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Cross-Listing, Information Environment, and Market Value: Evidence from U.S. Firms that List on Foreign Stock Exchanges

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ABSTRACT: This paper examines how cross-listing impacts analyst coverage and forecast accuracy for U.S. firms that cross-list on foreign exchanges. By focusing on U.S. firms cross-listing abroad, we are able to discriminate between two competing explanations for the improvements in information intermediation experienced by foreign firms cross-listing in the U.S. (Lang, Lins, and Miller 2003); that is, whether the improvements are driven by generic cross-listing effects or by the strict disclosure and regulatory requirements specific to the U.S. markets. Our cross-sectional analysis indicates that cross-listing is negatively associated with analyst coverage, and our time-series analysis yields only marginal evidence of post-cross-listing improvement in forecast accuracy. Thus the cross-listing benefits documented in prior research for foreign firms cross-listing in the U.S. are not generalizable to all cross-listings and may be attributable to the strong disclosure and regulatory environment prevalent in the United States.

Keywords: cross-listing; analyst coverage; forecast accuracy; Tobin's Q.

I. INTRODUCTION

This paper examines whether U.S. firms cross-listing on foreign exchanges benefit through improved information intermediation by analysts. Information intermediation here refers to the number of analysts following a firm and the accuracy of analysts' forecasts of earnings. We also examine the effects of cross-listing, analyst following, and forecast accuracy on firms' valuations as measured by their Tobin's Q ratios. Our study is motivated by the evidence in Lang, Lins, and Miller (hereafter, Lang et al. 2003) that analyst following, forecast accuracy, and market valuations increase for foreign firms that cross-list in the United States. While Lang et al. (2003) do not explore the reasons for these information environment improvements, Leuz (2003) suggests that the improvements in information intermediation documented by Lang et al. (2003) could be driven by either generic cross-listing effects or by the strict disclosure and regulatory environment specific to the U.S. markets.

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The generic effects of cross-listing relate to the removal of barriers to investment for foreign investors (Karolyi 1998). When markets are segmented, a foreign listing could make a firm visible and attractive to foreign investors who were previously unwilling or unable to invest due to regulatory constraints or a home equity bias (French and Poterba 1991; Baker et al. 2002). This widening of the potential investor base is likely to be associated with increased analyst activity and consequently with improved forecast accuracy for the cross-listed firms.

Alternatively, foreign firms that cross-list in the United States submit themselves to a tough disclosure and regulatory environment. The U.S. capital market environment is characterized by the requirement to conform to U.S. generally accepted accounting principles (GAAP), Securities and Exchange Commission (SEC) enforcement, and the expanded legal liability regime of the U.S. stock markets. Adherence to the U.S. disclosure requirements results in an increase in the amount and quality of information. Lang, Raedy, and Yetman (2003) find that firms cross-listed in the United States have better accounting quality relative to foreign firms not cross-listing in the United States. Improved accounting quality in turn likely influences analysts' decision to follow a firm as well as their ability to forecast earnings accurately (Lang and Lundholm 1996; Healy et al. 1999).

Leuz (2003) suggests that an analysis of U.S. firms cross-listing on foreign exchanges may help discriminate between the two competing explanations for the Lang et al. (2003) results. Disclosure requirements and legal liability are unlikely to increase for cross-listing U.S. firms as U.S. regulations are widely believed to be the most stringent (Ball et al. 2000; Leuz 2003). Yet the generic benefits of cross-listing, discussed above, may still accrue to these firms. If the Lang et al. (2003) results are due to the generic effects of international cross-listing, we should expect information intermediation to improve for these firms. However, if the Lang et al. (2003) results are due to the regulatory and disclosure environment prevalent in the United States, we should not observe any changes in analyst coverage and forecast accuracy for cross-listing U.S. firms. Accordingly, we examine changes in the analyst coverage and forecast accuracy for a sample of U.S. firms that cross-list on foreign exchanges.

Our paper also extends prior studies that investigate cross-listing U.S. firms. These studies have yielded mixed results on the benefits of cross-listing. Howe and Kelm (1987) find that overseas listings by U.S. companies result in significant wealth losses for their shareholders. By contrast, Lee (1991) finds that overseas listings on the London and Toronto stock exchanges do not significantly impact firm values. He concludes that listing effects are exchange-specific. In a survey of managers of NYSE-listed firms, Baker (1992) finds that the key motives for listing shares on the London, Frankfurt, and Tokyo stock exchanges include increasing visibility, broadening the shareholder base, gaining access to financial markets, improving relations with the foreign financial community, and increasing demand for the firm's stock. Finally, the evidence in Rees (1998) suggests that international listings are beneficial. Specifically, the market's reaction to the listing is positively related to the resulting liquidity gains and to the firm's ability to expand operations in foreign markets. Our paper adds to this literature by examining whether cross-listing U.S. firms benefit through improved information intermediation by analysts.[1]

[1] A related set of studies examines changes in analyst behavior for U.S. firms that diversify their operations internationally. Duru and Reeb (2002) find that international diversification is associated with a decrease in forecast accuracy and an increase in forecast optimism. However, Herrmann et al. (2007) find that the association between international diversification and forecast optimism dissipates in the post-Regulation FD period. Finally, several studies document that investors and analysts fail to appropriately assess the persistence of foreign earnings (Thomas 1999; Khurana et al. 2003; Callen et al. 2005).

