuance on market openness can be best viewed relative to other measures that might affect market openness. For example, from the fourth column, a one percent increase in GDP per capita (or \$50.34, from a mean of \$5,034) results in an increase in OPEN of only 0.0002. A one standard deviation increase (\$5,409) leads to an increase in OPEN of 0.023. Thus, relative to a base measure of market development, ADR listings have a significant economic impact on market openness.

Similarly, the share of market value that is traded as ADRs (ADRSHARE) is a significant factor in market openness (see the third and sixth columns). A one percentage point increase in ADRSHARE results in an increase of OPEN of 0.049, which is still economically meaningful.

The one-year-lagged effect of ADR listings on openness is also significant, with the same numerical and economic magnitude. The measure of ADR concentration, ADRCONCENT, is not statistically significant in any

of the specifications in which it enters. This might reflect the possibility that improvement in accounting disclosure standards precedes (and is not a function of) ADR listings. The size of the listing company would then have no effect on regulators' decisions to improve disclosure standards.

As previously mentioned, the information content present in the OPEN accounting measure is limited because a number of the data points are interpolated, such that the standard errors (and the statistical significance of the results) are overstated. To overcome this deficiency, I carry out a similar analysis with OPENI, the investability ratio adjusted for ADR issues. The results of this analysis are shown in panel B of table 7.

For the fraction of firms listed that have ADRs, or LISTNUM, the effect is consistent across all contemporaneous and lagged specifications. Higher fractions are correlated with lower openness, in the sense of the degree of investability of the remaining firms. For example, a one percentage point increase in LISTNUM results in a decrease in OPENI of 0.012 (fourth column). Relative to a mean value of OPENI of 0.414 (from table 2), a one percent increase in the fraction of firms listed with ADRs leads to a 2.8 percent decrease (equal to $-0.012/0.414$) in the mean measure of openness. A one standard deviation increase in LISTNUM (0.020, from table 3) results in an decrease of OPENI of 0.024, or a 5.6 percent decrease relative to its mean. Thus, relative to a base measure of market development, ADR listings have a significant economic impact on market openness.

Similarly, the share of market value that is traded as ADRs (ADRSHARE) is a significant factor in market openness (third and sixth columns). A one percentage point increase in ADRSHARE results in a decrease of OPEN of 0.008, which is still economically meaningful. The one-year-lagged effect of ADR listings on openness is also significant and of the same numerical and economic magnitude. The measure of ADR concentration, ADRCONCENT is not statistically significant in any of the specifications in which it enters.

This simple analysis of OPENI indicates that increasing numbers of ADRs, or a larger proportion of market capitalization in the form of ADRs, is generally correlated with the reduced investability of the remaining issues. Such reduced investability could stem from investment restrictions in the form of cross-shareholdings, government ownership, or reduced liquidity of the non-ADR-linked component of market capitalization. The following section addresses this question.

TABLE 7. Panel Regression Results: Measures of Market Openness, 1988–97^a

Explanatory variable	Contemporaneous		One-year lag				
Intercept	0.349* (22.303)	0.387* (20.203)	0.363* (14.393)	0.837* (20.333)	0.394* (16.292)	0.474* (14.398)	0.547* (10.222)
LISTNUM	4.393* (5.049)	3.298* (6.606)	4.239* (8.393)	4.001* (5.975)	3.092* (4.978)		4.387* (9.092)
ADRSHARE		0.493* (2.339)				0.278* (3.222)	
CONCENT		0.983 (1.433)			1.283 (1.298)		
GDPPOP	6.090E-06* (2.209)	8.398E-06* (3.222)	4.330E-06* (4.333)	4.000E-06 (1.276)	3.200E-06 (1.275)	2.102E-06 (1.145)	3.228E-06 (1.109)
Country dummies	No	Yes	Yes	No	Yes	Yes	Yes
Year dummies	No	Yes	Yes	No	Yes	Yes	Yes
Adjusted R ²	0.18	0.72	0.78	0.18	0.70	0.72	0.78
No. observations	230	230	230	207	207	207	207

	Panel B: OPENI							
Intercept	0.092* (9.209)	0.073* (5.498)	0.193* (5.050)	0.133* (4.500)	0.221* (3.444)	0.111* (4.330)	0.198* (4.088)	0.203* (5.448)
LISTNUM	-0.992* (-2.399)	-1.092* (-2.638)	-0.076* (-3.107)	-1.209* (-3.492)	-1.099* (-2.993)	-0.988* (-3.229)	-0.088* (-2.388)	-0.652* (-2.664)
ADRSHARE								
CONCENT		-0.099 (-0.882)				-0.983 (-0.446)		
GDPPOP	2.300E-08 (0.762)	4.393E-08 (0.938)	2.001E-08 (0.542)	4.333E-08 (0.877)	3.490E-08 (0.442)	2.009E-08 (0.399)	1.074E-09 (0.339)	1.330E-08 (0.888)
Country dummies	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Year dummies	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Adjusted R ²	0.08	0.44	0.44	0.43	0.05	0.44	0.44	0.45
No. observations	230	230	230	230	207	207	207	207

Source: Author's calculations.

* Significantly different from zero at the 10 percent level or better.

a. LEGORIG, the English legal origin dummy, is used as an instrument for an exogenous financial development measure in a two-stage least squares regression (first stage R² between 0.08 and 0.16; F statistics significant at 10 percent). In panel A, the dependent variable is OPENI, calculated as a measure (from 0-1) of the accounting standards of a given country. In panel B, the dependent variable is OPENI, calculated as the year-end values of the IFCGI index (minus ADR issues) divided by the IFCG index. Independent variables are LISTNUM, the number of listed ADRs at year-end divided by the total number of listed companies at the beginning of the year; ADRSHARE, the fraction of market value represented by ADRs; ADRCONCENT, the Herfindahl market-value concentration of ADR-listed shares; and GDPPOP, the GDP per capita in U.S. dollars. t statistics for heteroskedastic robust standard errors are in parentheses.

