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Journal of Financial Economics 88 (2008) 216–244
JOURNAL OF Financial ECONOMICS
www.elsevier.com/locate/jfec

Does international cross-listing improve the information environment ☆

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Received 31 January 2006; received in revised form 29 May 2007; accepted 15 June 2007
Available online 29 February 2008

Abstract

We investigate whether cross-listing in the U.S. affects the information environment for non-U.S. stocks. Our findings suggest cross-listing has an asymmetric impact on stock price informativeness around the world, as measured by firm-specific stock return variation. Cross-listing improves price informativeness for developed market firms. For firms in emerging markets, however, cross-listing decreases price informativeness. The added analyst coverage associated with cross-listing likely explains the findings in emerging markets, rather than changes in liquidity, ownership, or accounting quality. Our results indicate that the added analyst coverage fosters the production of marketwide information, rather than firm-specific information.
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JEL classification: G14; G15; G32; G34

Keywords: Cross-listing; Firm-specific stock return variation; Emerging markets; Analyst coverage

1. Introduction

This paper examines the information environment for corporations around the world, particularly the extent to which stock prices incorporate firm-specific information in an accurately and timely manner. We focus on the decision of a non-U.S. firm to cross-list in the U.S. market and its information environment. A firm's commitment to a higher level of disclosure and scrutiny associated with cross-listing can alter the incentives for different types of informed market participants to collect and trade on private information, and thereby influence a firm's information environment and stock price formation process. Our large sample includes more than 21,000 firms from more than 40 countries for the 1980–2003 period, allowing examination of both country- and firm-level determinants of stock price informativeness.

☆ We thank an anonymous referee, José Campa, Craig Doidge, José Guedes, Andrew Karolyi, Eva Liljeblom, Darius Miller, Randall Morck, Jordan Siegel, Clara Vega, and Bernard Yeung; and participants at the 2005 European Finance Association meetings and the Finance workshop at Universidade Católica Portuguesa for helpful comments.
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doi:10.1016/j.jfineco.2007.06.002

We document three primary empirical findings. First, cross-listing is positively associated with stock price informativeness. Second, the improvement in price informativeness is concentrated in developed market firms; cross-listing is negatively associated with price informativeness in emerging market firms. Finally, the added disclosure and scrutiny associated with cross-listing explains the improvement in price informativeness of developed market firms, while the added analyst coverage explains the impact for emerging market firms.

Empirical evidence supports the notion that non-U.S. firms that cross-list on U.S. exchanges experience a positive average abnormal return (Foerster and Karolyi, 1999; Miller, 1999); enjoy a lower cost of capital than non-cross-listed firms (Errunza and Miller, 2000; Hail and Leuz, 2004); and have higher Tobin's q ratios (Doidge, Karolyi, and Stulz, 2004). These results support the bonding hypothesis, which suggests that cross-listed firms gain by moving from a poorer quality legal environment to an environment with increased enforcement, enhanced disclosure, and moderated litigation procedures (Coffee, 2002). This suggests that a firm's information environment could be affected by the cross-listing, as a firm must commit to an increased level of disclosure and scrutiny in order to comply with U.S. Securities and Exchange Commission (SEC) regulations and U.S. Generally Accepted Accounting Principles (GAAP).

To date, however, there is limited direct evidence on the relation between a firm's information environment and cross-listing. It is hard to test this relation because we cannot directly measure a firm's information environment. One strand of literature suggests that more analyst coverage and more accurate earnings forecasts indicate an improved information environment (Lang and Lundholm, 1996; Healy, Hutton, and Palepu, 1999). Baker, Nofsinger, and Weaver (2002) find increased visibility, as measured by analyst and media coverage, around the time of cross-listing. Lang, Lins, and Miller (2003) show that non-U.S. firms listed on U.S. exchanges experience more analyst coverage and more accurate forecasts. Bailey, Karolyi, and Salva (2006) report greater volatility and trading activity around earnings announcements following the cross-listing of developed market firms, which they explain by changes in the firm's disclosure environment.

While this evidence suggests a positive link between the information environment and cross-listing, the association is not clear-cut for several reasons. First, the added reporting and disclosure required by regulators for cross-listing could crowd out or substitute for the collection of private information, so that, on balance, a smaller amount of firm-specific information would be incorporated into stock prices (Kim and Verrecchia, 2001).

Second, Easley, O'Hara, and Paperman (1998) and Roulstone (2003) argue that analyst activity is not necessarily a good proxy for private information trading because analysts are "showcasing" devices and they do not have significant firm-specific information. Moreover, Piotroski and Roulstone (2004) show that increased analyst coverage fosters the production of industry and marketwide information and dampens firm-specific stock return variation. Chan and Hameed (2006) also find that greater analyst coverage is associated with lower firm-specific return variation in emerging markets.

Finally, the impact of the cross-listing on the information environment can vary across countries. The enhanced disclosure associated with the cross-listing in the U.S. can produce different results depending on a country's home environment. Ball (2001) argues that changing accounting standards systems alone is not enough to improve actual financial reporting and disclosure. A wide range of other changes in the country's economic, legal, and political infrastructures is required to improve the actual quality of financial reporting, which in the end is determined by the actions of managers, regulators, and auditors. Licht (2003) and Siegel (2005) claim that U.S. enforcement is not effective in the case of non-U.S. firms that list on a U.S. exchange, but the voluntary disclosure that results from cross-listing allows firms to bond themselves by building their reputation. Lang, Raedy, and Wilson (2006) also find that the extra layer of regulation imposed by the SEC is not fully effective, and that a cross-listed firm's home environment continues to be relevant in explaining the quality of its U.S. GAAP-reported earnings.

To test whether cross-listing in the U.S. is, in fact, consistent with the hypothesis of an improvement in price informativeness, we use firm-specific stock return variation as a summary measure. Considerable research establishes that firm-specific stock return variation and price informativeness are closely related. French and Roll (1986) and Roll (1988) show that a significant portion of stock return variation is not explained by market movements. They suggest that firm-specific return variation (or idiosyncratic volatility) measures the rate of private information incorporation into prices via trading.

Empirical evidence supports the use of firm-specific return variation as a measure of stock price informativeness and particularly of private information about firms. In the U.S. market, high levels of firm-specific return variation are associated with more efficient capital allocation (Durnev, Morck, and Yeung, 2004; Chen, Goldstein, and Jiang, 2006), and with more information about future earnings embedded in stock prices (Durnev, Morck, Yeung, and Zarowin, 2003). Cross-country patterns of firm-specific return variation also correspond to likely patterns of price informativeness. Morck, Yeung, and Yu (2000) and Jin and Myers (2006) find high firm-specific stock return variation in developed markets, but low firm-specific return variation in emerging markets. They argue that when a country's environment is characterized by poor governance and opaque accounting, stock prices fail to reflect in a timely and accurate fashion specific information and events about a firm.

Our primary empirical result is that non-U.S. firms cross-listed on U.S. exchanges (NYSE, AMEX, and Nasdaq) have higher firm-specific return variation than other non-U.S. firms. Firm-specific return variation increases the most for firms in developed markets, and in countries with the strongest investor protection. While this finding supports the hypothesis of important positive information effects associated with the cross-listing, as well as the idea that a lower cost of private information leads to more informed trading, and hence more informative stock prices, this is not the whole story. In emerging market firms, the results suggest that cross-listing is associated with reduced firm-specific return variation.

The added disclosure and scrutiny associated with cross-listing seem to contribute to an improvement in stock price informativeness of firms in developed markets. In emerging markets, however, the added analyst coverage when a firm cross-lists its shares in the U.S. seems to dominate the positive information effect of the enhanced disclosure and scrutiny. In fact, the evidence suggests that cross-listed firms have lower firm-specific return variation (than non-cross-listed firms) when they have enhanced analyst coverage. These findings in emerging markets are consistent with the results in Chan and Hameed (2006) that analyst coverage is negatively associated with firm-specific return variation.

One alternative hypothesis to explain our findings is the change in firm ownership that results from the cross-listing. A number of authors have documented large block transactions and increased U.S. and institutional ownership around times of cross-listing (Bradshaw, Bushee, and Miller, 2004; Doidge, 2005; Leuz, Lins, and Warnock, 2005). Our findings may also result from a change in the trading environment that would affect stock volatility. Foerster and Karolyi (1998) find an increase in trading volume and a decrease in spreads of Canadian firms listing in the U.S. Other studies (see Domowitz, Glen, and Madhavan, 1998; Bacidore and Sofianos, 2002), however, argue that the liquidity impact of cross-listing depends on the home market level of integration.[1] Lang, Raedy, and Yetman (2003) also find that cross-listed firms have better accounting quality (than non-cross-listed firms), which suggests another hypothesis to explain our findings. Tests of the ownership, liquidity, and accounting quality hypotheses, however, do not explain our primary findings.

The positive association between firm-specific return variation and cross-listing in developed markets and the negative association in emerging markets are robust in several ways. An event study provides evidence of the dynamics of the increase in firm-specific return variation around the cross-listing in developed markets and of the reduction in return variation in emerging markets. We confirm these findings when we compare the reaction of stock prices to other information events—earnings announcements and takeovers—before and after the cross-listing. We also complement our primary findings using non-exchange-listed American Depositary Receipts (ADR). These type of ADRs experience an insignificant increase in firm-specific return variation in developed markets consistent with their minimal incremental disclosure requirements, while they have a negative and significant impact on firm-specific return variation in emerging markets. Cross-listing is similarly related to an alternative measure of price informativeness—the private information trading measure of Llorente, Michaely, Saar, and Wang (2002). We also find similar results using self-selection corrections to control for the endogeneity of the cross-listing decision.

The remainder of the paper is organized as follows. Section 2 describes the measurement of firm-specific stock return variation and the data. Section 3 presents our core evidence on the relation between cross-listing

[1]Domowitz, Glen, and Madhavan (1998) argue that cross-listing could result in greater trading costs, volatility, and adverse selection for non-U.S. stocks from emerging (i.e. segmented) markets, but less so for non-U.S. stocks from developed (i.e. integrated) markets.

and firm-specific return variation. Section 4 considers the role of analyst coverage, liquidity, firm ownership, and accounting quality in influencing the relationship between cross-listing and firm-specific return variation. Section 5 provides several robustness checks of our primary findings. Section 6 concludes.

2. Data

In this section, we describe the measurement of firm-specific return variation, the sample, and the control variables used in this study.

2.1. Measuring firm-specific stock return variation

Our central dependent variable is firm-specific stock return variation for each stock. Stock return innovations tied to common factors or market returns are the source of systematic risk. Idiosyncratic risk results from innovations that are specific to a stock. We measure these risks by regressing stock returns on the returns of market indexes, or factors. We estimate firm-specific return variation using a two-factor international model as in Morck, Yeung, and Yu (2000), which includes both the local and U.S. market index returns.

For each firm-year, the projection of a stock's excess return on the market factors is:

$$r_{it} = \alpha_i + \beta_{1i} r_{mt} + \beta_{2i} r_{USt} + e_{it}, \tag{1}$$

using weekly return data; with $E(e_{it}) = Cov(r_{mt}, e_{it}) = Cov(r_{USt}, e_{it}) = 0$; where r_{it} is the return of stock i in period t in excess of the risk-free rate; r_{mt} is the value-weighted excess local market return; and r_{USt} is the value-weighted excess U.S. market return.

We compute the stock's relative firm-specific return variation as the ratio of idiosyncratic volatility to total volatility σ_{ie}^2/σ_i^2. This is precisely $1 - R_i^2$ of Eq. (1). Given the bounded nature of R^2, we conduct our tests using a logistic transformation of $1 - R_i^2$:

$$\Psi_i = \log\left(\frac{1 - R_i^2}{R_i^2}\right) = \log\left(\frac{\sigma_{ie}^2}{\sigma_i^2 - \sigma_{ie}^2}\right). \tag{2}$$

Thus, our dependent variable Ψ_i measures firm-specific stock return variation relative to marketwide variation, or lack of synchronicity with the market. One reason for scaling firm-specific stock return variation by the total variation in returns is that firms in some countries are more subject to economywide shocks than others, and firm-specific events can be correspondingly more intense. We also do this for comparability to other studies, such as Morck, Yeung, and Yu (2000) and Jin and Myers (2006).

2.2. Sample description

It is not easy to determine which non-U.S. firms are cross-listed in the U.S., or when firms have initiated or ended their ADR programs, or the type of ADR. To construct a sample that is not biased toward recent ADR events, we use many different data sources for our cross-listing database. Data on non-U.S. firms listing in the U.S. market (NYSE, AMEX, Nasdaq, Level 1 over-the-counter, and Rule 144a private placements) with an ADR or ordinary listing are obtained from the primary depository institutions: Citibank, Bank of New York, JP Morgan, and Deutsche Bank. All the institutions have a part of the information, and no individual database includes all U.S. cross-listings actually available. We add to this information data collected directly from the stock exchanges on non-U.S. listings (including Canadian and Israeli firms that list directly on U.S. exchanges).

Firms regularly change listing type or exchange, and the effective dates shown in all the databases relate to their newest listing. We hand-check all active cross-listings to see whether a firm had a previous cross-listing using Factiva and Lexis-Nexis. We then supplement the database by adding all listings that are not included in the current versions of the different databases.