We obtain a sample of U.S. firms that cross-list on foreign stock exchanges. We then identify a control sample of non-cross-listed U.S. firms matched on industry and size. We conduct a cross-sectional analysis to examine whether there are differences in information intermediation (analyst following and forecast accuracy) and valuation (Tobin's Q) between cross-listed and non-cross-listed U.S. firms. We also conduct a time-series analysis to determine whether there are differences in information intermediation and valuation before and after cross-listing for the sample of cross-listed firms.

Our findings in the cross-sectional analyses indicate that there is no difference in forecast accuracy or Tobin's Q between cross-listed and non-cross-listed U.S. firms. Contrary to the results in Lang et al. (2003), we observe lower analyst following for cross-listed U.S. firms. Our time-series analyses indicate that cross-listing does not impact analyst following or Tobin's Q, but we find marginal evidence of an improvement in forecast accuracy following cross-listing. In summary, our sample of U.S. firms does not experience unequivocal improvements in information environment and valuation as a result of cross-listing abroad. Our results thus suggest that the improvement in information intermediation and valuation observed in Lang et al. (2003) for the non-U.S. firms cross-listing in the U.S. is attributable to the disclosure and regulatory environment in the United States and cannot be generalized to all international cross-listings.

The remainder of this paper is organized as follows. The second section presents the research design. The third section describes the sample and data sources. The results are presented in the fourth section, and finally, the fifth section concludes the paper.

II. RESEARCH DESIGN

To examine the association between cross-listing, information environment, and market valuation, we use models similar to those in Lang et al. (2003) and Leuz (2003). These models are estimated on a sample consisting of cross-listed and control firms. The models are as follows:

$$\begin{aligned} \textit{Analyst Following} = f\,(&\textit{Cross-Listed, Firm Size, Earnings Volatility,}\\ &\textit{Return-Earnings Correlation, Earnings Change,}\\ &\textit{Stock, Industry Controls)} \end{aligned} \tag{1}$$

$$\begin{aligned} \textit{Forecast Accuracy} = f\,(&\textit{Cross-Listed, Firm Size, Earnings Volatility,}\\ &\textit{Return-Earnings Correlation, Earnings Change,}\\ &\textit{Industry Controls)} \end{aligned} \tag{2}$$

$$\begin{aligned} \textit{Tobin's Q} = f\,(&\textit{Cross-Listed, Analyst Following, Forecast Accuracy, Firm Size,}\\ &\textit{Operating ROA, Sales Growth, Industry Controls)} \end{aligned} \tag{3}$$

where:

Analyst Following = the number of analysts following the firm;
Cross-Listed = an indicator variable that takes a value of 1 for cross-listed firms and 0 for control firms;
Firm Size = log of total assets;
Earnings Volatility = the standard deviation of earnings for the previous three years scaled by stock price;

Return-Earnings Correlation = the correlation between returns and earnings over the previous three years;
Earnings Change = the absolute value of the change in earnings per share scaled by stock price;
Stock = the log of change in book value of equity (Lang et al.'s [2003] proxy for new equity issued);
Industry Controls = fixed industry effects;
Forecast Accuracy = the negative of the absolute value of the analyst forecast error (I/B/E/S earnings per share less the I/B/E/S median analyst forecast in the eleventh month of the fiscal year) scaled by lag fiscal year-end stock price;
Tobin's Q = the firm's market-to-book ratio computed as the sum of the firm's market value of equity and book value of liabilities divided by total assets;
Operating ROA = the ratio of operating profit to average total assets; and
Sales Growth = the firm's three-year revenue growth rate.

We include firm size as an explanatory variable to control for information environment differences between large and small firms (e.g., Bhushan 1989). Following Lang et al. (2003) and Leuz (2003), we also include earnings volatility, returns-earnings correlation, and earnings change because these variables are associated with analysts' incentives to follow firms and with analyst forecast accuracy.[2] The coefficient on *Cross-Listed* captures how the information environment and market valuation of a cross-listed firm differs from that of a domestic-only listed firm. A positive sign on this coefficient would indicate that the information environment results documented by Lang et al. (2003) extend to our sample as well and thus are attributable to market segmentation. An insignificant estimate for *Cross-Listed* would suggest that cross-listing does not lead to information environment improvements for U.S. firms that list abroad, implying that the Lang et al. (2003) results are attributable to the U.S. regulatory and disclosure environment.

We estimate the models using variables computed for 2004, the latest year for which complete data are available to us. We also conduct time-series tests on a sub-sample of firms for which we have data for four years; specifically, the two years before and the two years after cross-listing. The objective of the time-series tests is to investigate how the information environments and market valuations of the cross-listing firms differ pre- and post-listing relative to the control sample. These tests are also similar to those conducted by Lang et al. (2003) and supplement the cross-sectional analysis.

