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Cross-listing premium in the US and the UK destination ☆

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ABSTRACT

This paper tests the main hypothesis that firms that cross-list have higher valuations, and provides evidence on the valuation effect of cross-listing on a major non-US market, the UK compared to the US market from source countries in the Asia-Pacific region in 2003–2004. We find evidence that there is a cross-listing premium in both markets. However, the evidence on whether the premium is significantly different in the two countries is mixed. Using univariate, OLS and random effects methods, we find some evidence that the premium in the US is higher, but using a treatment effect methodology we find that the difference is not robust.

1. Introduction

Over the past two decades, an increasing number of firms, especially those from the emerging market countries, has cross-listed their shares on the major foreign stock exchanges around the world. Based on the Annual Report and Statistics from the World Federation of Exchanges, Table 1 shows that up until 2004, there were 2632 foreign listings in the world's 50 major stock exchanges. The total value of shares trading for foreign firms accounted for 12% of total value of share trading around the world. In 2004 alone, 253 new foreign stocks were issued to the international capital markets.

This trend has caused tremendous competition among major stock exchanges around the world.[1] However, not all stock exchanges have equal appeal and foreign listings cluster in the United States and the United Kingdom. There are three major stock exchanges in the two countries, NYSE, NASDAQ and LSE, which are the three largest stock exchanges in the world in terms of average daily turnover (Table 1). Fig. 1 shows that those three stock exchanges had approximately a US$25 million value of share trading in 2004. This accounted for 61% of the total value of share trading around the world. About 1150 foreign companies were listing on these two destinations in 2004, which accounted for 44% of the total foreign stock cross-listings.

A main motive for cross-listing is a firm's need for capital funds. Several important questions emerge: why do some but not other foreign firms want to cross-list their shares overseas? What are the trade-offs for firms when choosing between the US and the UK as their cross-listing destinations?

In an important recent paper, Doidge, Karolyi, and Stulz (2004) find, for a sample of 40 countries, that "…at the end of 1997, foreign companies with shares cross-listed in the U.S. had Tobin's q ratios that were 16.5% higher than the q ratios of non-cross-listed firms from the same country." In this paper, we take a step further. We present evidence for a sample of six source countries in the Asia-Pacific region in 2003–2004 comparing the cross-listing premium in the US versus the UK destination. Our sample of

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[1] E.g. Santos and Scheinkman (2001) provide a solid theoretical framework for this mechanism and its implications; see also Coffee (2002).

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Table 1
Summary information of listings and exchanges around the world.

Exchange	Total companies	Domestic companies	Foreign companies	Total value of share trading (in millions US$)	Value of share trading-foreign (in millions US$)	Foreign %	Newly listed foreign companies 2004	Market capitalization (in millions US$)	Average daily turnover (in millions US$)
Americas									
NYSE	2293	1834	459	11,618,150.7	976,385.2	8%	20	12,707,578.3	46,103.8
Nasdaq	3229	2889	340	8,767,121.2	617,773.5	7%	23	3,532,912.0	34,790.2
TSX Group	3604	3572	32	651,059.1	744.0	0%	4	1,177,517.6	2,578.5
American SE	575	502	73	590,652.0	NA		20	83,018.9	2,352.2
Sao Paulo SE	388	386	2	103,990.1	52.2	0%	–	330,346.6	417.6
Mexican Exchange	326	151	175	45,388.8	1,327.8	3%	108	171,940.3	176.6
Santiago SE	240	239	1	12,123.5	–	0%	–	116,924.3	48.9
Buenos Aires SE	107	103	4	4832.1	238.5	5%	–	40,593.8	19.2
Colombia SE	106	106	–	2079.6	–	0%	–	25,222.9	8.5
Lima SE	224	192	32	1560.4	238.1	15%	–	17,974.8	6.2
Bermuda SE	58	21	37	67.6	–	0%	6	1852.0	0.3
Regional total	11,150	9995	1155	21,797,025.1	1,596,759.3	7%	181	18,205,881.5	86,502
Europe–Africa–Middle East									
London SE	2837	2486	351	5,169,023.6	2,228,931.5	43%	10	2,865,243.2	20,350.5
Euronext	1333	999	334	2,472,131.7	47,561.9	2%	12	2,441,261.4	9544.9
Deutsche Borse	819	660	159	1,541,122.7	137,001.0	9%	–	1,194,516.8	5996.6
BME Spanish Exchange				1,203,360.2	8,093.0	1%		940,672.9	4794.3
Borsa Italiana	278	269	9	969,234.2	94,532.0	10%	1	789,562.6	3771.3
Swiss Exchange	409	282	127	791,371.5	737,999.0	93%	1	826,040.8	3115.6
OMX Stockholm SE	276	256	20	462,501.3	50,282.6	11%	5	376,781.1	1828.1
OMX Helsinkl SE	137	134	3	223,686.9	4,146.5	2%	–	183,765.4	884.1
JSE South Africa	389	368	21	161,072.8	45,451.4	28%	1	442,525.5	641.7
Istanbul SE	297	297	–	146,604.9	–	0%	–	98,298.9	588.8
Oslo Bors	188	166	22	134,819.1	17,834.4	13%	4	141,624.2	532.9
Copenhagen SE	183	176	7	106,058.2	2243.9	2%	1	155,232.6	419.2
Irish SE	65	53	12	45,143.7	1021.1	2%	1	114,085.9	177.7
Athens Exchange	341	339	2	44,383.3	218.3	0%	1	121,921.4	175.4
Tel Aviv SE	578	573	5	33,066.7	–	0%	1	90,157.9	136.6
Wiener Borse	120	99	21	24,158.6	405.7	2%	2	87,776.3	96.6
Warsaw SE	230	225	5	16,269.3	273.5	2%	4	71,547.2	63.8
Budapest SE	47	46	1	13,369.4	27.6	0%	–	28,630.4	52.6
Tehran SE	402	402	–	12,125.2	–	0%	–	42,600.4	50.1
Ljubijana SE	140	140	–	1473.8	–	0%	–	9676.8	5.8
Luxembourg SE	234	42	192	645.2	40.6	6%	10	50,143.6	2.5
Malta SE	13	13	–	93.5	–	0%	–	2841.9	0.4
Regional total	9316	8025	1291	13,571,715.8	3,376,064.0	25%	54	11,074,907.2	53,230
Asia-Pacific									
Tokyo SE	2306	2276	30	3,218,112.8	612.1	0%	1	3,557,674.4	13,081.8
Taiwan SE Corp.	702	697	5	718,804.4	296.7	0%	–	441,435.8	2875.2
Australian SE	1583	1515	68	523,668.5	10,214.0	2%	8	776,402.8	2053.6
Korea Exchange	683	683	–	488,408.3	–	0%	–	389,473.4	1961.5
Hong Kong Exchanges	1096	1086	10	439,463.8	449.3	0%	–	861,462.9	1764.9
Shanghai SE	837	837	–	322,828.6	–	0%	–	314,315.7	1328.5
National SE India	957	957	–	260,409.2	–	0%	–	363,276.0	1025.2
Shenzhen SE	536	536	–	194,457.7	–	0%	–	133,404.6	800.2
Osaka SE	1090	1090	–	134,361.7	–	0%	–	2,287,047.8	546.2
Thailand SE	463,463	–		116,381.2	–	0%	–	115,390.4	475.0
BSE, The SE Mumbai	4730	4730		118,247.8	–	0%	–	386,321.1	465.5
Singapore Exchange	633	608	25	107,247.4	NA		–	217,617.8	423.9
Bursa Malaysia	959	955	4	61,636.4	1134.7	2%	–	181,623.8	248.5
Jakarta SE	331	331	–	27,517.7	–	0%	–	73,250.6	114.2
New Zealand Exchange	200	158	42	17,034.2	1473.0	9%	9	43,731.3	67.3
Philippine SE	235	233	2	3681.2	14.9	0%	–	28,602.0	14.9
Colombo SE	242	242	–	575.2	–	0%	–	3657.0	2.4
Regional total	17,120	16,934	186	6,752,836.1	14,194.7	0%	18	10,059,297.0	27,249
Total	37,586	34,954	2632	42,121,577.0	4,987,018.0	12%	253	39,340,085.7	166,980

Source: World Federations of Exchanges, Annual Report and Statistics (2004).

