

Essays on Firm's Advertising and Financing Strategies

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Abstract

Advertising: “The Good, the Bad and the Ugly”

In recent years, more and more traditional product-driven firms change their strategies and begin to bundle ads into their products and act as firms in the media industry. In the paper, I provide a simple duopoly model which focuses on both the product market and the advertising market to investigate factors behind such trend. From the firms’ perspective, the potential to earn revenue from advertisers, makes advertising a “good”. However, because consumers in the product market dislike such advertising, the bundling dampens demand. Advertising in this sense is a “bad”. There is also a third role played by advertising, however. Since the firm bundling ads sells a less attractive good, it has to price more aggressively than the one that does not do so. Thus, bundling ads leads to more aggressive product pricing and thereby intensify product market competition. In this sense, advertising can make things “ugly”.

To Cross-list in the US or in the UK? – A Study of Cross-listing Premium and Corporate Governance

This paper investigates the question of why some firms, especially those from the emerging market countries, choose to cross-list their share to the overseas capital markets. In particular, it studies firms from six Asia-pacific countries and focus on the cross-listing cases in the US and the UK, the two largest foreign listing hosts. I first provide a theoretical model to analyze the issue and generate my hypothesis. Then I test it using empirical data obtained from the *Worldscope* database. Specifically, I compare the cross listing premium between the two destinations using OLS, Random Effects and Treatment Effects regression. The results confirm that cross-listing has a positive effect to firm’s valuation and the higher the corporate governance standards in the destinations, the higher the cross-listing premiums in firm’s valuation.

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Essay I: Advertising: “The Good, the Bad and the Ugly”

1. Introduction

Advertisers are always seeking new ways to reach their consumers. Traditionally advertising has been bundled into media, like magazines, newspapers, television and radio. Today, however, advertisers are considering bundling ads into an increasingly diverse range of consumer products, such as video games, movie screenings, cell phone services, and wrapped cars.

Several real world examples have come out recently and caught the attention of world media. For instance, *The New York Times* documented that television-style ads is coming to mobiles¹. In September 2005, **Microsoft** started sending mobile ads, showing the company’s logo when customers viewed certain Web pages from their handsets. **Visa USA** also began a band campaign in September, in which consumers send a five-letter text code to receive weather reports. The reports come back with a banner: sponsored by Visa. The article also said that although this kind of marketing is still rudimentary, it is expected to change quickly, with phone-based ads incorporating more sophisticated graphics and videos. In 2006, **Verizon Wireless** and **Sprint Nextel** plan to test how consumers react to short video ads on their phones.

What makes those traditional product-driven firms changes their strategies and begin to bundle ads into their products and act as firms in the media industry? In this paper, I provide a simple duopoly model that helps to isolate the factors behind this

¹ See Matt Richtel “Their Ads Here-marketers want to appear on the small screen.” *The New York Times*, January 16, 2006, p. C2

decision. The model investigates both the product market and advertising market faced by the firms. When a firm decides to bundle another firm's ads into its product, it enters into a new market—the advertising market. This could of course bring an extra amount of revenue to the firm. In this sense, advertising is a good. However, bundled ads interrupt the consumption of the product and diminish consumer enjoyment. Consumers generally dislike them. Therefore, the quality of this product is reduced when the product is used as an advertising medium and this decreases the firm's product demand. In this sense, advertising is a bad. When one firm bundles and the rival does not, the rival firm benefits from its relatively enhanced product quality. The decision to bundle advertising must therefore include a consideration of how this negative effect in the product market will be enhanced by additional revenues in the advertising market. I show how this aspect of advertising can make competition more intense or, as the firms may view it, uglier.