The Impact of U.S. ADR Trading Activity on the Local Market

As previously mentioned, some ADR programs experience an initial surge of activity around the listing date and then gradually lose U.S. trading volume, with trading migrating back to the home market. In other instances, the ADR trading migrates to the U.S., reducing the liquidity and trading activity of the share in the local market. To determine the impact of this trading location preference on the remaining local market, I create a quartile dummy, TRADINGQ, that ranks each ADR program according to the fraction of total share trading (local and U.S., in number of shares) that takes place in the United States. For each ADR issue, I determine the time series average (for the length of the ADR program) of the yearly fraction of total trading volume that takes place in the United States. I then rank this time series average for all 231 ADR programs in the sample, break up the ranked list into quartiles, and assign a quartile dummy, TRADINGQ. I then interact this dummy with LISTNUM and generate four independent variables—LISTNUM0, LISTNUM1, LISTNUM2, and LISTNUM3—that indicate in which trading quartile TRADINGQ the particular ADR program falls. I then sum the total number of ADR programs in a given quartile and divide by the total number of listings to obtain a dispersion of LISTNUM as a function of U.S. traded volume. The resulting lowest quartile (LISTNUM0) ranges from 1 to 13 percent of total shares traded in the U.S. The second quartile (LISTNUM1) ranges from 13 percent to the median, 19 percent. The third quartile (LISTNUM2) ranges from 19 to 38 percent of trading activity, and the top quartile (LISTNUM3) starts at 38 percent and peaks at 52 percent.

Table 8, panel A, shows results from this quartile analysis for the specification of column 2 (contemporaneous regressions) in tables 4, 5, and 6, while panel B shows the results for column 6 (the same specification as column 2, but with one year lags). The ADRs that have higher U.S.-related trading activity tend to have a more negative impact on the local market than those with lower U.S. activity. This is evidence that the added traded volume and visibility of well-known foreign issues in the United States crowds out interest and activity in the local market. The greater the U.S. activity, the greater is the negative local market impact.

Time-Series Dependence: Fama-MacBeth Regressions

As mentioned above, clustering in time implies that country-year observations are not independent. The pooled regression standard errors are

TABLE 8 . Panel Regression Results: Effect of U.S. ADR Trading Activity on Local Market, 1988–97^a

<i>Explanatory variable</i>	<i>TURNOVER</i>	<i>VALTURN</i>	<i>NEWCOS</i>	<i>CAPGDP</i>	<i>OPEN</i>	<i>OPENI</i>
Panel A: Contemporaneous regressions						
LISTNUM0	-122.283 (-0.922)	-0.766 (-0.074)	-0.998 (-1.628)	-0.092 (-0.727)	0.828 (1.288)	-0.288 (-0.882)
LISTNUM1	73.292 (0.122)	-1.228* (-2.288)	1.299 (0.873)	0.877 (1.253)	0.044 (0.882)	1.298 (1.788)
LISTNUM2	49.239 (1.798)	-2.201* (-3.457)	-0.028 (-0.443)	-1.444 (-1.776)	3.877* (2.939)	-1.098 (1.922)
LISTNUM3	-398.992* (-2.388)	-2.988* (-4.061)	-1.554* (-4.210)	-1.211* (-3.988)	4.999* (5.988)	-2.099* (-4.388)
ADRCONCENT	-299.288 (-1.766)	-0.800 (-1.766)	0.331 (0.654)	-4.399* (-2.087)	0.337 (0.984)	-0.747 (-0.383)
GDPPOP	2.388E-03 (0.377)	4.993E-06 (0.122)	-2.440E-07 (-0.766)	1.299E-04* (2.387)	7.398E-06* (2.399)	4.599E-08 (1.088)
Adjusted <i>R</i> ²	0.77	0.59	0.18	0.55	0.77	0.54
No. observations	260	280	280	280	230	230
Panel B: Lagged regressions						
LISTNUM0	-21.938 (0.478)	0.874 (0.072)	-0.293* (-2.003)	0.029 (0.001)	0.000 (0.091)	2.398 (0.774)
LISTNUM1	67.876 (1.887)	0.287 (0.917)	-0.044* (-2.812)	0.182 (0.273)	0.002 (0.421)	-0.985 (-1.776)
LISTNUM2	-83.120 (-1.433)	-1.209 (-1.213)	-1.001* (-2.398)	-0.882 (-1.542)	1.992* (2.547)	-0.433 (-1.877)
LISTNUM3	-177.293 (-1.599)	-1.837* (-2.555)	-1.488* (-4.099)	-1.287* (-2.380)	4.399* (4.092)	-1.883* (-3.019)
ADRCONCENT	-64.004 (0.222)	-0.032 (-0.221)	-0.001 (-0.011)	-1.229* (-2.838)	0.773 (0.837)	-0.443 (-1.287)
GDPPOP	2.344E-06 (0.099)	5.440E-05 (0.344)	-4.398E-08 (-0.174)	1.990E-08* (4.988)	4.600E-07 (0.827)	4.499E-09 (1.110)
Adjusted <i>R</i> ²	0.67	0.68	0.18	0.67	0.57	0.55
No. observations	234	252	252	252	207	207

Source: Author's calculations.

* Significantly different from zero at the 10 percent level or better.

a. LEGORIG, the English legal origin dummy, is used as an instrument for an exogenous financial development measure in a two-stage least squares regression. Panel A shows the results for the contemporaneous specification of column 2 of tables 5, 6, and 7, while panel B shows the results for the one-year-lagged specification of column 6 of Tables 5, 6, and 7. Independent variables are LISTNUM0, LISTNUM1, LISTNUM2, LISTNUM3, the fraction of ADR listed firms whose corresponding share of U.S.-traded volume is in the lowest, second, third, and top quartile, respectively; ADRCONCENT, the Herfindahl market-value concentration of ADR-listed shares; and GDPPOP, the GDP per capita in U.S. dollars. *t* statistics for heteroskedastic robust standard errors are in parentheses.

TABLE 9. Fama-MacBeth Regressions: Liquidity^a

Explanatory variable	VALTURN		TURNOVER	
	Contemporaneous	One-year lag	Contemporaneous	One-year lag
LISTNUM	-1.109*	-0.928*	-109.299	-98.280
	(-2.109)	(-2.021)	(-0.282)	(-0.752)
ADRCONCENT	0.290	0.109	-3.201	-4.302
	(0.872)	(0.002)	(-0.008)	(-0.883)
GDPOP	4.344E-06	9.333E-08	1.010E-04	1.090E-04
	(0.329)	(0.233)	(0.003)	(0.021)
No. observations	28 × 10	28 × 9	26 × 10	26 × 9

Source: Author's calculations, following Fama and MacBeth (1973).