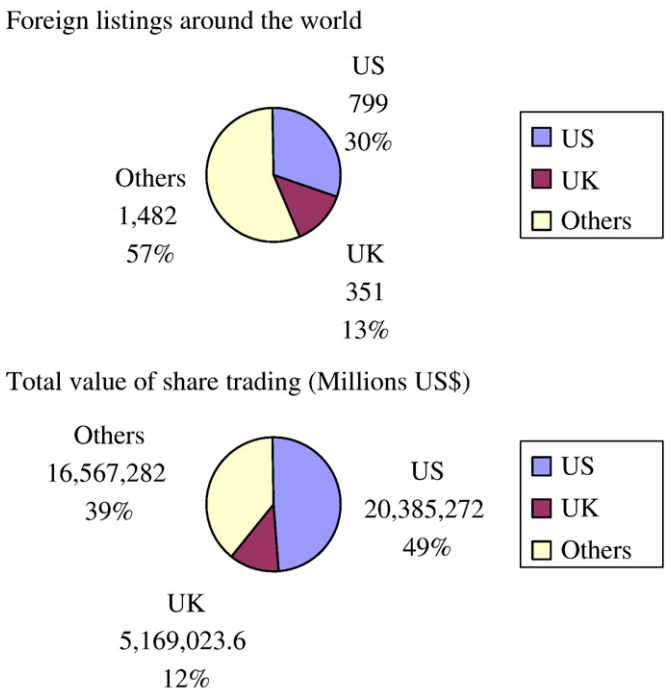

Fig. 1. Foreign listings and total value of share trading around the world.

source nations includes: Australia, China, India, Japan, Korea and Taiwan; e.g. Fig. 2.[2] Our main idea is that source countries' geography and proximity may matter for cross-listing destination premium. Firms may follow the leaders in a geographic region and follow the trends in cross-listing destination. For example, given the closer ties and proximity between Latin America and North America, firms in Latin America may choose the US destination. In the British sphere, firms may choose the UK destination. We chose the Asia-Pacific region, including China, where there is not a strict clear pattern of ties in terms of proximity to the US and the UK.[3]

One would expect that the more (less) stringent the corporate governance arrangement in the listing destination, the higher (lower) the increase in valuation for cross-listing firms. In particular, because the corporate governance standards are higher in both the US and the UK relative to the rest of the world, firms choosing to cross-list in those two destinations should have a higher increase in valuation, i.e., a cross-listing premium. From an accounting perspective, the US has better investor protection than the UK; hence we would expect the cross-listing premium to be higher for firms listing in the US than those listing in the UK. A recent paper by Doidge, Karolyi and Stulz (2009) also provide, among other things, an analysis of the "cross-listing premium" differences between the US and London.[4] Their sample of source countries is very large and broad and they find a significant difference in favor of US cross-listing versus London cross-listing. Our results indicate that in the restricted Asia-Pacific geographic region, it is less clear whether or not a significant difference between US and UK premium remains, given that trend setters from the region cross-list in both destinations.

Based on a country panel dataset, which includes 4491 firms' valuation observations from the six Asia-Pacific countries, we present empirical evidence on US and UK cross-listing premiums with univariate and multivariate econometric analysis. The empirical evidence presented is consistent with the hypothesis that cross-listing commands a premium both in the US and the UK. However, we find that the evidence on the difference in premium across the US and UK is mixed. Using univariate, OLS and random effects models we found a significant difference; with premiums in the US larger than the UK, consistent with Doidge et al. (2009). However, using a treatment effects methodology, this difference is not robust. Hence, geography and proximity may be factors that mitigate the corporate governance effects of cross-listing. Our evidence indicates that, both in the US and UK unobserved factors account for a negative correlation between the likelihood of cross-listing and valuation, but observables show that cross-listing commands a premium on valuation.

[2] Most notable in our study is the focus on the specific geographic region of source companies, and the inclusion of China in the sample.

[3] In our sample, 13 large companies, including Honda, Sony and Toyota in Japan cross-list both in the US and the UK destination, and are possibly trend setters in the region. Froot and Dabora (1999) show evidence of arbitrage opportunities in multi-listing cases.

[4] After completion of this paper, we became aware of the paper by Doidge, Karolyi and Stulz (2007).

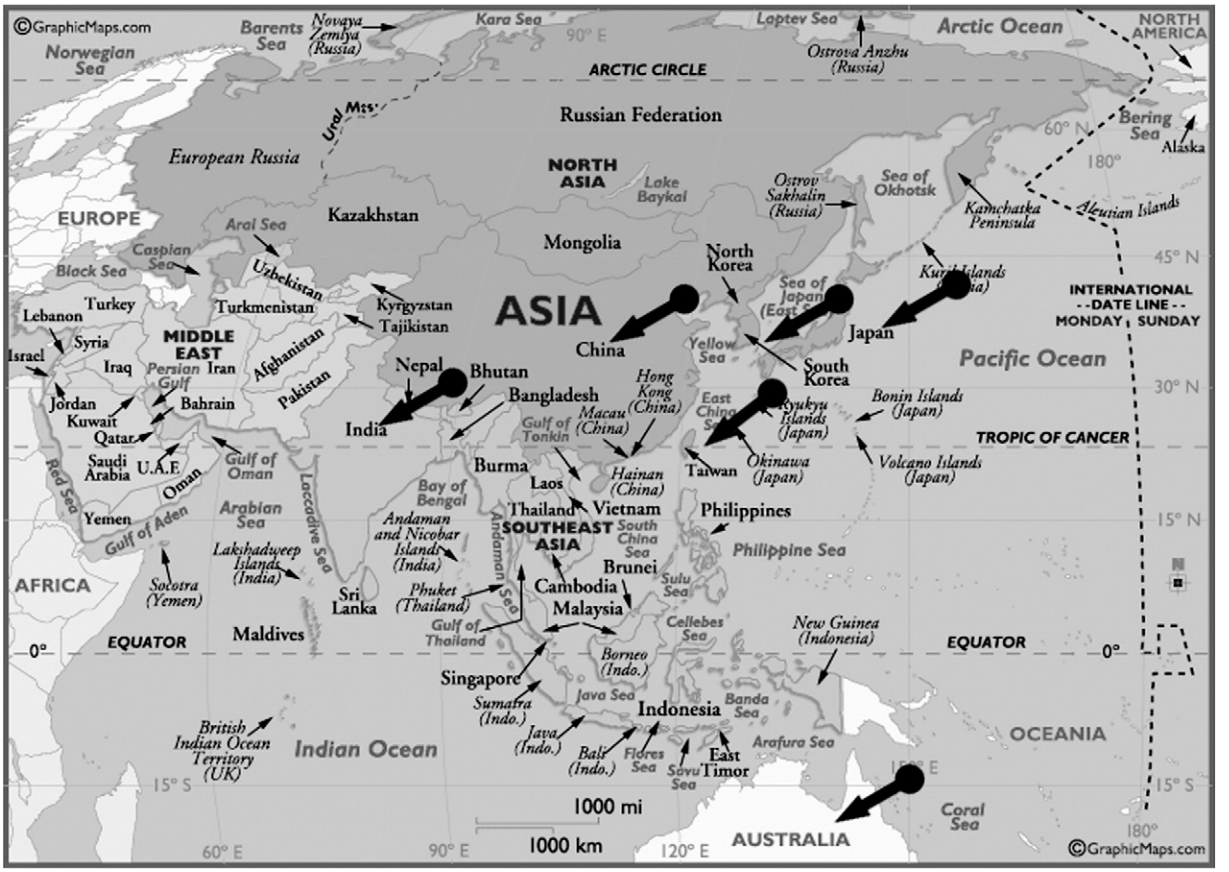

Fig. 2. Source countries in Pacific-Asia region: Australia, China, India, Japan, Korea and Taiwan.

The rest of the paper is organized as follows. In the next section, we review the previous research on international listing. In Section 3, we compare the listing requirements and costs between the US and the UK. Then, in Section 4 we discuss a simple model based on Doidge et al. (2004) and develop the main hypothesis. Section 5 describes the data and the empirical results are presented in Section 6. The last section offers concluding remarks; and an appendix provides details about the econometric methodology.

2. The reasons for international listing

Why do firms want to cross-list? We summarize four common explanations here.[5]

2.1. Market segmentation hypothesis

The market segmentation hypothesis is the most oft-cited reason for cross-listing. It is claimed that it allows investors to avoid cross-border barriers to investment. Those barriers may come from regulatory restrictions, information problems such as uninformative accounting practices or simply from the lack of knowledge about a security (e.g. Merton, 1987). Removing the barriers and integrating markets would allow for more efficient diversification and lower the risk of a security. Based on this hypothesis, a firm's stock price will rise, and the cost of capital will decline in response to the cross-listing.