According to the model, when certain conditions are satisfied, the firms will switch from being product-driven firms to being advertising financed media firms. These conditions represent the relative size of the advertising market to the product market, the spillover effect of bundling advertising on the rival firm's product demand relative to the adverse effect of advertising on the firm's product demand, and the degree of product differentiation. In addition, not all the equilibria are efficient. There are certain cases in which the firms will find themselves in prison's dilemma. Both will choose in equilibrium not to bundle advertising but would be better if they both did, and conversely there are cases where both will choose to bundle advertising but

they would be better off if they did not. I also investigate the social welfare in these cases. The result indicates that the welfare in the society could be improved in certain cases by either cooperation or government regulation on advertising media. Finally, by analyzing the equilibrium product prices, I show that because the firm that bundles ads sells a less attractive good, it has to price more aggressively than the one that does not bundling. The price can even be negative, where the firm actually gives away its products. Therefore, bundling ads intensifies product market competition.

The rest of the paper proceeds as follows. In the next section, I review some related literatures and compare them with my research. Then I present the formal model in Section 3. Section 4 discusses the model's implications for those traditional product-driven firms and policy makers. In Section 5, I analyze the equilibrium prices. Section 6 offers concluding remarks. Appendix contains all the proof, figures and tables for the above analysis.

2. Literature review

Previous literature has done quite a few studies on advertising issues. Chae and Flores (1998) focus on the TV industry and compare the television programming that is primarily financed by advertising with that primarily financed by viewers' payments. The main characteristic of the market for programming that they investigate is the degree of extensiveness or size of the market. A market is said to be extensive if the audience size is large but individual viewers' willingness to pay is relatively low, and intensive if the audience size is small but individual viewers' willingness to pay is relatively high. They find that a program is more likely to be broadcast as the market is more extensive. They also find that a broadcaster (narrowcaster, respectively) generates higher profits and welfare than a narrowcaster (broadcaster, respectively) if the market is extensive (intensive, respectively).

Sumner (2001) studies the advertising issues in the magazine market. He compares the prices paid by consumers with those paid by advertisers for 96 major magazines between 1980 and 1998. The statistics shows that advertisers paid more while consumers paid less than they did in 1980. He attributes the changes to the ability of magazines to deliver highly targeted, niche audiences and more informative ads showed in magazines relative to other media, like the network televisions.

The industry trend in the newspaper market also catches researchers' attention. Chaudhri (1998), for instance, studies the trend towards monopolization of the Australian newspaper industry. He uses a theoretical model to show that the special structure of the newspaper market, i.e., the duality in product space (newspaper

proprietors service two markets: advertisers and consumers) can render the conventional neoclassical wisdom about monopoly pricing incorrect. More specifically, upon attaining monopoly control of a newspaper market, a proprietor, for reasonable parameter values, opts to lower the price for his newspaper, which increases circulation, and hence, increased advertising revenue. This result may be amplified when competition from other media is limited, so that a monopoly newspaper has not only monopoly control over the market for readers, but also has market power in the market for advertising space. His theory is supported by empirical results from the Australian newspaper industry.

Dukes and Gal-Or (2003) explores a more general question for media industries. They examine the competitive structures of the media markets and the product markets. In their model, they show how the extent of competitiveness of the two markets affects the strength of the negotiating position of the parties and the resulting terms of the advertising contracts agreed among them. One particular type of contract they emphasize is an exclusivity contract, whereby broadcasters agree to air one producer's advertising messages and exclude its competition. They find that exclusive advertising contracts alleviate price competition in the product market relative to the nonexclusive regime. This is because advertiser in this case faces a reduced threat of customer stealing by competitors. Therefore, each lowers its investment in advertising, thus leading to less-informed consumers and alleviated price competition.

All the above papers, although study advertising and the media, they are quite different from this paper. First of all, they focus on the media industries, such as TVs,

magazines, newspapers, etc, while this paper asks the question which products become advertising media. Traditionally, bundling ads spots into products has not been seen as a choice that a firm faces. However more and more firms begin to consider bundling ads. Other papers on advertising media assume that the firms are either completely financed by ads or by customers' payments, but this paper considers competition and revenue in both the product market and advertising market. Finally, although some papers do consider two markets, none of them specifically examine the revenue trade-off between the product market and the advertising market caused by firm's advertising strategy, which is the main focus of my paper.