In the end, our final cross-listings database includes more than 4600 listings. The same firm can enter the database several times because of name changes, upgrades, or downgrades. When we identify the common listings for the same firm, we end up with a total of 2955 firms that have a cross-listing or had one at some time in the past. For each of these firms, we know exactly when each listing was initiated or ended.

The stock price and financial data for our study are drawn from Datastream and Worldscope. Our sample begins with all companies in the Worldscope database for the 1980–2003 period. We use this sample to construct our measure of firm-specific stock return variation and other firm-specific variables. This gives us 28,060 public companies in 47 markets both developed and emerging.

Annual firm-specific stock return variation estimates during the 1980–2003 period are calculated using weekly returns denominated in U.S. dollars for each stock. Individual equity returns and country index returns come from Datastream, and U.S. T-bill return data come from the Center for Research in Security Prices (CRSP).

We eliminate firms with negative sales in a particular year and with total assets under $100 million to make firms across countries more comparable. Results of regressions using all firms or firms with total assets of $10 million or more show the primary results are not affected by these filters. An additional filter is applied in the calculation of annual firm-specific return variation estimates. For each year, volatility is calculated for a stock only if Datastream provides valid returns in every week of the year. Thus, we exclude the years a stock enters and leaves the sample.[2] To avoid drawing spurious inferences from extreme values, we winsorize the observations in the bottom 1% and top 1% of the individual firm-specific return variation distribution over the whole sample period.

After imposing these requirements, we have 21,046 firms, including 879 that are listed on a U.S. exchange (via Level 2 and 3 ADRs and ordinary listings). Because we are interested in whether cross-listing improves the information environment of a firm, we focus on cross-listings on U.S. exchanges, whose firms are required to follow U.S. GAAP and face corresponding stricter disclosure requirements. In the main tests, firms with over-the counter (OTC) listings and Rule 144a private placements are considered as non-cross-listed, i.e. they are included in the benchmark sample.[3] In the robustness section, we complement our primary findings using non-exchange-listed ADRs.

Table 1 reports the median of the relative firm-specific stock return variation (σ_e^2/σ^2), the number of firms (N_{firms}), and the number of firm-year observations (N) for each country. The first three columns describe all firms in the sample. The number of firms in each country varies considerably. Sri Lanka has the fewest firms at 25 and Japan the most at 3514. The median firm-specific return variation also varies widely across countries. There is a 3.9 percentage point difference in the median firm-specific return variation between developed and emerging markets (absent firm-specific controls that vary considerably across countries). Overall, the median firm-specific stock return variation is 0.812 across all countries, which is in line with that in other country-level studies.[4]

The next two sets of columns show the same measures for non-cross-listed and cross-listed firms (exchange-listed). The proportion of firms listed in the U.S. varies widely across countries. Czech Republic, Malaysia, Pakistan, Poland, Sri Lanka, Thailand, and Turkey have no firms with cross-listings in the U.S., while Canada and the U.K. have more than 100.

Our main hypothesis is that cross-listed firms have higher firm-specific stock return variation than non-cross-listed firms. The median firm-specific return variation reported in Table 1 does not confirm this hypothesis, however, it does not control for firm-level characteristics known to affect firm-specific return variation (e.g., firm size). The overall median firm-specific return variation is 0.815 for non-cross-listed firms and 0.709 for cross-listed firms. When we compare developed and emerging markets, we see that the difference is much greater for emerging market firms: 0.786 for non-cross-listed and 0.579 for cross-listed firms. Individual country median firm-specific return variations confirm this finding. Only six countries (Austria,

[2]Volatility is not estimated when there is one or more missing weekly return in a particular year, but weeks with zero return are not counted as missing. In unreported results, we obtain similar findings when we only exclude stocks that trade for less than 30 weeks during a particular year as in Jin and Myers (2006).

[3]We obtain similar results when we eliminate these non-exchange-listed ADRs from the sample.

[4]The rank correlations between our country-level relative firm-specific stock return variation are 0.71 with the estimates in Morck, Yeung, and Yu (2000) and 0.81 with the estimates in Jin and Myers (2006).

Table 1
Median firm-specific stock return variation by country

σ_e^2/σ^2 is the median relative firm-specific stock return variation estimated using an international two-factor model for U.S. dollar weekly excess returns. N_{firms} is the number of firms. N is the number of firm-year observations. Cross-listed firms are firms that are listed on U.S. exchanges (Level 2 and 3 ADRs and ordinary listings). The sample period is from 1980 to 2003.

	All firms			Non-cross-listed firms			Cross-listed firms		
	σ_e^2/σ^2	N_{firms}	N	σ_e^2/σ^2	N_{firms}	N	σ_e^2/σ^2	N_{firms}	N
Panel A: *Developed markets*									
Australia	0.877	1,230	8,475	0.880	1,201	8,208	0.633	29	267
Austria	0.748	136	1,088	0.748	135	1,085	0.753	1	3
Belgium	0.761	180	1,832	0.761	178	1,826	0.660	2	6
Canada	0.907	1,406	11,368	0.916	1,127	9,456	0.843	279	1,912
Denmark	0.855	221	2,337	0.858	217	2,299	0.701	4	38
Finland	0.892	131	900	0.896	123	853	0.720	8	47
France	0.864	939	6,979	0.867	909	6,831	0.640	30	148
Germany	0.837	896	8,061	0.839	874	7,969	0.614	22	92
Greece	0.670	359	1,802	0.673	356	1,788	0.361	3	14
Hong Kong	0.825	722	6,091	0.825	705	6,019	0.837	17	72
Ireland	0.865	93	826	0.877	84	746	0.684	9	80
Italy	0.706	376	3,767	0.711	364	3,677	0.551	12	90
Japan	0.796	3514	42,206	0.798	3,476	41,625	0.618	38	581
Luxembourg	0.890	42	236	0.888	35	217	0.923	7	19
Netherlands	0.810	283	3,188	0.820	249	2912	0.675	34	276
New Zealand	0.851	123	872	0.856	116	834	0.641	7	38
Norway	0.843	224	1,525	0.849	215	1,474	0.624	9	51
Portugal	0.817	123	725	0.826	119	696	0.499	4	29
Singapore	0.717	355	3,031	0.716	348	2997	0.770	7	34
Spain	0.771	196	1,772	0.783	188	1,679	0.432	8	93
Sweden	0.807	372	2,258	0.813	361	2,169	0.533	11	89
Switzerland	0.802	326	3,353	0.803	311	3,286	0.715	15	67
U.K.	0.814	2,499	23,122	0.817	2,383	22,242	0.709	116	880
Developed markets	0.820	14,746	135,814	0.823	14,074	130,888	0.740	672	4,926
Panel B: *Emerging markets*									
Argentina	0.634	80	499	0.691	62	409	0.404	18	90
Brazil	0.759	304	1,152	0.811	272	1,010	0.498	32	142
Chile	0.841	173	1,196	0.866	151	1,036	0.625	22	160
China	0.890	1,164	5,761	0.892	1,152	5,700	0.534	12	61
Colombia	0.731	34	195	0.728	32	183	0.835	2	12
Czech Republic	0.849	66	225	0.849	66	225			
Hungary	0.710	37	187	0.723	36	181	0.153	1	6
India	0.729	342	2,470	0.729	332	2,435	0.714	10	35
Indonesia	0.843	249	1,123	0.847	247	1,106	0.466	2	17
Israel	0.643	139	743	0.624	103	573	0.695	36	170
Korea (South)	0.782	802	7,286	0.784	794	7,246	0.475	8	40
Malaysia	0.644	724	5,676	0.644	724	5,676			
Mexico	0.713	151	1,019	0.746	123	819	0.597	28	200
Pakistan	0.674	67	350	0.674	67	350			
Peru	0.926	70	286	0.936	67	271	0.773	3	15
Philippines	0.832	189	1,086	0.834	188	1,076	0.454	1	10
Poland	0.696	67	291	0.696	67	291			
Russian Federation	0.795	43	160	0.806	41	151	0.374	2	9
South Africa	0.861	558	4,109	0.871	539	3,882	0.664	19	227
Sri Lanka	0.596	25	145	0.596	25	145			
Taiwan	0.652	534	4,076	0.654	526	4,039	0.397	8	37
Thailand	0.808	399	2,680	0.808	399	2,680			
Turkey	0.863	57	219	0.863	57	219			
Venezuela	0.569	26	151	0.599	23	132	0.472	3	19
Emerging markets	0.781	6,300	41,085	0.786	6,093	39,835	0.579	207	1,250
All markets	0.812	21,046	176,899	0.815	20,167	170,723	0.709	879	6,176

Table 2
Descriptive statistics of firm-level variables

Panel A presents descriptive statistics of firm-specific stock return variation variables. σ^2 is the total stock return variation. σ_e^2 is the absolute firm-specific stock return variation estimated using an international two-factor model for U.S. dollar weekly excess returns. σ_e^2/σ^2 is the relative firm-specific stock return variation. Ψ is the logistic transformed relative firm-specific stock return variation. Panel B presents descriptive statistics of the firm-level control variables. *SIZE* is the logarithm of the market capitalization in U.S. dollars (Datastream item MV). *LEV* is leverage defined as the ratio of long-term debt (Worldscope item 03251) to total assets (Worldscope item 02999). B/M is the logarithm of the book-to-market equity (Worldscope item 03501 divided by Datastream item MV). *ROE* is the return on equity (Worldscope item 08301). *ANALYSTS* is the number of analysts covering a firm. *TURNOVER* is volume (Datastream item UVO) divided by number of shares outstanding (Datastream item NOSH). *OWNERSHIP* is the percentage of closely held shares (Worldscope item 08021). *EM* is the absolute value of accruals scaled by the absolute value of cash flow from operations. Accruals are the change in total current assets (Worldscope item 02201), minus the change in cash and cash equivalents (Worldscope item 02001), minus the change in total current liabilities (Worldscope item 03101), plus the change in short-term debt included in current liabilities (Worldscope item 03051), minus depreciation and amortization expenses (Worldscope item 01151). Cash flow from operations is operational earnings (Worldscope item 01551) minus accruals. Cross-listed firms are firms that are listed on U.S. exchanges (Level 2 and 3 ADRs and ordinary listings). The sample period is from 1980 to 2003.

	All firms				Non-cross-listed firms				Cross-listed firms			
	Mean	Median	Std Dev	*N*	Mean	Median	Std Dev	*N*	Mean	Median	Std Dev	*N*
Panel A: Firm-specific stock return variation variables												
σ^2	0.243	0.138	0.326	176,899	0.244	0.138	0.327	170,723	0.225	0.139	0.275	6,176
σ_e^2	0.193	0.102	0.287	176,899	0.194	0.102	0.289	170,723	0.164	0.087	0.245	6,176
σ_e^2/σ^2	0.767	0.812	0.187	176,899	0.770	0.815	0.185	170,723	0.681	0.709	0.219	6,176
Ψ	1.629	1.464	1.450	176,898	1.648	1.483	1.446	170,722	1.095	0.892	1.464	6,176
Panel B: Firm-level control variables												
SIZE	12.525	12.441	1.647	124,194	12.428	12.371	1.577	118,603	14.576	14.549	1.754	5,591
LEV	0.244	0.216	0.195	126,313	0.243	0.215	0.196	120,719	0.249	0.241	0.165	5,594
B/M	−0.376	−0.337	0.837	123,044	−0.362	−0.322	0.836	117,472	−0.668	−0.604	0.784	5,572
ROE	0.134	0.077	3.860	118,941	0.133	0.076	3.947	113,461	0.148	0.112	0.944	5,480
ANALYSTS	6.638	4.000	6.645	66,552	6.273	4.000	6.314	63,267	13.666	13.000	8.651	3,285
TURNOVER	0.590	0.275	0.957	136,673	0.585	0.268	0.964	131,168	0.691	0.501	0.765	5,505
OWNERSHIP	0.438	0.441	0.316	84,167	0.444	0.448	0.317	80,513	0.299	0.262	0.261	3,654
EM	1.220	0.816	1.156	54,342	1.232	0.826	1.160	50,620	1.066	0.676	1.087	3,722

Hong Kong, Luxembourg, Singapore, Colombia, and Israel) present median firm-specific return variation greater for cross-listed firms than for non-cross-listed firms.

Panel A of Table 2 reports the mean, median, and standard deviation for the total stock return variation, and absolute and relative firm-specific stock return variation. The median total stock return variation (σ^2) across all firms is 0.138. The median absolute firm-specific stock return variation (σ_e^2) is 0.102. The median relative firm-specific stock return variation (σ_e^2/σ^2) is 0.812. Non-cross-listed firms have a higher relative firm-specific return variation, as well as a higher absolute firm-specific return variation, than cross-listed firms.

2.3. Control variables

Panel B of Table 2 describes the control variables in our empirical design. Pastor and Veronesi (2003) use a variety of firm characteristics to explain the cross-section of individual firm idiosyncratic volatility, including firm size, leverage, book-to-market equity ratio, and return on equity. We obtain these variables from Datastream and Worldscope. $SIZE_{it}$ is the log of firm i stock market capitalization in U.S. dollars in year t. LEV_{it} is firm leverage, defined as the ratio of long-term debt to total assets. B/M_{it} is the log of the book-to-market equity ratio. ROE_{it} is the return on equity.