Two seminal studies of this literature are Foerster and Karolyi (1999) and Miller (1999). Foerster and Karolyi (1999) examine weekly abnormal returns for two years before and after the US cross-listing by establishing an American Depositary Receipt (ADR) program.[6] The result is firms that cross-list through ADR issuance eventually experience an unexpected increase in their stock price, of about 10% in the year before the listing. However, this unexpected increase is followed by a decrease of some 9% in the year after listing. Miller's (1999) study focuses on the 80 days around the cross-listing event and finds a positive 1.15% average

[5] Karolyi (1998, 2005) did a thorough review of the cross-listing literature; see also Tolmunen and Tortsilla (2005), Owers, Lin, and Rogers (2008) for studies of the relationship between cross-listing and mergers and acquisitions. Hargis (2000) focuses on financial development in emerging economies and cross-listing.

[6] The ADR program permits individuals in US markets to invest in non-US firms in US dollar-denominated receipts redeemable by specialized US financial institutions (Depositories) in the underlying shares.

abnormal return for 183 ADRs between 1985 and 1995. Other studies, like Alexander, Eun, and Janakiramanan (1988), Foerster and Karolyi (1993), Jayaraman, Shastri, and Tandon (1993), all use a similar approach to examine the stock price reaction when firms cross-list in the US. The evidence is of a positive price reaction to cross-listing. In addition, Alexander, Eun, and Janakiramanan (1987), Foerster and Karolyi (1993, 1999), Jayaraman, Shastri and Tandon (1993), Karolyi (1998), and Errunza and Miller (2000) all find evidence that confirms the prediction that the cost of capital declines following the cross-listing.

2.2. Liquidity hypothesis

Cross-listing can also be explained by a liquidity argument. From a stock trader's perspective, the greater the liquidity the smaller the spread. Mittoo (1992) presents a market survey, which shows that managers of foreign companies cite increased trading liquidity (28% of respondents) as a primary factor in their decision to cross-list. Cross-listing would help firms to get access to more investors, which would lead to higher volume. For instance, Tinic and West (1974) find that 112 Canadian stocks cross-listed on US exchanges have lower bid-ask spreads than their purely domestically traded counterparts. Amihud and Mendelson (1986) analyze asset pricing and the bid-ask spread using a theoretical model. They proxy the lack of liquidity as the cost of immediately executing a trade and, in their empirical test, they find evidence consistent with increased liquidity from multiple exchange listings. Foerster and Karolyi (1998), Domowitz, Glen, and Madhavan (2004), and Smith and Sofianos (1997) all study the impact of US cross-listing on the costs of transacting a particular security, and generally find that spreads decrease and trading volume increases following a cross-listing, both of which reflect an increase in liquidity. Moel (2001) investigates the effect of ADRs on the liquidity as well as other attributes of domestic stock markets. He finds that ADR listings decrease liquidity in domestic stock markets due to increased ADR order flow in US markets.

Although there is mounting evidence that is consistent with the market segmentation hypothesis and the liquidity hypothesis, they face a number of challenges in explaining the trend of cross-listing. The most evident one is that if cross-listing were to overcome the market segmentation and improve liquidity, thus lowering the cost of capital and bid-ask spreads, every foreign firm should choose to do so. Still, the majority of the public traded firms do not cross-list their shares overseas.

2.3. Information environment

The information disclosure requirements are often more stringent in the cross-listing destination countries, like the US and the UK. The information environment hypothesis assumes that some form of information asymmetry or market incompleteness exists. Cross-listing to a more stringent disclosure requirement regime allows firms to signal outside investors that they have better prospects than others. Earlier studies on this direction are Cantale (1996), Fuerst (1998) and Moel (1999). They develop theoretical models, which establish the signaling equilibrium in which firms that list on markets with high disclosure standards signal that they are high-value firms. In particular, Fuerst's (1998) model predicts that firms that cross-list in the US will experience abnormal operating performance, especially firms coming from less strict regulatory regimes.[7]

Evidence from empirical studies generally supports the predictions of those theoretical papers. Baker, Nofsinger, and Weaver (2002) find that NYSE listings are associated with greater analyst coverage and media hits. Lang, Lins, and Miller (2003) compare 235 US cross-listing firms with 4859 non-US cross-listing firms. They find that cross-listed firms have more than twice analysts' coverage than non cross-listed firms, and the accuracy of forecasts increases by 1.36% on average. Moreover, they find that Tobin's q is much higher for cross listed firms, and is positively associated with the increased analyst coverage and improved accuracy. Bailey, Karolyi, and Salva (2006) use an event study to investigate 427 firms' cumulative absolute abnormal returns and abnormal trading volume before and after US cross-listings. They show that the three-day abnormal return volatility increases from 2.75% to 3.38%. This is significant after controlling for the number of analysts, the forecast surprise relative to the median analyst, and the dispersion of their forecasts.

2.4. Corporate governance and the "bonding" hypothesis

Coffee (1999, 2002) and Stulz (1999) are the first to point out that corporate governance matters for cross-listing, the so-called "bonding" hypothesis. They argue that firms with poor home country corporate governance often cross-list their securities on stock markets located in countries with more rigorous governance standards. "Bonding" to more rigorous governance standards improves access to capital, which, in turn, lowers the cost of capital and increases the value of the firm. Firms outside the US are generally controlled by large shareholders and, from the perspective of the controlling shareholder, there are costs as well as benefits for cross-listing. Cross-listing limits the ability of the controlling shareholder to take private benefits from their firms, but it also provides external finance, and funds the investment opportunities available. Controlling shareholders are willing to "bond" themselves not to take private benefits when the value of having access to external capital is large relative to the size of private benefits. In such circumstances, firms often have investment opportunities that require external financing.

[7] Moel (1999) develops a two-country and two-security market equilibrium model where the security price increases as a function of the level of information disclosure. This model predicts that firms with higher volatility, operating in a low disclosure and low information trading environment, will disclose more information.

A sizable literature has tested the bonding hypothesis. Reese and Weisbach (2002), for example, examine the relation between the number of US cross-listings and the level of investor protection in the cross-listed firms' home countries. Their results show that: i. Equity issues increase following all cross-listings, regardless of shareholder protection; ii. The increase is larger for cross-listings from countries with weak protection; iii. Equity issues following cross-listings in the US will tend to be in the US for firms from countries with strong protection, and outside the US for firms from countries with weak protection. To avoid the limitations of event studies, Doidge et al. (2004) take another approach. They examine the firms' valuation premium with and without cross-listing, using Tobin's *q* as the measure of valuation. Using data from 40 countries on the valuation samples of 714 cross-listed and 4078 non cross-listed firms in 1997, they find a significant positive valuation premium for firms cross-listed in the US. Doidge (2004) estimates relationships between US cross-listings and the private benefits to insiders controlling the firm. His sample includes 745 firms domiciled in 20 countries over the 1994–2001 periods. A total of 137 of those firms are cross-listed in the US market. He finds that private benefits to insiders decline for firms cross-listed in the US.

3. Comparison of listing requirements and costs between US and UK

In this paper, we adopt the idea of "bonding" and present a theoretical model, followed by empirical tests to further explain how firms make cross-listing decisions, with particular focus on the destination to cross-list, thus comparing the US versus the UK. Listing requirements for the US and the UK stock markets differs greatly. The main differences are on the accounting standards accepted by the exchanges and the level of disclosure requirements.

In the US, American Depositary Receipts (ADRs) is the primary way for non-US firms to list in the US. It is a negotiable certificate that usually represents a foreign company's publicly traded equity. Depositary Receipts are created when a broker purchases the company's shares on the home stock market and delivers them to the depositary's local custodian bank, such as the Bank of New York, Citibank or Morgan Guaranty (now JP Morgan Chase). These financial intermediaries hold the foreign shares denominated in foreign currency and issue the US shares denominated in the US dollars, which are called an ADR. They can be traded freely, just like any other security, either on an exchange or on the over-the-counter market. Such trading alleviates certain obstacles associated with investing directly in the home market of non-U.S. companies. For instance, with ADRs, investors do not have to learn about unfamiliar foreign custody fees or carry out foreign exchange transactions.