* Significantly different from zero at the 10 percent level or better.

a. Fama-MacBeth regression coefficients and *t* statistics from the Fama-MacBeth standard errors (in parentheses) for the specifications of columns 2 (contemporaneous) and 6 (one-year lagged) of Tables 5, 6, and 7. The Fama-MacBeth coefficients are the averages of the coefficients of a year-by-year cross-sectional regression. The Fama-MacBeth standard errors are the standard errors of the time series of Fama-MacBeth coefficients.

therefore likely to be underestimated. The use of fixed effects allows the intercept of each country to vary, but it does not improve the statistical power of the regression slope coefficients. One well-known technique to overcome this time-series dependence is the Fama-MacBeth procedure.³³ In its simplest form (which I apply here, given the nature of the analysis), each year in the sample is considered separately for estimating the regression coefficients. The time series of regression coefficients is then assumed independent, and standard errors (and *t* statistics) are calculated from this time series. This procedure is inefficient, and the standard errors are likely to be overestimated. Thus the true standard errors lie between the original pooled regression standard errors and the Fama-MacBeth standard errors, with the Fama-MacBeth standard errors providing a lower bound for statistical significance. Tables 9, 10, and 11 show the results of the Fama-MacBeth analysis for some of the regression specifications in tables 5, 6, and 7.

Applying the more stringent Fama-MacBeth test of the constancy of the regression coefficients over time leads to reduced statistical significance. Even in this extreme case, however, LISTNUM is statistically significant for the openness measure (OPENI), the liquidity measure (VALTURN), and both measures of growth (NEWCOS and CAPGDP). The economic significance is somewhat reduced, to levels about half those from the

33. Fama and MacBeth (1973).

TABLE 10. Fama-MacBeth Regressions: Growth^a

Explanatory variable	NEWCOS		CAPGDP	
	Contemporaneous	One-year lag	Contemporaneous	One-year lag
LISTNUM	-0.992* (-2.103)	-1.099* (-2.003)	-0.877* (-2.287)	-0.741* (-2.210)
ADRCONCENT	-0.221 (-0.766)	0.029 (0.433)	-1.233* (-2.766)	-1.298* (-2.652)
GDPOP	2.230E-08 (0.381)	2.090E-08 (0.098)	1.770E-05 (1.922)	1.330E-05 (1.852)
No. observations	28 × 10	28 × 9	28 × 10	28 × 9

Source: Author's calculations, following Fama and MacBeth (1973).

* Significantly different from zero at the 10 percent level or better.

a. Fama-MacBeth regression coefficients and *t* statistics from the Fama-MacBeth standard errors (in parentheses) for the specifications of columns 2 (contemporaneous) and 6 (one-year lagged) of Tables 5, 6, and 7. The Fama-MacBeth coefficients are the averages of the coefficients of a year-by-year cross-sectional regression. The Fama-MacBeth standard errors are the standard errors of the time series of Fama-MacBeth coefficients.

pooled regressions. This demonstrates that ADR listing and issuance can have important economic consequences even in a year-by-year cross-sectional analysis.

Cross-Sectional and Regional Dependence: Seemingly Unrelated Regressions

Regional clustering of ADR listings is also present in the data. As in the case of the time series dependence, the assumption of independence—in

TABLE 11. Fama-MacBeth Regressions: Openness^a

Explanatory variable	OPEN		OPENI	
	Contemporaneous	One-year lag	Contemporaneous	One-year lag
LISTNUM	-0.393 (-0.128)	0.928 (-0.783)	-1.009* (-2.378)	-0.988* (-2.003)
ADRCONCENT	0.726 (0.082)	0.128 (0.211)	0.302 (0.093)	0.092 (0.884)
GDPOP	3.944E-08 (1.988)	4.293E-08 (0.287)	7.600E-09 (0.882)	3.090E-09 (0.932)
No. observations	23 × 10	23 × 9	23 × 10	23 × 9

Source: Author's calculations, following Fama and MacBeth (1973).

* Significantly different from zero at the 10 percent level or better.

a. Fama-MacBeth regression coefficients and *t* statistics from the Fama-MacBeth standard errors (in parentheses) for the specifications of columns 2 (contemporaneous) and 6 (one-year lagged) of Tables 5, 6, and 7. The Fama-MacBeth coefficients are the averages of the coefficients of a year-by-year cross-sectional regression. The Fama-MacBeth standard errors are the standard errors of the time series of Fama-MacBeth coefficients.

this case cross-sectional independence—is violated. A simplistic approach to this problem is to run separate regressions for the different regions; another is to use regional dummies. The first approach, however, involves a loss of statistical power, while the second does not correct for the fact that not only the intercepts but also the slope coefficients can change by region. In contrast, seemingly unrelated regressions (SUR) take into account all available information, while allowing the regression coefficients to vary by region.³⁴ In its simplest form, the regression equations for each of the regions are stacked in a block-diagonal form, and the ordinary least squares (OLS) coefficients are then calculated. In the case of identical regressors (as in this analysis), OLS on the SUR equation system is equivalent to generalized least squares (GLS), and it yields consistent, efficient estimates for the regression slope coefficients.

To carry out the analysis, I break the twenty-eight country sample into four regions: Africa (four countries), Asia (eleven countries), Europe (six countries), and Latin America (seven countries). Table 3 shows the allocation of the twenty-eight countries to the four regions. I carry out OLS estimation on the stacked block-diagonal sample and extract the relevant regression coefficients from the SUR equation system as detailed by Greene.³⁵ Because the degrees of freedom for the stacked subsamples are low, I do not carry out the two-stage estimation procedure of the previous sections, but rather use the *LEGORIG* variable as a dummy in the regressions. Table 12 shows the regional averages for the independent and dependent variables. Table 13 displays the results for the specification of column 2 of tables 5, 6, and 7 for the entire pooled sample as well as by region.³⁶

The impact of ADRs on emerging markets varies substantially by region. Africa and Latin America are generally the most negatively affected by ADR activity, with Latin America having a more pronounced and negative economic significance to the coefficients. A hypothesis centering on the origin of the legal system for each region would fail to explain Africa and Latin America's results, since all African countries in

34. The use of seemingly unrelated regressions was first proposed by Zellner (1962) and then popularized in the finance and accounting literature by Schipper and Thompson (1983).

35. Greene (2000).

36. The openness measures *OPEN* and *OPENI* for Africa had insufficient data to generate coefficients, and *LEGORIG* displayed no variance for either Africa or Latin America. Thus the results are not shown.

TABLE 12. Seemingly Unrelated Regressions: Regional Averages for Dependent and Independent Variables^a

Variable	Region				Total sample ^b
	Africa	Asia	Europe	Latin America	
Dependent					
TURNOVER	4.26	108.89	33.77	26.00	53.140
VALTURN	0.067	0.907	0.323	0.265	0.501
NEWCOS	0.005	0.118	0.157	0.017	0.085
CAPGDP	0.540	0.782	0.194	0.284	0.497
OPEN	0.982	0.389	0.804	0.756	0.635
OPENI	0.781	0.300	0.587	0.360	0.414
Independent					
LISTNUM	0.014	0.011	0.004	0.032	0.015
ADRSHARE	0.223	0.110	0.033	0.155	0.121
CONCENT	0.172	0.012	0.003	0.021	0.035
GDPPOP	1,580	6,119	6,376	4,154	5,034

Source: Author's calculations.