III. SAMPLE AND DATA SOURCES

Our sample consists of all U.S. firms cross-listed on any of six major international stock exchanges: Amsterdam, Frankfurt, London, Paris, Tokyo, and Zurich. We identified these firms through a search on the exchanges' websites in June 2005. Several sample firms have multiple cross-listings, and our search yields a sample of 82 such firms comprising a total of 162 cross-listings. A list of these firms, along with their respective SIC codes and foreign exchanges, is provided in the Appendix. Of the 82 firms, 45 firms are listed on the London stock exchange, 46 in Zurich, 24 in Amsterdam, 20 in Paris, 17 in Frankfurt, and

[2] Lang et al. (2003) use the standard deviation of returns instead of earnings volatility. However, Lang and Lundholm (1996) use earnings variability. Leuz (2003) also uses earnings variability, arguing that this variable is more significant than returns variability. Finally, both Lang et al. (2003) and Leuz (2003) refer to the earnings change variable as "earnings surprise."

ten in Tokyo. The number of cross-listings per firm ranges from one (45 firms) to six (Dow Chemical), with a mean (median) of 1.95 (1). For each cross-listed firm, we obtain the cross-listing date, where available, from either the exchange's or the firm's website. Our search yields 113 dates, with the earliest cross-listed firm being General Electric, which listed in Zurich on July 11, 1938.

A preliminary inspection of the sample indicates that the sample firms are among the largest U.S. corporations. For each sample firm, we attempt to identify a non-cross-listed control firm matched on industry (two-digit SIC code) and size (closest in total assets as of fiscal year-end 2004, but within 30 percent of the cross-listed firm's total assets). We are able to identify controls for 58 sample firms. While some large firms get excluded at this stage, sensitivity analysis indicates that the empirical results are qualitatively similar if we estimate our models on an unbalanced sample that includes these omitted, unmatched firms.

The data sources in this study are Compustat for financial data and I/B/E/S for analyst forecast data. Consistent with Lang et al. (2003), the analyst forecast variables are obtained or computed for the eleventh month of each fiscal year. Additional firms are lost due to the non-availability of these data, and the final estimation sample for the 2004 cross-sectional tests contains 100 observations for Models (1) and (2) and 104 for Model (3).[3]

IV. EMPIRICAL RESULTS

Descriptive Statistics

Table 1 presents descriptive statistics for the cross-listing and control firms. The averages for total assets indicate that the sample firms are large. Mean (median) 2004 year-end total assets are $48 billion ($15 billion) for cross-listing firms. While the corresponding averages are smaller for the control firms (mean $35 billion and median $12 billion), the size differences between cross-listing and control firms are not statistically significant. The two groups are also similar along other financial dimensions: profitability, leverage, and Tobin's Q. The average cross-listing firm is followed by around 15 analysts, whereas the average control firm is followed by 18 analysts. However, neither analyst following nor forecast accuracy differs significantly between the two groups of firms.

In Table 1, the only variable that is evidently different for cross-listing and control firms is historical sales growth. The averages for *Sales Growth* indicate that the cross-listing firms have experienced relatively slow revenue growth. The mean (median) three-year revenue growth rate for cross-listing firms is 15.9 percent (12.8 percent), compared with a mean (median) growth rate of 48 percent (28.5 percent) for the control firms.

Cross-Listing and Information Environment

Following Lang et al. (2003), we use analyst following and analyst forecast accuracy as our proxies for information environment. Column 2 of Table 2 reports estimation results for Equation (1), which provides a test of the relation between cross-listing and analyst coverage. The intercept is negative, consistent with both Lang et al. (2003) and Leuz (2003), suggesting that the model is incomplete and excludes factors that presumably are negatively associated with analyst following. The coefficients on the control variables (with the exception of *Stock*) have signs consistent with those obtained by previous studies (e.g., Lang et al. 2003). The coefficient on firm size is positive and significant, indicating that larger firms are followed by more analysts.

[3] Some of the variables in Models (1) and (2) require lagged data, and hence these Models use fewer observations than Model (3).

TABLE 1
Descriptive Statistics

Variables	MEAN			MEDIAN		
	Cross-Listed Firm	Control Firm	Diff. p-value	Cross-Listed Firm	Control Firm	Diff. p-value
Total Assets ($ million)	48269.25	35134.85	0.59	15441.89	11653.00	0.64
Operating ROA %	2.422	2.823	0.31	2.420	2.702	0.36
Debt-to-Equity	2.363	2.048	0.83	1.588	1.300	0.12
Tobin's Q (Market-to-Book)	2.049	2.258	0.35	1.748	1.734	0.94
Analyst Following	15.685	17.981	0.17	15.000	18.000	0.11
Forecast Accuracy	−0.003	−0.005	0.45	−0.001	−0.001	0.50
Earnings Volatility	0.050	0.050	0.99	0.016	0.021	0.48
Return-Earnings Correlation	0.436	0.283	0.27	0.752	0.656	0.28
Earnings Change	0.044	0.093	0.45	0.016	0.013	0.99
Stock ($ million)	765.059	638.737	0.70	492.700	265.000	0.51
Sales Growth %	15.903	48.087	0.01	12.840	28.510	0.01

Variable Definitions:

Total Assets = the firm's 2004 fiscal year-end total assets according to Compustat;
Operating ROA = the ratio of operating profit to average total assets;
Debt-to-Equity = the ratio of total liabilities to stockholders' equity;
Tobin's Q = the firm's market-to-book ratio computed as the sum of the firm's market value of equity and book value of liabilities divided by total assets;
Analyst Following = the number of analysts following the firm;
Forecast Accuracy = the negative of the absolute value of the analyst forecast error scaled by stock price;
Earnings Volatility = the standard deviation of earnings scaled by stock price for the previous three years;
Return-Earnings Correlation = the correlation between returns and earnings over the previous three years;
Earnings Change = the absolute value of the difference change in earnings per share scaled by stock price;
Stock = the change in book value of equity; and
Sales Growth = the firm's three-year revenue growth rate.