There are three levels of ADRs in the US. Each of them represents a different level of disclosure requirement and costs. Level I ADRs are only traded over-the-counter as Pink Sheet issues. It does not require Generally Accepted Accounting Principles (GAAP) reconciliation. Firms are also exempt from SEC filing under Rule 12g3-2(b), which allows home country accounting statements with adequate English translation. But Level I ADRs are traded with limited liquidity. Level II ADRs require partial GAAP reconciliation for different accounting items. Level III ADRs require full GAAP reconciliation. Both Level II and Level III require full SEC disclosure with Form 20-F and are the most prestigious and costly type of listing. As only Level II and Level III ADRs have stringent governance requirements, which are also confirmed by empirical studies, such as Doidge et al. (2004), we focus our study on these two types only.[8]

To cross-list in the UK, firms can list their equity directly on the London Stock Exchange's main market or through the Depositary Receipts (DRs), including Global Depositary Receipts (GDRs) and American Depositary Receipts (ADRs), and Euro Depositary Receipts (EDRs), which are denominated in euros. The disclosure requirements are more flexible compared with those in the US. Firms can adopt International Accounting Standards (IAS), US or UK Generally Accepted Accounting Principles (GAAP). And it is often believed that IAS gives managers more discretion to do earning management than US GAAP. Moreover, if firms' stocks are only traded by institutional investors, which are called Professional DRs, the requirements are even less demanding. Firms' financial accounting statements can be prepared under home country GAAP only, and no reconciliation between local GAAP and IAS, US or UK GAAP is required. Even the consolidation for multiple entities' financial statements is not required.

According to the above comparison, generally speaking, the listing requirements for cross-listing in the UK are less stringent than those in the US. Evidence from the previous cross-listing location studies is also consistent with this conclusion. Biddle and Saudagaran (1995), for example, study the reporting and regulatory costs of eight major listing locations around the world. In their study, they sent out a survey to 200 individuals who are actively involved in the foreign listing process. Those participants included corporate managers, investment bankers, public accountants, stock exchange officials, attorneys and academics. The survey asked them to rank several financial and regulatory factors in the eight countries. The factors included statutory reporting requirements, exchange reporting requirements, capital market expectations, and overall disclosure levels.[9] This study shows that the US has the highest disclosure level, which is higher than the UK.

As shown above, previous studies exclusively focused on the cross-listing destination to the US market.[10] In the UK, the London Stock Exchange (LSE) is one of the largest stock exchanges around the world. Including the LSE allows us to determine whether cross-listing can increase firm's valuation on a non-US market. The difference in the premium and the differential costs for cross-listing either in the US or the UK can help us to explain firm's cross-listing location preference.[11]

[8] See Karolyi (1998) Table 2. 1. There are also Reg S/Rule 144a and OTC pink sheets DRs in the US, but those are not used in our sample.

[9] See Biddle and Saudagaran (1995), Table 3.

[10] Some new studies focus on cross-listings in Europe and UK and discuss the influence of geographical proximity on cross-listings, e.g. Pagano, Röell, and Zechner (2002), Sarkissian and Schill (2009).

[11] There are other recent papers on cross-listing premium including Gozzi, Levine, and Schmukler (2008), King and Segal (2008), Sarkissian and Schill (2009), Doidge, Karolyi, and Stulz (2008), Halling (2008), Buchanan and English (2007).

4. Theoretical models

Recent ownership structure studies have shown that the ownership structure of firms is more concentrated in countries other than the US around the world (e.g. Prowse, 1992; Djankov et al., 2008). In many countries, especially developing ones, the primary agency conflict for large corporations is the one restricting expropriation of minority shareholders by the controlling shareholders, rather than that of restricting empire building by unaccountable managers (Claessens, Djankov, & Lang, 2002).

In the simple model of Doidge et al. (2004), it is assumed that a firm is fully controlled by a single shareholder who has the power to expropriate values from minority shareholders of the firm. The controlling shareholder has cash flow ownership in the firm denominated by $\alpha>0$. It is exogenously determined by the history of the firm. The firm's cash flow is denoted by *CF*. The controlling shareholder expropriates share $v\geq 0$ of the firm's cash flow. Because expropriation is costly, it has a deadweight cost to the firm's cash flow (La Porta, 2002). This cost is increasing in both the level of investor protection and in the fraction of cash flow that is expropriated. The cost function is quadratic and given by $\frac{1}{2}bv^2p$, where $b>0$ is a constant and $p>0$ is the investor protection quality that applies to the minority shareholders of the firm from the country that the firm is listed. Thus, the total gain of the controlling shareholder is given by

$$\alpha\left(1-v-\frac{1}{2}bv^2p\right)CF+vCF$$

where the first term is the share of cash flow that the controlling shareholder gets from his equity ownership and the second term is the proportion that he gets from expropriation. The firm has a growth opportunity, denoted by *g*. The distribution of growth opportunities across firms is assumed uniform over the interval $(0, g^{max})$.

When the controlling shareholder makes a cross-listing decision, she meets a tradeoff problem. On one hand, the firm will fulfill its growth opportunity and get access to lower cost of capital, taking advantage of risk sharing opportunities. This will increase the firm's valuation and the controlling shareholder will benefit from it. On the other hand, it will become more costly to divert the firm's value in a more stringent corporate governance regime than in the firm's own country; thus decreasing the controlling shareholder's utility. The optimal proportion of cash flow to divert is[12]

$$v^*=\frac{1-\alpha}{\alpha bp}.$$

Calculation of the firm's valuation using Tobin's *q*; from the minority shareholder's perspective yields

$q=(1-v-\frac{1}{2}bv^2p)CF$ if the firm is not cross-listed;

$q_{CL}=(1-v_{CL}-\frac{1}{2}bv_{CL}^2p_{CL})(CF+g)$, if the firm is cross-listed to a more stringent corporate governance regime; where the firm realizes its growth opportunity *g* and $p_{CL}>p$ is the protection quality at the destination.

First, the main hypothesis is that for $p_{CL}>p$ ceteris paribus firms that choose to cross-list should command a positive valuation premium, regardless of where they cross-list. Second, ceteris paribus, the higher the corporate governance quality in the destination stock exchange, the higher the cross-listing premium for a firm. In particular, the premium of firms that cross-listed in the US should be higher than that of firms cross-listed in the UK, as $p_{US}>p_{UK}$, it implies $\phi_{US}>\phi_{UK}$. However, differences in the realized growth opportunities across countries may mitigate this effect, that is, even though $p_{US}>p_{UK}$, in the case where the realized growth opportunity in the UK is large enough relative to the US, or $\bar{g}_{UK}>\bar{g}_{US}$, the premium difference may be negligible, or $\phi_{US}\approx\phi_{UK}$.

5. Data

In the empirical analysis, the most important variable is Tobin's *q*. It measures the valuation of firms and serves as the dependent variable. Following Doidge et al. (2004), we calculate the Tobin's *q* as follows:

$$TOBIN\_Q_i=\frac{Total\,Liability_i+Market\,Capitalization_i}{Total\,Assets_i,}$$

where the denominator is the firm's book value of total assets and the numerator is the firm's book value of total liability plus its market capitalization. All the financial information used above is obtained at the fiscal year-end in 2004. For simplicity and data constraints, this measure does not use the market value of debt in the numerator and uses total assets instead of replacement cost in the denominator, which is the formal definition of Tobin's *q*. Another concern for the measurement of *q* is that because fast growing firms are more likely to acquire assets, they tend to have a relatively high book value of total assets. Following the work of Hirsch and Seaks (1993), we use the natural logarithm of *q* for the dependent variable in the regression analysis.

[12] This is obtained by the controlling shareholder maximizing her total gain with choice of the share to divert; see eg. Doidge et al. (2004). The optimal cross-listing premium is, $\phi^*=CF\left(\frac{1-\alpha^2}{2\alpha^2b}\right)\left(\frac{1}{p}-\frac{1}{p_{CL}}\right)+g\left(1-\frac{1-\alpha^2}{2\alpha^2bp_{CL}}\right)$; and differentiating with respect to p_{CL}, we get $\frac{\partial\phi^*}{\partial p_{CL}}=\frac{1-\alpha^2}{2\alpha^2b}(CF+g)\frac{1}{p_{CL}^2}>0$; where ϕ^* is strictly concave in p_{CL} for the domain $p_{CL}\geq p$.

Table 2
Variables definition.