There are, however, two recent papers on advertising media which I consider closely related to this paper. They study media firms that are partly financed by advertising and partly by consumer payments, and directly explore how firms' incentives to put more ads into their own products are affected by competition in both the product market and advertising market.

Godes, Ofek and Sarvary (2003) look at both within and between competitions in the media industries. It is assumed that in each industry, firms compete in a standard Cournot fashion. They consider the intensity of competition as well as the inherent value of the products to consumers. In the benchmark model, the consumers are indifferent to the level of advertising. They find that only in the middle range of competition can the advertising market be more attractive than product market. Then they allow the media industries to differ with respect to the consumers' disutility of advertising. They find that low levels of consumer disutility may increase the

proportion of profits from advertising as compare to products.

There are several key differences between their approach and mine. First, in their basic model, firms compete in quantities in a homogeneous product market. Bundling ads into the product does not adversely affect consumer's valuation of the product. In equilibrium all firms will always choose to bundle some positive amount of advertising into their products. Moreover this outcome continues to hold even when they allow for consumer disutility from advertising. This outcome arises because the decision to advertise is not a strategic decision that affects how products are differentiated in the product market. Rather a firm's decision to bundle advertising is equivalent to incurring an additional "cost" in the product market. In equilibrium all firms choose to advertise and the amount of bundled advertising falls as the "cost" incurred increases. In my model, on the other hand, the product market is a differentiated duopoly where firms compete in prices, and a firm's decision to advertise affects not only consumer valuation of its product but also directly affects consumer valuation of the rival products. Specifically, if one firm decides to bundle advertising into its product, then consumer valuation of its product falls but consumer valuation of a rival product increases. This strategic interaction on how advertising affects consumer valuation of all products in the market is important, and suggests the possibility of an asymmetric outcome where some firms bundle advertising and others do not. Thus I include in the first stage of the game the firm's decision of whether or not to advertise, thereby allowing for asymmetric outcomes in both the product and advertising markets.

Kind, Nilssen and Sorgard (2005) use a different model setting to investigate how product market competition affects a firm's incentive to use its product as a medium for advertising. They assume that the consumer prices are strategic complements and model the product competition using the Bertrand model; whereas advertising prices are strategic substitutes, and resembles Cournot competition in quantities. They further introduce the advertiser and the consumer. The consumer has a disutility of being interrupted by commercials and she decides how much viewing time to spend on a certain TV channel. The advertiser decides how much the advertising level will be based on the consumer's time spending. Finally, the TV channels decide advertising prices and consumer payments.

Since their advertising prices are strategic substitutes and are equivalent to Cournot competition in quantities, the approach to model the advertising market is not dissimilar to mine. However the approach to model differentiation and the degree of competition in the product market is different. In Kind Nilssen and Soregard (2005), the degree of competition is measured by whether the rival's product is a close or poor substitute. The less differentiated the products the tougher is price competition for the same group of consumers. When the goods are perfect substitutes, Bertrand price competition drives price to marginal cost. It is the toughness of competition in the product market that underlies the firms' incentives to use their products as advertising media.

In contrast, my approach to model price competition in the differentiated product market permits market niches. In my model, when a firm's product is highly

differentiated, it faces a relatively small demand for its product. The firm has a market niche, and as such its demand is not much affected by the rival firm's price. Price competition is not tough but the market is small. This makes differentiation a double-edged sword. On the other hand when a firm markets a less differentiated product, one that is similar to the rival's product, firms compete in price for customers but there are more customers. More price competition occurs in markets where there is a larger demand for the products. Therefore more price competition in my model is not necessarily tougher with undifferentiated products because the greater price sensitivity that increased product substitutability brings is offset by the fact that such greater substitutability is associated with a larger overall market for the firms' products. Since audience size or product market sales is a key factor for advertisers, the size of the market is important and this model captures an important relationship between differentiation and market size.