* Significantly different from zero at the 10 percent level or better.

a. The countries in each of the regional portfolios are identified in table 3.

b. The sample-wide averages are taken from tables 2 and 3.

the sample are of English legal origin, while all the Latin American countries are of French legal origin. An explanation focused on the ability of local companies to substitute a local listing for an ADR (for example, owing to geographical proximity or the ability to trade contemporaneously and arbitrage price discrepancies) would also be unsatisfactory. African countries have only a brief window of contemporaneous trading with the United States, as does Europe. In contrast, an analysis (not shown) based on a measure of effective legal rights as an instrument (for example, the so-called rule of law variable described by La Porta and others), as opposed to legal origin, has high explanatory power for the case of Africa.³⁷ This corroborates the intuition that strong but unenforced laws are as detrimental as the strict enforcement of fundamentally weak laws.

The effect of ADR issuance on Asian markets is, for the most part, neutral. ADR issuance does not appear to affect openness, liquidity, or growth in any statistically significant manner, except for a weak positive effect on OPEN, which is not robust to more stringent specifications.

ADR issuance in European emerging markets is correlated with a negative and significant effect on the openness measures, but it is positively

37. For details on the rule of law variable, see La Porta and others (1997).

TABLE 13. Seemingly Unrelated Regressions: Breakdown of Coefficients by Region^a

<i>Region and explanatory variable</i>	<i>TURNOVER</i>	<i>VALTURN</i>	<i>NEWCOS</i>	<i>CAPGDP</i>	<i>OPEN</i>	<i>OPENI</i>
Total sample						
LISTNUM	-287.928 (-1.092)	-1.376* (-2.635)	-1.275* (-3.862)	-1.338* (-2.888)	2.398* (4.392)	-1.380* (-3.742)
ADRCONCENT	-99.210 (-1.283)	-0.982 (-1.528)	0.440 (0.900)	-3.312* (-3.409)	0.638 (1.029)	-0.320 (-0.911)
GDPPOP	1.837E-03 (0.109)	3.299E-07 (0.778)	-2.372E-06 (-0.526)	1.298E-05* (4.398)	6.539E-06* (3.653)	5.609E-08 (1.298)
LEGORIG	-45.839* (-3.493)	-0.398* (-2.398)	-0.070 (-1.100)	0.440* (3.298)	0.093 (1.389)	0.013 (0.658)
Africa ^b						
LISTNUM	109.678 (0.877)	-2.123* (-3.766)	-1.655* (-2.544)	-0.877 (-0.846)		
ADRCONCENT	-4.677 (-0.989)	-1.008* (-2.887)	-0.667 (-1.322)	-1.433 (-1.344)		
GDPPOP	1.330E-05* (3.566)	3.550E-05* (2.445)	-3.544E-07 (-1.334)	1.008E-05* (3.433)		
Asia						
LISTNUM	-122.678 (-0.099)	-0.999 (-1.843)	-0.766 (-1.934)	-1.864 (-1.649)	1.332* (2.229)	0.322 (0.776)
ADRCONCENT	-104.630 (-1.766)	-1.000 (-1.865)	-0.655 (-0.649)	-1.648 (-1.766)	-0.766 (-0.089)	-0.211 (-0.564)
GDPPOP	5.655E-04* (3.767)	3.766E-06 (1.437)	-3.677E-07 (-1.056)	3.440E-05* (5.787)	-6.000E-08 (-0.877)	-5.433E-09 (-0.745)
LEGORIG	-21.649 (-1.766)	0.566* (4.686)	-0.088 (-1.097)	0.655* (3.097)	0.877* (3.656)	0.766* (2.544)
Europe						
LISTNUM	-108.775 (-0.943)	-2.767 (-0.749)	1.566* (3.422)	-1.233* (-3.655)	-0.877* (-3.454)	-2.433* (-4.665)
ADRCONCENT	-88.211 (-0.539)	-0.076 (-0.133)	-0.566 (-3.677)	2.659 (1.634)	-0.655 (-0.098)	-0.008 (-0.766)
GDPPOP	-5.433E-04* (-2.544)	-1.246E-05 (-0.898)	-3.567E-05* (-2.979)	1.880E-08 (1.566)	5.677E-04* (5.678)	4.080E-05 (0.883)
LEGORIG	12.878 (0.032)	0.122 (0.658)	-0.088 (-1.544)	0.776* (4.767)	-0.322 (0.755)	-0.666* (-2.433)
Latin America ^c						
LISTNUM	-122.766* (-2.877)	-0.988* (-2.012)	-2.433* (-4.879)	-2.788* (-3.677)	1.322* (2.209)	-2.433* (-4.566)
ADRCONCENT	-63.877 (-1.433)	-0.634 (-1.329)	-0.776* (-3.566)	-2.665* (-4.877)	0.776* (2.344)	0.211 (0.866)
GDPPOP	-1.988E-08 (-0.788)	-4.566E-08 (-0.693)	-6.988E-08* (-3.767)	1.550E-07 (1.430)	3.440E-07* (2.766)	-5.440E-07* (-2.332)

Source: Author's calculations, following Zellner (1962).

* Significantly different from zero at the 10 percent level or better.

a. The countries in each of the regional portfolios are identified in table 3. SURs based on specification of column 2 of tables 5, 6, and 7; *t* statistics for heteroskedastic robust standard errors in parentheses.

b. For Africa, openness measures OPEN and OPENI had insufficient data to generate coefficients; LEGORIG had no variance.

c. For Latin America, LEGORIG had no variance.

correlated with NEWCOS, the rate of new company listing. These results are difficult to explain, and they might stem from the existing heterogeneity within the European country sample itself.

Causality

The above analysis demonstrates that, in general, ADR activity is negatively related to the degree of openness, liquidity, and growth of an emerging stock market. The results of the contemporaneous and lagged specifications indicate that the negative effect in the lagged specifications is sometimes economically more significant, which might imply that ADR issuance caused market contraction. The evidence is not very convincing, however. An equally likely scenario is that firms went abroad and issued ADRs in order to bypass a shrinking local equity market.