TOBIN_Q	The sum of firm's book value of total liability and its market capitalization divided by the firm's book value of total assets; in logarithms in the regression analysis.
CL_US	Takes the value of 1 if the firm is cross-listed in the stock exchange in the US (NYSE or NASDAQ), 0 otherwise.
CL_UK	Takes the value of 1 if the firm is cross-listed in the London Stock Exchange, 0 otherwise.
SG2Y	Geometric mean of annual sales growth rate in 2003 and in 2004.
INDU_Q	Median of Tobin's q of the selected firms in a certain industry. The industry is defined according to 2-digit SIC code.
SIZE	Log of sales (in million US$) at the fiscal year-end in 2004.
LIQ	Dollar value of shares traded in a country's equity markets divided by the country's average market capitalization for the time period
GDPG	GDP growth rate of the source country in year 2004.
COM_LAW	Takes the value of 1 if the firm is selected from countries that have a common law origin, 0 otherwise.

The independent variables are the two cross-listing dummy variables for the US and UK. They take the value of 1 if cross-listed in the country and 0 otherwise. The estimated coefficient will represent the cross-listing premium in each destination. We also include several firm-level and country-level variables as controls. First, two firm level variables are used to control for firm's growth opportunities. SG2Y is the geometric mean of a firm's annual sales growth rate in year 2003 and year 2004. INDU_Q is the median of Tobin's *q* level of the selected firms in a certain industry, which is defined by 2-digit SIC code.

COM_LAW is defined to have the value of 1 if the firm comes from common law origin countries, 0 otherwise. It is the rough proxy for the quality of corporate governance in the source countries. LIQ is the liquidity ratio of the selected countries. It is the dollar value of shares traded in a country's equity markets divided by the country's average market capitalization for the time period. Liquidity ratio is used to control for the liquidity explanation of cross-listing. SIZE is the log of sales (in million US$) of the firm at the fiscal year-end in 2004 and it captures the firm's size. GDPG is the GDP growth rate of the firm's source country in the year 2004 thus controlling for macroeconomic factors. Table 2 describes the definitions of all the variables used in the regression models.

The sample firms' financial information comes from the *WorldScope* database (July 2005 Edition). This database keeps the financial information of more than 25,000 public traded companies from 62 countries around the world. It represents approximately 95% of global market capitalization.

We focus on firms from the six Asia-Pacific countries, including Australia, China, India, Japan, Korea and Taiwan. The reason to choose those six countries is geographic since they are all in the Asia-Pacific region, which controls for the proximity factor for cross-listing decisions, plus they have cross-listed firm samples in both the US and the UK. There are 9656 such firms in the *WorldScope* database in 2004.

To make firms' characteristic variables more comparable, we select the sample in the following way. First, we only study large firms, which have total assets greater than 100 million (in US$). According to LaPorta (2002), shares of large firms are the most liquid, which undermines the concern that the differences in valuation are due to differences in liquidity.[13] By applying this rule, the sample decreases to 5963 firms. Then, we exclude observations from the finance, insurance and real estate industries by eliminating firms that have two-digit SIC code from 60 to 67. This is because the valuation ratios of financial institutions are usually not comparable to those of non-financial firms. This leaves us with 5318 observations. Then, firms should have financial statements in 2004 disclosed in the *WorldScope* database. This is the period in which Tobin's *q* is calculated. Firms should also have at least three years of sales data, so that we can calculate the average two-year sales growth rate.[14] Finally, we drop 13 firms that cross-list in both destinations. The final sample contains 4491 firms. Then, we select the necessary financial information from each firm in the database to calculate *TOBIN_Q*, *SG2Y*, *INDU_Q*, and *SIZE*.

The US cross-listing information comes from the website of Bank of New York (Complete DR Directory). Bank of New York is one of the major custodians of ADR program in US. This bank discloses a complete ADR list. We restrict to Level II and III ADRs only, as the cross-listing literature has shown that only the Level II and III ADRs programs have a higher corporate governance quality (Doidge et al., 2004; Schrage & Vaaler, 2005). We match the ADRs list from the website with our 4,504 sample firms and obtain the CL_US dummy. There are totally 55 US only cross-listing observations. We then obtain the list of UK cross-listing firms from the London Stock Exchange. After applying the same match technique, we get the CL_UK dummy, which shows 41 cross-listing records in the UK only.

Data for country-level variables are obtained from several other sources. They include the *World Development Indicator* from the World Bank for the *LIQ* and the *GDPG*, Djankov, La Porta, Lopez-de-Silanes, and Shleifer (2008) for the *COM_LAW* dummy.

To reduce the weight of outliers, we follow LaPorta (2002) and censor *TOBIN_Q* at the 2nd and 98th percentiles by setting extreme values to the 2nd and 98th percentile values, respectively.

Table 3 shows the descriptive statistics of the final sample. Table 4 provides the pairwise correlation coefficients of the variables.

[13] Large firms also have access to substitute mechanisms for limiting their expropriation of minority shareholders and increasing firms' valuation, including public scrutiny, reputation building (Gomes, 2000), foreign shareholdings, etc. It may make the effect of cross-listing overseas difficult to observe, and the results more conservative.

[14] An average of sales growth rate gives us a more reliable measure of sales growth than just have one year sales growth rate.

Table 3
Summary statistics.

Variable	Obs	Mean	Median	Std Dev	Min	Max
Q (level)	4491	1.213	1.08	0.519	0.55	3.19
TOBIN_Q (log)	4991	0.121	0.073	0.366	−0.60	1.16
CL_US	4491	0.012	0	0.110	0	1
CL_UK	4491	0.009	0	0.095	0	1
SG2Y	4491	12.262	5.79	32.664	−77.56	960.56
INDU_Q	4491	1.154	1.10	0.261	0.81	2.22
COM_LAW	4491	0.090	0	0.287	0	1
LIQ	4491	1.208	0.99	0.776	0.69	4.62
GDPG	4491	4.701	2.70	2.782	2.7	9.5
SIZE	4491	12.874	12.67	1.385	8.09	18.79

5.1. Empirical models: OLS and country random effects

The model predicts that all the cross-listed firms have higher valuation than those not cross-listed. Potentially, firms cross-listed in the US could have a higher valuation than firms cross-listed in the UK due to better governance, for a given identical realized growth opportunity; however this effect can be mitigated by better realized growth opportunities in the UK for example. We test those hypotheses using both OLS and country random effects by first estimating the following regression model:

$$TOBIN\_Q_{ic} = \beta_0 + \beta_1 CL\_US_{ic} + \beta_2 CL\_UK_{ic} + \beta_3 SG2Y_{ic} + \beta_4 INDUS\_Q_i + \beta_5 COM\_LAW_c + \beta_6 LIQ_c + a_c + \varepsilon_{ic} \quad (1)$$

where *c* indexes country and *i* indexes the industry within the country and *q* is in logs. The primary focus is to examine the signs and size of coefficients β_1 and β_2. The main hypothesis predicts that $\beta_1 > 0$, $\beta_2 > 0$ and $\beta_1 > \beta_2$. The variable SG2Y is used to control for the growth opportunity of a specific firm. The variable INDUS_Q is used to control for the growth opportunity in a certain industry. Each of them should have a positive coefficient. If the high valuation of cross-listed firms is simply because they have better investment opportunities, controlling for growth opportunity in the regression should make the cross-listing premium disappear. The variable COM_LAW separates the countries into two legal origin group, common law group or civil law group. La Porta (2002) have shown that countries with the common law legal origin have better protection of minority shareholders than do countries with civil law legal origin. If this is the case, firms from common law origin countries should have higher valuation and we should observe a positive sign for β_5, $\beta_5 > 0$. The variable LIQ is used to control for liquidity factor of the source countries. The more liquid a country's capital market, the higher the valuation of the firms that listed in that country, we predict $\beta_6 > 0$.

In order to study closely the valuation difference between the two destinations, we take the difference of the two dummy variables. Let DIFF = CL_US-CL_UK and run regressions on the following specification:

$$TOBIN\_Q_{ic} = \beta_0 + \beta_7 DIFF_{ic} + \beta_3 SG2Y_{ic} + \beta_4 INDUS\_Q_i + \beta_5 COM\_LAW_c + \beta_6 LIQ_c + a_c + \varepsilon_{ic} \quad (2)$$

If the effect of an increase in valuation is significantly different between the two destinations, we would observe $\beta_7 > 0$.

Table 4
Correlation matrix.

