NBER WORKING PAPER SERIES

# LOOK AT ME NOW: WHAT ATTRACTS U.S. SHAREHOLDERS?

John Ammer
Sara B. Holland
David C. Smith
Francis E. Warnock

Working Paper 12500
http://www.nber.org/papers/w12500

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
August 2006

The authors thank Mark Carey, Laura Field, Charles Hadlock, Andrew Karolyi, Christian Leuz, Ross Levine, Michelle Lowry, Darius Miller, Greg Nini, Bent Sorensen, Mark Spiegel, Michael Weisbach, and seminar participants at the 2004 EFA Meetings, 2006 AFA Meetings, Binghamton University (SUNY), College of William and Mary, European Central Bank, Federal Reserve Board, Federal Reserve System SCIEA Meetings, ISCTE Business School, Michigan State University, NYSE, Penn State University, Stockholm Institute for Financial Research, Universidad Catolica Portuguesa, Universidade do Porto, University of Houston, University of Minnesota, and University of Virginia for helpful comments. Nathanael Clinton provided exceptional research assistance. The views expressed in this paper are solely the responsibility of the authors and should not be interpreted as reflecting the views of the Board of Governors of the Federal Reserve System or of any other employee of the Federal Reserve System. The statistical analysis of security-level data on U.S. investors holdings reported in this study was conducted at the International Finance Division of the Board of Governors of the Federal Reserve System under arrangements that maintained legal confidentiality requirements. Warnock thanks the Darden School Foundation for generous support. The views expressed herein are those of the author(s) and do not necessarily reflect the views of the National Bureau of Economic Research.

Look at Me Now: What Attracts U.S. Shareholders?
John Ammer, Sara B. Holland, David C. Smith and Francis E. Warnock
NBER Working Paper No. 12500
August 2006
JEL No. G11, G15, G3, M4

## ABSTRACT

This paper investigates the underlying determinants of home bias using a comprehensive data set on U.S. investors' aggregate holdings of every foreign stock. Among those foreign stocks that are *not* listed on U.S. exchanges, which account for more than 96 percent of our usable data sample, we find that U.S. investors prefer firms with characteristics associated with greater information transparency, such as stronger home-country accounting standards. We document that a U.S. cross-listing is economically important, as U.S. ownership of a foreign firm roughly doubles upon cross-listing in the United States. We explore the cross-sectional variation in this "cross-listing effect" and find that the increase in U.S. investment is greatest for firms that are from weak accounting backgrounds and are otherwise informationally opaque, suggesting that the key effect of cross-listing is improvements in disclosure that are valued by U.S. investors. By contrast, cross-listing does not increase the appeal of stocks from countries with weak shareholder rights, suggesting that U.S. cross-listing cannot substitute for legal protections in the home country. Nor does the cross-listing effect appear to be driven simply by increased "familiarity" with the stock or lowered cross-border transactions costs.

John Ammer
Federal Reserve Board of Governors
john.ammer@frb.gov

David C. Smith
McIntire School of Commerce
University of Virginia
Charlottesville, VA 22904
dcs8f@comm.virginia.edu

Sara B. Holland
Finance Department
Haas School of Business
UC Berkeley
Berkeley, CA 94720-1902
holland@haas.berkeley.edu

Francis E. Warnock
Darden Business School
University of Virginia
Charlottesville, VA 22906-6550
and NBER
warnockf@darden.virginia.edu

## 1. Introduction

This paper uses a comprehensive dataset to examine the characteristics that make foreign stocks attractive to U.S. investors. Such a study is important because researchers continue to puzzle over the fact that U.S. investors exhibit a strong "home bias" for stocks in their own country. Currently, scholars tend to favor four explanations for the home bias: (1) Investors demand a level of informational transparency, including high-quality accounting standards, beyond that of the typical non-U.S. stock; (2) Investors value the strong legal protections provided by U.S. securities regulations and law; (3) Investors gravitate towards stocks that that are most "familiar"; or (4) Investors are inhibited from trading across borders because of high transactions costs. We present evidence that supports the first explanation – that transparency is important to U.S. investors – and casts doubt on the other three hypotheses.

Our dataset is derived from security-level U.S. Treasury/Federal Reserve Board surveys of foreign equity holdings of U.S. residents, which contains snapshots of *all* U.S. portfolio holdings of foreign equities at specific points in time. We match holdings data from the 1994 and 1997 surveys to firm-specific information on publicly traded firms from Worldscope and Datastream, resulting in information on 12,236 companies domiciled outside of the United States. Using these data, we concentrate on the connection between a foreign firm's decision to cross list on a U.S. stock exchange and U.S. investor interest in holding that firm's stock. Ahearne, Griever, and Warnock [2004], among others, have demonstrated that U.S. investors show a distinct preference for holding foreign stocks that are cross-listed in the United States, a phenomenon we term the "cross-listing effect."[1] Our estimates indicate that U.S. ownership in a foreign firm doubles upon cross listing.

We exploit this phenomenon along two dimensions. First, we explore the variation in U.S. investment across foreign stocks that are *not* cross-listed on a U.S. exchange. These firms represent the bulk of traded firms outside the United States, and of the 11,755 non cross-listed firms in our sample, more than one-quarter attract no U.S. investment. Yet U.S. investors hold at least 20 percent of the market

[1] See also Bradshaw, Bushee, and Miller [2004], Edison and Warnock [2004], and Aggarwal, Klapper, and Wysocki [2005].

capitalization in more than 200 non cross-listed firms, and exhibit clear preferences for stocks with certain characteristics. For instance, they tend to hold relatively large stakes in informationally transparent companies, including non-financial enterprises, dividend-paying firms, and members of the Morgan Stanley Capital International (MSCI) World index. More distinctly, U.S. investors favor non cross-listed stocks from countries with high average accounting standards and stocks backed by strong accounting practices (according to our proxy) at the firm level. Meanwhile, U.S. investors show no preference for firms from countries with strong minority investor protections. If anything, they take relatively larger positions in firms from countries with weak investor protections, controlling for accounting quality. Moreover, U.S. investors show no preference for foreign stocks that are more "familiar," as measured by the company's degree of international presence.

Second, we examine directly the reasons why U.S. investors look afresh at cross-listed firms. We use the following intuition: If cross listing reduces impediments to U.S. investment, then firms with the greatest impediments prior to listing should experience the largest jump in U.S. investment. We find that firms that use poor accounting practices, or that come from countries with poor average accounting standards, experience a statistically larger cross-listing effect than do firms from strong accounting backgrounds. This result is consistent with the idea that requisite reconciliations to U.S. GAAP, along with other mandated disclosures, make cross-listing firms more attractive to U.S. investors, particularly among firms that previously followed poor accounting practices.[2] By contrast, firms with previously weak investor protections do not increase their attractiveness by adopting U.S. securities laws. Holding all else constant, U.S. investment actually increases more upon cross-listing for firms that are (i) diffusely held and (ii) from countries with strong shareholder laws, as if U.S. investors viewed a cross-listing as a complement

[2] Foreign firms listed on U.S. exchanges are required to annually file SEC form 20-F, which contains a reconciliation of the firm's net income and shareholders' equity figures with U.S. GAAP. Researchers have questioned the value of these reconciliations relative to the reporting of U.S. firms (e.g., Rees and Elgers [1997], Pownall and Schipper [1999], and Lang, Ready, and Wilson [2006]), but have generally found the reporting of cross-listed firms to be more informative than that of their non cross-listed peers (e.g., Lang, Raedy, and Yetman [2003], Lang, Lins, and Miller [2003], Leuz, Nanda, and Wysocki [2003], and Barth, Landsman, Lang, and Williams [2006]).

to other protections for minority shareholders, rather than a substitute.[3] These results have interesting implications for "bonding" theories of cross-listing (Stulz [1999] and Coffee [1999, 2002]), which we return to below. Holding all else constant, we also observe no difference in investor interest in less-familiar versus more-familiar stocks upon cross-listing.

Finally, cross-border trading costs are unable to explain differences in U.S. interest across foreign stocks. U.S. investors hold about the same proportion of foreign stocks that are traded over-the-counter (OTC) in the United States as they do in peers not traded in the United States. Foreign firms whose stocks trade OTC are interesting because they save the U.S. investor the cost of a cross-border transaction but are not compelled to register with the SEC or reconcile financials with U.S. GAAP. More compellingly, we find that U.S. investors acquire a majority of their shares in cross-listed firms *directly* in the firm's home market, rather than through purchases of American Depositary Receipts (ADRs) on a U.S. exchange. Thus, the availability of foreign shares for trading within U.S. borders, by itself, is neither necessary nor sufficient for explaining the cross-listing effect.

We obtain our results using econometric methodologies that account for the underlying endogeneity between U.S. holdings behavior and the decision to cross-list on a U.S. exchange. We first jointly model the cross-listing and holding decisions as a system of simultaneous equations, using the methodology from the study of unionization and wages by Lee [1978]. This framework not only allows us to correct for the effects of selection bias, but also produces structural estimates of the relation between holding and listing. But because no single econometric methodology can be expected to perfectly account for endogeneity (Larcker and Rusticus [2005]), we buttress the parametric results with semi-parametric propensity score matching and non-parametric "difference-in-differences" methods for selection-bias adjustment.

Our paper is related to recent work examining the decision to cross-list, and the benefits that accrue from cross-listing. Lang, Lins, and Miller [2003] document increases in forecast accuracy and analyst

[3] Our results do not imply that American investors favor companies with poor firm-level investor protections. Indeed, Leuz, Lins, and Warnock [2006] show that where country-level investor protections are poor, U.S. holdings are lower in companies with poor corporate governance.

coverage of firms following a cross-listing, and show that these firms are valued more highly, on average, than their non cross-listed peers. They attribute the valuation gains to the improved information environment following the cross-listing.[4] Doidge, Karolyi, and Stulz [2004] study cross-listed firms' market-to-book ratios and find the valuation changes around a U.S. cross-listing to be higher for firms domiciled in countries with weak investor protections. They argue that the higher valuations are a result of improved legal protections. Doidge [2004] studies changes in control premiums around U.S. cross-listings and attributes a decline in the average premium to reductions in private benefits of control associated with improved legal protections.[5] In contrast to these studies, our paper focuses on *holdings* of foreign stocks, and changes in the quantity of holdings around a cross-listing, which may yield insights unavailable from stock price data. U.S. investors are unlikely to be the marginal investor in many of the firms in our sample, so their portfolio decisions are likely to have limited influence on the firm's stock price. Yet, observing how they change their positions in these firms might provide important guidance on how foreign firms attract outside capital.

The paper most closely related to our own is Bradshaw, Bushee, and Miller [BBM, 2004]. BBM use U.S. institutional holdings of foreign companies as reported in SEC 13(f) filings to examine the relation between investor interest in foreign companies and accounting choice. Utilizing both cross-sectional and time-series methods, they find that foreign firms with greater conformity to U.S. GAAP attract more U.S. institutional interest. Our paper builds on the results of BBM in two important ways. First, our sample is drawn from a survey covering *all* U.S. portfolio holdings of foreign equities. By contrast, SEC 13(f) requires only the reporting of U.S. holdings in foreign securities that trade on U.S. exchanges. This excludes holdings in all non-cross listed stocks as well as in the home-traded stocks underlying cross-listed

[4] See also Foerster and Karolyi [1999], Miller [1999], and Errunza and Miller [2000], who document positive stock price reactions to firms that cross-list on a U.S. exchange.

[5] Gozzi , Levine, and Schmukler [2005] question the relation between stock valuations and motivations for cross-listing, with a particular emphasis on interpretations related to legal protections. They show that the increases in valuation occur well before the cross-listing and decline in the year after the cross-listing, and find no relation between valuation changes around cross-listing and country-level investor protections. They argue that the observed pattern is more consistent with valuation increases leading to corporate expansions through cross-listing than changes in legal protections.

ADRs. Thus, the BBM sample covers only a small segment of the securities available to U.S. investors, and understates U.S. holdings in the firms covered in their sample. Second, our investigation attempts to disentangle the information-transparency explanation for U.S. investor interest from competing (but correlated) explanations of the home bias. Specifically, our paper distinguishes between two dimensions of the theory popularly known as the "bonding" hypothesis (Stulz [1999]; Coffee [1999, 2002]).

Bonding theories assert that international firms can improve corporate their governance standards by cross listing in the United States in order to bond themselves to U.S. accounting, disclosure, and legal practices. The first dimension of the bonding hypothesis relates to the perception that accounting and disclosure practices within the Unites States provide valuable information to investors at a lower cost than systems in other countries (Ball [2001]; Bushman, Piotrowski, and Smith [2004]). The second dimension is associated with the relatively strong legal protections investors receive in the United States through the enforcement of corporate and securities laws that protect minority investors, and backed by extensive property rights and contract law (Coffee [2002]; Levine [2005]). The two dimensions are likely to be correlated because countries with sound accounting and disclosure systems are likely to also have strong legal institutions in place to enforce compliance with the systems. However, valuable information production does not require strong legal backing; competitive concerns or reputation may be incentive enough to maintain compliance with a given level of reporting standards (Ball, Robin, and Wu [2003]; Leuz, Nanda, and Wysocki [2003]; Siegel [2005]). Our results suggest that U.S. investors value the production of high-quality information without necessarily putting weight on explicit protections provided through the U.S. legal system.

The rest of the paper proceeds as follows. Section 2 introduces the data used in the paper. Section 3 presents and estimates a simultaneous equations model of the cross-listing and holdings decisions. Section 4 describes the methodologies we use for estimating the average cross-listing effect and reports results, both for the average cross-listing effect and the firm-level regressions used to explore what drives the cross-listing effect. Section 5 concludes.

## 2. Data

### *2.1 Benchmark Survey Data*

Our investigation begins with comprehensive security-level data on U.S. holdings of foreign stocks as of December 31, 1997, obtained confidentially through benchmark surveys conducted jointly by the U.S. Treasury Department and the Federal Reserve Board. Later, we also use data from the predecessor March 1994 survey. The survey must be completed by all U.S. financial institutions, both within the United States and abroad, that are entrusted with the management or safekeeping of client equity holdings. Institutions covered include all U.S. custodian banks, other commercial and investment banks, mutual funds, pension funds, insurance companies, endowments, and foundations. Respondents are required to report the foreign stock and bond holdings of all their clients that are U.S. residents, and are subject to penalty under law for noncompliance.[6]

The survey is the source for official U.S. data on cross-border portfolio investment.[7] It is designed to pick up all recorded U.S. resident portfolio holdings of foreign equities. The only portfolio investments missed by the survey are "uncountable" holdings – i.e., those that evade detection because the U.S. resident used a foreign custodian, provided a foreign home address, or instructed the custodian not to employ a U.S. sub-custodian. Federal Reserve cross-checks with non-U.S. data collectors suggest that the number of uncountable holdings is small.