To test for the effects of analyst activity, we use data from the historical IBES summary database from 1990 to 2003. We calculate the number of analysts covering a firm (*ANALYSTS*) in each year of our sample.

We also test for the effects of changes in trading environment, firm ownership, and accounting quality. *TURNOVER* is defined as volume divided by number of shares outstanding. *OWNERSHIP* is the percentage of closely held shares, representing the proportion of equity owned by corporate officers, directors, and immediate family members; by individual shareholder holdings representing more than 5%; by other corporations (except shares held in a fiduciary capacity by financial institutions); and by pension/benefit plans and trusts. Both variables are also drawn from Datastream and Worldscope.

Following Leuz, Nanda, and Wysocki (2003) and Lang, Raedy, and Yetman (2003), we use total accruals as a proxy for earnings management (or an inverse proxy for accounting quality). *EM* is defined as the absolute value of firm accruals scaled by the absolute value of cash flow from operations. High values of *EM* suggest that insiders exercise accounting discretion to smooth reported earnings, thus masking true economic performance.

We compute the accrual component of earnings for firm i in each year t as $ACC_{it} = (\Delta CA_{it} - \Delta CASH_{it}) - (\Delta CL_{it} - \Delta DC_{it}) - DEP_{it}$, where ΔCA is the change in total current assets, $\Delta CASH$ is the change in cash and cash equivalents, ΔCL is the change in total current liabilities, ΔDC is the change in short-term debt included in current liabilities, and DEP is depreciation and amortization expenses. Changes in short-term debt are excluded from accruals because they relate to financing transactions rather than operating activities (see Dechow, Sloan, and Sweeney, 1995). Cash flow from operations (CFO) of firm i in year t is then computed by subtracting the accrual component from reported operational earnings ($NIBE$): $CFO_{it} = NIBE_{it} - ACC_{it}$.[5]

To avoid drawing spurious inferences from extreme values, we winsorize the observations in the bottom 1% and top 1% of each firm-level control variable in Panel B of Table 2 (with the exception of *SIZE* and *ANALYSTS*). As expected, cross-listed firms are considerably larger and more leveraged than non-cross-listed firms. Cross-listed firms have higher *ROE* and lower B/M ratios. Cross-listed firms have more analyst coverage: a median of 13 analysts for cross-listed firms and four for non-cross-listed firms. Finally, cross-listed firms are less aggressive in terms of earnings management: median *EM* of 0.676 for cross-listed firms and 0.826 for non-cross-listed firms.

We use several country-level variables as controls in the firm-specific return variation regressions. Following Morck, Yeung, and Yu (2000), to capture the extent to which a country's government respects private property rights, we construct a *good government index* as the sum of three indexes from La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1998), each ranging from zero to ten. These indexes measure (1) government corruption, (2) the risk of expropriation of private property by the government, and (3) the risk of government repudiation of contracts. Low values in each case indicate less respect for private property.

Other country-level variables are suggested in Morck, Yeung, and Yu (2000) and Jin and Myers (2006). We use the logarithm of a country's gross domestic product (GDP) per capita in U.S. dollars each year to proxy for the level of economic development. Our source is the World Bank WDI database. The other variables are: number of stocks, represented by the logarithm of the number of listed firms in each country in each year; country size measured by the logarithm of its geographic size in square kilometers; volatility of economic growth as measured by the sample variance of the annual GDP per capita growth using a three-year moving window; the industry Herfindahl index as a measure of industrial concentration, calculated using two-digit SIC code industry sales for each country in each year; the firm Herfindahl index as a proxy for degree of firm concentration, calculated using individual firm sales for each country in each year; and the disclosure score as a measure of accounting transparency, taken from the Global Competitiveness Reports for 1999 and 2000.

Finally, we include the official stock market liberalization date as a country-level control. The source of the liberalization dates is Bekaert, Harvey, and Lundblad (2005). Li, Morck, Yang and Yeung (2004) and Bae, Bailey, and Mao (2006) find greater firm-specific return variation in a country with its openness to foreign equity investment. These findings are related to our study as a cross-listing can be interpreted as a form of financial liberalization.

[5]We use *EM* as our primary measure of accounting quality because it can be estimated for each year without overlapping across years. We also consider other proxies for accounting quality (Leuz, Nanda, and Wysocki, 2003; Lang, Raedy, and Yetman, 2003): the ratio of the standard deviation of operating earnings and the standard deviation of cash flow from operations; and the correlation between changes in accruals and operating cash flows. Tests using these alternative proxies for accounting quality provide results similar to those using *EM*.

In additional tests, we include country-level proxies for the extent of investor protection (the antidirector rights index, *ANTI*) and quality of accounting standards (*ACC*) from La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1998).

3. Cross-listing and firm-specific stock return variation

Because we are interested in whether cross-listing improves stock price informativeness, we focus on cross-listings on U.S. exchanges, as these require firms to conform to SEC regulation and follow U.S. GAAP. We first present results using firm-specific return variation estimated from a two-factor international model with U.S. dollar-denominated weekly returns. To examine the robustness of these results, we test alternative estimates of firm-specific return variation using different currencies, factor models, and frequency of returns and an alternative measure of stock price informativeness.

3.1. Main regression tests

To control for factors besides cross-listing that are likely to be related to the cross-section of firm-specific return variation, we estimate the regression equation:

$$\Psi_{it} = b_0 + b_1 ADR_{it} + d_1 EMERGE_{it} + d_2 ADR_{it} \times EMERGE_{it} + b_2 SIZE_{it} + b_3 LEV_{it} + b_4 B/M_{it} + b_5 ROE_{it} + \sum_{j=1}^{9} c_j X_{it}^{(j)} + \varepsilon_{it}, \quad (3)$$

where Ψ_{it} is the logistic transformed relative firm-specific return variation of firm i in year t. ADR_{it} is a dummy variable that equals one if firm i is cross-listed on a U.S. exchange in year t, and zero otherwise. *EMERGE* is a dummy variable that equals one if firm i home market is an emerging market, and zero if it is located in a developed market (*EMERGE* is not included in the country fixed effects specifications, in which it is only used as an interaction variable). The additional regressors are the firm-specific return variation determinants already described. The additional controls are country fixed effects or country-level control variables $X^{(j)}$, industry fixed effects, and year fixed effects. We also estimate Eq. (3) imposing $d_2 = 0$ (a cross-listing effect is common to developed and emerging market firms), and without imposing $d_2 = 0$ (a cross-listing effect can vary from developed to emerging market firms). We assume cross-correlation and autocorrelation in our dependent variable is likely to occur. In this case, conventional standard errors in panel regression studies are severely biased downward. We thus adjust t-statistics in panel regressions for heteroskedasticity and within-firm correlation using clustered standard errors. We include year fixed effects to account for cross-sectional dependence.[6]

The coefficient of the interaction variable $ADR \times EMERGE$ measures the difference between emerging and developed markets in terms of the relation between cross-listing and firm-specific variation. It is of interest because theoretical discussion and empirical evidence on disclosure and its impact on the information environment suggests a different result for developed and emerging markets (see Ball, 2001). The literature also suggests that the cross-listing effect on the information environment can vary across countries: the market reaction to ADRs is related to a firm's home market level of development (Miller, 1999); the firm's cost of capital reduction associated with cross-listing is more pronounced in emerging markets (Hail and Leuz, 2004); and the added analyst coverage around cross-listing is stronger in countries with poor protection of minority shareholders (see Lang, Lins, and Miller, 2004). Thus, we examine the relation between the firm-specific return variation and cross-listing allowing for a differential effect for firms in developed and emerging markets.

Table 3 reports results for variants of the basic regression Eq. (3). Columns (1) and (2) report estimates of the basic equation using panel regression with country and industry fixed effects. The *ADR* coefficient is 0.0967 with a t-statistic of 3.23. This result suggests that stock prices of firms cross-listing on a U.S. exchange have significantly higher firm-specific return variation.

[6]For a review of error correction methods in panel data studies, see Petersen (2007).

Table 3
Regression of firm-specific stock return variation on cross-listing
Estimates of coefficients of the regression

$$\Psi_{it} = b_0 + b_1 ADR_{it} + d_1 EMERGE_{it} + d_2 ADR_{it} \times EMERGE_{it} + b_2 SIZE_{it} + b_3 LEV_{it} + b_4 B/M_{it} + b_5 ROE_{it} + \sum_{j=1}^{9} c_j X_{it}^{(j)} + \varepsilon_{it},$$

are shown where Ψ is the logistic transformed relative firm-specific stock return variation estimated from an international two-factor model for U.S. dollar weekly excess returns. *ADR* is a dummy variable that takes the value one if the firm is cross-listed on U.S. exchanges, and zero otherwise. *EMERGE* is a dummy variable that takes the value one if the firm's country of origin is an emerging market. *SIZE* is the logarithm of the market capitalization in U.S. dollars. *LEV* is leverage defined as the ratio of long-term debt to total assets. B/M is the logarithm of the book-to-market equity ratio. *ROE* is return on equity. Columns (1)–(6) present estimates of annual time-series cross-sectional regression including country, industry (2-digit SIC), and year fixed effects, or country random effects with the following country-level control variables $X^{(j)}$. Good government is an index of the country's government respect for private property rights. GDP per capita is the logarithm of the gross domestic product per capita in U.S. dollars. Number of stocks is the logarithm of the number of listed firms in each country. Country size is the logarithm of the geographical size in square kilometers. Variance of GDP growth is the sample variance of the annual GDP per capita growth. Industry Herfindahl is calculated using 2-digit SIC code industry sales for each country. Firm Herfindahl is calculated using individual firm sales for each country. Disclosure is a score for the country-level of accounting transparency. Liberalization is a dummy variable that takes the value one in the country's official financial liberalization year and thereafter, and zero otherwise. Columns (7)–(10) present estimates from Fama-MacBeth procedure and precision-weighted time series means (weighted least-squares, WLS). Columns (11) and (12) present estimates of time-series cross-sectional regression with firm fixed effects. The sample period is from 1980 to 2003. *t*-statistics are in parentheses. Standard errors in columns (1)–(4) are adjusted for heteroskedasticity and clustering at the firm level. Standard errors in columns (5)–(12) are adjusted for heteroskedasticity and serial correlation (one-period). Coefficients significant at the 5% level are in boldface.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Country fixed effects				Country random effects		Fama-MacBeth		WLS Fama-MacBeth		Firm fixed effects	
ADR	**0.0967**	**0.1922**	0.0281	**0.1082**	**0.1137**	**0.1935**	**0.1014**	**0.1401**	**0.0850**	**0.1379**	**0.1874**	**0.2233**
	(3.23)	(5.91)	(0.93)	(3.34)	(6.14)	(9.46)	(2.75)	(3.11)	(2.10)	(2.72)	(4.79)	(5.30)
EMERGE						−0.3028		−0.2397		**−0.4005**		
						(−1.07)		(−0.82)		(−2.59)		
ADR × *EMERGE*		**−0.4779**		**−0.4004**		**−0.4203**		**−0.2521**		**−0.2469**		**−0.2586**
		(−6.80)		(−5.63)		(−9.18)		(−2.68)		(−2.07)		(−2.30)
SIZE	**−0.3690**	**−0.3702**	**−0.3691**	**−0.3702**	**−0.3601**	**−0.3612**	**−0.3796**	**−0.3796**	**−0.3667**	**−0.3671**	**−0.0535**	**−0.0539**
	(−80.13)	(−80.46)	(−85.28)	(−85.68)	(−137.74)	(−138.07)	(−29.18)	(−29.47)	(−22.26)	(−22.02)	(−8.69)	(−8.75)
LEV	**−0.1074**	**−0.1071**	**−0.2718**	**−0.2712**	0.0175	0.0180	−0.0004	−0.0103	−0.0168	−0.0237	**−0.1541**	**−0.1551**
	(−3.43)	(−3.43)	(−9.22)	(−9.21)	(0.90)	(0.93)	(−0.01)	(−0.17)	(−0.47)	(−0.67)	(−4.35)	(−4.37)