	TOBIN_Q(log)	*CL_US*	*CL_UK*	*SG2Y*	*INDU_Q*	*COM_LAW*	*LIQ*	*GDPG*	*SIZE*
TOBIN_Q(log)	1.0000								
CL_US	0.0686	1.0000							
	(0.0000)								
CL_UK	0.0351	−0.0107	1.0000						
	(0.0185)	(0.4735)							
SG2Y	0.2165	0.0110	0.0185	1.0000					
	(0.0000)	(0.4625)	(0.2156)						
INDU_Q	0.1099	0.0163	0.0077	0.0142	1.0000				
	(0.0000)	(0.2759)	(0.6077)	(0.3404)					
COM_LAW	0.1926	0.0777	0.0920	0.0554	0.0701	1.0000			
	(0.0000)	(0.0000)	(0.0000)	(0.0002)	(0.0000)				
LIQ	0.0038	0.0380	0.0689	0.1071	−0.0346	−0.1316	1.0000		
	(0.7985)	(0.0109)	(0.0000)	(0.0000)	(0.0206)	(0.0000)			
GDPG	0.2737	0.0181	0.0316	0.2797	0.0243	0.0349	0.1394	1.0000	
	(0.0000)	(0.2249)	(0.0342)	(0.0000)	(0.1041)	(0.0195)	(0.0000)		
SIZE	−0.0014	0.1806	0.1184	−0.0143	−0.0011	−0.0249	0.0278	−0.3346	1.0000
	(0.0270)	(0.0000)	(0.0000)	(0.3391)	(0.9391)	(0.0956)	(0.0626)	(0.0000)	

(Pairwise correlation coefficients).
(Prob>|*r*| under H0: Rho = 0).
Significance level in parentheses.

For each specification, we ran OLS regressions, and then use the country random effects method. The variable a_c captures all unobserved country factors that affect $TOBIN\_Q_{ic}$, which do not change across industries.[15] In the random effects case, following Wooldridge (2002), we need to assume a_c is uncorrelated with each explanatory variable in all industries, i.e., $Cov(x_{ic},a_c)=0$, where x_{ic} stands for any explanatory variable in the previous regression functions. Define the composite error term as $v_{ic}=a_c+\varepsilon_{ic}$. As a_c is in the composite error in each industry, the v_{ic} are serially correlated across industries, hence we apply the GLS transformation.[16]

5.2. Self-selection and treatment effects

In the regressions, the firm's Tobin's q is explained by whether or not the firm is cross-listed. However, because firms with better growth opportunities are more likely to list and better growth opportunities mean better valuation, it is highly likely that firms with higher q self-select themselves into the cross-listed group. Thus, the error in the regression will be correlated with the two cross-listing dummies and will cause bias. In turn, we apply the treatment effects method, e.g. Heckman (1979), Greene (1997), Wooldridge (2002). In particular, we can think of cross-listing as a treatment for the firm's valuation. Each firm has a valuation outcome with and without this treatment; see Appendix A for technical details.

Specifically, we use the treatment effect two-step method to investigate the valuation effect of cross-listing in the two destinations separately. We compare the US cross-listing group with the non cross-listing group to see the treatment effects of the US cross-listing. Then, we compare the UK cross-listing group with the non cross-listing group to investigate the cross-listing effect in the UK. We use the variable COM_LAW as the main identifier; e.g. La Porta (2002).

In the first step, the estimation of the decision equation uses probit:

$$CL\_US_{ic} = \gamma_0 + \gamma_1 LIQ_c + \gamma_2 SIZE_{ic} + \gamma_3 COM\_LAW_c + \gamma_4 GDPG_c + u_{ic} \tag{3a}$$

$$CL\_UK_{ic} = \gamma_0 + \gamma_1 LIQ_c + \gamma_2 SIZE_{ic} + \gamma_3 COM\_LAW_c + \gamma_4 GDPG_c + u_{ic} \tag{3b}$$

The independent variables included here are the key firm-level as well as country-level characteristics that influence the cross-listing decision. The country with higher liquidity (LIQ) should be fertile ground for firms to expand and eventually cross-list. Also, larger firms, proxied by SIZE, are more likely to cross-list. Hence, we predict positive signs on parameters γ_1 and γ_2. Firms from common law countries have better investor protection, thus are more likely to cross-list. And firms from fast growing developing countries will have better growth opportunity. They are more likely to cross-list. We predict positive signs on the parameters γ_3 and γ_4. In the second step, after calculating λ_{ic} using the estimated results from the first step, the estimation of the valuation model uses λ_{ic} as a control variable and applies OLS:

$$TOBIN\_Q_{ic} = \beta_0 + \beta_1 CL\_US_{ic} + \beta_3 SG2Y_{ic} + \beta_4 INDUS\_Q_i + \beta_5 SIZE_{Ic} + \beta_8 \lambda_{ic} + v_{ic} \tag{4a}$$

$$TOBIN\_Q_{ic} = \beta_0 + \beta_2 CL\_UK_{ic} + \beta_3 SG2Y_{ic} + \beta_4 INDUS\_Q_i + \beta_5 SIZE_{Ic} + \beta_8 \lambda_{ic} + v_{ic} \tag{4b}$$

All the parameters have the same predicted signs as those in the random effects model. The coefficient of lambda, β_8 measures the extent to which unobserved factors that make cross-listing more likely to occur are associated with valuations, if positive (negative) cross-listing is more likely to occur with higher (lower) valuations.[17]

6. Empirical results

6.1. Univariate analysis

Table 5 reports the mean level Tobin's q for firms in each country by three categories, not cross-listed, cross-listed in the US, and cross-listed in the UK. It also presents the number of firms in each country by each category. There are totally 4491 firms in the dataset. Japan has the largest sample observations, which are 2543 firms. Australia companies account for the smallest proportion, which are 198 firms.

The first column reports the number of firms that are cross-listed neither in the US nor the UK, and their mean level Tobin's q by each country. The mean level Tobin's q varies widely across countries, from a minimum of 0.91 in Korea to a maximum of 1.56 in India. The second column shows the number of firms and the mean level Tobin's q for firms that cross-listed in the US only. There are 55 US cross-listed firms in this sample. The proportion of firms that are listed in the US varies widely across-countries, from 4 and 7 firms in both Korea and Taiwan respectively, to 18 firms in Japan. It then shows the difference in Tobin's q between the US

[15] The fixed effects method is not applicable for this dataset, because the country characteristic variables COM_LAW_c and LIQ_c are constant within a given country; if the fixed effects method is used, the two variables will be "differenced away" and the main source of corporate governance identification is lost.

[16] There is a positive serial correlation in the error term, where $Corr(v_{ic},v_{is})=\frac{\sigma_a^2}{\sigma_a^2+\sigma_\varepsilon^2}, c\neq s, \sigma_a^2=Var(a_c), \sigma_\varepsilon^2=Var(\varepsilon_{ic})$. In order to avoid this problem, we apply the GLS transformation thus defining $\lambda=1-\left[\frac{\sigma_\varepsilon^2}{\sigma_\varepsilon^2+T\sigma_a^2}\right]^{1/2}$. Then, the transformed regression is $TOBIN\_Q_{ic}-\lambda\,\overline{TOBIN\_Q}_c=\beta_0(1-\lambda)+\beta_1(x_{ic1}-\lambda\,\bar{x}_{c1})+\ldots+\beta_k(x_{ick}-\lambda\,\bar{x}_{ck})+(v_{ic}-\lambda\,\bar{v}_c)$, where the bar denotes the average. λ is an unknown parameter, but can be estimated. $\hat{\lambda}$ takes the form $\hat{\lambda}=1-\{1/[1+T(\hat{\sigma}_a^2/\hat{\sigma}_\varepsilon^2)]\}^{1/2}$, where $\hat{\sigma}_a^2$ is a consistent estimator of σ_a^2 and $\hat{\sigma}_\varepsilon^2$ is a consistent estimator of σ_ε^2.

[17] We are aware that variables that cause cross-listing may cause premium in valuations as well. We have proceeded with this identification scheme in an effort to examine the difference in premium between the US and UK destination.

Table 5
Univariate analysis.

	Not cross listed		Cross listed in US		Diff	Cross listed in UK		Diff	Total number
	Number	Mean q	Number	Mean q		Number	Mean q		
Australia	187	1.49	8	1.65	0.16	3	1.97	0.48	198
China	967	1.40	10	1.38	(0.02)	5	1.41	0.01	982
India	189	1.56	8	2.19	0.63	12	1.33	(0.23)	209
Japan	2516	1.12	18	1.41	0.29	9	1.07	(0.05)	2543
Korea	341	0.91	4	1.18	0.27	4	1.06	0.15	349
Taiwan	195	1.29	7	1.47	0.18	8	1.55	0.26	210
Mean Q		1.21		1.51			1.35		
Total	4395		55		1.51	41		0.62	4491
Test of difference between means									
(One tailed two-sample t test with unequal variances)									
Comparison									t-statistic
U.S.>non cross listed									4.678***
U.K.>non cross listed									1.724**

*$p<0.10$; **$p<0.05$; ***$p<0.01$.

cross-listed firms and the non cross-listed firms. The difference in each country is positive, except for −0.02 in China, which is a small amount. The total difference is 1.51. The results indicate that the mean Q for firms that cross-listed in the US is significantly higher at the 0.01 level (with t-statistic = 4.678) than that for non cross-listed firms.