The coefficient on *Cross-Listed* is negative and significant at the 0.01 level. U.S. firms that cross-list are, on average, followed by around four fewer analysts than are control firms. This result, which suggests that cross-listing negatively impacts the analyst following of U.S. firms, is in direct contrast to Lang et al.'s (2003) inference that cross-listing leads to an increase in analyst following. One possible reason for the decreased analyst following experienced by U.S. firms could be that the cross-listing coincides with the increased level of operating activity in the international product markets, thus making these firms more opaque for analysts. This would be consistent with the evidence in Thomas (2002), who finds that firms that are more diversified tend to be more opaque. The increased difficulty of predicting earnings may then discourage some analysts from following the firm, resulting in a decrease in analyst following.

Nevertheless, the evidence in Table 2 indicates that the Lang et al. (2003) conclusion on the informational effects of cross-listing does not apply to U.S. firms listing abroad. These results are consistent with the hypothesis that the benefits to foreign cross-listing firms accrue from the superior disclosure and regulatory environment prevalent in the United States rather than from market segmentation effects.

TABLE 2
Regressing Analyst Coverage (or Analyst Forecast Accuracy) on Cross-Listing Indicator and Control Variables

Analyst Following = *f (Cross-Listed, Firm Size, Earnings Volatility, Return-Earnings Correlation, Earnings Change, Stock, Industry Controls)* (1)

Forecast Accuracy = *f (Cross-Listed, Firm Size, Earnings Volatility, Return-Earnings Correlation, Earnings Change, Industry Controls)* (2)

	Analyst Following Model 1	Forecast Accuracy Model 2
Variable	**Estimate (p-value)**	**Estimate (p-value)**
Intercept	−9.9711 (0.07)	−0.0095 (0.03)
Cross-Listed	−4.2592 (0.01)	−0.0001 (0.96)
Firm Size	3.0228 (0.00)	0.0007 (0.10)
Earnings Volatility	−6.3730 (0.31)	−0.0003 (0.95)
Return-Earnings Correlation	1.0735 (0.34)	−0.0003 (0.76)
Earnings Change	−2.2453 (0.37)	−0.0286 (0.00)
Stock	−0.0001 (0.80)	
n	100	100
Adjusted R^2	0.31	0.70

Variable Definitions:
Analyst Following = the number of analysts following the firm;
Forecast Accuracy = the negative of the absolute value of the analyst forecast error scaled by stock price;
Cross-Listed = an indicator variable which takes a value of one for cross-listed firms and zero for control firms;
Firm Size = log of total assets;
Earnings Volatility = the standard deviation of earnings scaled by stock price for the previous three years;
Return-Earnings Correlation = the correlation between returns and earnings over the previous three years;
Earnings Change = the absolute value of the change in earnings per share scaled by stock price; and
Stock = the log of change in book value of equity.
The models are estimated using OLS with industry controls on 2004 fiscal year data.

Column 3 of Table 2 presents results for our tests of forecast accuracy differences between cross-listing and control firms (Equation (2)). The coefficients on the control variables indicate that earnings forecasts are less accurate for firms that generate relatively large earnings changes. These results are consistent with Lang et al. (2003).

However, the evidence in Table 2 does not support the hypothesis that cross-listing is associated with an improvement in forecasting accuracy. The coefficient on *Cross-Listed*

is negative and insignificant. A similar result (insignificant negative coefficient on the cross-listing variable) is also obtained by Leuz (2003), who finds that forecasting accuracy does not improve for Canadian firms that cross-list in the United States. Our results support Leuz's (2003) conjecture that disclosure requirements play a role in the forecast accuracy improvements experienced by foreign firms listing in the United States.

Since the descriptive statistics reported in Table 1 indicate that revenue growth is relatively slow for cross-listed firms, we re-estimate our models with sales growth as an additional explanatory variable. The inclusion of sales growth (not tabulated) does not qualitatively affect our results.

Cross-Listing and Market Valuation

Lang et al. (2003) document favorable market valuation effects for foreign firms cross-listing in the United States, after controlling for analyst following and forecast accuracy. We perform a similar analysis on our sample, and the results of this investigation are shown in Table 3. Consistent with Lang et al. (2003), we find that firm valuation is positively associated with analyst following. Untabulated analysis also indicates that this result holds

TABLE 3
Tobin's Q for Cross-Listed and Control Firms

Tobin's Q = f (Cross-Listed, Analyst Following, Forecast Accuracy, Firm Size, Operating ROA, Sales Growth, Industry Controls) (3)

Variable	Estimate (p-value)
Intercept	2.3624 (0.00)
Cross-Listed	0.1219 (0.49)
Analyst Following	0.0423 (0.00)
Forecast Accuracy	−6.0409 (0.48)
Firm Size	−0.2150 (0.01)
Operating ROA	25.2576 (0.00)
Sales Growth	0.0017 (0.30)
n	104
Adjusted R^2	0.46

Variable Definitions:

Cross-Listed = an indicator variable which takes a value of 1 for cross-listed firms and 0 for control firms;
Analyst Following = the number of analysts following the firm;
Forecast Accuracy = the negative of the absolute value of the analyst forecast error scaled by stock price;
Firm Size = log of total assets;
Operating ROA = the ratio of operating profit to average total assets; and
Sales Growth = the firm's three-year revenue growth rate.