Other data sources are necessarily more limited. For example, data on U.S. institutional investors' holdings as reported to the SEC on Form 13(f), and used by BBM, exclude holdings in securities that do not trade in U.S. markets, and in foreign securities that underlie ADRs. A small fraction of publicly traded firms domiciled outside of the United States actually trade in U.S. markets (3.5 percent in 1997, according

[6] Custodians are the main source of information, covering 97 percent of the market value of the securities in the 1997 survey. Institutional investors report in detail on their ownership of foreign securities only if they do not entrust the safekeeping of these securities to U.S.-resident custodians. If they do use U.S.-resident custodians, institutional investors report only the names of the custodians and the amounts entrusted.

[7] "Portfolio investments" exclude holdings for control purposes, defined to be individual holdings of 10 percent or more of shares outstanding. Excluding these large holdings is likely to have little impact in our sample because it is relatively uncommon for a single U.S. investor to hold more than 10 percent of a publicly traded foreign company. Griever, Lee, and Warnock [2001] provide a primer on the survey. Complete details of the 1997 survey, including forms, instructions, and data, are available from http://www.ustreas.gov/tic/fpis.html.

to the U.S. Treasury/Federal Reserve survey), and among those that do trade within U.S. borders, U.S. investors hold more than half of their ownership in the underlying security, not through ADRs. Thus, Form 13(f) filings cover only a small segment of the securities available to U.S. investors, and underestimate U.S. holdings in the firms covered in their sample. By simple comparison, 13(f) data appear to suggest that U.S. investors have holdings in only 5 percent of non-U.S. firms (see Table 2 of BBM), whereas our data registers U.S. ownership in over 70 percent of non-U.S. firms. An additional problem with the 13(f) data is that holdings of foreigners can be intermingled with U.S. holdings because the SEC permits (but does not encourage) institutions to consolidate their 13(f) holdings across subsidiaries, including foreign ones.

*2.2 Sample Selection*

We limit our investigation to U.S. holdings of non-U.S. companies tracked by Worldscope. This enables us to utilize the company financial and accounting information reported in Worldscope, and provides us with International Securities Identification Numbers (ISINs) for each of the company's outstanding securities. Obtaining the ISINs allows us to link more easily with other electronic databases, such as Datastream. We use the May 1999 release of Worldscope, which contains 1997 data on 13,445 non-U.S. companies domiciled in 52 different countries.

In our tests, we normalize firm-level U.S. holdings by measures of the market capitalization (market value of equity) of the company. Datastream, which provides the broadest international coverage of market price data, is our primary source for firm-level market capitalizations. When a value is missing in Datastream, we turn to reports from Morgan Stanley, which provide reliable market data for companies included in the MSCI All-country World index, or Worldscope, which provides December market capitalizations for those companies that complete their fiscal year at the calendar year-end. We also use Morgan Stanley and Worldscope to cross-check the Datastream numbers for recording errors. In total, we are able to calculate market capitalization figures for 12,236 of the original 13,445 Worldscope firms.

We define two different measures of firm-level U.S. investor holdings. The first measure is constructed as the ratio of dollar holdings in a stock to the firm's market capitalization, and is thus equivalent to the proportion of shares held by U.S. residents. Our second measure uses a different

denominator, an estimate of the stock's "market float," the market value of shares that are not closely held by insiders. Dahlquist, Pinkowitz, Stulz, and Williamson [2003] argue that such closely held shares are unlikely to be made available to outside investors, because insiders receive benefits from control that are not reflected in a stock's price. We calculate market float by scaling market capitalization down by the figure given in Worldscope's "closely held share" field, which reports the fraction of equity owned by corporate officers, directors and their family members, individual shareholders with more than 5 percent holdings, other corporations, and by the firm's own pension funds and trusts. However, we first adjust these Worldscope figures to exclude the value of depositary institution holdings, which are sometimes mistakenly counted in the closely held fields.[8] Because of missing data on insider holdings, we can calculate market float for only 8,528 of our original observations.

*2.3 Summary Statistics*

Table 1 reports the aggregate U.S. holdings share for firms in each of the 46 countries represented in our sample.[9] Even at the national level, U.S. holdings shares vary considerably. As of the end of 1997, U.S. investors owned nearly a quarter of the market capitalization of Argentine firms, and about a fifth of the market in Finland, Ireland, the Netherlands, Hungary, and Mexico.[10] Meanwhile, Americans held just 9 percent of the market capitalization for the 46 countries in aggregate, and less than 5 percent of Belgium, Greece, China, Colombia, and Taiwan. U.S. investor holdings also were relatively dispersed within the 46 countries, with non-zero stakes in 8,785 of the 12,236 stocks in the sample, ranging from very small firms to the world's largest non-U.S. companies.

Table 2 reports summary statistics for our market capitalization and market float samples. The

[8] Specifically, we exclude holdings by the Bank of New York, Morgan Guarantee Trust, and Citibank, because these shares are likely to be holdings for ADR programs, and the New Zealand Central Securities Depositary. There are other reasons to believe that the Worldscope measure of insider holdings contains measurement error. Worldscope coverage of the "closely held shares" field is uneven, and reporting requirements differ across countries. Moreover, it is unclear whether the classifications within Worldscope of what constitutes a closely held share conform well to theory on who gains private benefits from control and who would be willing to sell to a U.S. investor. For example, the measure includes holdings of large, unaffiliated blockholders.

[9] We exclude six countries with some Worldscope coverage but minimal U.S. holdings: Egypt, Jordan, Morocco, Slovakia, Sri Lanka, and Zimbabwe. Worldscope has 1997 data for a total of 42 firms from these countries.

[10] Countries that have a high share of U.S. ownership tend to have more cross-listed firms (Ahearne, Griever, and Warnock [2004]) and less pervasive insider holdings (Kho, Stulz, and Warnock [2006]).

Worldscope-based sample of 12,236 firms had an end-1997 market capitalization of $11,080 billion, representing more than 90 percent of the value of all non-U.S. equity (International Finance Corporation, [1998]). U.S. investors' $1,020 billion stake in these companies accounted for 88 percent of total U.S. foreign equity holdings and 9.2 percent of the market capitalization of the companies. On a market float-adjusted basis, U.S. investors held 13.5 percent of the Worldscope companies. As noted by Dahlquist, Pinkowitz, Stulz, and Williamson [2003], the market-float adjustment can account for part of the observed home bias in U.S. holdings.

Table 2 also breaks down the sample according to whether or not the sample firms are cross-listed on a U.S. exchange, defined to include both direct listings and ADRs listed on the New York Stock Exchange (NYSE), NASDAQ, or American Stock Exchange.[11] Of the 12,236 sample firms, 498 were cross-listed on a U.S. exchange at the end of 1997. U.S. investors held an (equal-weighted) average of 17.5 percent of the market capitalization (26.3 percent of market float) of these firms, compared to an average stake of just 2.9 percent (5.6 percent of market float) of the 11,738 foreign companies that were not cross-listed. This large difference in U.S. holdings of cross-listed and non cross-listed foreign firms forms the basis for what we term the "cross-listing" effect.

Among cross-listed firms, U.S. investors held the bulk of their holdings (11.1 percent of market capitalization) in the underlying security purchased in the foreign home market. This fact has an important implication. ADRs enable U.S. investors to forego concerns about trading in other currencies, dealing directly with foreign regulatory authorities, and potentially high execution costs on foreign stock markets. If investors were responding merely to the convenience of being able to trade these stocks in the United States we would expect most of the cross-listed holdings to be in the form of ADRs. In contrast, most U.S. holdings in cross-listed firms are in the underlying foreign security.

[11] An ADR is a traded financial claim backed by a set number of equity shares in the underlying company. ADRs are created when firm initiates a relationship with a broker that buys the firm's shares and instructs a U.S. financial institution, called a "depositary," to hold the shares in custody and issue negotiable securities backed by the shares, the "receipts," to an interested investor. Only "Level II" and "Level III" ADRs list and trade on one of the major U.S. stock exchanges.

The bottom of Table 2 includes information on U.S. ownership in foreign equities that trade as "Level 1" ADRs. These shares are traded in dollars in the United States, but over-the-counter. Because they are not listed on a major U.S. exchange, Level 1 ADRs are not required to reconcile financial statements with U.S. GAAP, or to disclose regularly with the SEC, and are not liable under most U.S. securities laws. For much of our analysis, we treat these firms as non cross-listed firms. U.S. investors do hold a greater proportion of shares in a Level 1 ADR-firm (8.1 percent of market capitalization, 14.6% of market float) than in the average foreign firm not traded in the United States, mostly in the form of the underlying foreign security. However, as discussed at the end of Section 4, most of the difference between the holdings of foreign companies with Level 1 ADRs and non U.S.-traded foreign companies can be explained by selection bias.[12]

## 3. Simultaneous model of the cross-listing and holdings decisions

To examine more closely the characteristics that make foreign stocks attractive to U.S. investors, we estimate a simultaneous system of three structural equations that separately model: (1) U.S. holdings in cross-listed firms, (2) U.S. holdings in non cross-listed firms, and (3) a foreign firm's decision to cross-list in the United States. We use the system to control for potential endogeneity problems that might bias the holdings estimates. For instance, estimates relating firm characteristics to U.S. holdings will be biased by selection if a firm's propensity to cross-list on a U.S. exchange is correlated with other characteristics of the firm that affect U.S. investors' holding decisions. Moreover, firms might cross-list in the United States for the specific purpose of increasing U.S. investor interest; thus the causation between cross-listing and U.S. holdings could run in both directions.

### *3.1 Modeling the holdings and cross-listing decisions*

We adapt the structural framework developed originally by Lee [1978] for a study of unionization and wages, which extends the Heckman [1979] selection-bias correction to a simultaneous system that

[12] Indeed, many Level 1 ADR programs have been initiated by U.S. investors or depository banks, not by the foreign companies themselves. Thus, it is not surprising that sample selection adjustments account for most of the increased holdings in the Level 1 ADRs.

allows feedback from bias-adjusted holdings equations to the cross-listing decision.

Conceptually, estimation begins with a model of U.S investor preferences for holding foreign equity:

$$H_i^L = \alpha_L + \mathbf{Z_i^L}\boldsymbol{\beta}_\mathbf{L} + \varepsilon_i^L \quad (1)$$

$$H_i^U = \alpha_U + \mathbf{Z_i^U}\boldsymbol{\beta}_\mathbf{U} + \varepsilon_i^U. \quad (2)$$

We separately model the holdings of cross-listed ($\mathbf{H_i^L}$) and non-cross listed stocks ($\mathbf{H_i^U}$) to recognize that decisions to hold these two types of stocks can be fundamentally different. This not only provides more flexibility in estimation, but also can help identify the structural parameters. Note that observations of $\mathbf{H_i^L}$ are $\mathbf{H_i^U}$ are truncated by selection since, at a given point in time, we can only observe a firm as cross-listed or not. That is, we cannot observe the counterfactual holdings in firm *i*. One way to think about our structural framework is that it fills in these gaps by estimating the counterfactual observations.

The instrument sets $\mathbf{Z_i^L}$ and $\mathbf{Z_i^U}$ contain firm- and country-level proxies for a variety of factors that could influence the willingness of U.S. investors to invest in a foreign firm. We divide the variables into three groups, and relate the groupings to prevailing theories of international investment.

First, U.S investors may want fundamental information about a foreign stock before deciding to purchase it. The ability to obtain information about a company will depend, among other things, on the accounting and disclosure practices of the company. Therefore, U.S. investors may favor companies that provide an accurate and timely accounting of their financial performance (Leuz and Verrecchia [2004]; BBM), and may be attracted to foreign stocks domiciled in countries with forthright accounting practices (Lang, Lins, and Miller [2003]).

To measure these effects, we first consider five proxies for information transparency. The first proxy is the logarithm of total (book) assets. Larger firms are generally believed to be more transparent than smaller firms, in part because they tend to get more coverage both from the press and from securities analysts. The second is a financial firm dummy. Financial firms hold assets that could be more difficult to

value than those of non-financial firms, are subject to more regulatory, rather than public disclosure, and may view public information disclosures as potentially risky to their business.[13] Third, we add a Canada dummy. Institutional similarities and ties within North America may make Canadian firms more transparent to U.S. investors. Fourth, we include a MSCI member dummy. MSCI index members are selected on the basis of liquidity, size, and market representation. Illiquidity can reflect asymmetric information (e.g., Easley and O'Hara [2004]) that would put U.S. investors at a disadvantage. Our fifth proxy is an English home language dummy. U.S. investors may find it easier to process information from companies that are guaranteed to disclose information in English.

As more direct measures of the ability to obtain information about a company, we include two measures of accounting quality. The first measure is the national accounting quality index compiled by the Center for Financial Analysis and Research (CIFAR). As reported by Bushman, Piotroski, and Smith [2004], the index averages across firms within a given country the number of items, out of a possible maximum of 90, that are included as part of a firm's financial statements. The second measure is a firm-level accounting quality index, constructed as the sum of four indicator criteria: The first criterion takes the value of one if a company uses a Big Six auditor; the second criterion equals one if the company received a clean audit report. The third takes a value of one if the firm used international accounting standards or US GAAP. And the fourth equals one if the firm reported consolidated statements. This variable measures variation in firm-specific accounting quality not picked up by the national accounting quality variable.