Similarly, the third column provides information about the number of firm and the mean Tobin's q for firms cross-listed in the UK, and also calculates the difference in q between the UK cross-listed firms and the non cross-listed firms in each country. Here we have 41 UK cross-listing observations. Again, Japan has the largest proportion, 12 of them. Australia has only 3 firms. Two countries have negative q differences, India and Japan; all others have positive differences. The total difference is 0.62. It is smaller than the total difference in the US case. The mean q for firms that cross-listed in the UK is also significantly higher at the 0.05 level (with t-statistic = 1.724) than that for the non cross-listed firms. We do find evidence that a cross-listing premium exists in the unconditional univariate analysis.

6.2. Results from OLS and random effects regressions

We present evidence on whether or not cross-listing premium can be explained by firm and country level characteristics. Table 6 provides the regression results of models (1) and (2). In each specification, we use both OLS and Random Effects. The inferences on the coefficients that test the hypothesis do not vary by changing from OLS to Random Effects method.

Table 6
The estimated coefficients from OLS and random effects regression.

	Specification (1)		Specification (2)	
	OLS	Random effects	OLS	Random effects
CL_US	0.172	0.146		
	(0.051)***	(0.051)**		
CL_UK	0.059	0.059		
	(0.043)*	(0.042)*		
DIFF			0.073	0.056
			(0.036)**	(0.036)*
SG2Y	0.002	0.002	0.002	0.002
	(0.000)***	(0.000)***	(0.000)***	(0.000)***
INDU_Q	0.132	0.174	0.133	0.181
	(0.021)***	(0.028)***	(0.021)***	(0.029)***
COM_LAW	0.216	0.211	0.224	0.217
	(0.022)***	(0.022)***	(0.022)***	(0.026)***
LIQ	0.002	0.001	0.004	0.002
	(0.007)	(0.007)	(0.007)	(0.007)
CONSTANT	−0.084	−0.131	−0.086	−0.139
	(0.025)***	(0.033)***	(0.025)***	(0.034)***
Observations	4491	4491	4491	4491
R^2	0.090		0.088	
Overall R^2		0.090		0.088
CL_US = CL_UK	$F(1,4484) = 2.92$*	$\text{Chi}^2(1) = 1.75$		

Dependent variable: *TOBIN_Q* (log).
*$p<0.10$; **$p<0.05$; ***$p<0.01$. Robust standard errors in parentheses.

In specification (1), we regress (log) Tobin's *q* on the two cross-listing dummies and the set of control variables. The OLS regression shows that the US cross-listing premium is significantly positive, an average increase of 17% in q value (from q = 1). The UK cross-listing premium is positive, but not statistically significant. The Random Effects case produces similar results even though the average increase for the US is under 15%. There is some evidence on the valuation effect of cross-listing. The last row shows the test of differences in the coefficient on US cross-listing versus UK cross-listing. In the OLS case, the US effect is marginally statistically larger than the UK effect, but not in the Random Effects case. For the control variables, except for the LIQ, all the coefficients of control variables are significantly positive and the estimated signs are consistent with the predictions. In particular, fast growing firms and firms in fast growing industries have higher Tobin's *q*; and firms have higher *q* in common law countries because of better investor protection.

In specification (2), we run the regression model (2) to investigate whether the difference of the cross-listing premium between the US and the UK is significant. In both OLS and Random Effects model, cross listing premiums in the US are significantly larger than those in the UK; although less so in the Random Effects case.

6.3. Results from treatment effect regression

After the above analysis, we mitigate the self-selection problem by applying the treatment effects method and Table 7 presents the results. We investigate the treatment effects of the US cross-listing and the UK cross-listing separately. In each treatment effect regression, we also provide the results of the first stage probit regression.

The probit model results demonstrate that firms are more likely to cross-list their shares in overseas capital markets, such as the US and the UK when they are i. Large firms; ii. Firms from countries with higher liquidity; iii. Firms from countries that have better investor protection; and iv. Firms from fast growing countries.

The specification of treatment effects corresponds to specification (1) in Table 6. After applying the treatment effects technique, the cross-listing premium in the US is still positive and significant and much larger in magnitude of the order of 90% in q value (from $q = 1$). The cross-listing premium in the UK is also positive, significant and even larger in magnitude. The empirical findings from the treatment effects regressions confirm the main hypothesis that cross-listing either in the US or in the UK has a positive effect on the firm's valuation. However, the magnitude of the coefficients and standard errors show that there is a difference across the US and UK, in favor of the UK.

All control variables, are significant and have the expected sign, except for SIZE which has a negative sign. The sign of β_8 (the coefficient of lambda) is negative indicating that the error term in the decision equation and the valuation equation are negatively correlated. Thus, *unobserved* factors that make cross-listing more likely to occur are associated with lower valuations, thus cross-listing may provide an opportunity for a firm to improve and achieve higher market valuations.

6.4. Test for the slope effects of cross-listing

Previous regressions focused on the cross-listing dummies, and showed the intercept difference in firm's valuation due to the cross-listing. In Table 8, we re-estimate the model (3a)–(4b) using the treatment effects regression, but at this time, we add

Table 7
The estimated coefficients using treatment effects.

	Cross listing in the US		Cross listing in the UK	
	First stage probit	Treatment effects	First stage probit	Treatment effects
	Dep. vble: *CL_US*	Dep. vble: *Q* (log)	Dep. vble: *CL_UK*	Dep. vble: *Q* (log)
CL_US		0.902		
		(0.122)***		
CL_UK				1.104
				(0.150)***
SG2Y		0.002		0.002
		(0.000)***		(0.000)***
INDU_Q		0.145		0.145
		(0.020)***		(0.020)***
COM_LAW	0.862		1.092	
	(0.158)***		(0.164)***	
LIQ	0.142		0.219	
	(0.060)**		(0.057)***	
Lambda		−0.339		−0.450
		(0.054)***		(0.062)***
GDPG	0.110		0.105	
	(0.027)***		(0.030)***	
SIZE	0.486	−0.014	0.359	−0.012
	(0.046)***	(0.004)***	(0.046)***	(0.004)***
CONSTANT	−9.833	0.091	−8.297	0.069
	(0.744)***	(0.061)*	(0.745)***	(0.059)***
Chi^2		440.1***		382.9***
Observations	4450	4450	4436	4436

*$p < 0.10$; **$p < 0.05$; ***$p < 0.01$. Robust standard errors in parentheses.

Table 8
Test for the slope effects of cross-listing.

	Cross listing in the US		Cross listing in the UK	
	First stage probit	Treatment effects	First stage probit	Treatment effects
	Dep. vble: *CL_US*	Dep. vble: *Q* (log)	Dep. vble: *CL_UK*	Dep. vble: *Q* (log)
CL_US		0.953		
		(0.343)***		
CL_UK				1.384
				(0.256)***
SG2Y		0.002		0.002
		(0.000)***		(0.000)***
SG_CL		0.005		0.009
		(0.002)***		(0.002)***
INDU_Q		0.145		0.144
		(0.020)***		(0.021)***
IND_CL		0.088		0.135
		(0.133)		(0.127)
COM_LAW	0.862		1.091	
	(0.158)***		(0.164)***	
COM_CL		0.251		0.150
		(0.076)***		(0.080)**
LIQ	0.142		0.219	
	(0.060)**		(0.058)***	
LIQ_CL		−0.009		−0.109
		(0.029)		(0.031)***
GDPG_CL		−0.031		−0.056
		(0.014)*		(0.015)***
Lambda		−0.335		−0.520
		(0.056)***		(0.070)***
GDPG	0.110		0.105	
	(0.027)***		(0.030)***	
SIZE	0.486	−0.013	0.359	−0.013
	(0.046)***	(0.004)***	(0.046)***	(0.004)***
CONSTANT	−9.833	0.085	−8.297	0.079
	(0.744)***	(0.062)*	(0.745)***	(0.061)*
Chi^2		467.2***		413.0***
Observations	4450	4450	4436	4436

*$p<0.10$; **$p<0.05$; ***$p<0.01$. Robust standard errors in parentheses.

several interaction terms. We interact the cross-listing dummies with all the other control variables allowing us to examine whether there are any differences in slopes due to cross-listing overseas.