Categorically attributing the direction of causality is impossible with the existing data set. Nevertheless, a Granger causality test can statistically detect the direction of causality.³⁸ Causality in the sense defined by Granger is inferred when the lagged values of a variable—say, the rate of change (or first difference) of LISTNUM—have explanatory power in a regression of a dependent variable—say, the rate of change of TURNOVER—on the lagged values of the rates of change of TURNOVER and LISTNUM.³⁹

The Granger causality test assumes that the information relevant to the prediction of the respective variables (in this example, Δ TURNOVER and Δ LISTNUM, where $\Delta(\cdot)$ is the first difference operator) is fully described by the time series data of these variables. This assumption is critical. It implies that there are no other intervening variables that would explain movements in both Δ TURNOVER and Δ LISTNUM. The above analysis suggests, however, that other variables can indeed explain these movements. In particular, the legal origin dummy (LEGORIG) and changes in GDPOP have a statistically significant impact on both Δ TURNOVER and Δ LISTNUM. To adjust for this effect, I first regress the dependent and independent variables on changes in GDPOP and the LEGORIG dummy and then use the residuals of these regressions as inputs to the Granger causality test described below. Thus only the supposedly unexplained vari-

38. Granger (1969); Greene (2000).

39. The transformation to rates of change or first differences is necessary because the Granger test assumes nonautocorrelated disturbances. A simple Durbin-Watson test indicates that the disturbances in the levels of the independent variables are indeed autocorrelated. The economic significance of this transformation or of the resulting regression coefficients is not discussed; only the results of the Granger causality test are presented.

ation in the independent and dependent variables is used to test for Granger causality.

A form of the Granger causality test involves estimating the following regressions:⁴⁰

$$(2) \quad \Delta \text{TURNOVER}_t = \sum_{i=1}^n \alpha_i \Delta \text{LISTNUM}_{t-i} + \sum_{j=1}^n \beta_j \Delta \text{TURNOVER}_{t-j} + u_{1t} \text{ and}$$

$$(3) \quad \Delta \text{LISTNUM}_t = \sum_{i=1}^m \lambda_i \Delta \text{LISTNUM}_{t-i} + \sum_{j=1}^m \delta_j \Delta \text{TURNOVER}_{t-j} + u_{2t},$$

where the disturbances, u , are assumed to be uncorrelated and where $\Delta \text{TURNOVER}$ and $\Delta \text{LISTNUM}$ are not the variables themselves, but the residual terms from a regression of the variables on changes in GDPOP and LEGORIG . Equation 2 postulates that current (unexplained) $\Delta \text{TURNOVER}$ is related to past values of $\Delta \text{TURNOVER}$ itself as well as of $\Delta \text{LISTNUM}$, and equation 3 postulates a similar behavior for $\Delta \text{LISTNUM}$.

Four possible outcomes can be distinguished. First, unidirectional Granger causality from $\Delta \text{LISTNUM}$ to $\Delta \text{TURNOVER}$ is suggested if the estimated coefficients on the lagged $\Delta \text{LISTNUM}$ in equation 3 are jointly statistically different from zero (that is, $\sum \alpha_i \neq 0$) and the set of estimated coefficients on the lagged $\Delta \text{TURNOVER}$ in equation 3 is not statistically different from zero (that is, $\sum \delta_i = 0$). Second, unidirectional Granger causality from $\Delta \text{TURNOVER}$ to $\Delta \text{LISTNUM}$ is present if the set of lagged $\Delta \text{LISTNUM}$ coefficients in equation 2 is not statistically different from zero (that is, $\sum \alpha_i = 0$) and the set of the lagged $\Delta \text{TURNOVER}$ coefficients in equation 3 is statistically different from zero (that is, $\sum \delta_i \neq 0$). Third, bilateral Granger causality is indicated when the sets of $\Delta \text{LISTNUM}$ and $\Delta \text{TURNOVER}$ coefficients are statistically significantly different from zero in both regressions. Finally, independence is implied when the sets of $\Delta \text{LISTNUM}$ and $\Delta \text{TURNOVER}$ coefficients are not statistically significant in either regression.

40. An alternative formulation is to use a vector autoregression (VAR) approach, with likelihood ratio test on the coefficients of interest.

Granger causality testing is very sensitive to the number of lags used in the analysis. Davidson and McKinnon suggest using as many lags as possible.⁴¹ From a practical viewpoint, the conclusions will be stronger if the Granger causality test results are not very sensitive to the lag length.

The first step in implementing a Granger causality test is to regress, say, current Δ TURNOVER on all lagged values of Δ TURNOVER and other variables, excluding the lagged Δ LISTNUM variables. This restricted regression generates the restricted residual sum of squares, RSSR. The regression is then run again, this time including the lagged Δ LISTNUM terms. This unrestricted regression yields the unrestricted residual sum of squares, RSSUR.

The null hypothesis is $H_0 : \sum \alpha_i = 0$, that is, lagged Δ LISTNUM terms are misspecified in the regression (and Δ LISTNUM does not Granger cause Δ TURNOVER). I test this hypothesis by applying an F test, given by

$$(4) \quad F = \frac{(\text{RSSR} - \text{RSSUR}) / m}{\text{RSSUR} / (n - k)},$$

which is F -distributed with m and $(n - k)$ degrees of freedom. In the present case, m is equal to the number of lagged Δ LISTNUM terms and k is the number of parameters estimated in the unrestricted regression. The computed F value and the corresponding p value can be used to reject (or not reject) the null, that is, whether (unexplained) Δ LISTNUM Granger causes (unexplained) Δ TURNOVER. The regression is repeated for equation 3, that is, whether Δ TURNOVER Granger causes Δ LISTNUM.

Table 14 shows the results of Granger causality tests for the transformed dependent variables Δ OPENI, Δ TURNOVER, and Δ NEWCOS against the transformed independent variable Δ LISTNUM. Each pair tests unidirectional Granger causality from the transformed independent variable Δ LISTNUM to the transformed dependent variable (for example, Δ OPENI) and vice versa, with the given number of (yearly) lags. The resulting F values and p values for the given F values are shown to indicate the statistical significance of the Granger causality test.