Second, U.S. investors may care about the safety of their investment in the hands of managers who operate outside U.S. borders. LaPorta, Lopez-de-Silanes, Shleifer, and Vishny [1999, 2002] document substantial cross-country variation in how well legal systems protect outside shareholders from expropriation by firm insiders. Durnev and Kim [2005], among others, show that the quality of corporate governance within a country can vary greatly across firms. Thus, U.S. investors could tilt their investments toward countries with strong legal protections of minority investors and seek out firms with a reputation for good corporate governance. We include three measures that capture governance/legality issues. The first is

[13] For evidence on the opaqueness of financial firms, see Morgan [2002].

the proportion of shares held by insiders. Investors may shy away from firms that are closely held, fearing the power of insiders to expropriate firm resources at the expense of minority shareholders.[14] The second is a dummy for dividend-paying firms. A company's dividend-paying record can be viewed as a commitment device, with the willingness to dispense cash signaling a commitment not to expropriate funds from minority shareholders.[15] The third is the country's shareholder rights index. U.S. investors may choose to underweight firms from markets with weak protections of minority shareholders.[16]

Third, U.S. investors in foreign stocks may gravitate toward firms with products that are familiar. Huberman [2001], Barber and Odean [2003], Ackert, Church, Tomkins, and Zhang [2003], Kaniel, Li, and Starks [2003], and Grullon, Kanatas, and Weston [2004] present evidence suggesting that investor purchases of equity can depend on simple name recognition arising through product endorsements and branding, advertising, news coverage, or even abnormal trading volume. These papers attribute investment in familiar stocks to a behavioral motivation that is distinct from seeking better information about stock fundamentals.[17] To proxy for familiarity we use foreign sales (as a proportion of total sales). Companies that do substantial foreign business might be more recognizable to U.S. investors through advertising, the media, and direct consumer purchases.

Some of our variables can serve dual roles. For example, size and the MSCI and Canada dummies, which we present as information variables, also proxy for familiarity. In addition, we also include some more general control variables. We include the firm's market-to-book value. We take low market value to be a rough indicator of financial distress, which tends to increase conflicts of interests among stakeholders in the firm in a way that might be particularly problematic for cross-border minority investors. We also

[14] For evidence demonstrating that outside investors avoid ownership in closely held companies, see La Porta, Lopez-de-Silanes, Shleifer, and Vishny [1999], Johnson, La Porta, Lopez-de-Silanes, and Shleifer [2000], and Leuz, Lins, and Warnock [2006].
[15] See Faccio, Lang, and Young [2001], Kalcheva and Lins [2004], Pinkowitz, Stulz, and Williamson [2006], Easterbrook [1984], and Jensen [1986].
[16] See La Porta, Lopez-de-Silanes, Shleifer, and Vishny [1998].
[17] However, the term "familiar" has also been used to refer to how well-informed investors are about particular stocks. Merton's [1987] paper on expanding investor base required that new investors "learn" the first two moments of a stock's return. Moreover, Coval and Moskowitz [1999, 2001] and Ivkovic and Weisbenner [2005] study geographic preferences for holding stock and argue that investors "buy local" because they are better informed about companies that are close to where they live. In this context, familiarity implies that rational investors select stocks for which they have good information.

include a country's dividend tax withholding rate faced by U.S. investors. Withholding taxes can cause U.S. investors to face higher tax rates on dividends originating from a given foreign country than on U.S. stock dividends. This would make stocks from the foreign country less attractive to U.S. investors, particularly if other potential investors in stocks from the two countries did not face the same tax rate differential (otherwise, prices could adjust to equilibrate after-tax expected returns). Often a U.S. investor can obtain a tax credit that fully offsets a dividend tax that has been withheld by a foreign government. However, U.S. pension funds are not taxed directly on dividends, so tax credits are of no use to them, and thus taxes charged on foreign dividends generally will represent a differential between the foreign and domestic dividend tax rates that U.S. pensions face (the domestic rate is zero). Thus at least one important investor group is clearly affected by dividend withholding tax rates.

The second part of the simultaneous system involves a firm's decision to cross-list on a U.S. exchange. We motivate the decision by considering the potential benefits and costs of cross-listing. Let $X_i^*$ represent the net benefits that flow to firm *i* from cross-listing on a U.S exchange. We assume that these benefits can be described by the following relation,

$$X_i^* = \alpha_x + \gamma_0\left[H_i^L - H_i^U\right] + \gamma_1 H_i^U + Z_i^X\beta_x - \varepsilon_i^X, \qquad (3)$$

where $H_i^L$ and $H_i^U$ are the endogenously determined proportion of firm *i*'s equity that would be held by U.S. investors if the firm were cross-listed (L) in the United States or not cross-listed (U), respectively. The difference $H_i^L - H_i^U$ models the anticipated impact of listing on U.S. holdings. It is included in (3) to allow for foreign firms to cross-list in the United States precisely because it attracts greater U.S. investor interest. $H_i^U$ also enters equation (3) independently to allow the *level* of U.S. holdings prior to cross-listing to affect a firm's decision to cross-list. We posit that firms with large pre-existing U.S. shareholdings could cross-list on a U.S. exchange to reduce trading costs for their shareholder base.

The vector $\mathbf{Z}_i^X$ contains other firm- and country-specific variables that are associated with benefits and costs of cross-listing, but that are taken to be exogenous. There are both direct and indirect costs associated with listing in the United States that could make firms reluctant to cross-list. Most cross-listed

firms face a host of direct registration, disclosure, and compliance costs. They must register with the U.S. Securities and Exchange Commission (SEC) and submit periodic filings that are in English and include financial statements reconciled to U.S. generally accepted accounting principles (GAAP). They must meet the listing requirements of the U.S. exchange, which are often stricter than those in the firms' home country, and pay both listing fees to the exchange and filing fees to the SEC. Firms that cross-list to raise new capital must also register their securities under the SEC 1933 Securities Act and the 1934 Exchange Act. Indirect costs include the commitments that cross-listed firms make to abide by U.S. regulations and law. Firms that violate exchange regulations risk fines and the threat of delisting. Those that violate SEC regulations face potential shareholder lawsuits and civil or criminal penalties under U.S. law. Closely held firms may be especially reluctant to cross-list if the increased level of disclosure and legal oversight gives more power to minority shareholders.

The benefits of cross-listing varies across firms and can include product market considerations (to the extent that listing on the NYSE can help make a foreign company a household name in the United States), employee compensation (to the extent that it includes grants of options or stock), and takeover strategy (where a cross-listed stock can serve as a takeover currency). One potential benefit that both practitioners and theorists cite as a reason for cross-listing is to increase the set of investors that can, at low cost, access information and trade shares in the firm. That is, cross-listing reduces "receiver" costs associated with expanding the shareholder base (Merton, [1987]).[18] This in turn may improve risk sharing, pricing, and the liquidity of a firm's stock. Accordingly, firms seeking to expand their shareholder base through increased U.S. ownership might have the strongest incentive to cross-list. Firms may also list in the U.S. to reduce institutional frictions associated with maintaining their existing investor base. For example, if a firm already has U.S. investors, it may cross-list to make it easier for those investors to manage their

[18] Lang, Lins, and Miller [2003] argue that foreign firms may cross-list simply to expand their "shareholder base", the set of investors available to purchase a given firms' shares. See also Merton [1987], Miller [1999], Foerster and Karolyi [1999], Karolyi and Stulz [2003], and Doidge, Karolyi, and Stulz [2004]. The argument is also popular among U.S. practitioners who encourage foreign clients to cross list. See Fanto and Karmel [1997], and the ADR websites at JPMorgan (www.adr.com/research/about_types.html) and the Bank of New York (www.adrbny.com).

stock portfolios. But the other considerations (product market, compensation, takeover currency) might be more important: Any consideration that involves expanding the shareholder base must be weighed against that of relinquishing any private benefits of control.

Some of the variables that impact holdings decisions are already included in our system because they also likely influence the cross-listing decision. The proportion of shares held by insiders proxies for the cost of relinquishing private control benefits through increased disclosure and monitoring associated with cross-listing (Doidge, Karolyi, and Stulz [2004]). Firm size will be important for the listing decision if there are economies of scale in the direct costs of listing, including regulatory compliance and accounting disclosure. We include the financial firm dummy for two reasons. First, the direct costs of cross-listing for financial firms may be higher, because accounting principles for financial instruments and contracts tend to be among the most complicated and contentious. Second, indirect costs may also be greater, if financial firms are wary of the impact of public information disclosures on their businesses, and so they might be less eager to cross-list. We include the Canada dummy because cross-listing should be less costly for Canadian firms because Canadian firms enjoy an exemption from most SEC reporting requirements.[19] Finally, we posit that firms from countries with weak accounting standards will find it more costly to prepare financial statements in accordance with U.S. GAAP.

In addition, we include two variables that are unique to the cross-listing specification: home-country trading volume/GDP (because the benefits from cross-listing might be particularly high for firms that quickly "outgrow" their underdeveloped home equity markets) and a Germanic language dummy (because the direct costs of complying with U.S. regulations may be lower for managers who are more comfortable with the English language).

*3.2 Estimating the model*

We do not observe $X_i^*$ in equation (3). Instead, we observe realizations of the indicator variable $X_i$,

[19] Under the Multi-Jurisdictional Disclosure System (MJDS) agreement between the SEC and the Canadian Securities Administration, Canadian firms can cross-list on a U.S. exchange without conforming to U.S. GAAP and with only minimal reporting to the SEC.

$$X_i = 0 \text{ if } X_i^* < 0 \tag{4}$$

$$X_i = 1 \text{ if } X_i^* \geq 0. \tag{5}$$

$X_i$ equals one when firm *i* is cross-listed on a U.S. exchange, and zero otherwise. Note that equations (3), (4), and (5), coupled with an assumption that the error term $\varepsilon_i^X$ is normally distributed, imply that the listing decision can be estimated using a probit model.

Taking into account selectivity adjustments, U.S investor preferences for holding cross-listed and non cross-listed stocks become:

$$H_i^L = \alpha_L + Z_i^L \beta_L - \frac{\phi(\hat{\alpha}_R + Z_i^R \hat{\beta}_R)}{\Phi(\hat{\alpha}_R + Z_i^R \hat{\beta}_R)} \lambda_L + \eta_i^L \tag{6}$$

and

$$H_i^U = \alpha_U + Z_i^U \beta_U + \frac{\phi(\hat{\alpha}_R + Z_i^R \hat{\beta}_R)}{1 - \Phi(\hat{\alpha}_R + Z_i^R \hat{\beta}_R)} \lambda_U + \eta_i^U. \tag{7}$$

Now $H_i^L$ and $H_i^U$ take on the additional interpretation of being the estimated holdings in firm *i* when the firm is cross-listed and when it is not, while ϕ and Φ denote the probability density and cumulative density functions of the standard normal distribution. Equations (3), (6), and (7) now constitute a system of equations which can be estimated with maximum likelihood techniques. The estimation procedure is discussed in the appendix. We note here only that the coefficients on λ in (6) and (7) are the inverse Mills ratio, which forms the basis for standard corrections for selectivity bias when inclusion in an estimation sample is contingent on a discrete outcome (see Heckman [1979] or Maddala [1983]), and a similar but less frequently used correction for selectivity bias for the non-selected observations.

Importantly, the estimates $\hat{\alpha}_L, \hat{\beta}_L$ and $\hat{\alpha}_U, \hat{\beta}_U$ from (6) and (7) are used to calculate fitted values $\hat{H}_i^L$ and $\hat{H}_i^U$, which can then be plugged into the structural probit specification, (3). Because $H_i^L$ and $H_i^U$ are scaled (by market capitalization or market float) to only take on values between zero and one, we work off of transformations of equations (6) and (7). These transformations, along with other details of the estimation process, are described in the appendix.

Identification of the model parameters depends on our ability to find at least some variables that directly determine one of the two endogenous variables, but not the other. We hypothesize that the two unique variables in the cross-listing equation, home-country trading volume/GDP and the Germanic language dummy importance of a stock market within a country, uniquely identify the cross-listing decision. A firm's trading volume in its home market, measured relative to the country's size, should not influence U.S. investor preferences for holding stocks from that country. However, a company operating within a country may "outgrow" its home market if that market is relatively small, meaning that the size or activity of the home market could directly influence a firm's incentives to cross-list. A firm from a Germanic-language country should find it easier to produce documents in English, but U.S. investors should show no strong distinct preference for investing in these firms.

Conversely, a country's dividend tax policy, or whether or not it has a tax treaty with the United States, should not influence a firm's decision to list here, beyond the implied impact that the policy would have on holdings. Thus, excluding the tax treaty withholding rate from the listing equation, aids in separately identifying the holdings equations.

*3.2 Results from the model*

Table 4 reports estimates of our structural model of cross-listing and U.S. holdings.[20] The reported estimates are scaled to reflect the median percentage impact on the dependent variable of a one-unit change in the explanatory variable (the rescaling procedure is described in the appendix). In the baseline specification reported in Panel A, holdings are scaled by market capitalization. Panel B reports the results when holdings are scaled by market float. For both of these panels, we estimate the simultaneous model using the cross-section of 8,067 stocks for which data on all instruments are available. Panel C of Table 4 reports results for a specification that is similar to the baseline, except that it includes as a variable the

[20] To make our results more readily interpretable, we report rescaled functions of the estimates. Specifically, for the coefficients on instruments in the listing decision equation, we calculate the marginal effect of a one-unit change in the instrument on the percentage point probability of cross-listing. Similarly, the coefficients in the holdings equations are scaled to reflect the marginal effect of a change in the instrument on the holdings share of U.S. investors (measured in percentage points). See the appendix for complete details on transformations and on the estimation technique.

proportion of a firm's sales that are foreign. Because this variable is missing from Worldscope in many cases, including for most of the financial firms, the results in Panel C exclude these missing cases and omit the few remaining financial firms. A total of 5,155 usable observations remain for estimation in Panel C.

*3.2.1 What drives holdings in firms that are not cross-listed?*

Results for the holdings equations (4) and (5) appear in the middle columns, starting with the estimates from the equation of firms that are not cross-listed. Among firms that are not cross-listed, most of the explanatory variables are significant, often with signs that accord with intuition. U.S investors prefer firms that are larger, non-financial, included in the MSCI World index, have high market-to-book ratios, and pay dividends. They are also attracted to firms from countries that use English as an official language, particularly Canadian firms, and firms with low dividend tax withholding rates. The latter result indicates that an additional reason that a home bias might exist is that U.S. investors shy away from international investments when cross-border dividend withholding rates are high.