Table 3 (*continued*)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Country fixed effects				Country random effects		Fama-MacBeth		WLS Fama-MacBeth		Firm fixed effects	
B/M	**−0.1387**	**−0.1390**	**−0.2024**	**−0.2025**	**−0.1344**	**−0.1350**	**−0.1128**	**−0.1086**	**−0.1203**	**−0.1160**	0.0035	0.0036
	(−15.40)	(−15.44)	(−22.98)	(−23.00)	(−26.61)	(−26.74)	(−5.86)	(−5.53)	(−5.02)	(−4.65)	(0.49)	(0.50)
ROE	−0.0003	−0.0003	−0.0005	−0.0005	−0.0001	−0.0001	−0.0265	−0.0222	0.0001	0.0002	0.0002	0.0002
	(−0.59)	(−0.63)	(−0.75)	(−0.77)	(−0.14)	(−0.16)	(−1.09)	(−0.97)	(0.31)	(0.43)	(0.21)	(0.21)
Good government					−0.1179	−0.1625	0.1665	0.0322	−0.0761	**−0.1662**		
					(−0.81)	(−1.05)	(1.35)	(0.24)	(−1.66)	(−3.16)		
GDP per capita					0.0320	0.0186	**0.0895**	**0.0924**	**0.0627**	**0.0616**		
					(0.73)	(0.43)	(2.34)	(2.74)	(3.62)	(3.70)		
Number of stocks					−0.0302	−0.0377	0.0032	−0.0186	−0.0185	−0.0243		
					(−0.35)	(−0.44)	(0.07)	(−0.35)	(−0.51)	(−0.68)		
Country size					0.0748	0.0911	0.0221	0.1896	−0.0070	0.2972		
					(0.04)	(0.05)	(0.04)	(0.31)	(−0.02)	(0.74)		
Variance of GDP					−0.3100	−0.3321	−0.7277	−1.5616	0.4957	−0.4481		
					(−0.16)	(−0.18)	(−0.32)	(−0.78)	(0.46)	(−0.50)		
Industry Herfindahl					0.0133	0.0328	0.0404	0.0326	−0.0540	−0.0324		
					(0.23)	(0.56)	(0.78)	(0.65)	(−1.36)	(−0.74)		
Firm Herfindahl					0.0558	0.0604	**0.0975**	**0.0932**	**0.0427**	**0.0436**		
					(1.37)	(1.50)	(3.69)	(3.84)	(2.24)	(2.38)		
Disclosure					0.3404	0.3330	0.1072	0.1049	**0.3279**	**0.2821**		
					(1.63)	(1.61)	(0.62)	(0.63)	(3.33)	(2.84)		
Liberalization					**0.3346**	**0.3289**	**−0.6299**	**−0.5507**	**−0.6063**	**−0.6394**		
					(11.04)	(10.85)	(−3.20)	(−2.43)	(−3.34)	(−3.39)		
Constant					**3.3687**	**4.2394**	0.4712	1.9421	**3.1244**	**4.3896**		
					(2.46)	(2.70)	(0.33)	(1.11)	(3.73)	(4.51)		
Country dummies	Yes	Yes	Yes	Yes								
Industry dummies	Yes	Yes	Yes	Yes								
Year dummies	No	No	Yes	Yes								
N	115,884	115,884	115,884	115,884	112,654	112,654					116,293	116,293
R^2	0.22	0.22	0.31	0.32	0.17	0.17					0.46	0.47

Column (2) shows an asymmetric impact of cross-listing on firm-specific return variation in developed versus emerging market firms. The *ADR* coefficient is positive and significant for developed market firms, while the interaction $ADR \times EMERGE$ coefficient is negative and significant, which supports a differential impact in emerging market firms. Overall, cross-listing has a negative and significant effect ($b_1 + d_2$) on firm-specific return variation of emerging market firms.

Column (3) and (4) include year fixed effects (in addition to country and industry fixed effects) to account for residuals correlation across firms in a given year (cross-sectional dependence). Inclusion of year fixed effects has some impact on the economic and statistical significance of the relation between firm-specific variation and cross-listing. The evidence, however, remains consistent with a significant positive relation between cross-listing and firm-specific return variation in developed markets, and a negative and significant relation in emerging markets. Column (4) shows an *ADR* coefficient of 0.1082 with a *t*-statistic of 3.34 for developed market firms. The differential impact for emerging market firms is −0.4004 with a *t*-statistic of −5.63; the emerging market firm coefficient is −0.2922 (= 0.1082 + (−0.4004)).

These results are economically significant. In the panel regression results in column (4), the cross-listing of a developed market firm increases the logistic transformed relative firm-specific return variation, Ψ, by 10.8 percentage points, roughly 10% of the average Ψ across cross-listed firms. The cross-listing of an emerging market firm reduces Ψ by 29.2 percentage points, roughly 27% of the average Ψ across cross-listed firms.

Columns (5)–(6) estimate Eq. (3) using country random effects and country-level variables that are known to be correlated with firm-specific return variation. The results confirm a positive relation between firm-specific return variation and cross-listing in developed markets and a negative relation in emerging markets. The *ADR* coefficient estimate for developed markets is 0.1935. The differential relation of emerging markets relative to developed markets is −0.4203. Country-level variables results are consistent with those in previous research (e.g., Morck, Yeung, and Yu, 2000). We find that firm-specific return variation is positively associated with the good government index, country size, and financial liberalization.

Besides the strong and asymmetric relation between cross-listing and firm-specific return variation in developed and emerging markets, the panel regression results in Table 3 suggest overall that firm-level variables are significant determinants of firm-specific stock return variation at the international level. Larger firms have lower firm-specific return variation. Leverage reduces the firm-specific return variation. Value firms (high book-to-market) have lower firm-specific return variation. Interestingly, some of the country-level variables found significant in country-level studies are no longer significant once we control for firm-specific characteristics.

Time series and cross-sectional dependence is a potential concern with our panel regression results. An alternative solution to our previous adjustment for these effects is the Fama and MacBeth (1973) procedure, which estimates a separate regression for each cross-section in each year and then takes the time series mean of the coefficients. Standard errors are adjusted for heteroskedasticity and serial correlation (one-period). The results in columns (7) and (8) confirm our primary findings.

The Fama and MacBeth (1973) procedure is inefficient, however, when the dependent variable suffers from an errors-in-variables problem. To address this concern, we present in columns (9) and (10) alternative precision-weighted time-series averages of the coefficients of the cross-sectional regressions. This procedure weights the coefficients by their standard errors when averaging across the cross-sectional regressions estimates and is basically a weighted least-squares (WLS) methodology. Standard errors are heteroskedasticity and serial-correlation-corrected. These estimates confirm our primary findings of a significant positive relation between cross-listing and firm-specific return variation in developed markets, and a negative and significant relation in emerging markets. The *ADR* coefficient is 0.1379 with a *t*-statistic of 2.72 for developed market firms, and the differential impact for emerging market firms is −0.2469 with a *t*-statistic of −2.07.

Finally, columns (11) and (12) of Table 3 present estimates using panel regression with firm fixed effects that control for all unobserved heterogeneity across firms and account for autocorrelation in the residuals. Again, we find a significant positive relation between cross-listing and firm-specific return variation in developed markets, and a negative and significant relation in emerging markets.

3.2. Separate regressions for developed and emerging markets

Table 4 presents the results of estimating Eq. (3) separately for developed markets (Panel A) and emerging markets (Panel B) instead of using an emerging market interaction dummy variable as in Table 3. The separate regressions for developed and emerging markets in Table 4 allow us to isolate the impact of cross-listing on firm-specific return variation in these two sets of countries with different characteristics and environments.

Column (1) of Panel A reports results for the developed markets sample of firms using panel regression with country and industry fixed effects. The estimated *ADR* coefficient is 0.1742 with a *t*-statistic of 5.34. Including year fixed effects reduces the statistical and economic significance of the relation between firm-specific return variation and cross-listing, but the *ADR* coefficient in column (2) is still positive and significant at the 1% level (0.0872 with a *t*-statistic of 2.70). This result is also economically significant. The cross-listing of a developed market firm increases Ψ by 8.7 percentage points, roughly 8% of the average Ψ across cross-listed firms.

Using country-random effects with country-level control variables in column (3) does not change the economic and statistical nature of the positive relation between cross-listing and firm-specific return variation. Cross-sectional regression estimates using the Fama and MacBeth (1973) and WLS procedures, in columns (4) and (5), confirm the positive relation between cross-listing and firm-specific return variation in developed markets. Finally, panel regression with firm fixed effects, in column (6), also presents consistent results.

Column (1) of Panel B reports results for the emerging markets sample of firms using panel regression with country and industry fixed effects. The estimated *ADR* coefficient is −0.2215 with a *t*-statistic of −3.65. Including year fixed effects does not change the results (*ADR* coefficient of −0.1986 with a *t*-statistic of −3.28). Other estimates confirm the negative relation between cross-listing and firm-specific return variation in emerging markets. This result is also economically significant. The cross-listing of an emerging market firm reduces Ψ by 19.7 percentage points, roughly 18% of the average Ψ across cross-listed firms.

The signs of the coefficients in Table 4 of the other firm-level determinants of firm-specific return variation are consistent in both developed and emerging markets with the sign of the coefficients in Table 3. Larger, higher leverage and value firms have lower firm-specific return variation. The magnitude of these coefficients, however, is different in developed and emerging markets as the characteristics of the average firm in these two markets are different. The average developed market firm is larger and has lower leverage and book-to-market than the average emerging market firm.

Overall, our evidence is consistent with an asymmetric relation between cross-listing and stock price informativeness (as proxied by firm-specific return variation) with respect to the country's level of development: cross-listed firms in developed markets experience *higher* firm-specific variation than non-cross-listed firms; and cross-listed firms in emerging markets experience *lower* firm-specific variation than non-cross-listed firms.

3.3. Event study: changes in firm-specific stock return variation around cross-listing

Our panel regression results have established the link between cross-listing and firm-specific return variation. Cross-sectional regression estimates confirm the findings.

We need to be careful about interpretation of the relation between cross-listing and firm-specific return variation. A major concern is endogeneity; that is, firms with higher firm-specific return variation could be more likely to cross-list. Firms might anticipate the likelihood of cross-listing for particular needs (e.g., raising external capital) or growth opportunities, and time their decisions to cross-list. Such firms would be more likely to adhere to more stringent disclosure requirements, adopt better governance standards and practices, and attract foreign analysts in advance of cross-listing. In the presence of endogeneity, any inferences obtained using standard statistical approaches would be subject to a selection bias.

We address this concern in several ways. The first is an event study that allows us to compare firm-specific return variation before and after cross-listing for a given firm. While an event study is not an entirely satisfactory solution to the endogeneity issue, because of partial anticipation of the event, it does allow us to address the timing issue. Second, we perform an alternative event study that does not focus on the cross-listing event, but rather examines the reaction of the stock price to other information events (earnings and takeovers announcements) before and after the cross-listing for a given firm. Finally, we consider a model of choice of

Table 4
Regression of firm-specific stock return variation on cross-listing using separate estimations for developed and emerging markets

Estimates of coefficients of the regression

$$\Psi_{it} = b_0 + b_1 ADR_{it} + b_2 SIZE_{it} + b_3 LEV_{it} + b_4 B/M_{it} + b_5 ROE_{it} + \sum_{j=1}^{9} c_j X_{it}^{(j)} + \varepsilon_{it},$$

are shown where Ψ is the logistic transformed relative firm-specific stock return variation estimated from an international two-factor model for U.S. dollar weekly excess returns. *ADR* is a dummy variable that takes the value one if the firm is cross-listed on U.S. exchanges, and zero otherwise. *SIZE* is the logarithm of the market capitalization in U.S. dollars. *LEV* is leverage defined as the ratio of long-term debt to total assets. B/M is the logarithm of the book-to-market equity ratio. *ROE* is return on equity. Columns (1)–(3) present estimates of annual time-series cross-sectional regression including country, industry (2-digit SIC), and year fixed effects, or country random effects with the following country-level control variables $X^{(j)}$. Good government is an index of the country's government respect for private property rights. GDP per capita is the logarithm of the gross domestic product per capita in U.S. dollars. Number of stocks is the logarithm of the number of listed firms in each country. Country size is the logarithm of the geographical size in square kilometers. Variance of GDP growth is the sample variance of the annual GDP per capita growth. Industry Herfindahl is calculated using 2-digit SIC code industry sales for each country. Firm Herfindahl is calculated using individual firm sales for each country. Disclosure is a score for the country-level of accounting transparency. Liberalization is a dummy variable that takes the value one in the country's official financial liberalization year and thereafter, and zero otherwise. Columns (4) and (5) present estimates from Fama-MacBeth procedure and precision-weighted time series means (weighted least-squares, WLS). Column (6) presents estimates of time-series cross-sectional regression with firm fixed effects. The sample period is from 1980 to 2003. *t*-statistics are in parentheses. Standard errors in columns (1) and (2) are adjusted for heteroskedasticity and clustering at the firm level. Standard errors in columns (3)–(6) are adjusted for heteroskedasticity and serial correlation (one-period). Coefficients significant at the 5% level are in boldface.