For the openness measure Δ OPENI, for example, Δ LISTNUM Granger causes Δ OPENI marginally for an increasing number of lags (the p value increases from 0.073 to 0.045), while the opposite scenario (that is,

41. Davidson and McKinnon (1993).

TABLE 14. Granger Causality Tests^a

Direction of causality	F value	# of lags (m)	DF (n - k)	p value of F
Liquidity				
Δ LISTNUM \rightarrow Δ TURNOVER	3.512	1	202	0.062
Δ TURNOVER \rightarrow Δ LISTNUM	2.653	1	202	0.105
Δ LISTNUM \rightarrow Δ TURNOVER	3.192	2	174	0.044
Δ TURNOVER \rightarrow Δ LISTNUM	2.372	2	174	0.096
Δ LISTNUM \rightarrow Δ TURNOVER	3.091	3	146	0.029
Δ TURNOVER \rightarrow Δ LISTNUM	2.152	3	146	0.096
Growth				
Δ LISTNUM \rightarrow Δ NEWCOS	3.652	1	222	0.057
Δ NEWCOS \rightarrow Δ LISTNUM	2.876	1	222	0.091
Δ LISTNUM \rightarrow Δ NEWCOS	3.543	2	194	0.031
Δ NEWCOS \rightarrow Δ LISTNUM	2.609	2	194	0.076
Δ LISTNUM \rightarrow Δ NEWCOS	3.321	3	166	0.021
Δ NEWCOS \rightarrow Δ LISTNUM	2.513	3	166	0.060
Openness				
Δ LISTNUM \rightarrow Δ OPENI	3.265	1	172	0.073
Δ OPENI \rightarrow Δ LISTNUM	2.809	1	172	0.096
Δ LISTNUM \rightarrow Δ OPENI	3.091	2	144	0.048
Δ OPENI \rightarrow Δ LISTNUM	2.218	2	144	0.113
Δ LISTNUM \rightarrow Δ OPENI	2.763	3	116	0.045
Δ OPENI \rightarrow Δ LISTNUM	2.315	3	116	0.079

Source: Author's calculations, following Granger (1969).

a. The tests are performed between the first difference of the residuals of the measures of liquidity (TURNOVER), growth (NEWCOS), openness (OPENI), and number of listed ADRs (LISTNUM) regressed on the common factors CAPGDP and LEGORIG. The resulting transformed variables are labeled Δ TURNOVER, Δ NEWCOS, Δ OPENI, and Δ LISTNUM. The *p* value of *F* is the corresponding *p* value for the *F* value test result for the given number of lags (*m*) and the degrees of freedom, *DF* (*n* - *k*) where *n* is the number of observations and *k* is the number of regressors in the unrestricted equation for the *F* test.

Δ OPENI Granger causes Δ LISTNUM) is not statistically significant. In other words, "causation" is such that changes in the number of listed ADRs (represented by the transformed variable Δ LISTNUM) "precede" changes in the investability and openness of the local market (as proxied by Δ OPENI), but not vice versa. Increasing numbers of ADRs thus result in marginally reduced investability of non-ADR issues.

A similar analysis can be carried out for the liquidity measure, Δ TURNOVER, and the growth measure, Δ NEWCOS. For these two variables, the direction of Granger causation is much clearer, since the statistical significance increases with an increasing number of lags. Changes in the number of listed ADRs thus precede changes in liquidity and growth.

Since the previous section established that the correlation between these variables is negative, it follows that increasing numbers of listed ADRs “precede” reductions in the liquidity of the remaining firms and in the growth rate of new listed firms, and not vice versa.

Conclusion

In this exploratory paper, I use a sample of twenty-eight emerging stock markets as the basis for empirically analyzing the effect of ADRs on emerging market development and determining whether the ADR market has helped or hindered the development of local markets. I study the role of ADRs with regard to three aspects of market development: liquidity, growth, and openness.

The paper is motivated by Merton’s innovation spiral and by the literature on financial development and economic growth.⁴² The innovation spiral, as applied to the ADR markets competing with the local markets, suggests the hypothesis that the local market will develop and grow in order to compete effectively with the ADR market. The preliminary evidence from this study, however, does not support that hypothesis. On the contrary, ADRs appear to negatively affect liquidity, investability, and the ability of the local market to become more relevant through growth in listed firms and capitalization ratios, although ADRs may still be instrumental in increasing openness in accounting standards and openness.

I also document a differential effect of ADR issuance depending on the region, with the effect being most deleterious and economically significant for African and Latin American markets. Furthermore, ADRs with higher trading volume in the United States tend to have a bigger impact on the development of the local market. Finally, Granger causality tests indicate that increases in the number of listed ADRs precede this market contraction, and not vice versa. This points to the evidence that liquidity and reduced market growth are a result of increased ADR issuance, as opposed to increased ADR issuance being a result of illiquid or stagnant markets.

As evidenced by multiple studies, financial development leads to economic growth.⁴³ If the stock market is well developed, it will contribute

42. Merton (1993).

43. For example, Rajan and Zingales (1998); Beck, Levine, and Loayza (2000).

to economic growth through the efficient allocation of savings into real investment, resulting in the accumulation of capital. A reduction in stock market activity could thus have a negative impact on a country's level of economic development. This effect is likely to be particularly serious if the stock market's ability to serve as a source of capital for new and emerging companies is reduced. The policy implications of this contraction in stock market activity are manifold. Although further analysis is necessary to determine the optimal regulatory and market participant response, controls or restrictions on firms listing abroad are not likely to be as productive as rethinking a country's securities laws (for example, to improve minority shareholder protection), improving regulatory and disclosure standards, and more strictly enforcing existing legal codes.

Appendix: An Overview of Security Listing in the United States

The institutional structure of the U.S. stock market is multitiered. At the top of the hierarchy are the two established national stock exchanges—the NYSE and the AMEX—together with the Nasdaq.⁴⁴ The next tier comprises a multitude of smaller regional exchanges. With a few exceptions, the Securities and Exchange Commission (SEC) requires registration for U.S. and foreign companies traded on a U.S. exchange or on Nasdaq.⁴⁵ In addition, each of the three national markets has its own set of listing requirements, pertaining to firm size, profitability, number of shareholders, and so forth. These requirements differ for U.S. and foreign firms.

There are also three major over-the-counter markets: the Over-the-Counter Bulletin Board (OTCBB), the Pink Sheets, and PORTAL. The OTCBB was established by NASD in 1988 as a regulated interdealer quotation system that displays real-time quotes, last-sale prices, and volume information for over-the-counter (OTC) securities.⁴⁶ An OTC equity security generally is any equity that is not listed or traded on the NYSE, AMEX, or Nasdaq. OTCBB securities include national, regional, and for-

44. See the web sites www.nyse.com, www.nasd.com, and www.amex.com for detailed information on these three markets and their listing requirements. See also Cochrane, Shapiro, and Tobin (1996) for institutional details.

45. The exceptions relate mostly to a few firms listed on Nasdaq that were grandfathered in when the SEC broadened its registration requirements in 1983.