A number of the non cross-listed holdings estimates indicate that U.S. investors are sensitive to the amount and quality of information available on foreign-traded firms. Most prominently, the positive and statistically significant signs on the accounting variables, measured at both the firm and country level, suggest that U.S. investors value high-quality disclosure when choosing a foreign firm in which to invest. These findings are consistent with BBM, who show that U.S. investment is higher in firms with greater conformity to U.S. GAAP. Our estimates in Panel A of Table 4 suggest that an increase of 20 points in a country's national accounting quality index (CIFAR score), a move on the scale equivalent from going from an Austrian firm to a Swedish firm, increases U.S. investment by 0.75 percent of market capitalization, holding all else constant. Moving from a value of 2 to 4 on the firm-level accounting quality scale increases U.S. investment by a similar account. Given that U.S. investment averages 3 percent of the market capitalization of non-listed firms, these estimates are economically significant.

Other findings are also consistent with the importance of information quality. The size of the firm could proxy for information quality because efficiencies in information production, high regulatory oversight, and frequent press coverage are likely to increase the amount of reliable information available on

large firms. Information on companies in English is more readily accessible to the English-speaking U.S. public, making them more transparent to U.S. investors.[21] Finally, the tendency to avoid foreign financial firms is consistent with a preference for transparency, since evidence suggests that financial firms are less transparent than others (Morgan [2002]).

Some of our estimated coefficients are also consistent with the idea that U.S. investors tend to favor familiar foreign stocks. Perhaps the most convincing evidence appears in Panel C, where we find larger U.S. holdings for companies with higher foreign sales. However, the economic significance of the estimate is small, implying that U.S investors holds 0.009 percentage points (i.e., $0.0018 \times 0.5$) more in a firm with half of its sales abroad, compared with a firm with no foreign sales.

One puzzling finding is the negative association between holdings and the level of shareholder rights protection provided by a firm's home country. This result holds whether we use the LaPorta, Lopez-de-Silanes, Shleifer, and Vishny [1998] index of anti-director rights (as reported), or country-level estimates of the blockholder premium in share prices from Dyck and Zingales [2004] (not reported). The willingness of American investors to undertake relatively large positions in countries in which minority shareholders are vulnerable suggests a relative lack of concern about institutional enforcement of their property rights, at least at the time of the 1997 survey.

The negative sign on the proportion of shares held by insiders is difficult to interpret. It is consistent with both a relatively mechanical effect by which closely-held insider shares reduce the supply of available float, and with the idea that investors avoid firms in which resources are more likely to be diverted to the private benefit of the insiders (Leuz, Lins, and Warnock [2006]). One way to separate the two effects—the supply effect and the corporate governance effect—would be to include the insider holdings variable in the float-adjusted specifications in Panel B. But doing so induces measurement error

[21] Our English-language dummy variable could also capture cross-country institutional differences associated with legal origin because the legal system of most English-speaking countries grew out of English common law (see LaPorta, Lopez-de-Silanes, Shleifer, and Vishny [1998] and Rajan and Zingales [2003]).

with a positive bias, rendering an estimate that is difficult to interpret.[22] This bias, along with the fact that our insider holdings variable is a blunt measure that includes the holdings of large, unaffiliated shareholders, leads us to exclude insider holdings from the right-hand-side variables in Panel B.

Finally, the selectivity correction variable most often enters with a statistically insignificant estimate. This low significance does not imply that the holdings estimates are free from selection bias. Indeed, as documented in Section 4, selection bias can explain 3 to 5 percentage points of the observed ownership in cross-listed firms. The lack of significance does suggest that our simultaneous model has low power to detect biases associated with unobserved correlation between the holdings and cross-listing decisions. When the selectivity correction is significant, as in Panel B, the negative sign implies that the set of firms that are unlisted have unobservable characteristics that make their stock less likely to be held by U.S. investors. In other words, holding all else constant, the mean holdings of the unlisted sample would be higher if the sample were drawn randomly from a group of firms with the same observable characteristics.

*3.2.2 The cross-listing decision and U.S. holdings*

In accordance with our intuition about factors that reduce the costs of cross-listing, the estimates in Panels A - C reveal that firms are more likely to cross-list on a U.S. exchange if they are large, have better home-country accounting standards, or are domiciled in Canada. The two variables that uniquely identify the listing equation enter strongly with estimated signs that are in line with our expectations. Turning to the impact of holdings on the cross-listing decision, our evidence is mixed. The Panel B (float-adjusted) estimates imply that both the expected increase in U.S. investment from cross-listing and the level of U.S. holdings prior to listing can positively influence the cross-listing probability. These results are consistent

---

[22] To see this, let $\hat{F}_i$ represent our market-float adjusted holdings, $\hat{U}_i$ represent the market capitalization (unadjusted) holdings, and $\hat{I}_i$ be our measurement of the proportion of shares held by insiders. Then, by definition,

$$\hat{F}_i = \frac{\hat{U}_i}{1-\hat{I}_i}.$$

Suppose that the insider stake is measured with some error so that $\hat{I}_i = I_i + \eta_i$, where $I_i$ is the insiders' true stake and $\eta_i$ is some white-noise error. Then, $\text{cov}(\hat{F}_i - F_i, \hat{I}_i - I_i) > 0$. In other words, measurement error in the proportion of insider holdings imparts a positive bias on the coefficient estimate in the holdings model when scaled by market float. Intuitively, a positive measurement error shock increase the right-hand-side variable (measured proportion of shares held by insiders) as it also increases the dependent variable (holdings, by reducing the denominator).

with the idea that firms cross-list to both expand their investor base and service their existing U.S. investor base. But the statistical certainty of the positive sign is more tenuous for the estimates in Panels A and C, which creates some doubt about the robustness of the results. To some extent, the imprecision in the estimates arise because of uncertainty about ($\hat{H}^{L}$), given that the cross-listed holdings equation (4) is estimated with relatively few observations.

Only a few estimates are significant in the listed holdings equation (4), and our adjusted $R^2$ ranges from 5 to 15 percent. This suggests that U.S. investors have relatively indistinct preferences among cross-listed firms; among these firms the most important attribute is that they have cross-listed. Only the proportion of shares held by insiders, which mainly captures an arithmetic supply effect on the denominator of the U.S. holdings share, is significantly different from zero at the 5 percent level in the baseline specification. Across the other specifications, U.S. investors appear to shy away from financial firms and favor high market-to-book firms and firms with extensive foreign sales, even after they have cross-listed.

## 4. The Cross-Listing Effect

The remainder of the paper has two goals. First, we estimate the average effect of cross-listing on U.S. shareholdings, taking account of the fact that the cross-listing decision represents an endogenous choice that cannot be assumed to be independent of investors' portfolio preferences. Second, we explore how the cross-listing effect varies across firms across different types, so that we can make inferences about why cross-listing matters. Because the association between cross-listing and U.S. holdings is so strong, pinning down the underlying causes of this relationship should offer significant insight into the ultimate sources of home bias in investor portfolios.

### *4.1 Methodologies to measure the cross-listing effect*

The cross-listing effect cannot be accurately computed using simple comparisons between average U.S. holdings of cross-listed firms and non cross-listed firms, because such comparisons are likely to overstate the magnitude of the cross-listing effect because of selection bias. Selection bias will exist if, as is

likely, a firm's propensity to cross-list on a U.S. exchange is correlated with other characteristics of the firm that affect U.S. investors' holding decisions. In particular, firms that cross-list in the United States may tend to be the types that U.S. investors would hold anyway, whether they cross-listed or not.

Our goal in correctly measuring the cross-listing effect is to first estimate the unobservable counterfactual of what U.S. holdings would have been in cross-listed firms had they not cross-listed. In this case, the average cross-listing effect is an estimate of

$$E(H_i^L \mid X = 1) - E(H_i^L \mid X = 0), \qquad (8)$$

where X is an indicator variable set to one when a firm has cross-listed on a U.S. exchange, $E(H_i^L \mid X = 1)$ is the expected level of U.S. holdings in cross-listed firm *i* conditional on it being listed, and $E(H_i^L \mid X = 0)$ is the expected level of holdings in cross-listed firm *i* if it had not cross-listed.[23] Statisticians refer to equation (8) as a "treatment effect" estimator because it measures the expected effect of treatment X on the unit *i* drawn from some population.

Corrections for selection bias are themselves subject to specification error (Larcker and Rusticus [2005]; Heckman, Ichimura, Smith, and Todd [1998]; Lalonde [1986]). Therefore, we incorporate three different estimators from the labor econometrics literature to robustly measure the average cross-listing effect. These estimators also generate firm-specific estimates of the cross-listing effect, which can then be used for more in-depth analysis.

The first estimator is the Heckman [1979]-like estimator from our structural model from Section 3. After estimating that model, we estimate $E(H_i^L \mid X = 0)$ by inserting cross-listed firm observations into the estimated non cross-listed holdings equation (7) and then averaging over the resulting fitted holdings.

Our second estimator uses the propensity-score method of matching, also termed "p-matching," originally developed by Rosenbaum and Rubin [1983].[24] P-matching uses fitted cross-listing probabilities ("propensity scores") generated from estimates of equation (3) to match each cross-listed firm with a non

[23] One could also estimate the listing impact from the non cross-listed firms, $E(H_U|X=1) - E(H_U|X=0)$, or from both cross-listed and non cross-listed firms to generate an unconditional listing impact, $E(H|X=1) - E(H|X=0)$. Heckman, Ichimura, Smith, and Todd [1998] provide a nice overview of issues relating to the different measures.

[24] See Imbens [2004] and Stuart [2004] for recent reviews of matching applications to treatment effect estimators.

cross-listed firm.[25] The idea is that the holdings of p-matched non cross-listed firms are likely to be similar to what a listed firm's holdings would have been if unlisted, so the average holdings of p-matched firms can be used to estimate $E(H_i^L \mid X = 0)$. The p-matching estimator requires no explicit model of holdings, which reduces the risk of specification error (Drake [1993]; Dehejia and Wahba [2002]; and Zhao [2004]). The estimator has also been shown to outperform the Heckman [1979] correction in experimental studies of selection bias (Glazerman, Levy, and Myers [2004]). One drawback to the p-matching estimator is that it does not account for unobserved correlation between the holdings and cross-listing decisions.

We generate our third estimate of the average cross-listing effect using the "difference-in-differences" estimator (Heckman and Robb [1985]; Heckman, LaLonde, and Smith [1999]). This estimator requires holdings observations on cross-listed firms prior to their cross-listing. For this, we draw upon U.S. holdings data from the earlier March 31, 1994 survey. The difference-in-differences estimator compares the change in holdings of a firm that was not cross-listed in 1994 but cross-listed by 1997 to firms that remained non cross-listed between 1994 and 1997. That is, the cross-listing effect is given by

$$E(H_i^L \mid X = 1) - E(H_i^L \mid X = 0) = (\overline{H}_i^{L,1997} - \overline{H}_i^{U,1994}) - (\overline{H}_j^{U,1997} - \overline{H}_j^{U,1994}), \qquad (9)$$

where *i* indexes a firm that cross-lists between the 1994 and 1997 surveys, *j* indexes a firm that remains non cross-listed in both surveys, and bars over the variables reflect sample means across the *i* and *j* categories. The difference-in-differences estimator incorporates many of the advantages of the p-matching estimator. Moreover, unlike the p-matching estimator, the difference-in-differences estimator accounts for unobservable components of selection bias, assuming that the characteristics of a type-*i* firm do not change in a way that is left uncontrolled by the type-*j* firms.[26] For our application, the key drawback of the difference-in-differences estimator is that it relies on a relatively narrow subset of firms (129) that were

[25] The asymmetry in our data makes p-matching a particularly attractive method because we have a large set of firms from which to select a match (roughly 30 non cross-listed firms for each of our cross-listed firms).
[26] Heckman, Ichimura, Todd, and Smith [1998] provide experimental evidence that difference-in-differences estimators outperform both standard Heckman [1979] corrections and p-matching estimators.

traded only in their home market in 1994, but cross-listed by 1997.[27]

*4.2 The average cross-listing effect*

Estimates of the average cross-listing effect are summarized in Table 5. Requiring a complete set of explanatory variables for the Heckman [1979]-based and p-matching estimators reduces our sample to 8,067 firms, 279 of which cross-listed on a U.S. exchange. As reported in row 1 of Table 5, at the end of 1997 U.S. investors held an average of 16.4 percent of the market capitalization of these 279 cross-listed firms, an average that is slightly less than for the somewhat larger sample in Table 2. Accordingly, for our Heckman-based and p-matching (cross-sectoinal) estimates of the average cross-listing effect, we use 16.4 percent as our estimate of $E(H_i^L \mid X = 1)$.

Shown in row 2 of Table 5, the Heckman [1979]-based estimate of $E(H_i^L \mid X = 0)$ is 5.6 percent of market capitalization. Consistent with selection-bias intuition, the estimate implies that U.S. investors would have held a larger mean share of these firms had they not cross-listed than the 2.9 percent average holding in firms that were not actually cross-listed (Table 2). Nonetheless, the estimate implies a statistically significant, and economically large, average cross-listing effect of 10.8 percent of market capitalization (14.7 percent in terms of a firm's measured float).[28] In other words, the Heckman [1979]-corrected estimates imply that U.S. holdings in a typical cross-listed stock are 10.8 percentage points higher than they would be without the U.S. listing.

The p-matching and difference-in-differences methodologies produce results that are close to the Heckman [1979]-based estimates. As shown in row 4 of Table 5, p-matching produces an estimate of $E(H_i^L \mid X = 0)$ equal to 6.4 percent of market capitalization (9.0 percent of market float), which is higher than the corresponding Heckman [1979] estimate, but which still implies a statistically significant listing effect equivalent to 10.0 percent of market capitalization (16.3 percent of market float). The bottom panel of Table 5 reports U.S. holdings of firms in March 1994 that were not cross-listed but that cross-listed by

[27] Because the sample size would be reduced to an even greater extent by requiring insider holdings information, we do not report difference-in-differences estimates using the market float measure.

[28] The standard error for the listing effect estimate is calculated as the observation-weighted standard deviation of the 279 paired differences.

December 1997, amounting to 8.6 percent of market capitalization for the 132 cases in which we had holdings data for the earlier period. Adding the 0.6 percentage increase in the holdings of non cross-listed firms over the period 1994-1997 yields our highest estimate of $E(H_i^L \mid X = 0)$ -- 9.2 percent of market capitalization. Nonetheless, with U.S. investors holding 17.1 percent of these firms by the end of 1997, this still implies an average cross-listing effect of 7.9 percent. [29] Overall, the three techniques estimate the average cross-listing effect to range from 8 to 11 percent.