	(1)	(2)	(3)	(4)	(5)	(6)
	Country fixed effects		Country random effects	Fama-MacBeth	WLS Fama-MacBeth	Firm fixed effects
Panel A: *Developed markets*						
ADR	**0.1742**	**0.0872**	**0.1947**	**0.0998**	**0.0925**	**0.2267**
	(5.34)	(2.70)	(9.42)	(2.49)	(2.29)	(5.36)
SIZE	**−0.3670**	**−0.3676**	**−0.3597**	**−0.3741**	**−0.3619**	**−0.0576**
	(−73.55)	(−79.39)	(−128.25)	(−26.69)	(−21.12)	(−8.79)
LEV	**−0.0706**	**−0.2628**	**0.0740**	−0.0122	−0.0160	**−0.1246**
	(−1.98)	(−7.92)	(3.49)	(−0.18)	(−0.30)	(−3.18)
B/M	**−0.1083**	**−0.1755**	**−0.1258**	**−0.1076**	**−0.1122**	0.0040
	(−11.14)	(−18.44)	(−22.84)	(−5.79)	(−5.16)	(0.51)
ROE	0.0003	0.0002	0.0005	0.0146	0.0004	0.0002
	(0.53)	(0.52)	(0.51)	(0.50)	(0.71)	(0.22)
Good government			0.1388	−0.3023	**−0.6067**	
			(1.76)	(−1.18)	(−2.55)	
GDP per capita			0.0655	**0.1999**	**0.2312**	
			(0.19)	(4.77)	(6.69)	
Number of stocks			0.0266	−0.0142	−0.0179	
			(0.27)	(−0.26)	(−0.49)	
Country size			0.0680	0.5771	0.7835	
			(1.69)	(0.92)	(1.83)	
Variance of GDP			0.1292	**−4.5752**	**−6.3752**	
			(1.49)	(−2.05)	(−3.93)	
Industry Herfindahl			1.0150	0.0288	−0.0321	
			(0.61)	(0.43)	(−0.41)	
Firm Herfindahl			−2.2620	**0.0699**	0.0190	
			(−0.44)	(1.98)	(0.54)	
Disclosure			−0.0923	−0.0509	−0.0081	
			(−0.33)	(−0.33)	(−0.08)	
Liberalization			**0.4858**	−0.2073	**−1.6165**	
			(11.16)	(−1.27)	(−3.87)	
Constant			0.2259	3.2391	**6.0932**	
			(0.08)	(1.26)	(2.82)	
Country dummies	Yes	Yes				
Industry dummies	Yes	Yes				
Year dummies	No	Yes				

Table 4 (*continued*)

	(1)	(2)	(3)	(4)	(5)	(6)
	Country fixed effects		Country random effects	Fama-MacBeth	WLS Fama-MacBeth	Firm fixed effects
N	94,481	94,481	94,717			94,886
R^2	0.21	0.32	0.18			0.44
Panel B: Emerging markets						
ADR	**−0.2215**	**−0.1986**	**−0.2161**	**−0.2801**	**−0.2415**	−0.0415
	(−3.65)	(−3.28)	(−5.26)	(−5.36)	(−5.04)	(−0.40)
SIZE	**−0.3871**	**−0.3841**	**−0.3785**	**−0.4517**	**−0.4072**	−0.0366
	(−35.01)	(−35.34)	(−51.59)	(−14.34)	(−17.41)	(−1.87)
LEV	**−0.3199**	**−0.2765**	**−0.2927**	−0.0247	−0.1789	**−0.2757**
	(−5.30)	(−4.67)	(−6.22)	(−0.19)	(−1.84)	(−3.16)
B/M	**−0.2753**	**−0.2432**	**−0.1861**	**−0.1507**	**−0.1727**	0.0047
	(−13.98)	(−12.79)	(−14.46)	(−5.19)	(−5.52)	(0.22)
ROE	**−0.0064**	**−0.0056**	**−0.0058**	−0.0311	−0.0020	0.0001
	(−2.20)	(−2.71)	(−1.98)	(−1.57)	(−0.94)	(0.02)
Good government			−0.0338	0.0658	0.0370	
			(−0.32)	(0.68)	(0.28)	
GDP per capita			−0.1279	−0.0445	−0.0385	
			(−0.35)	(−1.43)	(−1.13)	
Number of stocks			−0.0670	−0.1513	−0.1364	
			(−0.22)	(−1.11)	(−1.10)	
Country size			0.0348	−1.9078	−0.7961	
			(0.23)	(−0.95)	(−0.86)	
Variance of GDP			−0.0128	−5.3485	−0.5823	
			(−0.09)	(−1.20)	(−0.62)	
Industry Herfindahl			−1.4452	**−0.1170**	**−0.1217**	
			(−0.20)	(−2.56)	(−2.09)	
Firm Herfindahl			0.6053	0.0816	0.0560	
			(0.09)	(1.23)	(1.09)	
Disclosure			0.2080	−0.0865	−0.0338	
			(0.37)	(−1.14)	(−0.60)	
Liberalization			**0.1803**	−0.4131	**−1.5379**	
			(4.38)	(−1.65)	(−4.17)	
Constant			6.5316	**8.4777**	**7.3331**	
			(1.47)	(5.74)	(5.64)	
Country dummies	Yes	Yes				
Industry dummies	Yes	Yes				
Year dummies	No	Yes				
N	21,403	21,403	17,937			21,407
R^2	0.25	0.32	0.16			0.53

the cross-listing that tries to adjust for the endogeneity bias using two-stage least squares and the Heckman (1979) correction in Section 5.3.

To capture whether there has been a change in firm-specific return variation, we calculate the mean and median logistic transformed relative firm-specific return variation (Ψ) before and after the year of the cross-listing. Since the event is centered on the year of the ADR issuance, we eliminate this year from the calculations. We consider three alternative prior- and post-event windows of equal length (one year, two years, and three years) around the cross-listing event. We require a firm to have a complete set of annual firm-specific return variation in the prior- and post-event windows. A longer event window allows us to better capture the entire change in firm-specific return variation. As estimates of firm-specific return variation are intrinsically noisy, a longer event window lets us obtain more reliable measures of our dependent variable. One disadvantage of a longer window is fewer observations, particularly in emerging markets.

Table 5
Event study: change in firm-specific stock return variation around cross-listing

This table reports mean and median of the logistic transformed relative firm-specific stock return variation (Ψ) estimated from an international two-factor model for U.S. dollar weekly excess returns around cross-listing (exchange-listed Level 2 and 3 ADRs) for three alternative windows. The event window includes, alternatively, the one-year, two-year, and three-year period before and after the cross-listing, excluding the year of the cross-listing. The sample includes all cross-listing events for which firm-specific stock return variation data are available before and after the event. The significance value (p-value in brackets) of the difference in mean and median before and after cross-listing is based on t-tests and Kruskal–Wallis non-parametric tests. The sample period is from 1980 to 2003.

	N	Before ADR Mean	After ADR Mean	After-Before [p-value]	Before ADR Median	After ADR Median	After-Before [p-value]
Event window: (−1, 1) *years*							
Developed markets	354	1.4084	1.6606	0.2522 [0.046]	1.3618	1.5197	0.1579 [0.038]
Emerging markets	85	0.7184	0.1777	−0.5407 [0.005]	0.6126	0.1636	−0.4490 [0.009]
Event window: (−2, 2) *years*							
Developed markets	275	1.1593	1.4299	0.2706 [0.029]	1.0717	1.4881	0.4164 [0.030]
Emerging markets	66	0.7607	0.2580	−0.5027 [0.004]	0.6413	0.1870	−0.4543 [0.009]
Event window: (−3, 3) years							
Developed markets	209	1.1023	1.3768	0.2745 [0.049]	1.3618	1.5197	0.1579 [0.033]
Emerging markets	44	0.8944	0.4084	−0.4860 [0.029]	1.0028	0.3631	−0.6397 [0.033]

Table 5 shows an increase in firm-specific return variation around the cross-listing event for the sample of developed market firms. Mean and median relative firm-specific return variation after the cross-listing are always greater than before the cross-listing in all three different windows. Tests for differences in means (t-test) and in medians (Kruskal–Wallis test) around the cross-listing are always significant at the 5% level. This increase is also economically significant. Using, for example, a two-year window, the cross-listing of a developed market firm increases Ψ by 27.1 percentage points, roughly 24.7% of the average Ψ across cross-listed firms. The magnitude of the cross-listing effect is comparable to studies that examine related events. Bae, Bailey, and Mao (2006) find that a country's financial liberalization is associated with an increase in Ψ of almost 22 percentage points.[7]

Emerging market cross-listed firms experience a significant decline in firm-specific return variation following the year of the cross-listing in all three windows. The extent of the changes in firm-specific return variation in this event study is very similar to results in the panel regressions. This decrease is also economically significant. Using, for example, a two-year window, the cross-listing of an emerging market firm reduces Ψ by 50.3 percentage points, roughly 45.9% of the average Ψ across cross-listed firms.

Fig. 1 shows evolution of the median firm-specific return variation across firms for the five-year window before and after the cross-listing separately for firms in developed and emerging markets. Firm-specific return variation increases prior to the cross-listing and continues to increase after the cross-listing for firms in developed markets. Firm-specific return variation drops mainly at the time of and after the cross-listing for firms in emerging markets.

Overall, firm-specific stock return variation is higher when a developed market firm cross-lists in the U.S. market, and lower after an emerging market firm cross-lists. This event study evidence suggests that our

[7]Bae, Bailey, and Mao (2006) report an increase in the logarithm of relative firm-specific return variation of nine percentage points. This increase corresponds to an increase in the logistic transformed relative firm-specific return variation of 21.7 percentage points ($= 9\%/(1 - 0.585)$; where 0.585 is the average relative firm-specific return variation in their study.

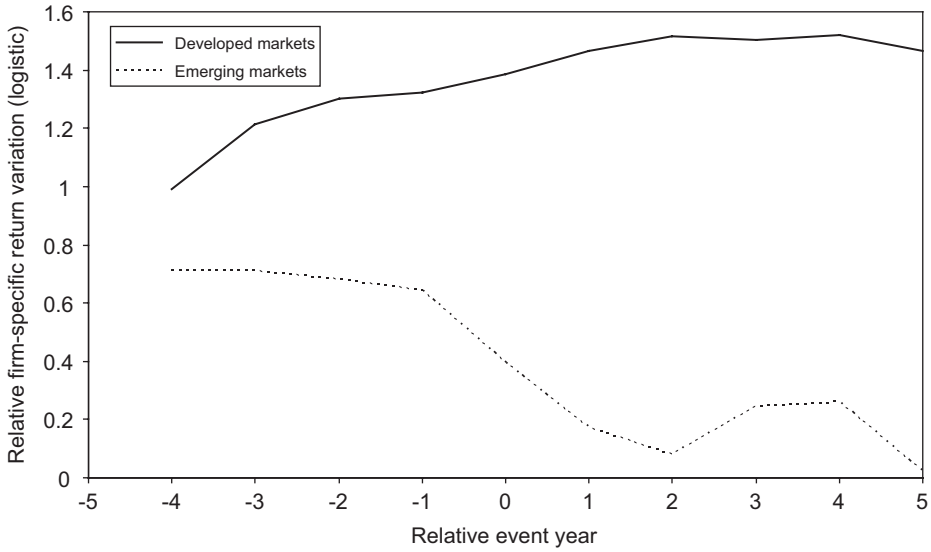

Fig. 1. Firm-specific stock return variation around the cross-listing. This figure plots the annual time series of the logistic transformed relative firm-specific return variation around the cross-listing (year 0) using a two-year backward moving average. Firm-specific stock return variation is the median across all firms in developed or emerging markets in each event year estimated using an international two-factor model for U.S. dollar weekly excess returns.

panel-based results are not likely driven by reverse-causality, and the relation between cross-listing and firm-specific return variation seems to be economically relevant.

An alternative event study focuses on an information event other than the cross-listing. We study the reaction of stock prices to two important information events: (1) earnings announcements, and (2) takeover announcements, before and after a firm cross-lists. Earnings announcements are a crucial, regular information event that are associated with significant reactions in stock prices and increased trading by investors and insiders (see Bhattacharya, Daouk, Jorgenson, and Kehr, 2000). Merger activity has increased dramatically around the world, and the market for corporate control is usually seen as an important mechanism to discipline managers (Jensen, 1986). Takeover announcements are also associated with significant stock price reactions and increased trading by investors and insiders (see Bris, 2005).

Following Bailey, Karolyi, and Salva (2006), we study the absolute abnormal return reaction at the time of earnings announcements before and after the U.S. cross-listing. Earnings announcement dates are taken from the historical IBES database for the 1987–2003 period. We confine the sample to firms with at least three annual earnings announcements both before and after the cross-listing. Abnormal returns are obtained as prediction errors from the international two-factor model for U.S. dollar daily excess returns. The estimation window for this event study is the interval $(-200, -11)$ days before the announcement day. Absolute abnormal returns are cumulated using a three-day event window $(-1, 1)$ around the announcement day to obtain a proxy for firm-specific return variation. Absolute abnormal returns are a valid proxy for firm-specific return variation in short windows as it is the case.

Panel A of Table 6 shows an increase in cumulative absolute abnormal returns to earnings announcements after cross-listing for the sample of developed market firms. Mean (median) cumulative absolute abnormal returns significantly increase around earnings announcements from 4.72% (3.28%) before cross-listing to 6.69% (5.22%) after cross-listing. Emerging market cross-listing firms experience an insignificant change in cumulative absolute abnormal returns following the cross-listing. The mean (median) cumulative absolute abnormal returns around earnings announcements is unchanged at roughly 5% (4%) before and after the cross-listing.

Panel B shows results for the absolute abnormal return reaction to takeover announcements before and after the U.S. cross-listing. Takeover announcement dates are taken from the Securities Data Corporation

Table 6
Event study of earnings and takeover announcements: change in cumulative absolute abnormal returns around cross-listing

Panel A reports mean and median of cumulative absolute abnormal returns in a three-day window $(-1, 1)$ around earnings announcements for the period before and after cross-listing (exchange-listed Level 2 and 3 ADRs). Panel B reports mean and median of cumulative absolute abnormal returns of the acquirer firm in a three-day window $(-1, 1)$ around takeover announcements for the period before and after cross-listing. Abnormal returns are prediction errors from an international two-factor model for U.S. dollar weekly excess returns using an estimation window $(-200, -11)$ with respect to the announcement day. The significance value (p-value in brackets) of the difference in mean and median before and after cross-listing is based on t-tests and Kruskal–Wallis non-parametric tests. t-statistics are in parentheses. The sample period is from 1987 to 2003.