46. See the organization's website (www.otcbb.com) for more information.

eign equity issues, warrants, units, American depositary receipts (ADRs), and direct participation programs (DPPs). About 6,200 securities are currently traded in the OTCBB, of which 412 are foreign issues and ADRs. Issuers of OTCBB securities often have no reporting obligations to any federal regulatory authority, but they must file NASD Form 211. As of April 1998, however, all foreign issues and ADRs must be registered with the SEC pursuant to Section 12 of the SEC act of 1934.

The Pink Sheets, which compete directly with the OTCBB, are published twice daily by the National Quotation Bureau (NQB, a private company). They are principally a listing of stocks, with the names and telephone numbers of market makers. In general, quotes are not shown in Pink Sheet issues unless they are also quoted on the OTCBB. In 1994, a total of 662 ADRs and over 7,700 foreign securities (out of about 15,000) traded on the Pink Sheets and the OTCBB.

PORTAL (Private Offerings, Resales, and Trading through Automatic Linkages) was started by NASD in 1990. It is an electronic real-time market system for the quotation of SEC Rule 144A and Regulation S securities, including both domestic and foreign issues. Rule 144A and Regulation S securities are non-SEC registered private placements to qualified institutional buyers (QIBs).⁴⁷ The QIBs include institutions that manage at least \$100 million in securities and registered broker-dealers that own and invest on a discretionary basis at least \$10 million in securities of non-affiliates. The QIBs can resell these securities to one another.

Foreign Security Listing in the United States

Foreign firms can list in the United States either through a direct, ordinary listing or through ADRs. In a direct listing, the foreign firm lists its shares directly on a U.S. exchange. This listing entails an exact replication of the settlement facilities required for U.S. securities, but it has slightly different generally accepted accounting principles (GAAP) reporting and SEC registration requirements. Canada has the largest number of direct listings. Foreign companies that meet the following two conditions are considered to be essentially U.S. issuers and are subject to the same requirements as U.S. companies: the first condition is that 50 percent or more of the firm's shares are held by U.S. nationals; the second is that the

47. Regulation S securities have the further restriction that they cannot be held by U.S. individuals or entities.

issuer's business is headquartered in the United States, that most of the senior executives or directors are U.S. citizens, or that 50 percent or more of the assets are located in the United States. On this basis, a number of firms incorporated in the Bahamas, Bermuda, and the Cayman Islands are effectively U.S. companies for the purposes of listing in the U.S. markets. A number of foreign issuers bypass SEC registration and trade directly in the OTCBB or the Pink Sheets.

The second U.S. listing option is a depositary receipt (DR) program.⁴⁸ DRs are negotiable certificates that grant ownership of corporate shares to U.S. investors. These certificates represent depositary shares which account for a fixed number of underlying shares remaining on deposit in the issuer's home market. DRs were developed by J.P. Morgan in 1927 as a vehicle for investors to invest in and earn dividends on non-U.S. stock without direct access to the local market itself. DRs used in the United States are known as American depositary receipts, or ADRs. The certificates can also be offered in more than one market outside the issuer's home country; these are called global depositary receipts, or GDRs. Depositary banks (mainly the Bank of New York, Morgan Guaranty Trust, and Citibank) hold the securities in custody in the country of origin and convert all dividends and other payments to certificate holders into dollars in the United States. U.S. investors, therefore, bear all currency risk, and they pay fees to the depositary. New ADRs are created and cancelled by a depositary as needed. The number of ADRs is limited by the number of shares available for trading (the so-called float).⁴⁹

The following example illustrates the steps involved in the creation of an ADR. First, a U.S. investor contacts his or her broker to buy a hundred ADRs of ABC company. The broker then has two options: purchase a hundred existing ADRs in the U.S. markets or purchase a hundred shares (assuming a 1:1 conversion ratio) in the home market and have new ADRs created. The broker will likely select the lowest-cost option to fill the order. If the second option is chosen, the broker will then contact a local broker in the home market. The local broker, in turn, purchases a hundred

48. For more information, see Bank of New York (1996) and the bank's web site (www.bankofny.com/adr/) or Citibank (1995) and the Citibank web site (www.citibank.com/corpbank/adr/).

49. This float for foreign listings is sometimes constrained by foreign ownership restriction regulations. See Stulz and Wasserfallen (1995) and Domowitz, Glen, and Madhavan (1997) for empirical evidence on the impact of these restrictions on share prices in Switzerland and Mexico, respectively.

of the issuer's shares in the local market, which are then deposited with the depositary's custodian in the home market. Next, the custodian notifies the depositary that it received the underlying shares for deposit and instructs the depositary to create a hundred new ADRs and transfer them to the investor's broker. Finally, the broker delivers the shares to the investor. The process for canceling ADRs is exactly the opposite.

One might expect that ADR prices could deviate from their underlying dollar-price equivalent (if traded separately without creation or cancellation). However, efficient arbitrage by market players (such as that exercised by the broker when deciding whether to buy existing ADRs or to create new ones) usually forces a realignment of the two different dollar prices within a range that is not conducive to arbitrage.

*Benefits of ADRs*⁵⁰

ADRs are popular among issuers and investors for a number of reasons. First, since ADRs are traded in dollars and depositaries convert all dividends to dollars, many pension funds and banks that cannot hold foreign securities can invest in foreign firms through ADRs. Second, ADRs facilitate cost-effective bookkeeping for issuers because the depositary acts as stock transfer agent and registrar for both the ADRs and the underlying home shares. Third, ADRs are as easy to buy and sell as U.S. securities. They settle according to U.S. rules, and thus they fail very rarely. Without ADRs, investors would have to find a broker willing to execute trades abroad, and the average failure rate and settlement delays in non-U.S. markets are appreciably higher. Fourth, ADRs result in substantial cost-savings for investors relative to investing in foreign securities directly. Double commissions, safe-keeping fees abroad, the costs associated with physical delivery, and the costs of cashing dividend checks denominated in foreign currencies can all be avoided. Finally, for SEC-registered ADRs, investors receive timely information from the depositaries, and the ownership rights of investors are generally better protected than in the case of direct foreign securities, since records exist in the United States and are easily accessible. Also, if the ADRs are listed in a major exchange, investors have relatively quick access to reliable, recent trade and market data on the securities.