3. The model

I analyze the issue using a two-firm and two-market dynamic game model. Firms sell their products in the product market. They also consider whether to use their products as advertising media and get extra revenue from the advertising market.

The product market has some degree of differentiation and the two firms compete in price. The firms face their demand functions as follows:

$$q_i = v - p_i + \theta p_j - \beta A_i + \alpha A_j, \quad A_i = \{0,1\}, i = 1, 2; j \neq i \quad (1)$$

, where $0 < \theta < 1$, $0 < \alpha < 1$, v and β are both normalized to take the value of 1. v captures the size of the product market. Firm i 's product demand depends on its own price p_i as well as upon the price of the rival, which is p_j . The parameter θ measures the positive effect on the firm's demand due to a price increase from its rival's product. It also gives some sense of how substitute the two goods are. When θ approaches zero, it means that the two goods are completely independent. One firm changing its price will not affect the other firm's demand. As θ increases, the two goods have a larger degree of substitution. Observe as well that the larger is θ , the larger is the firm's overall market. Increased substitutability or less differentiation is associated with operating in a bigger market whereas low substitutability or a small value of θ is associated with selling a highly differentiated product in a relatively small market niche.

The firm's demand is also affected by its advertising strategy, denoted by A_i and its rival's advertising strategy A_j . A_i or A_j takes the value of 1 if the firm chooses to advertise, 0 otherwise. β and α are parameters that capture the magnitude of the

impact for advertising strategies on firm's demand function. Because consumers generally dislike advertising bundled into a product, by doing so, the firm's product quality is reduced, which will have a negative impact on its demand. Thus, I put a minus sign for strategy A_i . On the other hand, if its rival bundles advertising in its product, it relatively enhances the firm's product quality and helps to shift out the firm's own demand function. So the impact of A_j is positive. I assume each firm meets the same constant marginal cost of production, which, for simplicity, is set equal to zero.

In the advertising market, because the "ads" are bundled into firms' products, the quantity of ads that the firm sells is actually proportional to the quantity of the goods that the firm sells in the product market. For convenience, I assume that the ads are sold in a fixed proportion of amount of firm's own product and normalize it to 1². The inverse demand function for advertising faced by the firms is:

$$r = kv - A_1 q_1 - A_2 q_2 \quad (2)$$

, where $k \geq 1$ and r denotes the price of advertising that firms charge to the advertising slot on their products. The parameter k measures the size of the advertising market relative to the product market. Assuming $k \geq 1$ ensures that the advertising market is not too small to be considered by the firms. If both firms advertise, the two firms compete in the advertising market in a standard Cournot fashion. If only one firm advertise, it takes the whole market. Again, firms have the same constant marginal cost of production, which is set equal to zero.

² Alternatively, I can use an extra parameter to capture the quantity of ads that the firm bundles into its own product and let the firm decides how much ads to put on its product. This, however, will increase the number of parameters, which makes the analysis much more complicated while adding little additional insight.

The game has two stages. In the first stage, each firm simultaneously decides whether or not to advertise. The strategy space is discrete. After the first stage, outcome is observed. The firms then compete in price, p_1 and p_2 , in the differentiated product market in the second stage. I solve the game in the usual fashion by using the backward induction.

Stage 2:

In stage two, the advertising strategies, A_1 and A_2 have already been determined in the previous stage. Given demand for the differentiated product i , $q_i(p_i, p_j; A_i, A_j)$, $i=1,2, j \neq i$, and the price r in the advertising market, firm i chooses price p_i to maximize its profit $\pi_i(p_i, p_j; A_i, A_j)$:

$$\text{Max}_{p_1} \pi_1 = p_1 q_1 + A_1 r q_1 \quad (3)$$

$$\text{Max}_{p_2} \pi_2 = p_2 q_2 + A_2 r q_2 \quad (4)$$

Solve the functions (3) and (4) (see appendix 8.1 for proof), I got the maximized profits:

$$\pi_1^* = \frac{(1+A_1^2 - \theta A_1 A_2)(2+\theta + (2\alpha - (1+k)\theta)A_2 - (\alpha(1+\theta^2) + \theta(-2+k-k\theta^2))A_1^2 A_2 + 2(1+\theta)A_2^2 + 2(\alpha-\theta)A_2^3)}{(-4+\theta^2 - 2\theta(-1+\theta^2)A_1^3 A_2 + 2(-2+\theta^2)A_2^2 - 2\theta A_1 A_2(-3+\theta^2 + (-1+\theta^2)A_2^2) + A_1^2(2(-2+\theta^2) + (-3+2\theta^2 + \theta^4)A_2^2))} \\ - \frac{A_1(2-\alpha\theta + k(-2+\theta^2) + (1+\theta)^2 A_2 + (-1+k)(-1+\theta^2)A_2^2)^2}{(5)}$$

$$\pi_2^* = \frac{(1+A_2^2 - \theta A_1 A_2)(2+\theta + 2(\alpha-\theta)A_1^3 + (-2+\alpha\theta - k(-2+\theta^2))A_2 - (1+\theta)A_1^2(-2+(-1+k)(-1+\theta)A_2))}{(-4+\theta^2 - 2\theta(-1+\theta^2)A_1^3 A_2 + 2(-2+\theta^2)A_2^2 - 2\theta A_1 A_2(-3+\theta^2 + (-1+\theta^2)A_2^2) + A_1^2(2(-2+\theta^2) + (-3+2\theta^2 + \theta^4)A_2^2))} \\ - \frac{A_2(-2\alpha + \theta + k\theta + (1+\theta)^2 A_2 + (\alpha(1+\theta^2) + \theta(-2+k-k\theta^2))A_1^2)^2}{(6)}$$

Stage 1:

In the first stage, the two firms simultaneously decide whether to bundle

advertising into their products. The problem can be illustrated by the following 2 by 2 matrix.

		Firm 2			
		$A_2 = 0$		$A_2 = 1$	
Firm 1	$A_1 = 0$	$\pi_{1(00)}^*$	$\pi_{2(00)}^*$	$\pi_{1(01)}^*$	$\pi_{2(01)}^*$
	$A_1 = 1$	$\pi_{1(10)}^*$	$\pi_{2(10)}^*$	$\pi_{1(11)}^*$	$\pi_{2(11)}^*$

In the game, each firm has two available strategies: advertising and not advertising. The payoff associated to each particular pair of strategies that the two firms choose is shown in the appropriate cell of the matrix. In particular, the equilibrium product prices and profits in each possible strategy combination are as follows:

$$(1) \quad A_1^* = 0 \quad A_2^* = 0$$

$$p_{1(00)}^* = p_{2(00)}^* = \frac{1}{2-\theta}$$

$$\pi_{1(00)}^* = \pi_{2(00)}^* = \left[\frac{1}{2-\theta} \right]^2 \quad (7)$$

$$(2) \quad A_1^* = 1 \quad A_2^* = 0$$

$$p_{1(10)}^* = \frac{3(1+\alpha)\theta - 2k}{8-3\theta^2}, \quad \pi_{1(10)}^* = \frac{2(2k + \theta + \alpha\theta - k\theta^2)^2}{(8-3\theta^2)^2} \quad (8)$$

$$p_{2(10)}^* = \frac{4 + 4\alpha - k\theta}{8-3\theta^2}, \quad \pi_{2(10)}^* = \frac{(4 + 4\alpha - k\theta)^2}{(8-3\theta^2)^2} \quad (9)$$

$$(3) \quad A_1^* = 0 \quad A_2^* = 1$$

$$p_{1(01)}^* = p_{2(10)}^* = \frac{4 + 4\alpha - k\theta}{8-3\theta^2}, \quad \pi_{1(01)}^* = \pi_{2(10)}^* = \frac{(4 + 4\alpha - k\theta)^2}{(8-3\theta^2)^2}$$