	Before ADR		After ADR		After-Before	Before ADR		After ADR		After-Before
	N	Mean	N	Mean	[p-value]	N	Median	N	Median	[p-value]
Panel A: *Cumulative absolute abnormal returns around earnings announcements* $(-1, 1)$ *days*										
Developed markets	951	0.0472	933	0.0669	0.0197	951	0.0328	933	0.0522	0.0194
		(31.74)		(44.61)	[0.000]		(21.07)		(33.17)	[0.000]
Emerging markets	177	0.0505	212	0.0504	−0.0001	177	0.0411	212	0.0428	0.0017
		(19.18)		(20.96)	[0.978]		(15.15)		(17.26)	[0.589]
Panel B: *Cumulative absolute abnormal acquirer returns around takeover announcements* $(-1, 1)$ *days*										
Developed markets	324	0.0589	753	0.0669	0.0080	324	0.0426	753	0.0509	0.0084
		(18.93)		(30.70)	[0.034]		(12.31)		(22.46)	[0.024]
Emerging markets	23	0.0646	78	0.0707	0.0061	23	0.0580	78	0.0519	−0.0062
		(5.58)		(11.26)	[0.642]		(4.80)		(7.89)	[0.644]

(SDC) Mergers and Acquisitions database for the 1987–2003 period. We restrict the sample to deals in which the acquirer is a firm that is cross-listed in the U.S. in at least one year in our sample period, and the target is a publicly listed company. We exclude from the sample LBOs, as well as spinoffs, recapitalizations, self-tender and exchange offers, repurchases, minority stake purchases, acquisitions of remaining interest, and privatizations. Abnormal returns are obtained as prediction errors from the international two-factor model for U.S. dollar daily excess returns. The estimation window for this event study is the same interval $(-200, -11)$ days before the announcement day. Absolute abnormal returns are cumulated using a three-day event window $(-1, 1)$ around the announcement day to obtain a proxy for firm-specific return variation.

There is a rise in cumulative absolute abnormal returns to takeover announcements after cross-listing for developed market firms. The mean (median) cumulative absolute abnormal returns around takeover announcements significantly increases from 5.89% (4.26%) before cross-listing to 6.69% (5.09%) after cross-listing. Emerging market firms experience an insignificant change in cumulative absolute abnormal returns following the cross-listing. The mean (median) cumulative absolute abnormal returns around takeover announcements is unchanged at roughly 7% (5%) before and after cross-listing.[8]

The results of these two important firm-level events confirm that stock prices of cross-listed firms adjust quickly and more strongly to the release of important information, but only in developed markets. The relation between cross-listing and firm-specific return variation does not seem driven by endogeneity or partial anticipation.

4. Interpreting the relation between cross-listing and firm-specific stock return variation

We test four alternative hypotheses to explain why developed market cross-listed firms have higher firm-specific return variation than non-cross-listed firms, while emerging market cross-listed firms have lower firm-specific return variation than non-cross-listed firms. We first analyze the role of analysts as providers of

[8]In untabulated results, we also study the absolute abnormal return reaction of the target firm at the time of the takeover announcement before and after the U.S. cross-listing. The results largely confirm our findings using acquiror firms, but we have fewer observations for a target firm because of delisting following deal completion.

firm-specific information impounded in stock prices, and whether the importance of analysts changes with cross-listing. Other alternative hypotheses are related to changes in the trading environment, firm ownership, and accounting quality as a result of the U.S. cross-listing.

4.1. Analyst coverage

The literature suggests that the behavior of analysts can change when there are important changes in firm- or country-level environment. Lang, Lins, and Miller (2003) find that non-U.S. firms listing their shares in the U.S. enjoy more analyst coverage, especially in emerging markets.

To study how analyst activities can influence the relation between cross-listing and firm-specific return variation, we estimate the regression equation:

$$\Psi_{it} = b_0 + b_1 ADR_{it} + d_1 ANALYSTS_{it} + d_2 ADR_{it} \times ANALYSTS_{it} + b_2 SIZE_{it} + b_3 LEV_{it} + b_4 B/M_{it} + b_5 ROE_{it} + \varepsilon_{it}, \quad (4)$$

where $ANALYSTS_{it}$ is the logarithm of the number of analysts covering firm i in year t. This regression augments the primary regression in Eq. (3) with analyst coverage, and interaction of analyst coverage with the ADR dummy variable. Our hypotheses are (1) that analyst coverage exerts a negative impact on firm-specific return variation ($d_1 < 0$), especially in emerging markets (Chan and Hameed, 2006); and (2) that increased analyst coverage strengthens the negative relation between cross-listing and firm-specific return variation ($d_2 < 0$). We estimate Eq. (4) separately for samples of developed and emerging market firms to test our hypotheses on the impact of analyst coverage. We estimate Eq. (4) using country, industry, and year fixed effects, and adjusting standard errors for heteroskedasticity and autocorrelation.

Columns (1) and (5) of Table 7 present the results. Column (1) for developed markets shows a positive relation between cross-listing and firm-specific return variation when we control for the level of analyst coverage. Consistent with our hypothesis, we find that the $ANALYSTS$ coefficient is negative and strongly significant. Higher analyst coverage is associated with more synchronized returns and lower firm-specific return variation, consistent with the U.S. evidence in Piotroski and Roulstone (2004). The interaction variable ($ADR \times ANALYSTS$) coefficient is negative and significant, which suggests that enhanced analyst coverage negatively impacts the relation between cross-listing and firm-specific return variation. Indeed, the evidence here suggests that the improved firm-specific return variation in developed markets is stronger in firms with lower analyst coverage.

This cross-listing effect is also economically significant. The cross-listing of a developed market firm increases the logistic transformed relative firm-specific return variation (Ψ) by nearly 19 percentage points, roughly 17% of the average across cross-listed firms. This increase compares with an increase of 10.8 percentage points absent of analyst coverage controls (see Table 3). Thus, we conclude that differences in analyst coverage reduce the positive effect of cross-listing for developed market firms by 43% ($= (19 - 10.8)/19$).

Column (5) shows the results for emerging markets. There is evidence of a *positive* relation between cross-listing and firm-specific return variation in emerging markets, rather than negative, when we control for the level of analyst coverage. Like Chan and Hameed (2006), we find that analyst coverage is negatively associated with firm-specific return variation in emerging markets ($d_1 < 0$). More important, the interaction variable ($ADR \times ANALYSTS$) coefficient is negative and significant.

We interpret these results as follows. For firms with lower analyst coverage, the dominating effect of the cross-listing on stock price informativeness results from the increased disclosure and scrutiny associated with the cross-listing. Price informativeness improves, and firm-specific information is now quickly and more accurately incorporated into stock prices. Additional analyst coverage, however, in particular for emerging market firms, can actually have the opposite effect. Analyst coverage is negatively related to firm-specific return variation (i.e., analysts produce primarily marketwide information), and the overall result is a decrease in stock price informativeness.

Table 7
Regression of firm-specific stock return variation on cross-listing: the role of analysts, liquidity, ownership, and accounting quality

Estimates of coefficients of the annual time-series cross-sectional regression of

$$\Psi_{it} = b_0 + b_1 ADR_{it} + d_1 ANALYSTS_{it} + d_2 ADR_{it} \times ANALYSTS_{it} + d_3 Z_{it} + d_4 ADR_{it} \times Z_{it} + b_2 SIZE_{it} + b_3 LEV_{it} + b_4 B/M_{it} + b_5 ROE_{it} + \varepsilon_{it},$$

are shown where Ψ is the logistic transformed relative firm-specific stock return variation estimated from an international two-factor model for U.S. dollar weekly excess returns. *ADR* is a dummy variable that takes the value one if the firm is cross-listed on U.S. exchanges, and zero otherwise. *ANALYSTS* is the logarithm of the number of analysts covering a firm. *Z* is alternatively *TURNOVER*, *OWNERSHIP*, and *EM*. *TURNOVER* is volume divided by number of shares outstanding. *OWNERSHIP* is the percentage of closely held shares. *EM* is the absolute value of accruals scaled by the absolute value of cash flow from operations. *SIZE* is the logarithm of the market capitalization in U.S. dollars. *LEV* is leverage defined as the ratio of long-term debt to total assets. *B/M* is the logarithm of the book-to-market equity ratio. *ROE* is return on equity. Regressions include country, industry (2-digit SIC), and year fixed effects. The sample period is from 1990 to 2003. *t*-statistics are in parentheses. Standard errors are adjusted for heteroskedasticity and clustering at the firm level. Coefficients significant at the 5% level are in boldface.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Developed markets				Emerging markets			
ADR	**0.1895**	**0.2223**	**0.2756**	**0.2217**	**0.4470**	**0.4830**	0.2352	0.3009
	(2.03)	(2.12)	(2.23)	(1.98)	(2.75)	(2.99)	(1.29)	(1.53)
ANALYSTS	**−0.0924**	**−0.0518**	**−0.0459**	**−0.0423**	**−0.0875**	**−0.0821**	**−0.0792**	**−0.1095**
	(−9.48)	(−5.06)	(−4.52)	(−3.30)	(−4.97)	(−4.74)	(−4.41)	(−4.62)
ADR × *ANALYSTS*	**−0.0835**	−0.0659	**−0.1094**	**−0.0931**	**−0.2495**	**−0.2304**	**−0.1890**	**−0.1867**
	(−2.00)	(−1.61)	(−2.41)	(−1.99)	(−3.80)	(−3.61)	(−2.75)	(−2.39)
TURNOVER		**−0.1611**				**−0.0551**		
		(−9.84)				(−5.69)		
ADR × *TURNOVER*		−0.0516				−0.0606		
		(−0.89)				(−1.51)		
OWNERSHIP			**0.0070**				**0.0041**	
			(16.14)				(5.57)	
ADR × *OWNERSHIP*			0.0002				0.0012	
			(0.11)				(0.57)	
EM				0.0001				−0.0017
				(1.70)				(−0.94)
ADR × *EM*				−0.0002				−0.0042
				(−0.45)				(−0.60)
SIZE	**−0.2886**	**−0.3102**	**−0.2619**	**−0.2970**	**−0.3204**	**−0.3296**	**−0.3076**	**−0.2950**
	(−40.85)	(−42.71)	(−34.99)	(−32.14)	(−21.07)	(−21.80)	(−19.83)	(−14.68)
LEV	**−0.2155**	**−0.2184**	**−0.1653**	**−0.3055**	**−0.3588**	**−0.3200**	**−0.2994**	**−0.5659**
	(−5.49)	(−5.39)	(−4.08)	(−5.74)	(−4.80)	(−4.38)	(−3.84)	(−5.12)
B/M	**−0.0909**	**−0.0827**	**−0.0800**	**−0.0812**	**−0.2271**	**−0.2526**	**−0.2096**	**−0.1999**
	(−8.45)	(−7.53)	(−7.13)	(−5.83)	(−10.21)	(−11.28)	(−9.14)	(−6.82)
ROE	−0.0024	0.0005	−0.0026	−0.0035	−0.0034	−0.0025	−0.0018	−0.0018
	(−0.70)	(0.15)	(−0.76)	(−0.37)	(−1.04)	(−0.79)	(−0.87)	(−0.55)
N	45,179	41,092	38,240	25,964	10,819	10,618	9,827	6,018
R^2	0.3618	0.3742	0.3771	0.3459	0.2871	0.295	0.2889	0.3048

4.2. Trading environment, ownership, and accounting quality

Three alternative hypotheses could explain our primary findings. The trading environment, firm ownership, and accounting quality have been suggested as determinants of firm-specific return variation and there are important changes in all these characteristics as a result of cross-listing.[9]

[9]Another hypothesis is a change in firm-level corporate governance such as board structure and takeover defenses following cross-listing. It is hard to test this hypothesis because corporate governance measures available for non-U.S. firms have only a single observation per firm (S&P ratings) or a short series (ISS ratings). When we consider these ratings, however, we find no evidence that corporate governance explains our findings.

There is evidence of a considerable change in a firm's trading environment as a consequence of cross-listing and that could impact stock return volatility and firm-specific stock return variation. Several authors show stocks have narrower spreads and greater trading volume as a result of cross-listings (e.g. Foerster and Karolyi, 1998), while other authors argue that the effect on liquidity is more complex and depends on the level of home market integration (e.g. Domowitz, Glen, and Madhavan, 1998; Bacidore and Sofianos, 2002).