The dependent variable is *Tobin's Q*, the firm's market-to-book ratio, computed as the sum of the firm's market value of equity and book value of liabilities divided by total assets.
The model is estimated using OLS with industry controls on 2004 fiscal year data.

for separate sub-samples of cross-listing firms and control firms. We do not find an association between forecast accuracy and firm values. The coefficient on forecast accuracy is negative and insignificant. This suggests that the positive coefficient on analyst following is attributable to analysts' propensity to cover high-value firms (Leuz 2003).

The coefficient on *Cross-Listed* is similarly insignificant, indicating that the values of cross-listing firms are not different from those of control firms. After controlling for the other determinants of Tobin's Q, we find no evidence that cross-listing affects firm valuation. U.S. firms cross-listing abroad evidently do not benefit in a fashion similar to foreign firms that cross-list in the United States. Among the control variables in Table 3, *Firm Size* and *Operating ROA* have significant coefficients. Tobin's Q ratios are high for small, profitable firms. The coefficient on sales growth is positive, as expected, but insignificant.

Time-Series Tests

Our cross-sectional tests indicate that cross-listing is negatively associated with analyst following and not associated with either forecast accuracy or Tobin's Q. We supplement our cross-sectional tests with time-series tests of how cross-listing affects the information environment and valuation of firms. As discussed in Lang et al. (2003), the time-series analysis allows us to discount the possibility that the cross-sectional results are driven by a self-selection bias (that firms with specific information environment and market value attributes choose to cross-list).

We estimate regressions using panel data around the cross-listing date. These data consist of up to four firm-years for each cross-listing firm—two years before and two years after the listing date—and the corresponding firm-years for the control firms. Inclusion of the control firms in the estimation sample ensures that the results are not driven by industry- or market-wide trends. We choose to restrict this analysis to all identifiable (15) listings during 1994–2002. I/B/E/S coverage is sparse prior to that period, and two years of post-listing data are not available for subsequent listings.[4] We lose additional firm-years because of data requirements for the explanatory variables. Similar to Lang et al. (2003), we use all available firm-years for these estimations.

In order to examine changes in firms' information environments and market valuations around the cross-listing date, we use the following adaptations of Equations (1) through (3):

$$\begin{aligned} \textit{Analyst Following} = f\,(&\textit{Post, Cross-Listed, Post*Cross-Listed, Firm Size,}\\ &\textit{Earnings Volatility, Return-Earnings Correlation,}\\ &\textit{Earnings Change, Stock, Industry Controls)} \end{aligned} \tag{4}$$

$$\begin{aligned} \textit{Forecast Accuracy} = f\,(&\textit{Post, Cross-Listed, Post*Cross-Listed, Firm Size,}\\ &\textit{Earnings Volatility, Return-Earnings Correlation,}\\ &\textit{Earnings Change, Industry Controls)} \end{aligned} \tag{5}$$

$$\begin{aligned} \textit{Tobin's Q} = f\,(&\textit{Post, Cross-Listed, Post*Cross-Listed, Analyst Following,}\\ &\textit{Forecast Accuracy, Firm Size, Operating ROA,}\\ &\textit{Sales Growth, Industry Controls)} \end{aligned} \tag{6}$$

where *Post* equals 1 for the post-cross-listing years and 0 for the pre-cross-listing years.

[4] The small number of firms (15 matched-pairs) available for analysis is a limitation of the time-series tests.

In Equations (4) through (6), *Post* captures trends in the dependent variables for the control firms and *Cross-Listed* reflects how the dependent variables differ between the cross-listed and control firms. *Post*Cross-Listed* thus isolates trends that are unique to cross-listing firms.

The estimation results for the time-series test of analyst following are reported in Table 4, Column 2. The estimation results for Equation (4) indicate that cross-listing does not impact the analyst following of U.S. firms. Although the coefficient on *Post*Cross-Listed* is negative (consistent with the cross-sectional results), it is not significant. Table 4, Column 3, presents the estimation results for the time-series test of forecast accuracy. The coefficient on *Post*Cross-Listed* is positive and marginally significant (p-value 0.11), suggesting that forecasting accuracy may improve slightly following cross-listing for the sample firms relative to control firms. The results for the control variables are consistent with those reported for the cross-sectional regression, except that earnings volatility is significant.

Table 5 presents the estimation results for the time-series test of Tobin's Q. The time-series results are consistent with those of the cross-sectional test reported earlier. There is no evidence that Tobin's Q is associated with cross-listing (*Post*Cross-Listed*). The results for the control variables are also consistent.

The analyst following results in Tables 2 and 4 are inconsistent with those of Lang et al. (2003), as well as those reported by Baker et al. (2002). These prior studies document increases in analyst following for international firms that list on United States and London stock exchanges (Baker et al. 2002). Our results suggest that these benefits do not accrue to U.S. firms listing abroad, perhaps because the U.S. disclosure and regulatory environment is the most stringent.