For the US regression, the cross-listing effect continues to be statistically significance. The interaction terms for the sales growth rate with the listing dummy is significant and positive. This means there are valuation differences between the listing and non-listing firms, but the gap increases as the growth opportunities increase. The governance interaction is significantly positive. The sign of the latter interaction is not consistent with the previous literature. Doidge (2004) argues that firms listing in the US are more valuable, the lower the corporate governance quality is in the home countries; the coefficients for the variable should be negative. The reason is that the firm in a lower governance quality home country has a lower valuation. Everything equal, the firm should have a higher premium if it chooses to cross-list. In our analysis, the signs of the liquidity, industry and gross domestic product growth interaction terms are consistent with Doidge (2004), but they are not statistically significant.

For the UK cross listing regressions, the cross-listing premium is also positive, significant and larger in magnitude. The signs for the interaction variables are qualitatively analogous to the US case and the difference across the US and UK cross-listing premium is again in favor of the UK. For the UK, the signs of the liquidity, industry and gross domestic product growth interaction terms are statistically significant.

In general, our evidence shows that growth opportunities significantly increase the cross-listing premium, but the effects in the US and the UK destination are mixed depending on the statistical method. Hence, the main finding that cross-listing commands a premium and growth opportunities further increase the premium remains, but the empirical differences between the US and the UK destination from Asia-Pacific source countries are mixed in this sample.

7. Summary and conclusions

In this paper, we test hypothesis that cross-listing firms have higher valuation than non cross-listing ones, in general, allowing for several controls. We use data on public traded firms from six Asia-Pacific countries in 2003–2004. We perform means difference tests, OLS, the random effects and treatment effects regressions. The results generally confirm the hypothesis that cross-listing commands a premium on valuation; and growth opportunities further increase the premium. However, the

evidence of a difference in premium between the US and UK is mixed. We found some evidence in favor of the US in the univariate, OLS and random effects models. But, the results are not robust when the treatment effect methodology is applied; even when interactions with growth opportunities are taken into account, in the treatment effect case. Our evidence on observables is that cross-listing firms command a statistically significant premium; but we find no evidence in favor of US commanding higher premiums in the Asia-Pacific source countries. We found that unobserved factors that make cross-listing more likely to occur either in the US or the UK are associated with lower valuations, hence cross-listing provides an opportunity for a firm to improve and achieve better market valuations.

The main contribution of this paper is to provide evidence on the valuation effect of cross-listing on a major non-US market compared to the US market when the source nations are in the Asia-Pacific region. Regional and other geography effects and growth opportunities could be potential sources of mitigating factors for the effects of better corporate governance on the cross-listing premium. One policy implication is that the pattern of cross-listing shows that better firms from the Asia-Pacific region enjoy the benefits from bonding and prefer to cross-list in overseas stock exchanges, such as the US and the UK. This may mitigate the growth in the home country capital markets. Policy makers should be aware of this trend and try to develop regulations and policies that reinforce the corporate governance arrangements in their domestic markets. The development of governance standards may help develop local capital market and prevent domestic firms from cross-listing shares overseas, thus raising the liquidity of their markets.

The study also has several limitations. First, there are few firms cross-listed in the sample. Second, ideally, we should obtain Tobin's *q* before and after cross-listing for a specific firm, thus exploring the time dimension more fully. Also, a fruitful avenue for future research is to explore the effects of exogenous restrictions such as the Sarbanes-Oxley act in the US on firm's decision to cross-list and possibly the inclusion of nominal monetary factors.

Appendix A

Let y_1 denote the outcome with treatment and y_0 the outcome without treatment. Because a firm cannot be in both states, we cannot observe both y_0 and y_1 simultaneously. Thus, we face the problem of missing data. Theoretically, the solution is to propose and estimate a model of the self-selection decision. That is to add a "decision equation" to the outcome equation. Formally, the model consists of the following two equations:

$$logq_i = \underline{\beta}' \underline{X}_i + \delta CL_i + \varepsilon_i (\text{Valuation equation}) \tag{A1}$$

$$CL_i^* = \underline{\gamma}' \underline{w}_i + u_i (\text{Cross}-\text{listing decision equation}), \tag{A2}$$

where under bars denote vectors or matrices. Eq. (A1) is called the valuation equation. It is basically the model in the previous section, where $\underline{X}_i$ is the set of exogenous control variables and CL_i is the dummy variable that equals one for a firm that cross-lists, zero otherwise. Because the firms that cross-list are not random and because their decisions are related to log *q*, CL_i and ε_i are correlated. Eq. (A2) is the cross-listing decision equation. CL_i^* is an unobserved latent variable; $\underline{w}_i$ is a set of exogenous variables that affect the cross-listing choice, and $\underline{w}_i$ and $\underline{X}_i$ may include common variables or even be identical. We assume that the cross-listing decision is determined by

$$CL_i = 1, \text{ if } CL_i^* > 0,$$

$$CL_i = 0, \text{ if } CL_i^* < = 0, \tag{A3}$$

Also, we assume ε_i and u_i are jointly normally distributed with means zero, and standard deviations σ_ε and σ_u, where σ_u is normalized to one,

$$\begin{pmatrix} \varepsilon \\ u \end{pmatrix} \approx N\left(\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} \sigma_\varepsilon & \sigma_{u,\varepsilon} \\ \sigma_{\varepsilon,u} & 1 \end{pmatrix} \right), \tag{A4}$$

and ρ is the coefficient of correlation.

First, we check the case where we just estimate the valuation equation directly. The expected valuation for the firms that choose to cross-list will be

$$E[log\, q_i | CL_i = 1] = \underline{\beta}' \underline{X}_i + \delta + E[\varepsilon_i | CL_i = 1] = \underline{\beta}' \underline{X}_i + \delta + \rho\sigma_\varepsilon \lambda_{i1}(\underline{\gamma}' \underline{w}_i), \tag{A5}$$

where $\lambda_{i1}(\underline{\gamma}'\underline{w}_i)$ is the "inverse Mills' ratio" computed as $\dfrac{\phi((\underline{\gamma}'\, \underline{w}_i))}{\Phi(\underline{\gamma}'\, \underline{w}_i)}$, where $\phi(.)$ and $\Phi(.)$ are the density function and cumulative distribution function for the standard normal, respectively. The expected valuation for the firms that choose not to cross-list will be

$$E[log\, q_i | CL_i = 0] = \underline{\beta}' \underline{X}_i + E[\varepsilon_i | CL_i = 0] = \underline{\beta}' \underline{X}_i + \rho\sigma_\varepsilon \lambda_{i2}(\underline{\gamma}' \underline{w}_i), \tag{A6}$$

where $\lambda_{i2}(\underline{\gamma}'\underline{w}_i)$ is computed as $\frac{-\phi((\underline{\gamma}'\ \underline{w}_i)}{1-\Phi(\underline{\gamma}'\ \underline{w}_i)}$. Then, the difference in expected value between cross-listed firms and non cross-listed firms (the cross-listing premium) is given by

$$E[logq_i|CL_i=1]-E[q_i|CL_i=0]=\delta+\rho\sigma_\varepsilon\left[\frac{\phi_i}{\Phi_i(1-\Phi_i)}\right] \tag{A7}$$

So, the difference estimated by the least squares coefficient on the treatment dummy variables will be biased. The selection problem is apparent.[18]

Hence, we use the treatment effects two-step method to estimate Eqs (A1)–(A2) together. In the first step, the treatment effects method will use probit estimation to estimate $\underline{\gamma}'$ in Eq. (A5). Those consistent estimates can be used to compute value for λ_{i1} and λ_{i2}. Then, in the second step, it applies OLS to estimate Eq. (A1) by adding an additional term, λ_i, which is calculated by

$$\lambda_{i1}(\ \underline{\gamma}'\underline{w}_i)CL_i+\lambda_{i2}(\ \underline{\gamma}'\underline{w}_i)(1-CL_i).$$

In sum, the corrected valuation equation should be estimated as follows:

$$\log q_i=\ \underline{\beta}'\underline{X}\ i+\delta CL_i+\delta_\lambda\lambda_i+v_i\quad\text{(Corrected valuation equation)}. \tag{A8}$$

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[18] There is an important issue of selection versus simultaneity in the problem examined in this paper, see Hajivassiliou and Ioannides (2007) for a discussion and application. In this paper, we focus on the selection problem using the Heckit methodology.

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