To study how the trading environment can influence the relation between cross-listing and firm-specific return variation, we estimate the regression equation:

$$\Psi_{it} = b_0 + b_1 ADR_{it} + d_1 ANALYSTS_{it} + d_2 ADR_{it} \times ANALYSTS_{it} + d_3 Z_{it} + d_4 ADR_{it} \times Z_{it} + b_2 SIZE_{it} + b_3 LEV_{it} + b_4 B/M_{it} + b_5 ROE_{it} + \varepsilon_{it}, \quad (5)$$

where $Z_{it} = TURNOVER_{it}$, defined as volume divided by number of shares outstanding of firm i in year t. This regression augments the regression in Eq. (4) with both turnover and interaction of turnover with the ADR dummy variable. We estimate Eq. (5) separately for the sample of developed and emerging market firms to test the influence of turnover.

Columns (2) and (6) of Table 7 present the results. Three results stand out. First, the results confirm the positive relation between cross-listing and firm-specific stock return variation in both developed and emerging markets when we control for analyst coverage. Second, there is a negative relation between turnover and firm-specific return variation. This suggests that high turnover is associated with a decline in the incorporation of firm-specific information into stock prices. This result is consistent with evidence in Chan and Hameed (2006) that actively traded stocks react to market information in a timely way, so that their individual price movements are better synchronized with market movements. Finally, the interaction variable ($ADR \times TURNOVER$) coefficient is insignificant.

Cross-listing also produces important changes in firm ownership. Doidge (2005) finds that cross-listing is associated with lower holdings by controlling shareholders, particularly in emerging markets. To study how firm ownership can influence the relation between cross-listing and firm-specific return variation, we estimate Eq. (5) with $Z_{it} = OWNERSHIP_{it}$, which is the percentage of closely held shares.

Columns (3) and (7) of Table 7 present the results. The $OWNERSHIP$ variable is positively related to firm-specific return variation; that is, firms with a higher percentage of closely held shares have higher firm-specific return variation. This result is consistent with the finding of Piotroski and Roulstone (2004) that insiders convey firm-specific information. There remains a significant positive relation between cross-listing and firm-specific return variation in developed markets. In emerging markets, there is weak evidence of a negative relation between cross-listing and firm-specific return variation (controlling for analyst coverage). Finally, the interaction variable ($ADR \times OWNERSHIP$) coefficient is insignificant. We conclude that firm ownership is not the most likely explanation of our primary findings.

A final hypothesis is suggested by Lang, Raedy, and Yetman (2003). They find that cross-listed firms have higher-quality accounting than non-cross-listed firms, and the difference arises from changes around the cross-listing. Cross-listed firms are less aggressive in terms of earnings management than non-cross-listed firms, even though they are more aggressive than comparable U.S. firms (Lang, Raedy, and Wilson, 2006). To study how accounting quality can influence the relation between cross-listing and firm-specific return variation, we estimate the regression Eq. (5) with $Z_{it} = EM_{it}$, defined as the absolute value of firm accruals scaled by the absolute value of cash flow from operations.

Columns (4) and (8) of Table 7 present the results. The EM variable is insignificantly related to firm-specific return variation, which does not support the presence of a substitution or crowding-out effect between disclosure and private information collection. The results confirm a positive relation between cross-listing and firm-specific return variation in both developed and emerging markets when we control for analyst coverage. The interaction variable ($ADR \times EM$) coefficient is insignificant. We conclude that differences in accounting quality do not appear to explain our primary findings.

The evidence with respect to alternative hypotheses supports that the increase in analyst activities around cross-listings contributes to reduced firm-specific return variation in emerging markets. Added analyst forecasting activities are negatively associated with firm-specific return variation as analysts generate primarily marketwide, rather than firm-specific information.

5. Robustness and alternative measures

Our primary findings are robust to variations in firm-specific return variation measurement and other aspects of our methodology. We also provide consistent evidence using an alternative measure of stock price informativeness and correcting for the endogeneity in the decision to cross-list.

5.1. Robustness tests

As in our primary regression tests, robustness checks include country, industry, and year fixed effects, and standard errors are adjusted for heteroskedasticity and autocorrelation.

A first concern is the measurement of firm-specific return variation. Our results thus far use firm-specific return variation estimated using an international two-factor model (local and U.S. market index return) and weekly excess returns denominated in U.S. dollars. Here, we perform several robustness checks with respect to return frequency, currency denomination, and the model of returns used to estimate the firm-specific return variation.

Column (1) of Table 8 uses firm-specific return variation estimated using monthly returns instead of weekly returns. This alleviates the concern of serial and cross-serial correlation in weekly stock returns, particularly in emerging markets. Column (2) checks the robustness of our results with respect to return currency denomination. Column (3) considers a local market model instead of the two-factor international model to estimate firm-specific return variation. Our positive relation between cross-listing and firm-specific return variation in developed markets and negative relation in emerging markets is confirmed in all three cases.

Columns (4)–(8) of Table 8 show our results are robust in other ways. To rule out the possibility that our findings are the result of trends in the data, we reestimate Eq. (3) for 1990–2003 (column (4)). We choose 1990 because country coverage and within-country coverage of Worldscope expanded significantly after 1990. Column (5) excludes the 1997–1998 Asian crisis which might affect our findings in emerging markets, because a significant number of cross-listings occurred in the mid-1990s before the crisis. The results in columns (4) and (5) for the alternative sample periods confirm our findings of a positive relation between cross-listing and firm-specific return variation in developed markets and a negative relation in emerging markets.

Column (6) of Table 8 considers a sample excluding Canadian firms; Canada has many more cross-listed firms than other countries, and Canadian stocks are directly listed on U.S. exchanges (instead of using the ADR mechanism). Column (7) excludes financial firms (SIC codes 6000-6999) from the sample. Column (8) expands the sample from firms with assets of over $100 million to those with assets of over $10 million. The basic results are unaffected by these sample variations.[10]

Column (9) of Table 8 estimates Eq. (3) using the country median firm-specific stock return variation across firms in each year as the dependent variable instead of firm-level data. This variation allows us to evaluate the effect of interdependence of observations within a country. Since the *ADR* variable in this estimation is the percentage of stocks cross-listed in a country-year (and not a dummy variable as in the firm-level regressions), the size of the coefficients is not directly comparable with the other results. The country-level regression results support our primary findings of a positive relation between cross-listing and firm-specific return variation in developed markets, and a negative relation in emerging markets.

Column (10) of Table 8 estimates the relation between firm-specific return variation and cross-listing ignoring time series information. That is, we estimate the relation using a panel with only two observations by firm, obtained by taking averages before and after the cross-listing event. This variation allows us to check the robustness of our results with respect to serial correlation. Following Bertrand, Duflo, and Mullainathan (2004), we regress firm-specific return variation on the usual firm-level controls (not including the ADR dummy variable) and including country, industry, and year fixed effects. Next, for each cross-listed firm, we take the average residuals for the years before the cross-listing and the years after the cross-listing. Finally, we obtain an estimate of the cross-listing effect from a regression in this two-period panel across cross-listed firms.

[10]We also compare these results with Dasgupta, Gan, and Gao (2006), who find a negative relation between cross-listing and firm-specific return variation for firms with assets of over $10 million. The differences in our results are potentially explained by their smaller sample of listings on U.S. exchanges, which is 35% smaller than ours.

Table 8
Robustness of regression of stock price informativeness on cross-listing
Estimates of coefficients of the annual time-series cross-sectional regression

$$\Psi_{it}(PRIVATE_{it}) = b_0 + b_1 ADR_{it} + d_2 ADR_{it} \times INF_{it} + d_3 ADR\_OTC_{it} + d_4 ADR\_OTC_{it} \times EMERGE_{it} + b_2 SIZE_{it} + b_3 LEV_{it} + b_4 B/M_{it} + b_5 ROE_{it} + b_6 DIVERSITY_{it} + \varepsilon_{it},$$

are shown where Ψ is the logistic transformed relative firm-specific stock return variation and *PRIVATE* is the amount of private information trading measure of Llorente et al. (2002). *ADR* is a dummy variable that takes the value one if the firm is cross-listed on U.S. exchanges, and zero otherwise. *ADR_OTC* is a dummy variable that takes the value one if the firm is cross-listed in the U.S. via a Level 1 over-the-counter ADR or a Rule 144a placement, and zero otherwise. INF_{it} is alternatively represented by *EMERGE*, *ANTI*, and *ACC*. *EMERGE* is a dummy variable that takes the value one if the firm's country of origin is an emerging market. *ANTI* is the antidirector rights index. *ACC* is a country-level index of the quality of accounting standards. *SIZE* is the logarithm of the market capitalization in U.S. dollars. *LEV* is leverage defined as the ratio of long-term debt to total assets. *B/M* is the logarithm of the book-to-market equity ratio. *ROE* is return on equity. *DIVERSITY* is the dispersion of analysts forecasts defined as the standard deviation of analysts' earnings forecasts, normalized by the mean forecast times the square root of the number of analysts. Column (1) uses the firm-specific stock return variation estimated using monthly excess returns. Column (2) uses the firm-specific stock return variation estimated using local currency returns. Column (3) uses the firm-specific stock return variation estimated using a local market model. Columns (4) and (5) consider a sample period starting in 1990 and excluding the 1997–1998 Asian crisis. Columns (6)–(8) consider a sample excluding Canadian firms, excluding financial firms (SIC codes 6000-6999), and with firms with assets of over $10 million. Column (9) uses country median firm-specific return variation across firms in each year as dependent variable. In this case, *ADR* is the percentage of cross-listed stocks relative to total number of stocks in a country; other explanatory variables are country medians across firms. Column (10) uses a panel with only two observations by firm given by the time series averages of firm-specific return variation and explanatory variables before and after the ADR. Regressions include country, industry, and year fixed effects, with exception of columns (9) and (10). The sample period is from 1980 to 2003, with exception of columns (4) and (5). *t*-statistics are in parentheses. Standard errors are adjusted for heteroskedasticity and clustering at the firm level. Coefficients significant at the 5% level are in boldface.

	(1) Monthly returns	(2) Local returns	(3) Local model	(4) 1990–2003	(5) Excludes 1997–1998	(6) Excludes Canada	(7) Excludes financials	(8) Assets < $10 mil.	(9) Country medians	(10) Time aggregate	(11) OTC ADRs	(12) Antidirector rights	(13) Accounting standards	(14) *PRIVATE*
ADR	**0.0888**	**0.0884**	**0.2181**	**0.1688**	**0.2345**	**0.2543**	**0.2174**	**0.0835**	**13.7201**	**0.1541**	**0.2174**	**−0.2252**	**−0.8516**	**0.0170**
	(2.88)	(2.04)	(5.08)	(2.33)	(2.38)	(1.98)	(1.99)	(2.84)	(6.93)	(2.42)	(5.06)	(−2.78)	(−3.87)	(2.07)
ADR × EMERGE	**−0.3015**	**−0.4451**	**−0.4595**	**−0.3859**	**−0.4601**	**−0.4898**	**−0.5267**	**−0.4095**	**−10.2865**	**−0.4216**	**−0.4902**			**−0.0417**
	(−4.60)	(−4.87)	(−5.22)	(−2.18)	(−2.53)	(−2.31)	(−2.79)	(−5.96)	(−3.90)	(5.24)	(−5.57)			(−3.10)
ADR_OTC											0.0408			
											(1.39)			
ADR_OTC× EMERGE											**−0.2761**			
											(−5.28)			
ADR × ANTI												**0.0676**		
												(3.54)		
ADR × ACC													**0.0131**	
													(4.17)	
SIZE	**−0.2445**	**−0.5668**	**−0.4687**	**−0.4827**	**−0.4682**	**−0.4658**	**−0.4495**	**−0.3571**	**−0.1898**		**−0.4684**	**−0.3678**	**−0.3672**	0.0012
	(−59.58)	(−85.75)	(−83.27)	(−28.28)	(−33.49)	(−29.62)	(−25.64)	(−111.82)	(−3.87)		(−79.66)	(−84.92)	(−84.31)	(0.86)
LEV	**−0.3037**	**−0.4760**	**−0.3010**	−0.2736	−0.2580	−0.3267	**−0.4290**	**−0.2196**	−0.5102		**−0.3015**	**−0.2819**	**−0.2793**	−0.0065
	(−10.81)	(−9.73)	(−7.57)	(−1.74)	(−1.22)	(−1.68)	(−2.22)	(−8.80)	(1.06)		(−7.57)	(−9.45)	(−9.30)	(−0.76)
B/M	**−0.1575**	**−0.2993**	**−0.2678**	**−0.2545**	**−0.2367**	**−0.2776**	**−0.2451**	**−0.1703**	0.0785		**−0.2670**	**−0.1871**	**−0.1857**	−0.0034
	(−19.70)	(−21.34)	(−23.39)	(−5.43)	(−6.39)	(−6.85)	(−6.11)	(−27.21)	(−0.95)		(−23.26)	(−21.49)	(−21.24)	(−1.42)
ROE	−0.0004	−0.0003	−0.0003	−0.0003	−0.0001	−0.0003	−0.0003	−0.0007	**−0.7895**		−0.0003	−0.0004	−0.0004	−0.0001
	(−0.81)	(−0.22)	(−0.54)	(−0.34)	(−0.15)	(−0.30)	(−0.59)	(−1.14)	(−3.19)		(−0.53)	(−0.69)	(−0.71)	(−1.59)
DIVERSITY														**0.0191**
														(2.09)
N	115,610	115,805	115,858	95,615	100,344	110,047	89,226	163,099	797	998	115,884	112,523	111,011	52,224
R^2	0.17	0.28	0.28	0.29	0.29	0.28	0.27	0.33	0.13	0.03	0.28	0.32	0.32	0.01

The results in column (10) with time aggregation again support our primary findings of a positive relation between cross-listing and firm-specific return variation in developed markets and a negative relation in emerging markets.