In results not reported in the tables, we also estimate the average difference between U.S. holdings in companies with U.S. Level 1 ADRs and foreign companies not trading in the United States, analogous to the average cross-listing effect. Recall from Table 2 that U.S. investors held 8.1 percent of the market capitalization of Level 1 ADR-firms. According to the selection-bias estimators, U.S. investors would have held between 5 and 6 percent of the shares in these firms anyway, implying a small "Level 1" effect of 2 to 3 percent of market capitalization. Thus, the greater part of the average cross-listing effect derives from benefits associated with the exchange listing itself.

*4.3 Determinants of the cross-listing effect.*

We conjecture that firms experiencing the largest cross-listing effect are those for which cross-listing most sharply reduces frictions to investment. If theories linking the importance of cross-listing to improved information flow, protection under U.S. laws, and increased familiarity are to have some descriptive power, then the largest cross-listing effect should be experienced by firms that (i) have weak accounting standards prior to cross-listing, or are financially opaque, (ii) poorly protect outside investors, or are from countries with weak investor rights protections, and (iii) have low name-recognition in the United States. To explore these implications, we regress firm-level measures of the cross-listing effect on our measures of information quality, accounting quality, investor protection, and familiarity.

[29] In our sample, 23 of the 129 firms that cross-listed between the two survey dates also undertook seasoned equity offerings (SEOs). It is plausible that the combination of a SEO and cross-listing has different implications for U.S. holdings than a cross-listing alone, particularly if the issue targets U.S. investors. However, when we compare the change in U.S. holdings for cross-listing stocks with and without these SEOs, we find no statistically significant difference. Accordingly, we do not treat cross-listing firms that raise public equity differently from other cross-listing firms. For further evidence on the capital-raising behavior of cross-listed firms, see Reese and Weisbach [2002] and Henderson, Jegadeesh, and Weisbach [2004].

Our first set of regressions uses cross-listing estimates generated by the Heckman [1979] model. The first two columns in Table 6, under the label "Heckman [1979]-based", report estimates of the marginal impact of each instrument on the cross-listing effect. These figures are calculated as the difference in the estimates ($\hat{\beta}_L - \hat{\beta}_U$) from equations (1) and (2).[30] Estimated p-values of a test that the cross-listed and non cross-listed parameters are the same (i.e., their difference is zero) are from bootstrapped distributions and are reported in parentheses below the estimates. For the three variables—national accounting quality index, firm-level accounting quality index, and English home language home dummy—that are included in the non cross-listed holdings equation but excluded from the cross-listed holdings, we report the bootstrapped p-value and the negative of the estimate from the non cross-listed equation (i.e., we assume the coefficient on the excluded variables is the scalar zero).

The third and fourth columns of Table 6 report the results from regressions using the difference-in-differences setup to generate firm-level estimates of the cross-listing effect. Specifically, we regress the 1994 to 1997 change in holdings of stocks that were not cross-listed in 1994 on a cross-listing dummy, its interactions with instruments measured as of 1994 and 1997, and the change in the value of instruments over the 1994 to 1997 period,

$$\Delta H_i = \alpha_D + X_i \gamma_D + X_i \mathbf{Z_i^{1994}} \boldsymbol{\beta_D} + \left(\mathbf{Z_i^{1997}} - \mathbf{Z_i^{1994}}\right)\theta_D + \mathbf{Z_i^{1994}} \varphi_D + \varepsilon_i^D , \qquad (10)$$

where $X_i$ equals one if the firm cross-lists in 1997, and zero otherwise. We include changes and first-period levels of the instruments in the regression as controls for changes in firm characteristics and in U.S. investor preferences, respectively. For brevity, we report only the interaction estimates ($\boldsymbol{\beta_D}$) in Table 6 which, like the marginal sensitivity estimates from the structural model, identify the marginal influence of the instruments on the cross-listing effect.

Data peculiarities handicap our chances of finding statistically strong relations in the cross-section. The parameters of the structural cross-listed holdings equation are measured imprecisely (see Table 4), making it difficult to confidently distinguish the signs on the conditional cross-listing effects in the first two

[30] The estimates of $\beta_L$ and $\beta u$ are separately reported in Table 4.

columns. Moreover, 1994 firm-level data requirements further reduce the number of cross-listed firms available for analysis in the third and fourth columns of the table.

Nonetheless, several interesting patterns emerge in Table 6. First and foremost, the results are consistent with the notion that improvement in the availability and quality of value-relevant information about a firm is a key aspect of cross-listing in U.S. markets. In particular, we obtain negative and statistically significant coefficient estimates for the firm-level accounting quality index in our difference-in-differences specifications, implying that improved accounting practices linked to cross-listing spurs U.S. investment in firms with previously weak accounting standards. Our model-based estimates also imply that opacity arising from either weak national accounting standards or uninformative disclosure choices at the firm level is a deterrent to U.S. investment in foreign stocks that are not cross-listed.

Further evidence for the importance of transparency comes in the smaller difference-in-differences estimate of the listing effect for Canadian firms. Because Canadian firms are not required to reconcile to U.S. GAAP or increase disclosures as much upon cross-listing, cross-listing should have less impact on U.S. investors' willingness to hold Canadian stocks. We also find U.S. holdings react less to cross-listing by firms from other English-speaking countries, for which information in English is likely more readily available at low cost. One further bit of evidence favoring an information explanation is the reduced listing effect for the more liquid stocks that are included in the MSCI World index. To the extent that illiquidity reflects asymmetric information between company insiders and other potential traders, as in the models of Diamond and Verrecchia [1991] and Easley and O'Hara [2004], the enhanced disclosure requirements associated with cross-listing will tend to matter more for less liquid stocks.

Second, we do not find that U.S. investors respond to the enhanced protections of U.S. securities laws in the manner that has been suggested by some proponents of the investor-protection hypothesis. In particular, the positive coefficients on the shareholder rights index in the difference-in-differences exercise indicate that, all else equal, cross-listing has a smaller impact on U.S. investors' holdings for firms from countries with weaker shareholder protection. Our result here does *not* imply that U.S. investors fail to value shareholder protection provided by other countries' legal systems, but is consistent with cross-listing

*complementing* such legal rights. In fact, to the extent that cross-listing in the United States makes a firm more transparent, legal protections provided to minority shareholders in the home country may become more effective. (Furthermore, the disclosure requirements accompanying a U.S. listing typically include information about home-country legal risks that may leave some U.S. investors better informed about their rights.) What our results *do* suggest is that cross-listing in the United States is not a substitute for adequate protection of minority shareholders under the home-country legal system.

Finally, the results in Table 6 provide relatively little support for the idea that U.S. investors increase their weighting in foreign stocks merely because cross-listing makes the names of the underlying companies more familiar to the investors. Firms with limited international sales experience no greater increase in U.S. holdings than firms with extensive international sales, all else equal. Furthermore, we do not find a statistically robust relationship between total firm assets and the cross-listing listing effect.

*4.4 More on trading costs and the cross-listing effect*

The fact that U.S. investors hold large proportions of their shares in the underlying foreign security, and that trading in the United States alone (as an over-the-counter stock) does not greatly increase U.S. investor interest, indicate that home-market trading costs are unlikely to explain the cross-listing effect. Nevertheless, we run several other tests (not reported in tables) to explore whether variation in home-market transactions costs could impact the cross-listing effect. Specifically, we incorporate into our cross-sectional regressions proxies for trade and market openness including home-country GDP, home country stock market capitalization, a dummy variable separating emerging and industrialized markets, and measures of bilateral U.S. trade. None of these variables are statistically related to the cross-listing effect.[31]

## 5. Conclusion

We use a comprehensive 1997 survey of U.S. investor holdings in non-U.S. companies to document that cross-listing on a U.S. exchange substantially increases U.S. investor holdings of a foreign

[31] These findings are consistent with Ahearne, Griever, and Warnock [2004], who show that measures of barriers-to-investment explain little of the cross-country holdings patterns of U.S. investors.

stock, a phenomenon we term the "cross-listing effect." Our selection bias-corrected estimates imply that firms can increase their U.S. holdings by 8 to 11 percent of their market capitalization by cross-listing in the United States, doubling or more the amount prior to cross-listing. Of course, this does not imply that every firm in the world could obtain a cross-listing effect of this magnitude, but our results suggest that our estimates were applicable to at least several hundred firms that were not yet cross-listed.

We find a *smaller* U.S. holdings increase from cross-listing for firms with more transparent financial accounting. This result is consistent with requisite financial disclosure being a key element of cross-listing, from the point of view of U.S. investors. We do not find strong evidence that adopting U.S. legal protections is an important aspect of a U.S. listing, but this may be because variation in shareholder protection is more difficult to measure in our cross-section of firms than variation in transparency. However, our findings are generally consistent with Siegel [2005], who shows that, in practice, U.S. securities law enforcement does not extend to cross-listed companies, and Gozzi, Levine, and Schmukler [2005], who demonstrate that cross-listing does not improve the valuation of companies from poor investor-protection countries.

Despite the large average cross-listing effect on U.S. holdings, results from our simultaneous model of the cross-listing and holdings decisions offer only weak support for the idea that prospects for an expanded shareholder base are a key motive for cross-listing. We find some evidence that foreign firms are more likely to cross-list in the United States when they already have a large base of U.S. shareholders, suggesting that some firms cross-list to service their shareholder clientele.

Our analysis also has policy implications. Firms that voluntarily commit to increased disclosure appear to attract more outside investment, and governments can promote and enforce disclosure to attract capital flows to their countries. Accordingly, the U.S. cross-listing effect should diminish for firms from countries that improve disclosure standards for publicly traded firms.[32] Our results also suggest that legal protections for small shareholders may be more effective in an environment that also ensures transparency.

[32] Similarly, Armstrong et al. [2006] find that European markets reacted positively to events associated with the 2005 adoption of International Financial Reporting Standards (IFRS) in Europe.

**Appendix: Estimating the Structural Model**

Because the holdings variables $H_i^L$ and $H_i^U$ are measured as shares of a firm's equity value, they are well-defined only over the range from zero to one. This implies that (6) and (7) cannot be estimated consistently using ordinary least squares because the limited range induces dependence between the instruments $\mathbf{Z}_i$ and the residual.[33] We circumvent this problem by transforming the holdings data by the inverse of the logistic function. However, because the inverse logistic is defined only on the *open* interval from zero to one, and we have a number of firms in our sample with no reported U.S. holdings, we shift the domain of the inverse logistic to the left by a small fixed amount, S,

$$F^{-1}(H) = \ln(H + S) - \ln(1 - H - S). \qquad \text{(A-1)}$$

Figure A-1 graphs the "shifted" $F^{-1}$ assuming a shift parameter (S) of 10 percent. A disadvantage of this function is that it is only defined for holdings (H) below 90 percent. But it has the favorable property of being nearly linear in H between 0 and 80 percent, the range in which most of our observations fall. The smoothness of the function reduces the chance that our results will be significantly distorted by some quirk of the chosen functional form. After incorporating the inverse shifted logistic transformation, we rewrite our holdings equations as

$$F^{-1}\left(H_i^L\right) = \alpha_L + \mathbf{Z_i^L}\boldsymbol{\beta}_\mathbf{L} + \varepsilon_i^L \qquad \text{(A-2)}$$

$$F^{-1}\left(H_i^U\right) = \alpha_U + \mathbf{Z_i^U}\boldsymbol{\beta}_\mathbf{U} + \varepsilon_i^U . \qquad \text{(A-3)}$$

Lee [1978] proposes a multi-stage method for consistently estimating a system like ours in which a first-stage, reduced-form probit generates Heckman [1979]-type correction terms for the holdings equations (A-2) and (A-3). The corrected second-stage estimation of the holdings equations produces consistent estimates of the relation between the instruments and (transformed) holdings, and makes it possible to calculate fitted holdings values as a function of the instruments. The final stage of estimation involves using the fitted holdings for estimation of the structural probit in equation (7).

In order to implement the Lee [1978] estimation framework, we need to make a few additional assumptions and a slight modification to our specification. Both of these issues relate to the joint statistical distribution of the residuals in the three equations. First, the error terms from the listing equation ($\varepsilon_i^X$) and the two holdings equations ($\varepsilon_i^L, \varepsilon_i^U$) must be jointly normally distributed,

$$(\varepsilon_i^X, \varepsilon_i^L, \varepsilon_i^U) \sim N(0, \Omega), \qquad \text{(A-4)}$$

where $\Omega$ is a 3 x 3 variance covariance matrix. The second issue arises because the first step in the original Lee [1978] procedure involves estimating a reduced form probit for the binary variable into which the linear equations for the other dependent variable have been substituted. In our model, equations (A-2) and (A-3) are not linear in holdings, thus we must recast the interaction elements in our listing decision equation in terms of the transformed holdings variable so that our reduced-form listing equation will be tractable. In particular,

$$X_i^* = \alpha_x + \gamma_0\left[F^{-1}\left(H_i^L\right) - F^{-1}\left(H_i^U\right)\right] + \gamma_1 F^{-1}\left(H_i^U\right) + \mathbf{Z_i^X}\boldsymbol{\beta}_\mathbf{x} + \varepsilon_i^X . \qquad \text{(A-5)}$$

Under assumption (A-4), the probit model implied by equations (A-5), (8), and (9) can be estimated jointly with the linear specifications in equations (A-2) and (A-3), as long as certain identification restrictions are

[33] See, for example, the introductory discussion of truncated variables in Maddala [1983]. In principal, U.S. holdings could be negative, but in practice, short positions are not reflected in the holdings survey. Similarly, with short positions held by others, it is conceivable that H could exceed 1, but in practice it is below 0.9.

met. Lee [1978] has shown that multi-stage estimation will produce estimates of structural parameters that are consistent in the presence of selection bias.

One advantage of this framework is that although we only observe $H_i^L$ for firms that have a U.S. listing and $H_i^U$ for firms that do not, we can use our parameter estimates to make inferences about what U.S. holdings of a firm's stock would have been had the firm made the counterfactual choice about whether to cross-list. Furthermore, we can generate estimates of the cross-listing effect—i.e., the impact of cross-listing on U.S. holdings ($H_i^L - H_i^U$)—either unconditionally or conditional on specific firm characteristics.