$$p_{2(01)}^* = p_{1(10)}^* = \frac{3(1+\alpha)\theta - 2k}{8-3\theta^2}, \quad \pi_{2(01)}^* = \pi_{1(10)}^* = \frac{2(2k + \theta + \alpha\theta - k\theta^2)^2}{(8-3\theta^2)^2}$$

$$(4) \quad A_1^* = 1 \quad A_2^* = 1$$

$$p_{1(11)}^* = p_{2(11)}^* = \frac{\alpha(4-\theta) - k}{5 - 5\theta + \theta^2}$$

$$\pi_{1(11)}^* = \pi_{2(11)}^* = \frac{(2-\theta)(k + \alpha - k\theta)^2}{(5 - 5\theta + \theta^2)^2} \quad (10)$$

Using the iterated elimination of strictly dominated strategies and comparing the profits under different pair of strategies, I find that there are four possible Nash equilibria based on the different results of the profits.

If $\pi_{1(00)}^* > \pi_{1(10)}^*$ and $\pi_{2(10)}^* > \pi_{2(11)}^*$, then none of the firm will advertise. (No Ads)

If $\pi_{1(00)}^* > \pi_{1(10)}^*$ and $\pi_{2(10)}^* < \pi_{2(11)}^*$, then two equilibriums exist: none will advertise and both will advertise.

If $\pi_{1(00)}^* < \pi_{1(10)}^*$ and $\pi_{2(10)}^* > \pi_{2(11)}^*$, then there are two asymmetric equilibria. one firm advertises and the other one does not. (One Ads)

If $\pi_{1(00)}^* < \pi_{1(10)}^*$ and $\pi_{2(10)}^* < \pi_{2(11)}^*$, then both firms will advertise. (Both Ads)

The main purpose of the paper is to answer the question of what drives those product-driven firms to act as advertising media. The expression of the equations (7)-(10) and the analysis of potential Nash equilibrium show that this choice depends on the values of parameters, k , α and θ . k , α and θ determine the profits under different strategies. And the comparison of those profits determines the equilibrium.

To better analyze the problem and to see how changing the parameter values leads to different Nash equilibria, I examine the relationship between α and θ while holding k constant at 1. I then increase k by increments $\Delta k = 0.1$ and repeat the process. Each case of value k represents a certain kind of advertising markets facing the two firms. Then I set $\pi_{1(00)}^* = \pi_{1(10)}^*$ and $\pi_{2(10)}^* = \pi_{2(11)}^*$, and, for the given k value,

plot the curves in the θ, α space. The regions divided by the two lines represent different Nash equilibriums that the firms will take under certain combination of parameters, k , α and θ . I analyze how these regions change as k increases. These results are illustrated by the various graphs in Figure 1.

4. Discussion of the results

I organize the discussion of the results illustrated in Figure 1 in the following way: First, I present the main proposition and then briefly discuss the results of my findings regarding the relative size of the advertising market as reflected in the parameter k . Then I describe the conditions under which the firms confront a prisoner's dilemma in stage one and the extent to which the failure to maximize producer surplus is equivalent to a failure to maximize total surplus—i.e. consumers are also adversely affected in the prisoner's dilemma. The analysis allows me to draw some tentative policy conclusions.

4.1 The size of the advertising market relative to the size of the product market

The parameter k captures the size of the advertising market relative to the size of the product market. As the various graphs in Figure 1 show, this parameter is an important determinant of whether firms have an incentive to enter the advertising market and bundle ads into their products. When k increases, it becomes more and more likely that both firms will enter the market and engage in such bundling. Table 1 also provides several numerical cases with respect to different sizes of advertising markets and shows where the Nash equilibrium is. The following Proposition offers insight into this issue. (Proofs are contained in the Appendix 8.2.)