Our tests thus far have been for cross-listing on U.S. exchanges (Level 2 and 3 ADRs and ordinary listings), which require firms to follow U.S. GAAP and stricter disclosure requirements. The added disclosure requirements for Level 1 OTC listings and Rule 144a private placements, however, are minimal. There is evidence that these types of listings are associated with a lower cost of capital (Doidge, Karolyi, and Stulz, 2004) and an increase in analyst coverage (Bailey, Karolyi, and Salva, 2006; Doidge, Karolyi, Lins, Miller, and Stulz, 2008) although the effects are weaker than for the listings on U.S. exchanges.

To test whether firm-specific return variation changes for non-exchange-listed ADRs, we add as additional explanatory variables a dummy variable for OTC and Rule 144a placements (ADR_OTC) and its interaction with the emerging market dummy variable. The results in column (11) of Table 8 confirm our expectation that these types of listings have less of an effect on firm-specific return variation. The positive relation between cross-listing for a non-exchange-listed ADR and firm-specific return variation is insignificant, which is consistent with their minimal incremental disclosure requirements. In addition, as for cross-listings on U.S. exchanges, we find evidence that non-exchange-listed ADRs have a negative impact on firm-specific return variation in the case of emerging market firms. This evidence is consistent with the interpretation of our results that the negative relation in emerging markets is explained by an increase in analyst coverage, which occurs even for non-exchange-listed ADRs.

To what extent is the change in firm-specific return variation following cross-listing explained by the quality of a country's governance or infrastructure? We consider two aspects of a country's infrastructure such as investor protection and accounting standards, as an alternative to the developed and emerging markets classification. We first test whether the asymmetric effect between cross-listing and firm-specific return variation is related to a country's investor protection as measured by the anti-director index ($ANTI$). This measure is an increasing function of the level of investor protection in a country (La Porta, Lopez-de-Silanes, Shleifer, and Vishny, 1998). Firms from countries with the strongest investor protection experience higher firm-specific return variation following the cross-listing. In column (12) using $ANTI$, the coefficient is -0.2252 with a t-statistic of -2.78, and the $ADR \times ANTI$ coefficient is 0.0676 with a t-statistic of 3.54.

Jin and Myers (2006) link firm-specific return variation to management opportunism and transparency. They argue that the net benefit of hiding bad news from investors (which may smooth returns but requires that insiders absorb costs associated with bad news) is reduced in more transparent firms, because insiders have limited opportunity to expropriate the proceeds of good news. They consider accounting transparency as an inverse measure of the probability that insiders will expropriate outsiders. In column (13) we present results using the quality of accounting standards (ACC) in alternative to $EMERGE$. The results support that firms from countries with poorer disclosure requirements experience less firm-specific return variation. Firms from countries with stronger disclosure requirements experience increased firm-specific return variation following the cross-listing, as the added disclosure and scrutiny imposed by U.S. laws is the dominant effect.

To summarize, the increase in firm-specific return variation following cross-listing is concentrated in firms in countries with stronger investor protection and accounting standards.

5.2. Alternative measure of stock price informativeness

There is empirical evidence that supports the interpretation of firm-specific stock return variation as a measure of stock price informativeness. This interpretation, however, is not without controversy. Limits to arbitrage, pricing errors, and noise also manifest themselves in volatility. Dasgupta, Gan, and Gao (2006) develop a model (derived from Jin and Myers, 2006) that suggests that the relation between price informativeness and firm-specific return variation is ambiguous. In particular, more transparency can have a different impact on firm-specific return variation, depending on the quality of legal institutions.

To substantiate our interpretation of the relation between cross-listing and price informativeness, we also test for the relation between cross-listing and an alternative dependent variable that measures the level of private information incorporated into stock prices. We use the private information trading measure suggested by Llorente, Michaely, Saar, and Wang (2002), which is based on stock return autocorrelation conditional on

trading volume. To construct the measure for each firm-year, we estimate the time-series regression

$$r_{it} = \alpha_i + \gamma_i r_{i,t-1} + (a_i + b_i DIVERSITY_{i,t-1}) r_{i,t-1} V_{i,t-1} + \beta_i r_{mt} + e_{it}, \quad (6)$$

using weekly return and volume data; where *DIVERSITY* is the dispersion of analysts forecasts, defined as the standard deviation of analysts' earnings forecasts, normalized by the mean forecast times the square root of the number of analysts (following Jin and Myers, 2006), and V_{it} is log weekly turnover detrended by subtracting a 26-week moving average.

The amount of private information trading, denoted as *PRIVATE*, is given by the regression coefficients on the interaction variable $r_{it}V_{it}$, yielding one observation for each firm-year. Higher values of the variable tend to indicate more information-based trading (as opposed to noise or liquidity trading).

This interpretation of *PRIVATE*, however, is not without concerns. For firms with considerable information asymmetry, *PRIVATE* tends to be positive, as more volume indicates more information-based trading and the stock exhibits positive return autocorrelation. For firms with low information asymmetry, *PRIVATE* tends to be negative, as more volume indicates liquidity-based trading and the stock exhibits negative return autocorrelation. We attempt to deal with this concern by considering the interaction variable coefficient as a linear function of the level of information asymmetry. The dispersion of analyst forecasts (*DIVERSITY*) is a proxy for information asymmetry and difference of opinion.[11]

Results of Eq. (3) using the private information trading measure are presented in column (14) of Table 8. The results for this alternative measure of stock price informativeness support our primary findings of a positive relation between cross-listing and firm-specific return variation in developed markets and a negative relation in emerging markets. The *ADR* coefficient is 0.0170 with a *t*-statistic of 2.07 for developed market firms; the differential impact for emerging market firms is −0.0417 with a *t*-statistic of −3.10. Not surprisingly, our proxy for information asymmetry (*DIVERSITY*) has a positive and significant coefficient.

Overall, the evidence using this alternative measure is consistent with the idea of an asymmetric relation between cross-listing and the information environment, depending on the country's level of development. Cross-listings always improve stock price informativeness in developed markets, but in emerging markets the reverse happens.

5.3. Endogeneity

A remaining concern is self-selection. Firms with higher firm-specific return variation could be more likely to cross-list, which could introduce a selection bias in our estimate of the relation between cross-listing and firm-specific return variation.

We now consider two alternative self-selection models to deal with this concern. We estimate the firm-specific return variation regression by two-stage least squares (2SLS) using an estimated probability of cross-listing as an instrument for the cross-listing status. The fitted values from the probit model are used as an instrument for the *ADR* dummy variable in the second-stage firm-specific return variation regression. We specify a model of the choice (probit model) of cross-listing as a function of country characteristics and firm size (Doidge, Karolyi, and Stulz, 2004).

Profitable firms with strong investment opportunities and considerable need for external finance are more likely to cross-list in the U.S. Thus, we include in the model of choice additional firm characteristics: level of investment opportunities available to the firm, proxied by the annual sales growth rate (*INVOP*); and a measure of dependence on external finance (*EXTFIN*) defined as capital expenditures minus cash flow from operations divided by capital expenditures, following Rajan and Zingales (1998). *EXTFIN* for non-U.S. firms is computed using data from U.S. firms in the same industry (two-digit SIC). The country-level variables are the legal origin (common law dummy variable), accounting standards, judicial efficiency from La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1998), and the log GDP per capita.

[11]We conduct several robustness checks of our results with respect to estimation of *PRIVATE*: (1) we consider that the interaction variable coefficient is constant, rather than a function of the level of information asymmetry; (2) we consider firm size as a proxy for information asymmetry, rather than the dispersion of analyst forecasts. These variations do not affect our findings.

Table 9
Regression of firm-specific stock return variation on cross-listing: self-selection bias Estimates of coefficients of the annual time-series cross-sectional regression

$$\Psi_{it} = b_0 + b_1 ADR_{it} + d_2 ADR_{it} \times EMERGE_{it} + b_2 SIZE_{it} + b_3 LEV_{it} + b_4 B/M_{it} + b_5 ROE_{it} + b_\lambda \lambda_{it} + \varepsilon_{it},$$

are shown where Ψ is the logistic transformed relative firm-specific stock return variation estimated from an international two-factor model for U.S. dollar weekly excess returns. *ADR* is a dummy variable that takes the value one if the firm is cross-listed on U.S. exchanges, and zero otherwise. *EMERGE* is a dummy variable that takes the value one if the firm's country of origin is an emerging market. *SIZE* is the logarithm of the market capitalization in U.S. dollars. *LEV* is leverage defined as the ratio of long-term debt to total assets. B/M is the logarithm of the book-to-market equity ratio. *ROE* is return on equity. We use alternatively the two-stage least squares (2SLS) estimation with cross-listing probabilities from the probit model as instrument, and the Heckman two-stage estimator. λ is the inverse Mills ratio in the Heckman model. Regressions include country, industry, and year fixed effects. The sample period is from 1980 to 2003. *t*-statistics are in parentheses. Standard errors are adjusted for heteroskedasticity and clustering at the firm level. Coefficients significant at the 5% level are in boldface.

	Probit	2SLS	Heckman
ADR		**0.5643**	**0.3855**
		(7.58)	(6.63)
ADR × *EMERGE*		**−1.0451**	**−0.8873**
		(−13.22)	(−19.83)
SIZE	**0.4431**	**−0.3716**	**−0.3652**
	(77.49)	(−97.61)	(−103.99)
LEV	**0.3412**	**−0.0878**	**−0.0844**
	(7.67)	(−4.24)	(−4.08)
B/M	**0.1276**	**−0.1737**	**−0.1716**
	(11.09)	(−31.24)	(−31.20)
ROE	0.0006	0.0007	0.0007
	(0.08)	(0.34)	(0.38)
INVOP	0.0009		
	(0.37)		
EXTFIN	**0.0942**		
	(15.26)		
Common law	**0.9141**		
	(31.86)		
Accounting standards	**−0.0192**		
	(−10.94)		
Judicial efficiency	**−0.0847**		
	(−11.12)		
GDP per capita	**0.0328**		
	(2.13)		
λ			0.0032
			(0.10)
Constant	**−6.3378**		
	(−48.69)		
N	99,921	99,921	99,921
R^2		0.16	

The first column of Table 9 presents the results of the probit estimation. The results support the conclusion that legal origin, accounting standards, judicial efficiency, and GDP per capita are significantly related to the cross-listing decision. Firms in common law countries are more likely to cross-list. Firms in countries with more lenient accounting standards and inefficient judicial systems are more likely to cross-list. The log GDP per capita is positively associated with the cross-listing decision. At the firm level, we find that large firms are more likely to cross-list. We also find that more capital-constrained firms are more likely to pursue a U.S. listing, as indicated by the *EXTFIN* coefficient.

The second alternative follows the Heckman (1979) two-step estimation procedure. We first estimate the probit model above and then use the estimated cross-listing probabilities to measure λ, the correction for self-selection. In the second stage, we estimate the firm-specific return variation regression.

Columns (2) and (3) of Table 9 present the results of the 2SLS model and the Heckman (1979) model. These corrections for selection bias suggest that the relation we have found between cross-listing and firm-specific return variation is robust to endogeneity concerns.

6. Conclusion

We have examined the determinants of stock price informativeness for a large panel of non-U.S. stocks in both developed and emerging markets, taking firm-specific stock return variation as the primary measure of informativeness. Recent cross-country evidence and firm-level evidence support a conclusion that this measure assesses the extent to which information about a firm is quickly and accurately impounded in stock prices.

Our primary contribution is to show that the added scrutiny and disclosure associated with the U.S. cross-listing can have very different results for firms' stock price informativeness around the world. There is a strong asymmetric relation between cross-listing and firm-specific stock return variation with respect to a country's level of development. Cross-listing is associated with higher firm-specific return variation in developed markets; in emerging markets, cross-listing is associated with lower firm-specific return variation. We also find that the increase in firm-specific return variation is greatest for firms in countries with the strongest investor protection.

Research suggests that the behavior of informed market participants can change when there are important changes in firm- or country-level environment. While cross-listings are linked to an increase in analyst coverage, more coverage and more public information seems to actually deter some participants from collecting firm-specific information as well as reduce the active trading of informed traders. This is particularly important in emerging markets, where we find evidence of a strong negative relation between cross-listing and firm-specific stock return variation in the presence of extensive analyst coverage. This result is not explained by any change in the trading environment, firm ownership, and accounting quality that result from the cross-listing.

Our findings suggest some policy recommendations for financial market regulators. Actions intended to enable greater scrutiny or stricter disclosure obligations can actually have a counter-effect. The increased disclosure associated with U.S. exchange rules can, in fact, crowd out private information collection in the case of emerging market firms. Policies intended to promote accounting transparency standards could, thus, overestimate improvements in a market's information environment. To improve the overall information environment, regulators must complement disclosure standards with other policy initiatives to encourage investment in the production of private information and to minimize crowding out effects.

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