Supplementary Analyses

Cross-Listing and Forecast Dispersion

We also examine how cross-listing affects forecast dispersion. Lang et al. (2003) conduct a similar test but do not include it in their primary analyses. They contend that the impact of cross-listing on dispersion is difficult to predict. For example, increased disclosure could increase or decrease dispersion, depending on whether the new information is public or private. Similarly, changes in a firm's accounting choices around cross-listing could lead to an increase in forecast dispersion, despite the improved information environment. Lang et al. (2003) nevertheless investigate the relationship between forecast dispersion and cross-listing, and find that the association between the two variables is negative but not statistically significant. In a similar fashion, we re-estimate our Models (2) and (5) with forecast dispersion as the dependent variable. We find no evidence of a statistically significant association between dispersion and cross-listing.

Stock Price Reaction to Cross-Listing

Finally, as we find no information environment benefits for our sample of cross-listing firms, we investigate how the stock market reacts to the cross-listings. We examine raw, market-adjusted, and size-adjusted returns for the cross-listing date as well as for a three-day event window (day −1 through day +1). We obtain returns data for 94 cross-listings by sample firms from CRSP. The raw, market-adjusted and size-adjusted returns for the event period are statistically indistinguishable from 0. For example, the mean three-day market-adjusted return around the cross-listing date is 0.21 percent (p-value 0.57), whereas the median return is −0.15 percent (p-value 0.76). Similarly, the mean three-day size-adjusted return is 0.21 percent (p-value 0.54) whereas the median return is 0.00 percent

TABLE 4
Time Series Analysis of Analyst Coverage (or Analyst Forecast Accuracy) for Cross-Listed versus Control Firms

$$\textit{Analyst Following} = f(\textit{Post, Cross-Listed, Post*Cross-Listed, Firm Size, Earnings Volatility, Return-Earnings Correlation, Earnings Change, Stock, Industry Controls}) \quad (4)$$

$$\textit{Forecast Accuracy} = f(\textit{Post, Cross-Listed, Post*Cross-Listed, Firm Size, Earnings Volatility, Return-Earnings Correlation, Earnings Change, Industry Controls}) \quad (5)$$

Variable	Analyst Following Model 4 Estimate (p-value)	Forecast Accuracy Model 5 Estimate (p-value)
Intercept	−34.8948 (0.00)	−0.0074 (0.25)
Post	−0.0699 (0.95)	−0.0009 (0.48)
Cross-Listed	−1.6709 (0.25)	−0.0016 (0.26)
*Post*Cross-Listed*	−1.1783 (0.52)	0.0032 (0.11)
Firm Size	5.1377 (0.00)	0.0008 (0.20)
Earnings Volatility	22.6956 (0.02)	−0.0273 (0.01)
Return-Earnings Correlation	−0.8864 (0.27)	−0.0001 (0.93)
Earnings Change	−10.2887 (0.35)	−0.0380 (0.01)
Stock	0.0010 (0.11)	
n	82	82
Adjusted R^2	0.71	0.58

Variable Definitions:

Analyst Following = the number of analysts following the firm;
Forecast Accuracy = the negative of the absolute value of the analyst forecast error scaled by stock price;
Post = 1 for the post-cross-listing years and 0 for the pre-cross-listing years;
Cross-Listed = an indicator variable which takes a value of 1 for cross-listed firms and 0 for control firms;
Firm Size = log of total assets;
Earnings Volatility = the standard deviation of earnings scaled by stock price for the previous three years;
Return-Earnings Correlation = the correlation between returns and earnings over the previous three years;
Earnings Change = the absolute value of the change in earnings per share scaled by stock price; and
Stock = the log of change in book value of equity.

The models are estimated using OLS on panel data with industry controls.
The data consist of up to two firm-years each of pre- and post-cross-listing data for the cross-listed and control firms.

TABLE 5
Time Series Analysis of Tobin's Q for Cross-Listed versus Control Firms

*Tobin's Q = f (Post, Cross-Listed, Post*Cross-Listed, Analyst Following, Forecast Accuracy, Firm Size, Operating ROA, Sales Growth, Industry Controls)* (6)

Variable	Estimate (p-value)
Intercept	8.4982 (0.00)
Post	−0.2450 (0.57)
Cross-Listed	0.5547 (0.26)
*Post*Cross-Listed*	−0.3715 (0.56)
Analyst Following	0.1396 (0.00)
Forecast Accuracy	30.9723 (0.11)
Firm Size	−1.0252 (0.00)
Operating ROA	26.1965 (0.00)
Sales Growth	0.0024 (0.15)
n	91
Adjusted R^2	0.36

Variable Definitions:
Post = 1 for the post-cross-listing years and 0 for the pre-cross-listing years;
Cross-Listed = an indicator variable which takes a value of 1 for cross-listed firms and 0 for control firms;
Analyst Following = the number of analysts following the firm;
Forecast Accuracy = the negative of the absolute value of the analyst forecast error scaled by stock price;
Firm Size = log of total assets;
Operating ROA = the ratio of operating profit to average total assets; and
Sales Growth = the firm's three-year revenue growth rate.
The dependent variable is *Tobin's Q*, the firm's market-to-book ratio, computed as the sum of the firm's market value of equity and book value of liabilities divided by total assets.
The model is estimated using OLS on panel data with industry controls.
The data consist of up to two firm-years each of pre- and post-cross-listing data for the cross-listed and control firms.