Proposition 1 (a) *When the advertising market is relatively small, $1 \leq k < 1.36903$, no firm will enter the advertising market and bundle advertising with its product. (b) When the advertising market is relatively large, $k \geq 4$, both firms enter the advertising market and will bundle advertising. (c) For values of k such that $1.36903 \leq k < 4$, various equilibria are possible in which either no firm, one firm or both firms*

advertise. In particular, If $1.36903 \leq k < 1.74175$, one firm and no firm advertising equilibria exist; If $1.74175 \leq k < \frac{5}{\sqrt{2}} - 1^3$, no firm, one firm and both firms advertising equilibria exist; If $\frac{5}{\sqrt{2}} - 1 \leq k < 4$, one firm and both firms advertising equilibria exist.

Case (a) Small size advertising market ($k < 1.36903$)

When k is relatively small ($k < 1.36903$), the advertising market is so small that it is not attractive to both firms. The extra revenue from selling advertisement cannot offset the adverse effect of bad advertising on firm's product demand. So, it is not profitable to do so. Both firms remain in the product industry and compete in price. The "No Ads" strategy covers the whole θ, α parameter space.

Case (b) Large size advertising market ($k \geq 4.0$)

When the advertising market is large, four times of the product market, it becomes very attractive to the firms. The revenue collected from selling ads can easily offset the negative impact of bad advertising to its product demand. Therefore both firms will choose to bundle ads, no matter what kinds of firm-specific characteristics the companies hold.

Case (c) Middle size advertising market ($1.36903 \leq k < 4$)

In this case, the results are mixed. Which equilibrium to observe depends further on how differentiated the products are, which is denoted by parameter θ and on how much impact the choice of advertising has on its rival's product demand, which is represented by parameter α . The case can be further split into three scenarios. (i)

³ $\frac{5}{\sqrt{2}} - 1 \approx 2.53553$

When $1.36903 \leq k < 1.74175$, the advertising market starts to be attractive. We begin to observe the asymmetric equilibrium in such kind of markets, i.e. if one firm bundles ads, it is more profitable for the other firm not to bundle ads and instead market a higher quality on the product market. In particular, this initially occurs in the upper left corner of the θ, α space. In this region the positive effect on the rival's demand of bundling is relatively large whereas the effect of the rival's price is relatively small. As the two products are not very substitutable, the product market base is small and firms have incentive to get extra revenue from ads. So, if one firm enters the advertising market and the rival firm does not, then the firm who advertise will earn extra revenue and its rival also benefit from staying at the product market and sells goods with higher quality. As k increases and the potential revenues from advertising rise, it becomes much more likely that the equilibrium will include at least one firm bundles advertising with its product. (ii) When $1.74175 \leq k < \frac{5}{\sqrt{2}} - 1$, we can observe three kinds of equilibriums in the same market, "No Ads", "One Ads" and "Both Ads". The "Both Ads" case initially occurs at the bottom-left part of the picture, where both θ , and α are small. In this region, one firm's decision to advertise does not spillover much to the other and the products are not that closely substitutable. The size of this region increases with the increase of k . The "No Ads" case still exists and remains at the bottom-right part of the area. Its size decreases with the increase of k . So, generally speaking, the larger the size of the advertising market, the more likely the firm will choose to advertise. (iii) When $\frac{5}{\sqrt{2}} - 1 \leq k < 4$, the advertising market

becomes even larger and there are no “ No Ads” cases in such kind of market. Moreover, it is highly likely that both firms will advertise. According to figure 1 (n), when the advertising market is 2.6 times larger than the product market, the probability to observe “both ads” is more than 80 percent. And this probability increases with the increase of size of the advertising market. It is still the case that when the product are close substitutes and when the benefit from the rival’s advertising activity is low, none of the firms will choose to advertise.

4.2 The prisoner’s dilemma

For certain values of parameters, k , α and θ , the “Both Ads” or “No Ads” equilibrium is not the first best outcome from the point of view of firm profitability. Instead, they reflect prisoner’s dilemma type of outcomes and as such both firms could be made better off if they could cooperate and achieve another outcome. To determine whether the game is a prisoner’s dilemma, I need to compare $\pi_{1(00)}^*$ with $\pi_{1(11)}^*$ in each game. If “Both Ads” is the equilibrium in the game, but $\pi_{1(00)}^* > \pi_{1(10)}^*$, or if “No Ads” is the equilibrium, but $\pi_{1(00)}^* < \pi_{1(10)}^*$, such game is actually a prisoner-type dilemma. Again, in the (0,1) θ - α space, I draw the critical curve along with $\pi_{1(00)}^* = \pi_{1(10)}^*$. This curve separates the equilibrium region into prisoner’s dilemma and none prisoner’s dilemma categories.