In the first stage of the Lee [1978] methodology, the two holdings equations (A-2) and (A-3) are substituted into the listing probit (A-5) to form a reduced-form listing equation that can be estimated on a stand-alone basis by numerical maximum likelihood. The set of independent variables ($\mathbf{Z^R}$) for the first-stage reduced-form probit specification consists of all of the instruments in the structural equations for listing and holdings:

$$\mathbf{Z^R} = \mathbf{Z^X} \cup \mathbf{Z^L} \cup \mathbf{Z^U}. \tag{A-6}$$

We can write the first-stage equation as

$$X_i^* = \alpha_R + Z_i^R \beta_R - \varepsilon_i^R \ , \tag{A-7}$$

where

$$\varepsilon_i^R = \gamma_0 \varepsilon_i^L + Z_i^R (\gamma_0 - \gamma_1) \varepsilon_i^U + \varepsilon_i^X \ . \tag{A-8}$$

The estimates from the probit model embodied in equations (A-7), (A-8), and (A-9) can be used to construct the selectivity-bias correction in the holdings-equations residuals ($\varepsilon^L$ and $\varepsilon^U$). It can be shown that for listed firms ($X^* = 0$),

$$E(\varepsilon_i^L \mid X^* \geq 0) = -\mathrm{cov}(\varepsilon_i^X, \varepsilon_i^L) \frac{\phi(\alpha_R + Z_i^R \beta_R)}{\Phi(\alpha_R + Z_i^R \beta_R)}, \tag{A-9}$$

where the variance of $\varepsilon^X$ has been normalized to one and $\phi$ and $\Phi$ denote the probability density function and cumulative density function, respectively, of the standard normal distribution. The ratio

$$\frac{\phi(\alpha_R + Z_i^R \beta_R)}{\Phi(\alpha_R + Z_i^R \beta_R)} \tag{A-10}$$

is often referred to as the "inverse Mills ratio". Estimates of the ratio form the basis for standard corrections for selectivity bias when inclusion in an estimation sample is contingent on a discrete outcome (see Heckman [1979] or Maddala [1983]). Intuitively, the inverse Mills ratio accounts for the unobserved correlation between the listing decision and holdings. There is also a similar, but less frequently used correction for selectivity bias for the non-selected observations,

$$E(\varepsilon_i^U \mid X^* < 0) = \mathrm{cov}(\varepsilon_i^X, \varepsilon_i^U) \frac{\phi(\alpha_R + Z_i^R \beta_R)}{1 - \Phi(\alpha_R + Z_i^R \beta_R)}. \tag{A-11}$$

The second stage of the Lee procedure involves estimating the holdings equations by ordinary least squares by rewriting them as

$$F^{-1}(H_i^L) = \alpha_L + Z_i^L \beta_L - \frac{\phi(\alpha_R + Z_i^R \beta_R)}{\Phi(\alpha_R + Z_i^R \beta_R)} \lambda_L + \eta_i^L \quad \text{(A-12)}$$

and

$$F^{-1}(H_i^U) = \alpha_U + Z_i^U \beta_U + \frac{\phi(\alpha_R + Z_i^R \beta_R)}{1 - \Phi(\alpha_R + Z_i^R \beta_R)} \lambda_U + \eta_i^U . \quad \text{(A-13)}$$

Note that $\lambda_k = \text{cov}(\varepsilon_i^X, \varepsilon_i^k)$ for k = L, U and $E(\eta_i^L \mid X^* \geq 0) = E(\eta_i^U \mid X^* < 0) = 0$. We use our first-stage estimates of the parameters $\alpha_R$ and $\beta_R$ in (A-12) to construct the selectivity variables, and then substitute these variables into equations (A-12) and (A-13). The coefficient associated with the selectivity adjustment provides an estimate of the unobserved covariance between the listing decision and each of the holding equations. The final stage of the Lee procedure involves using the consistent estimates of $\alpha_L$, $\alpha_U$, $\beta_L$, and $\beta_U$ from (A-12) and (A-13) to construct fitted values of ($F^{-1}$) using the original holdings equations (A-12) and (A-13). The fitted holdings are inserted back into the structural listing decision equation (A-5), which is then estimated as a probit model via numerical likelihood maximization.

As noted by Lee [1978], it is possible to construct consistent standard errors for equations (A-12) and (A-13) after making a correction for heteroscedasticity associated with the selectivity terms. However, inferences about the distribution of the estimated parameters in the listing decision equation (A-5) are complicated by the use of the generated variables $E(F^{-1}|Z)$ in the final-stage probit estimation. Furthermore, for judgments about how the cross-listing effect on U.S. holdings varies across different types of firms (i.e., the *conditional* cross-listing effect), we construct statistics that involve parameter estimates from more than one equation. Accordingly, we opt to estimate the distribution of the full set of model parameters via non-parametric bootstrap simulations. Specifically, for each of the three versions of the model we estimated, we randomly drew 1,000 hypothetical samples with the same number of observations (with replacement), re-estimating the full model and computing the statistics of interest with each simulation.

Because our structural equations (A-5), (A-12), and (A-13) are nonlinear, the estimated parameters of the model are difficult to interpret. Therefore, we report rescaled functions of the estimates that are more readily interpretable. Specifically, for the coefficients on instruments in the listing decision equation, we calculate the marginal effect of a one-unit change in the instrument on the percentage point probability of cross-listing, estimated using each of 8,067 firms in the sample (or the 5,155 firms used in Panel C),

$$100 * \hat{\Phi}_i' * \hat{\boldsymbol{\beta}} \ , \qquad \text{where} \quad \text{(A-14)}$$

$$\hat{\Phi}_i' \equiv \Phi'\left(\hat{\alpha} + \hat{\gamma}_0 \left[F^{-1}\left(\hat{H}_i^L\right) - F^{-1}\left(\hat{H}_i^U\right)\right] + \hat{\gamma}_1 F^{-1}\left(\hat{H}_i^U\right) + \mathbf{Z_i}\hat{\boldsymbol{\beta}}_{\mathbf{X}}\right) . \quad \text{(A-15)}$$

We then report in Table 6 the *median* of the marginal effect estimates. The formulae for scaling the estimated impact of holdings on the cross- listing decision are somewhat more complicated:

$$\frac{\hat{\Phi}_i'}{F'\left(\hat{H}_i^L\right)} * \hat{\gamma}_0 ; \quad \text{(A-16)}$$

$$\frac{\hat{\Phi}_i'}{F'\left(\hat{H}_i^U\right)} * \hat{\gamma}_1 + \left(\frac{\hat{\Phi}_i'}{F'\left(\hat{H}_i^L\right)} - \frac{\hat{\Phi}_i'}{F'\left(\hat{H}_i^U\right)}\right) * \hat{\gamma}_0 . \quad \text{(A-17)}$$

The reported figures represent the median marginal impact on the cross-listing probability of changes in ($H^L$-$H^U$) and in ($H^U$), all else equal. The extra term in (22) reflects the fact that a unit change in ($H^U$) with ($H^L$-$H^U$) held constant implies a unit change in ($H^L$).

Similarly, the coefficients ($\hat{\boldsymbol{\beta}}$) in the holdings equations are scaled to reflect the marginal effect of

a change in the instrument on the holdings share of U.S. investors (measured in percentage points),

$$100 * F'\left(\hat{\alpha}_C + \mathbf{Z}_i \hat{\boldsymbol{\beta}}_C\right) * \hat{\boldsymbol{\beta}}_C, \qquad F'(\bullet) > 0, \qquad C \in \{L, U\}. \tag{A-18}$$

We then report the median estimated effect, which varies with the slope of the logistic transformation function (F).

**References**


Ackert, L., B. Church, J. Tomkins, and P. Zhang, 2003. What's in a name? An experimental examiniation of investment behavior. College of Business, Georgia Institute of Technology.

Aggarwal, R., L. Klapper, and P. Wysocki, 2005. Portfolio preferences of foreign institutional investors. *Journal of Banking and Finance* 29, 2919-2946.

Ahearne, A., W. Griever, and F. Warnock, 2004. Information costs and home bias: an analysis of U.S. holdings of foreign equities. *Journal of International Economics* 62, 313-336.

Armstrong, C., M. Barth, A. Jagolinzer, and E. Riedl, 2006. Market Reaction to Events Surrounding the Adoption of IFRS in Europe. Working paper.

Ball, R., 2001. Infrastructure Requirements for an Economically Efficient System of Public Financial Reporting and Disclosure. Brookings-Wharton Papers on Financial Services, 127–169.

Ball, R., Robin, A., Wu, J., 2003. Incentives versus Standards: Properties of Accounting Income in Four East Asian Countries, and Implications for Acceptance of IAS. *Journal of Accounting and Economics* 36, 235-270.

Barber, B. M. and T. Odean, 2003. All that glitters: The effect of attention and news on the buying behavior of individuals and institutional investors. University of California at Davis working paper.

Barth, M., W. Landsman, M. Lang, C. Williams, 2006. Accounting Quality: International Accounting Standards and US GAAP. UNC Working paper.

Bradshaw, M. T., B. J. Bushee, and G. S. Miller, 2004. Accounting choice, home bias, and U.S. investment in non-U.S. firms. *Journal of Accounting Research* 42(5), 795-841.

Bushman, R., J. Piotroski, and A. Smith, 2004. What determines corporate transparency? *Journal of Accounting Research* 42(2), 207-251.

Coffee, J., 1999. The Future as History: The Prospects for Global Convergence in Corporate Governance and Its Implications. Columbia Law School Center for Law and Economic Studies Working Paper No. 144.

Coffee, J., 2002. Racing towards the top? The impact of cross-listings and stock market competition and its implications. *Northwestern University Law Review* 93, 641-708.

Coval, J., and T. Moskowitz, 1999. Home bias at home: Local equity preference in domestic portfolios. *Journal of Finance* 54, 2045-2073.

Coval, J., and T. Moskowitz, 2001. The geography of investment: Informed trading and asset prices. *Journal of Political Economy* 109, 811-841.

Dahlquist, M., L. Pinkowitz, R. Stulz, and R. Williamson, 2003. Corporate governance and the home bias. *Journal of Financial and Quantitative Analysis* 38, 87-110.

Dehejia, R. and S. Wahba, 2002. Propensity score matching methods for non-experimental causal studies. *Review of Economics and Statistics* 84, 151–161.

Diamond, D. and R. Verrecchia, 1991. Disclosure, liquidity, and the cost of capital. *Journal of Finance* 46, 1325-1359.

Doidge, C., 2004. U.S. cross-listings and the private benefit of control: evidence from dual-class firms. *Journal of Financial Economics* 72, 519-553.

Doidge, C., G.A. Karolyi, and R. Stulz, 2004. Why are foreign firms listed in the U.S. worth more? *Journal of Financial Economics* 71, 205-238.

Drake, C., 1993. Effects of misspecification of the propensity score on estimators of treatment effects. *Biometrics* 49, 1231–1236.

Durnev, A. and H. Kim, 2005. To Steal or Not to Steal: Firm Attributes, Legal Environment, and Valuation. *Journal of Finance* 60(3): 1461-1493.

Dyck, A.and L. Zingales, 2004. Private Benefits of Control: An International Comparison. *Journal of Finance* 59(2), 537-600.

Easley, D., and M. O'Hara, 2004. Information and the Cost of Capital. *Journal of Finance* 59(4), 1553-1583.

Easterbrook, F., 1984. Two Agency Cost Explanations of Dividends. *American Economic Review* 74(4), 650-659.

Edison, H. J., and F. Warnock, 2004. U.S. Investors' Emerging Market Equity Portfolios: A Security-Level Analysis. *Review of Economics and Statistics* 84(3), 691-704.

Errunza, V., and D. Miller, 2000. Market Segmentation and the Cost of Capital in International Equity Markets. *Journal of Financial and Quantitative Analysis* 35(4), 577-600.

Faccio, M., L. Lang, and L. Young, 2001. Dividends and Expropriation. *American Economic Review* 91(1), 54-78.

Fanto, J., and R. Karmel, 1997. A report on the attitudes of foreign companies regarding a U.S. listing. *Stanford Journal of Law, Business and Finance* 24, 763-812.

Foerster, S. R., and G. A. Karolyi, 1999. The effects of market segmentation and investor recognition on asset prices: Evidence from foreign stocks listing in the United States. *Journal of Finance* 54, 981-1013.

Glazerman, S., D. Levy, and D. Myers, 2003. Nonexperimental versus experimental estimates of earnings impacts. *The Annals of the American Academy of Political and Social Science* 589, 63–93.

Gozzi, J., R. Levine, and S. Schmukler, 2005. Internationalization and the evolution of corporate valuation. NBER Working Paper 11023.

Griever, W., G. Lee, and F. E. Warnock, 2001. The U.S. system for measuring cross-border investment in securities: a primer with a discussion of recent developments. *Federal Reserve Bulletin*, 87(10): 633-650.

Grullon, G., G. Kanatas, and J. P. Weston, 2004. Advertising, breath of ownership, and liquidity. *Review of Financial Studies* 17: 439-461.

Heckman, J. J., 1979. Sample selection bias as a specification error. *Econometrica* 47, 153-161.

Heckman, J., H. Ichimura, J. Smith, and P. Todd, 1998, Characterizing selection bias using experimental data. *Econometrica*, 66, 1017-1098.

Heckman, J., R. LaLonde, and J. Smith, 1999. The economics and econometrics of active labor market programs, in O. Ashefelter and D. Card, eds, *Handbook of Labor Economics*, Amsterdam: Elsevier.

Heckman, J. and R. Robb Jr., 1985, Alternative methods for evaluating the impact of interventions. in *Longitudinal Analysis of Labor Markets Data*, ed. By J. Heckman and B. Singer. New York: Cambridge University Press, pp. 156-245.

Henderson, B., N. Jegadeesh, and M. Weisbach, 2004, World markets for raising new capital. *Journal of Financial Economics* (forthcoming).

Huberman, G., 2001. Familiarity breeds investment. *Review of Financial Studies*, 14(3):659-680.

Imbens, G. W. 2004. Nonparametric estimation of average treatment effects under exogeneity: a review. *Review of Economics and Statistics* 86, 1, 4–29.

International Finance Corportation, 1998. *Emerging Stock Markets Factbook*.

Ivkovic, Z., and S. Weisbenner, 2005. Local does as local is: information content of the geography of individual investors' common stock investments. *Journal of Finance* 60: 267-306.