(p-value 0.75). Thus cross-listing on a foreign exchange does not appear to be either a good news or bad news event for the average U.S. firm.

Pre-Regulation FD Evidence

Our main test compares information intermediation by analysts for cross-listed and control firms for the year 2004. Prior studies (e.g., Heflin et al. 2003) indicate that Regulation FD, implemented in the year 2000, significantly impacted the information environment of firms in the U.S. Herrmann et al. (2007) find that the association between international diversification and analyst optimism, documented by Duru and Reeb (2002), dissipates in the post-Regulation FD period. Accordingly, we re-estimate our cross-sectional models (Equations (1)–(3)) using 1998 data to eliminate the possibility that our results are

specific to the post-Regulation FD period. The results for these older data (not tabulated) also indicate that the analyst following, forecast accuracy, and market valuations of cross-listed firms are not significantly different from those of control firms.

Foreign Sales

Our cross-sectional test indicates that the analyst following of cross-listed firms is low in comparison to the control firms. One potential reason for this result is that cross-listing firms are likely more active in international product markets, and consequently more opaque to analysts, relative to control firms as conjectured by Duru and Reeb (2002). To explore this possibility, we compare the average foreign sales to total sales ratios for our cross-listed and control firms. We are able to obtain these data from firms' 10-Ks for 32 matched pairs. Our analysis indicates that the mean (median) ratio of foreign sales to total sales is 0.43 (0.42) for the cross-listing firms and 0.37 (0.33) for the controls. However, the mean and median differences between the cross-listing and control firms are not statistically significant at conventional levels.

Alternate Measure of Cross-Listing

Our results indicate that U.S. firms cross-listing on foreign exchanges do not experience the information intermediation improvements enjoyed by foreign firms cross-listing on U.S. exchanges. This suggests that the benefits of cross-listing can be ascribed to the disclosure and regulatory regimes of the listing exchanges rather than to generic cross-listing effects. Our results (as well as those reported by Lang et al. 2003) are based on a dichotomous measure of cross-listing—an indicator variable that classifies firms as cross-listed and non-cross-listed.

An alternate measure of cross-listing is the number of exchanges on which a firm cross-lists. This alternate measure also provides an additional test of potential generic cross-listing benefits since these benefits, which relate to a widening of a firm's investor base through the removal of barriers for foreign investors, should be increasing in the number of foreign exchanges on which the firm cross-lists. Cross-listing in multiple markets should presumably lead to the removal of more barriers, allowing the firm access to more potential investors, thus generating greater generic benefits.

Accordingly, we re-estimate Equations (1)–(3), substituting the variable *Number_of_Exchanges* for *Cross-Listed*. These estimations yield results (not tabulated) that are similar to those reported in Tables 2 and 3. Specifically, analyst following (forecast accuracy and Tobin's Q) is negatively associated with (are not associated with) the number of foreign exchanges on which a firm cross-lists. These results further lend credence to the notion that the potential benefits of cross-listing are derived not from generic cross-listing effects, but rather from the institutional characteristics of the listing exchanges.

V. CONCLUSION

This paper examines the relation between cross-listing of U.S. firms on foreign stock exchanges and financial analyst intermediation as measured by analyst coverage and forecast accuracy. We also examine the effects of cross-listing on firm valuation as measured by Tobin's Q. Our paper extends prior research by Lang et al. (2003), who examine cross-listing effects for non-U.S. firms that list in the United States. They find an increase in analyst following and forecast accuracy for cross-listed firms relative to other non-U.S. firms. They further find that increased analyst following and forecast accuracy associated with cross-listing results in higher firm valuations as measured by Tobin's Q. Leuz (2003) suggests that the improvements in information intermediation documented by Lang et al.

(2003) could be due to either the generic effects of cross-listing or due to the improvement in the disclosure practices of firms listing in the United States.

The purpose of our study is to investigate these two alternative explanations by examining cross-listing effects for a sample of U.S. firms that list on foreign stock exchanges. U.S. firms that list abroad are not likely to face a stricter disclosure and regulatory environment than at home (Ball et al. 2000; Leuz 2003). If these firms experience the same improvements in information intermediation as foreign firms cross-listing in the United States, then the improvements are likely attributable to generic cross-listing effects such as market segmentation. However, if information intermediation does not improve for U.S. firms cross-listing abroad as it does for foreign firms cross-listing in the United States, then the cross-listing benefits documented by Lang et al. (2003) can be attributed to unique regulatory features of the U.S. stock markets.

We select a sample of U.S. firms that cross-list on six foreign stock exchanges: Amsterdam, Frankfurt, London, Paris, Tokyo, and Zurich. We also select a control sample of U.S. firms matched on industry and size that do not cross-list on foreign exchanges. Our cross-sectional analysis indicates that cross-listing is negatively associated with analyst coverage, and our time-series analysis yields only marginal evidence of a post-cross-listing improvement in forecast accuracy. The evidence also indicates that cross-listing does not impact U.S. firms' valuations. Overall, our results suggest that U.S. firms do not experience the definite information intermediation improvements enjoyed by foreign firms cross-listing in the United States. Accordingly, the cross-listing benefits documented by Lang et al. (2003) are likely attributable to the regulatory and disclosure environment specific to the United States. Such benefits do not appear to be a feature of all international cross-listings.