50. The next two sections follow closely the exposition in Gande (1997).

Types of ADR Programs

Table A1 summarizes the essential features of the different types of ADR programs. On the basis of these characteristics, Gande classifies ADR programs along the following three dimensions: sponsored versus unsponsored; public versus private, based on where it is traded; and capital-raising versus non-capital-raising, depending on the objective of the firm.⁵¹

Unsponsored programs are started by a depositary in response to market demand from U.S. investors for a given foreign firm's shares. In an unsponsored program, the depositary and the foreign company have no formal agreement. Unsponsored ADR programs can be created by multiple depositaries for the same firm, and investors bear a large portion of the depositary's administrative expenses. In 1983, the SEC imposed rules that made the creation of unsponsored ADRs very difficult, and most unsponsored ADRs now trade on the OTCBB or the Pink Sheets. However, a few foreign firms were grandfathered in and thus trade on exchanges. Sponsored programs are issued by an exclusive depositary selected by the foreign company through a deposit agreement. The depositary agrees to issue ADR certificates, distribute notices, proxies, annual reports, and other firm documents, in exchange for which the firm bears the depositary's administrative costs.

Public ADRs are ADRs that trade on the OTCBB, the Pink Sheets, the NYSE, AMEX, or Nasdaq. These public programs are further classified into Level I, II, or III programs depending on the objective of the foreign company. In contrast, private programs encompass ADRs that are privately placed with QIBs in the Rule 144A market. A foreign firm does not have to have an ADR in order to place securities in the Rule 144A market.

If the objective of the foreign company is to use existing shares to broaden the shareholder base (without raising new funds), it has the option of establishing either a Level I program that trades on the OTCBB or the Pink Sheets or a more stringent Level II program that permits listing on the NYSE, AMEX, or Nasdaq.⁵² If a firm plans to raise capital through new shares, it must choose between a Level III program, which is listed on the

51. Gande (1997).

52. These rules changed in April 1998. All Level I ADR programs and non-ADR foreign securities traded on the OTCBB must now comply with the Level II disclosure requirements to continue trading. An interesting question for future research is how this event affects the behavior of foreign firms trading on the OTCBB.

TABLE A 1. Depositary Program Options

<i>Program characteristic</i>	<i>Level I</i>	<i>Level II</i>	<i>Level III (public offering)</i>	<i>Rule 144A RADR (private placement)</i>	<i>Global depositary receipt (GDR)</i>
Goal of program	Broaden shareholder base	Broaden shareholder base	Raise capital	Raise capital	Raise capital
New versus existing shares	Existing shares	Existing shares	New shares	New shares	New shares
Description	Unlisted program in the United States	Listed on a recognized U.S. exchange	Offered and listed on a recognized U.S. exchange	Private placement in United States to qualified institutional buyers (QIBs)	Global offering of securities in two or more foreign markets
Trading	OTCBB; Pink Sheets	NYSE; AMEX; Nasdaq	NYSE; AMEX; Nasdaq	U.S. private placement market, quoted on PORTAL	PORTAL; U.S. exchanges; non-U.S. exchanges
SEC registration	Registration statement on Form F-6	Registration statement on Form F-6	Forms F-1 and F-6 for initial public offering	None	Varies depending on structure of U.S. offering (144A vs. level 3)
U.S. reporting requirements	Exemption from reporting under Rule 12g3-2(b)	Form 20-F filed annually	Form 20-F filed annually. Short Forms F-2 and F-3 may be used for subsequent offerings	12g3-2(b) exemption or agreement to provide information on request	Varies depending on structure of U.S. offering (144A vs. level 3)
Accounting method	Not specified	Financial statements must be partially reconciled to U.S. GAAP	Financial statements must be fully reconciled to U.S. GAAP	Reconciliation to U.S. GAAP not required	Not specified

Source: Citibank (1995).

NYSE, AMEX, or Nasdaq, or a private placement program based on Rule 144A ADRs. Each of these four programs is described below.

LEVEL I LISTINGS. A Level I listing is the easiest method for a foreign company to enjoy the benefits of a publicly traded ADR without modifying its current reporting. Registration of the underlying shares is not required, although the ADRs must be registered with the SEC using form F-6. This form requires information about the terms of the ADRs, together with a minimum of facts about the issuer and the shares on deposit with the custodian in the issuer's home country. Thus the issuer generally has no obligation or liability in connection with the registration of the ADRs. Level I firms are not required to file Form 20-F with the SEC.⁵³ Specifically, Level I issuers that have total assets of \$5 million or less or under 300 shareholders are exempt from the reporting provisions of the Securities Exchange Act of 1934. Even Level I firms that exceed these limits may elect exemption from reporting requirements under Rule 12g3-2(b) of the act. If the company is exempt from reporting, it is only required to provide (on Forms 6-K) its financial statements in English and other information that is already mandated by the authorities of the issuer's home country, such as annual reports and prospectuses. This additional information does not have to be in English, but an English summary must be provided. As of late 1997, more than 1,400 foreign issuers were using the rule 12g3-2(b) exemption.

LEVEL II LISTINGS. Firms that want to list their securities on the NYSE, AMEX, or Nasdaq must set up a Level II program. In addition to Forms F-6 and 6-K required for Level I programs, Level II issuers must file a low disclosure Form 20-F (Item 17). The issuer must also meet the listing requirements of the exchange in which its ADRs will trade.

53. SEC Form 20-F is used by foreign firms to file annual reports with the SEC (the equivalent of Form 10-K), which must be filed within six months after the close of the fiscal year (Form 10-K must be filed within ninety days). Form 20-F calls for financial statements and other specific disclosures about the firm's business. The issuer may use non-U.S. GAAP if a reconciliation to U.S. GAAP is presented for material differences in earnings, earnings per share, and balance sheet items. Form 20-F has two sets of mutually exclusive financial statement requirements, referred to as Item 17 (low disclosure) and Item 18 (high disclosure). Item 17 contains the minimum disclosure requirements and generally does not require U.S. GAAP disclosures if those disclosures are not required under the home exchange listing. Item 17 does not require footnote disclosures about income taxes, leases, pensions, nonconsolidated affiliated, related parties, or complete industry and geographic segment information. Item 18, which must be completed in a capital-raising listing, mandates these disclosures.

LEVEL III LISTINGS. Firms wishing to raise capital with ADRs use a Level III program. Level III companies must file Form F-6 for registration, Forms 6-K, and a high disclosure Form 20-F (Item 18). In addition, both the ADR and the underlying share must be registered with the SEC, using the appropriate F-series registration form (F-1, F-2, or F-3). The F-series forms require disclosure of essentially the same information that would be required for a public offering by a U.S. issuer of securities (on Form S-1, S-2, or S-3). The issuer must also meet the listing requirements of the exchange in which its ADRs will trade.

PRIVATE PLACEMENT OF RULE 144A ADRS. Under SEC Rule 144A, companies can raise capital in the United States through private placements of sponsored ADRs with QIBs. The SEC has no reporting or registration requirements on this type of placement. A Rule 144A ADR is also known as a restricted ADR, or RADR.