Jensen, M., 1986. Agency Cost of Free Cash Flow, Corporate Finance, and Takeovers. *American Economic Review (Papers and Proceedings)* 76(2), 323-329.

Johnson, S., R. La Porta, F. Lopez-de-Silanes, and A. Shleifer, 2000. Tunneling. *American Economic Review* (Papers and Proceedings) 90, 22-27.

Kalcheva, I., and K. Lins, 2004. International evidence on cash holdings and expected managerial agency problems. University of Utah working paper.

Kaniel, R., D. Li, and L. T. Starks, 2003. The investor recognition hypothesis: International evidence and determinants. Duke University, Fuqua School working paper.

Karolyi, A. and R. Stulz, 2003. Are assets priced locally or globally?, in G. Constantinides, M. Harris and R. Stulz, eds.: The Handbook of the Economics of Finance, North-Holland Publishers, New York, NY.

Kho, B., R. Stulz, and F. Warnock, 2006. Financial globalization, governance, and the evolution of the home bias. NBER Working Paper 12389.

Lalonde, R., 1986. Evaluating the econometric evaluations of job training programs with experimental data, *American Economic Review* 76, 604-620.

Lang, M., K. Lins, and D. Miller, 2003. ADRs, analysts, and accuracy: Does cross listing in the U.S. improve a firm's information environment and increase market value? *Journal of Accounting Research* 41(2), 317-345.

Lang, M., J. Ready, W. Wilson, 2006. Earnings management and cross listing: Are reconciled earnings comparable to US earnings? UNC Working paper.

Lang, M., J. Raedy, M. Yetman, 2003. How Representative are Firms that are Cross Listed in the United States? An Analysis of Accounting Quality. *Journal of Accounting Research* 41, 363-386.

La Porta, R. F. Lopez-de-Silanes, A. Shleifer, and R. Vishny, 1998. Law and finance. *Journal of Political Economy* 106, 1113-1155.

La Porta, R. F. Lopez-de-Silanes, A. Shleifer, and R. Vishny, 1999. Corporate ownership around the world. *Journal of Finance* 54, 471-515.

La Porta, R., F. Lopez-de-Silanes, A. Shleifer, and R. Vishny, 2002, Investor Protection and Corporate Valuation, *Journal of Finance*, Vol. 57, No. 3, 1147-1170.

Larcker, D., T. Rusticus, 2005. On the Use of Instrumental Variables in Accounting Research. Wharton working paper.

Lee, L.F., 1978, Unionism and wage rates: A simultaneous equations model with qualitative and limited dependent variables, *International Economic Review*, 19, 415-433.

Leuz, C., Lins, K., and F. Warnock, 2006. Do foreigners invest less in poorly governed firms? NBER Working Paper 12222.

Leuz, C., Nanda, D., Wysocki, P., 2003. Earnings Management and Investor Protection: an International Comparison. *Journal of Financial Economics* 69, 505-527.

Leuz, C., and R. Verrechia, 2004. The Economic Consequences of Increased Disclosure. *Journal of Accounting Research* 38: 91-124.

Levine, R., 2005. Law, Endowments, and Property Rights. *Journal of Economic Perspectives*, 19(3), 61-88.

Maddala, G., 1983. *Limited-Dependent and Qualitative Variables in Econometrics*. Cambridge Press.

Merton, R. C., 1987. A simple model of capital market equilibrium with incomplete information. *Journal of Finance* 42, 483-510.

Miller, D., 1999. The market reaction to international cross-listings: evidence from depositary receipts. *Journal of Financial Economics* 51, 103-123.

Morgan, D. P., 2002. Rating banks: Risk and uncertainty in an opaque industry. *American Economic Review* 92, 874-888.

Pinkowitz, L., R. Stulz, and R. Williamson, 2006. Does the Contribution of Corporate Cash Holdings and Dividends to Firm Value Depend on Governance? A Cross-Country Analysis. *Journal of Finance* (forthcoming).

Pownall, G., and K. Schipper, 1999. Implications of Accounting research for the SEC's consideration of International Accounting Standards for U.S. securities. *Accounting Horizons* 13 (September): 259–280.

Rajan, R. G., and L. Zingales, 2002. The great reversals: the politics of financial development in the twentieth century. *Journal of Financial Economics* 65, 5-50.

Rees, L. Elgers, P., 1997. The market's valuation of non-reported accounting measures: retrospective reconciliations of non-US and US GAAP. *Journal of Accounting Research* 35(1), 15-127.

Reese, W., and M. Weisbach, 2002. Protection of minority shareholders interests, cross-listings in the United States, and subsequent equity offerings. *Journal of Financial Economics*, 66(1): 65-104.

Rosenbaum, P. R. and D. B. Rubin. 1983. The central role of the propensity score in observational studies for causal effects. *Biometrika* 70, 41–55.

Siegel, J., 2005. Can foreign firms bond themselves effectively by renting U.S. securities laws? *Journal of Financial Economics* 75(2).

Stuart, E., 2004. Matching methods for causal inference: Designing observational studies. Harvard University Department of Statistics mimeo.

Stulz, R., 1999. Globalization of equity markets and the cost of capital. Paper prepared for the SBF/NYSE Conference on Global Equity Markets.

Zhao, Z., 2004. Using matching to estimate treatment effects: data requirements, matching metrics, and Monte Carlo evidence. *Review of Economics and Statistics* 86, 1, 91–107.

**Table 1: U.S. Holdings by Country, December 31, 1997**

The table shows the proportion of market capitalization held by U.S. investors and the number of firms with positive U.S. holdings among the 12,236 non-U.S. stocks in our sample, sorted by country. Data on the value of U.S. holdings are from the U.S. Treasury/Federal Reserve Board survey of U.S. holdings of foreign securities. Market capitalization data are from Worldscope.

| Country | Percent of Market Capitalization Held by U.S. Investors | Number of Firms with Positive U.S. Holdings | Country | Percent of Market Capitalization Held by U.S. Investors | Number of Firms with Positive U.S. Holdings |
|---|---|---|---|---|---|
| Argentina | 24 | 38 | Korea | 10 | 248 |
| Australia | 10 | 268 | Luxembourg | 8 | 8 |
| Austria | 8 | 54 | Malaysia | 5 | 348 |
| Belgium | 4 | 66 | Mexico | 19 | 83 |
| Brazil | 13 | 128 | Netherlands | 19 | 136 |
| Canada | 11 | 484 | New Zealand | 14 | 47 |
| Chile | 7 | 63 | Norway | 13 | 120 |
| China | 4 | 85 | Pakistan | 12 | 42 |
| Colombia | 4 | 17 | Peru | 18 | 20 |
| Czech Republic | 5 | 41 | Philippines | 9 | 96 |
| Denmark | 8 | 88 | Poland | 17 | 39 |
| Finland | 21 | 74 | Portugal | 13 | 50 |
| France | 11 | 403 | Russia | 9 | 20 |
| Germany | 6 | 271 | Singapore | 7 | 162 |
| Greece | 4 | 64 | South Africa | 5 | 150 |
| Hong Kong | 7 | 332 | Spain | 11 | 104 |
| Hungary | 21 | 19 | Sweden | 14 | 153 |
| India | 6 | 186 | Switzerland | 11 | 144 |
| Indonesia | 8 | 107 | Taiwan | 1 | 174 |
| Ireland | 21 | 56 | Thailand | 9 | 192 |
| Israel | 11 | 49 | Turkey | 9 | 77 |
| Italy | 10 | 143 | United Kingdom | 10 | 1,446 |
| Japan | 6 | 1,876 | Venezuela | 14 | 14 |
| | | | Total | 9 | 8,785 |

**Table 2: Summary Statistics for Sample, December 31, 1997**

The table reports aggregate U.S. holdings, the number and market capitalization of the sample firms, and U.S. holdings in cross-listed and non cross-listed firms. Data on the value of U.S. holdings are from the U.S. Treasury/Federal Reserve Board survey of U.S. holdings of foreign securities. Market capitalization figures and are from Worldscope. We calculate market float by scaling market capitalization down by the figure given in Worldscope's "closely held share" field. We label a non-U.S. firm as cross-listed if its shares are listed on the NYSE, AMEX, or NASDAQ. Level 1 ADRs trade only on over-the-counter markets and are not considered to be cross-listed on a U.S. exchange.

| | Firm Market Capitalization Available (46 countries) | Firm Market Float Available (46 countries) |
|---|---|---|
| Number of Firms Available | 12,236 | 8,528 |
| Total market value of equity (billions of US$) | $11,080 | $5,927 |
| Value of U.S. holdings (billions of US$) | $1,020 | $802 |
| Implicit share held by U.S. investors | 9.2% | 13.5% |
| Firms Cross-Listed on a U.S. Exchange | 498 | 293 |
| Average share held by U.S. investors | 17.5% | 26.3% |
| Average share held in ADR form | 6.4% | 12.4% |
| All Firms Not Cross-Listed on U.S. Exchange | 11,738 | 8,235 |
| Average share held by U.S. investors | 2.9% | 5.6% |
| Memo: | | |
| Firms underlying Level 1 ADRs | 672 | 524 |
| Average share held by U.S. investors | 8.1% | 14.6% |
| Average share held in ADR form | 1.7% | 2.8% |

**Table 3**
**Variables and Instruments**

This table provides definitions and sources for the explanatory variables used in the sample selection corrections, the cross-sectional regressions, and the simultaneous model of U.S. holdings and the cross-listing decision.

| Variable | Definition | Included in: |
|---|---|---|
| <u>Firm-level variables</u> | | |
| Total assets | Logarithm of the 1997 book value of a firm's assets from Worldscope, included as a measure of firm size. | $\mathbf{Z}_i^R$, $\mathbf{Z}_i^X$, $\mathbf{Z}_i^L$, $\mathbf{Z}_i^U$ |
| Financial firm dummy | Dummy variable that takes on the value of one when a firm is identified by Worldscope as belonging to industry SIC Codes 60-69 in 1997. | $\mathbf{Z}_i^R$, $\mathbf{Z}_i^X$, $\mathbf{Z}_i^L$, $\mathbf{Z}_i^U$ |
| Proportion of shares held by insiders (%) | Worldscope's 1997 value for the number of closely held shares as a percentage of common shares outstanding, adjusted to remove those stakes mistakenly counted as insider ownership by Worldscope. These include holdings by the Bank of New York, Morgan Guarantee Trust, and Citibank, because these shares are holdings for ADR programs, and the New Zealand Central Securities Depository. | $\mathbf{Z}_i^R$, $\mathbf{Z}_i^X$, $\mathbf{Z}_i^L$, $\mathbf{Z}_i^U$ |
| MSCI index membership dummy | Dummy variable equal to one when a firm is included as a member of the MSCI All-country World index at the end of 1997. | $\mathbf{Z}_i^R$, $\mathbf{Z}_i^L$, $\mathbf{Z}_i^U$ |
| Dummy for dividend-paying firm | Dummy variable equal to one when a firm pays a dividend in 1997, as reported by Worldscope. | $\mathbf{Z}_i^R$, $\mathbf{Z}_i^L$, $\mathbf{Z}_i^U$ |
| Market-to-book value ratio | Year-end closing share price divided by the per-share book value of equity in 1997, as reported by Worldscope. | $\mathbf{Z}_i^R$, $\mathbf{Z}_i^L$, $\mathbf{Z}_i^U$ |
| Foreign sales as a proportion of total sales (%) | Proportion of sales generated from operations in foreign countries relative to total sales in 1997, as reported by Worldscope. | $\mathbf{Z}_i^R$, $\mathbf{Z}_i^L$, $\mathbf{Z}_i^U$ |

**Table 3 (continued): Variables and Instruments**.

| Variable | Definition | Included in: |
|---|---|---|
| Canada dummy | Dummy variable set equal to one for Canadian firms. | $\mathbf{Z}_i^R$, $\mathbf{Z}_i^X$, $\mathbf{Z}_i^L$, $\mathbf{Z}_i^U$ |
| Firm-level accounting quality index | Index ranging from zero to four, calculated using criteria from Aggarwal, Klapper, and Wysocki [2003]. Four components takes a value of one if the firm (1) used a BigSix auditor, (2) received a clean audit report, (3) used international accounting standards or US GAAP, and (4) reported consolidated statements. The index is the sum of the four components. | $\mathbf{Z}_i^R$, $\mathbf{Z}_i^U$ |
| Country-level variables | | |
| Home-country trading value/GDP(%) | 1997 dollar volume of trading in the home market of a firm, normalized by the dollar value of the country's 1997 gross domestic product (GDP). The volume data are obtained from the International Finance Corporation [1998] and the GDP figures are collected from the International Monetary Fund's *International Financial Statistics.* | $\mathbf{Z}_i^R$, $\mathbf{Z}_i^X$ |
| Home-country dividend withholding tax rate faced by U.S. investors | For countries maintaining a bilateral tax treaty with the United States, we use the treaty tax rate, as reported in the IRS publication 901, *U.S. Tax Treaties*. For countries with no U.S. tax treaty, we calculate dividend withholding rates from 1997 gross and net dividend payments to holders of ADRs, as reported in Bloomberg's *Corporate Action Calendar*. | $\mathbf{Z}_i^R$, $\mathbf{Z}_i^L$, $\mathbf{Z}_i^U$ |
| Germanic home language dummy | Dummy variable set equal to one for firms domiciled in a country in which a Germanic language—Danish, Dutch, English, German, Norwegian, or Swedish—is an official language. | $\mathbf{Z}_i^R$, $\mathbf{Z}_i^X$ |
| English home language dummy | Dummy variable that equals one if the company's domicile is a country in which English is an official language. | $\mathbf{Z}_i^R$, $\mathbf{Z}_i^U$ |

**Table 3 (continued): Variables and Instruments**.

| Variable | Definition | Included in: |
|---|---|---|
| National accounting quality index | Values for 1995 reported by Bushman, Piotroski, and Smith [2004]. Compiled by the Center for Financial Analysis and Research, the index averages across firms within a given country the number of items, out of a possible maximum of 90, that are included as part of a firm's financial statements. | $\mathbf{Z}_i^R$, $\mathbf{Z}_i^X$, $\mathbf{Z}_i^U$ |
| Shareholder rights index | Calculated by La Porta, Lopez-de-Silanes, Shleifer, and Vishny [1998]. Index takes on a value between 0 and 6 depending on how many of the following applies to a country's equity market: percentage of outstanding shares required to call an extraordinary meeting less than or equal to 10 percent, cumulative voting or proportional representation of minority interests on board, voting by mail permitted, mechanisms in place for oppressed minority investors, preemptive right that can only be waived by a shareholder vote, and protection of shareholders from requirements that shares be deposited before a shareholder meeting. | $\mathbf{Z}_i^R$, $\mathbf{Z}_i^L$, $\mathbf{Z}_i^U$ |

**Table 4: Jointly Estimating U.S. Holdings Behavior and Cross-listing Decision**

The table reports estimates of a simultaneous system that includes a probit specification of a firm's decision to cross-list and two equations that determine the holdings by U.S. investors—one conditional on cross-listing on a U.S. exchange as of December 31, 1997, and one conditional on not cross-listing. The dependent variable in the latter two equations is a nonlinear transformation of U.S. holdings in a given company, scaled by either the company's market capitalization or market float (the appendix describes the transformation). For ease of exposition, the estimated slope coefficients are rescaled as follows: (1) For the cross-listing equation, the reported figures are scaled to reflect the marginal impact on the percent probability of listing of a unit change in the variable in question. The marginal impact reported is the median impact over the firms in the sample; (2) For the U.S. holdings equations, the reported figures are scaled to reflect the marginal impact on the percent of shares held of a unit change in the variable in question. Again, the marginal impact reported is the median impact over the firms in the sample (whether listed or not). The Gain in U.S. Holdings Share from Cross-Listing (%) is the endogenously estimated forecast of the change in holdings resulting from cross-listing. The U.S. Holdings Share without Cross-Listing (%) is the endogenously determined estimate of what U.S. holdings would be if a firm does not cross-list. The other variables, which are assumed exogenous to the system, are defined in Table 3. Bootstrapped p-values corresponding to a null hypothesis of a zero median impact appear in parentheses below each reported figure.