Our results are subject to the following caveats. We study a small sample of large firms, and this constrains the generalizability of our results. The small sample size likely has an adverse impact on the power of our tests. Moreover, the benefits of cross-listing are potentially greater for small firms that operate in a relatively poor information environment. Second, we cannot exclude the possibility that the contrast between our results and those obtained by Lang et al. (2003) is attributable to systematic differences between our samples. Finally, our evidence raises several interesting questions. Since information intermediation and market valuations do not improve for our U.S firms listing on foreign exchanges, what prompts these firms to cross-list? Which specific aspects of the U.S. environment are the most attractive and beneficial to cross-listing foreign firms? The study of cross-listings, accordingly, remains a fruitful avenue for future research.

APPENDIX
List of Cross-Listed U.S. Companies

Compustat Name	SIC	Amsterdam	Frankfurt	London	Paris	Tokyo	Zurich
3M CO	2670						X
ABBOTT LABORATORIES	2834			X			X
AFLAC INC	6321					X	
ALCOA INC	3350		X	X			X
ALTRIA GROUP INC	2111	X	X	X	X		X
AMERICAN EXPRESS	6199			X	X		X
AMERICAN INTERNATIONAL GROUP	6311			X	X	X	X
AMR CORP/DE	4512						X
ANHEUSER-BUSCH COS INC	2082			X			X

APPLE COMPUTER INC.	3571		X				
ARCHER-DANIELS-MIDLAND CO	2070		X				X
AT&T CORP	4813	X		X	X		X
ATMEL CORP	3674				X		
BAKER HUGHES INC	3533						X
BANK OF AMERICA CORP	6020			X		X	
BAXTER INTERNATIONAL INC	3841						X
BELLSOUTH CORP	4813	X	X	X			X
BIOMARIN PHARMACEUTICAL INC	2836						X
BOEING CO	3721	X		X		X	X
BOWATER INC	2621			X			
BRUNSWICK CORP	3510			X			
CAMPBELL SOUP CO	2030						X
CATERPILLAR INC	3531		X	X	X		X
CEVA INC	6794			X			
CHEVRONTEXACO CORP	2911	X					
CISCO SYSTEMS INC	3576	X					
CLEAN DIESEL TECHNOLGIES INC	2810			X			
COLGATE-PALMOLIVE CO	2844	X	X	X	X		X
CONOCOPHILLIPS	2911						X
CORNING INC	3679						X
DEERE CO. DL 1	3523		X				
DOW CHEMICAL	2821	X	X	X	X	X	X
DU PONT (E I) DE NEMOURS	2820	X	X		X		X
ELCOM INTERNATIONAL INC	7370			X			
ELECTRONIC DATA SYSTEMS CORP	7370			X			
ENGELHARD CORP	2810						X
EXXON MOBIL CORP	2911			X			
FOOT LOCKER INC	5661	X					X
FORD MOTOR CO	3711	X		X	X		X
FORTUNE BRANDS INC	3490	X	X				
FRANKLIN RESOURCES INC	6282			X			
GENERAL ELECTRIC CO	9997	X		X	X		X
GENERAL MOTORS CORP	3711	X	X	X	X		X
GOODYEAR TIRE & RUBBER CO	3011						X
HERCULES INC	2890						X
HONEYWELL INTERNATIONAL INC	3728			X			
INTEL CORP	3674	X					X
INTL BUSINESS MACHINES CORP	7370	X		X	X	X	

INTL FLAVORS & FRAGRANCES	2860	X					
INTL PAPER CO	2600	X					X
ITT INDUSTRIES INC	3561		X	X	X		
IVAX CORP	2834			X			
JPMORGAN CHASE & CO	6020			X		X	
LILLY (ELI) & CO	2834			X			X
MARATHON OIL CORP	2911	X					X
MARSH & MCLENNAN COS	6411			X			
MCDONALD'S CORP	5812		X		X		X
MERCK & CO	2834				X		
MERRILL LYNCH & CO INC	6211			X	X	X	
MICROSOFT CORP	7372	X					
MOLEX INC	3678			X			
MOTOROLA INC	3663					X	
NEWS CORP	7812			X			
OCCIDENTAL PETROLEUM CORP	1311	X					
OXIS INTERNATIONAL INC	2835				X		
PEPSICO INC	2080	X				X	X
PFIZER INC	2834			X	X		X
PG&E CORP	4931						X
PROCTER & GAMBLE CO	2840		X		X		
ROCKWELL AUTOMATION	3620			X			
SARA LEE CORP	2000	X		X			X
SBC COMMUNICATIONS INC	4813	X					X
SCHLUMBERGER LTD	1389						X
SOTHEBY'S HOLDINGS -CL A	7389			X			
TENNECO AUTOMOTIVE INC	3714			X			
TEXAS INSTRUMENTS INC	3674						X
TORCHMARK CORP	6311			X			
UNISYS CORP	7373			X			X
UNITED TECHNOLOGIES CORP	3720		X	X			X
UTEK CORP	6799			X			
VERIZON COMMUNICATIONS INC	4813		X	X			X
XEROX CORP	3577			X			X
ZIMMER HOLDINGS INC	3842						X

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