**Table 4 (continued): Jointly Estimating U.S. Holdings Behavior and Cross-listing Decision**

| **Panel A: Baseline** | Cross-Listing | U.S. Holdings Share (%) of Market Cap. If: | | |
|---|---|---|---|---|
| | % Probability | Not Cross-Listed | Cross-Listed | Difference |
| Gain in U.S. Holdings Share from Cross-Listing (%) | 0.210 (0.212) | | | |
| U.S. Holdings Share without Cross-Listing (%) | 0.555 (0.054) | | | |
| Home-country trading volume/GDP | -0.811 (0.004) | | | |
| Germanic home language dummy | 0.541 (0.020) | | | |
| Proportion of Shares Held by Insiders (%) | 0.034 (0.225) | -0.024 (0.000) | -0.155 (0.000) | -0.131 (0.000) |
| Financial firm dummy | -1.851 (0.008) | -0.964 (0.000) | -0.163 (0.523) | 0.801 (0.351) |
| Canada dummy | 3.729 (0.002) | 0.483 (0.186) | -0.324 (0.449) | -0.811 (0.379) |
| $Log_2$ of total assets | 0.466 (0.007) | 0.261 (0.000) | -0.164 (0.332) | -0.427 (0.144) |
| National accounting quality index | 0.117 (0.001) | 0.036 (0.001) | | |
| Market value/Book value | | 0.008 (0.020) | 0.060 (0.133) | 0.052 (0.189) |
| MSCI member dummy | | 3.202 (0.000) | -1.358 (0.232) | -4.575 (0.002) |
| Shareholder rights index | | -0.419 (0.000) | -0.679 (0.084) | -0.254 (0.271) |
| Dummy for dividend-paying firms | | 0.631 (0.000) | -1.947 (0.307) | -2.600 (0.234) |
| Home-country dividend withholding tax rate faced by U.S. investors | | -0.056 (0.000) | -0.006 (0.464) | 0.050 (0.315) |
| Firm-level accounting quality index | | 0.379 (0.000) | | |
| English home language dummy | | 0.904 (0.000) | | |
| Selectivity correction (normalized by its own standard deviation) | | 0.105 (0.130) | -0.125 (0.515) | |
| Adjusted R-squared | 0.26 | 0.26 | 0.10 | |
| Number of observations | 8067 | 7788 | 279 | |

**Table 4 (continued): Jointly Estimating U.S. Holdings Behavior and Cross-listing Decision**

| **Panel B: Float-Adjusted** | Cross-Listing % Probability | U.S. Holdings Share (%) of Market Float if: Not Cross-Listed | Cross-Listed | Difference |
|---|---|---|---|---|
| Gain in U.S. Holdings Share From Cross-Listing (%) | 0.152 (0.035) | | | |
| U.S. Holdings Share without Cross-Listing (%) | 0.375 (0.011) | | | |
| Home-country trading volume/GDP | -0.805 (0.002) | | | |
| Germanic home language dummy | 0.482 (0.074) | | | |
| Proportion of Share Held by Insiders (%) | -0.006 (0.057 | | | |
| Financial firm dummy | -0.768 (0.111 | -1.968 (0.000) | -5.819 (0.069) | -3.773 (0.146) |
| Canada dummy | 2.576 (0.001) | 2.431 (0.021) | -0.180 (0.443) | -2.613 (0.209) |
| $Log_2$ of total assets | 0.253 (0.018) | 0.602 (0.000) | 0.806 (0.177) | 0.183 (0.460) |
| National accounting quality index | 0.101 (0.000) | 0.000 (0.546) | | |
| Market value/Book value | | 0.017 (0.006) | 0.091 (0.032) | 0.073 (0.098) |
| MSCI member dummy | | 5.395 (0.000) | -2.321 (0.157) | -7.772 (0.000) |
| Shareholder rights index | | -0.717 (0.000) | 0.006 (0.590) | 0.723 (0.303) |
| Dummy for dividend-paying firms | | 0.974 (0.000) | -6.431 (0.066) | -7.478 (0.037) |
| Home-country dividend withholding tax rate faced by U.S. investors | | -0.077 (0.000) | 0.041 (0.407) | 0.119 (0.266) |
| Firm-level accounting quality index | | 0.803 (0.000) | | |
| English home language dummy | | 2.555 (0.000) | | |
| Selectivity correction (normalized by its own standard deviation) | | -0.368 (0.037) | -3.438 (0.102) | |
| Adjusted R-squared | 0.28 | 0.20 | 0.05 | |
| Number of observations | 8067 | 7788 | 279 | |

**Table 4 (continued): Jointly Estimating U.S. Holdings Behavior and Cross-listing Decision**

| **Panel C: Non-financial** | Cross-Listing | U.S. Holdings Share (%) of Market Cap. if: | | |
|---|---|---|---|---|
| | % Probability | Not Cross-Listed | Cross-Listed | Difference |
| Gain in U.S. Holdings Share from Cross-Listing (%) | 0.109 (0.174) | | | |
| U.S. Holdings Share without Cross-Listing (%) | 0.229 (0.129) | | | |
| Home-country trading volume/GDP | -0.839 (0.002) | | | |
| Germanic home language dummy | 0.977 (0.001) | | | |
| Proportion of Share Held By Insiders (%) | 0.012 (0.265) | -0.027 (0.000) | -0.137 (0.000) | -0.109 (0.002) |
| Foreign sales as a proportion of total sales (%) | 0.007 (0.193) | 0.018 (0.000) | 0.051 (0.050) | 0.033 (0.117) |
| Canada dummy | 2.592 (0.016) | 0.394 (0.315) | 1.013 (0.410) | -0.607 (0.453) |
| $Log_2$ of total assets | 0.432 (0.010) | 0.338 (0.000) | 0.090 (0.479) | -0.248 (0.282) |
| National accounting quality index | 0.055 (0.012) | 0.025 (0.036) | | |
| Market value/Book value | | 0.008 (0.031) | 0.115 (0.101) | 0.108 (0.123) |
| MSCI member dummy | | 3.178 (0.000) | -2.165 (0.186) | -5.364 (0.003) |
| Shareholder rights index | | -0.408 (0.000) | 0.139 (0.439) | 0.548 (0.256) |
| Dummy for dividend-paying firms | | 0.703 (0.000) | -1.057 (0.406) | -1.770 (0.323) |
| Home-country dividend withholding tax rate faced by U.S. investors | | -0.039 (0.000) | -0.276 (0.095) | -0.235 (0.128) |
| Firm-level accounting quality index | | 0.204 (0.001) | | |
| English home language dummy | | 1.029 (0.000) | | |
| Selectivity correction (normalized By its own standard deviation) | | -0.062 (0.313) | -0.199 (0.496) | |
| Adjusted R-squared | 0.30 | 0.26 | 0.14 | |
| Number of observations | 5155 | 4970 | 185 | |

**Table 5: Average Cross-Listing Effect for Cross-Listed Stocks**

The table reports estimates of the average cross-listing effect across 279 cross-listed firms using three alternative treatment estimators. The "Heckman-based" estimates (rows 2 and 3 of Panel A) are based on fitted holdings from the non cross-listed holdings equation (4) using data on the cross-listed firms. Parameter estimates for these equations appear in the second column of the first two panels of Table 4. The "p-matching" estimates (rows 4 and 5) are U.S. holdings of a sample of non cross-listed firms that have been paired with the cross-listed sample on the basis of fitted probabilities from a reduced-from probit model of the cross-listing decision. Panel B presents "differences-in-differences" estimates using data on U.S. holdings for March 31, 1994 and December 31, 1997. The sample in Panel B is restricted to stocks that were not cross-listed in U.S. markets in the earlier period, with the columns distinguishing between stocks that cross-listed before the second period and those that did not. Standard errors are shown in parentheses.

| Panel A: Heckman-based and P-Matching Methods | U.S. investors' aggregate holdings as percentage of: | |
|---|---|---|
| | Market capitalization | Market Float |
| 1. Mean holdings of cross-listed stocks, $E(H_i^L \mid X = 1)$ | 16.4 | 25.3 |
| 2. Heckman-based estimate of $E(H_i^L \mid X = 0)$ | 5.6 | 10.5 |
| **3. Heckman-based estimate of cross-listing effect,** $E(H_i^L \mid X = 1) - E(H_i^L \mid X = 0)$ | **10.8** **(0.7)** | **14.7** **(1.2)** |
| 4. P-matching estimate of $E(H_i^L \mid X = 0)$ | 6.4 | 9.0 |
| **5. P-Matching estimate of cross-listing effect,** $E(H_i^L \mid X = 1) - E(H_i^L \mid X = 0)$ | **10.0** **(0.8)** | **16.3** **(1.3)** |

| Panel B: Difference-in-Differences | Stocks Cross-listed on U.S. exchange by December 1997 | Stocks not Cross-listed on U.S. exchange by December 1997 |
|---|---|---|
| 6. Holdings: March 31, 1994 | 8.6 | 2.3 |
| 7. Holdings: December 31, 1997 | 17.1 | 2.9 |
| 8. Change in holdings (1994-1997) | 8.5 | 0.6 |
| **9. Difference-in-differences estimate of cross-listing effect** $E(H_i^L \mid X = 1) - E(H_i^L \mid X = 0)$ | **7.9** **(0.5)** | |
| 10. Number of Observations | 132 | 9479 |

**Table 6: Determinants of Cross-Listing Effect**

The table reports cross-sectional analyses of firm-level estimates of the cross-listing effect as a function of firm and country instruments. The Heckman [1979]-based estimates are calculated as the difference between the second and third columns of Table 4 in panels A and C. Reported in the difference-in-differences columns are coefficient estimates from a regression of the change in U.S. holdings (as a percentage of market capitalization) between March 31, 1994 and December 31, 1997 on a cross-listing dummy interacted with 1994 values of the instrument. The sample is restricted to stocks that were not cross-listed in U.S. markets in the earlier period. A dummy variable for cross-listing between 1994 and 1997, first-period values of the instruments, and changes in the instruments (between the first and second period) are included as control variables, in addition to the reported interactions between the instruments and cross-listing. P-values are shown in parentheses.

| | Heckman [1979]-based | | Differences-in-differences | |
|---|---|---|---|---|
| | Baseline | Non-financial | | |
| Proportion of Shares Held by Insiders (%) | -0.131<br>(0.000) | -0.109<br>(0.002) | | |
| Financial firm dummy | 0.801<br>(0.351) | | -6.879<br>(0.000) | -5.123<br>(0.003) |
| Canada dummy | -0.811<br>(0.379) | -0.607<br>(0.453) | -6.660<br>(0.000) | -3.634<br>(0.112) |
| $Log_2$ of total assets | -0.427<br>(0.144) | -0.248<br>(0.282) | | -0.549<br>(0.021) |
| National accounting quality index | -0.036<br>(0.000)†† | -0.025<br>(0.036) †† | -0.041<br>(0.732) | 0.169<br>(0.181) |
| Market value/Book value | 0.052<br>(0.189) | 0.108<br>(0.123) | | -0.549<br>(0.000) |
| MSCI member dummy | -4.575<br>(0.002) | -5.364<br>(0.003) | -3.237<br>(0.029) | -2.190<br>(0.140) |
| Shareholder rights index | -0.254<br>(0.271) | 0.548<br>(0.256) | 2.738<br>(0.000) | 2.714<br>(0.000) |
| Dummy for dividend-paying firms | -2.600<br>(0.234) | -1.770<br>(0.323) | | 1.127<br>(0.483) |
| Home-country dividend withholding tax rate faced by U.S. investors | 0.050<br>(0.315) | -0.235<br>(0.128) | | |
| Firm-level accounting quality index | -0.379<br>(0.000)†† | -0.204<br>(0.001)†† | -2.018<br>(0.000) | -3.103<br>(0.000) |
| English home language dummy | -0.904<br>(0.000)†† | -1.029<br>(0.000)†† | -3.682<br>(0.060) | -7.874<br>(0.001) |
| Foreign Sales as a proportion of total sales (%) | | 0.033<br>(0.117) | | |
| Number Not Cross-Listed | 7788 | 4970 | 9195 | 7285 |
| Number Cross-Listed | 279 | 185 | 128 | 96 |
| Adjusted R-squared | | | 0.05 | 0.05 |

††Standard errors are from "not cross-listed" specification in Table 4 under the assumption that the cross-listed coefficients equal zero.

**Fig. A-1: Shifted Inverse Logistic Distribution Function**