First, I investigate the “No Ads” case that arises for relatively small k ($k < 1.36903$) using the method mentioned above. Figure 2 illustrates this outcome for the case in which k is exactly 1.3. As shown, the upper left part of the parameter space shaded in green is the region of the prisoner’s dilemma, as $\pi_{1(00)}^* < \pi_{1(10)}^*$. Although

neither firm has entered the advertising market, both would be better off if each did. Table 1 Case (a) provides two numerical examples in this market. In this part of the area, the products of the two firms are poor substitutes (θ is relatively low) and the benefits on firm's demand from the rival's advertising activity is relatively high (a relative high α). We know that when the two goods are less substitutable and when the shift on product demand due to the rival's advertising activity becomes larger, the product market will be less attractive than the advertising market. To bundle ads should be a better strategy. However, as the advertising market size is still very small, for each firm, advertising is strictly dominated by not advertising. A rational firm will not play strictly dominated strategies, because there is no belief that its rival will do so. Such causes the prisoner's dilemma. Therefore, if the two firms could cooperate and both advertise, they will earn higher profits than what they earn in the equilibrium.

Now I turn to the "Both Ads" equilibrium case. The last two graphs in Figure 2 shows "Both Ads" equilibrium in two different types of markets, but the results are similar. Again, the green shaded area in the "Both Ads" region is the prisoner's dilemma cases, because $\pi_{1(00)}^* > \pi_{1(10)}^*$ here. In this part of the "Both Ads" region, θ is relatively high and α is relatively low. This means that the two products are less differentiated, which makes the overall product demand higher and the market becomes very profitable. Also, there is not much benefit on firm's demand from the rival's advertising activity. So if both firm choose to only focus on the product market, both of them will be better off. However, a rational firm will choose to advertise when the "not advertising" strategy is strictly dominated by the "advertising" one. This

result has public policy implication. In a certain industry, where the products are close substitutes and the product demand is not very sensitive to bad advertising, if both firms do bad advertising, they will be better off if the advertising market is banned by the government. The market equilibrium cannot itself choose the first best outcomes. Again, Table 1 Case (b) provides numerical examples.

4.3 Analysis of Social welfare

So far, I have studied the bad advertising solely from the firm's perspective. Advertising is a "good" for the firm's product that is advertised, whereas it is a "bad" for the firm's product that is used as a medium. By comparing firm's profits under different values of parameters, I investigate when the different types of Nash Equilibriums come out and whether the equilibrium leads to the first best outcomes for firms. Now, I turn to the welfare side of the issue, and examine under what circumstances will the game generates a greater surplus and how is it related to firm's profit maximizing equilibrium.

The total welfare, denoted by W , is measured by the sum of firm's profits and the consumers' surplus. For the "No Ads" equilibrium, the consumers' surplus can be expressed as

$$CS_{(00)} = \frac{1}{2} q_{(00)}^* \left(\frac{1}{1-\theta} - p_{(00)}^* \right) \times 2 = \frac{1}{1-\theta} q_{(00)}^{*2}$$

Therefore, the total welfare under this equilibrium is

$$W_{(00)} = CS_{(00)} + 2\pi_{(00)}^* = \frac{3-2\theta}{(1-\theta)(2-\theta)^2} \quad (11)$$

Similarly, the consumer's surplus and the total welfare under the "Both Ads" equilibrium are calculated as follows:

$$\begin{aligned}
CS_{(11)} &= \frac{1}{2} q_{(11)}^* \left(\frac{\alpha}{1-\theta} - p_{(11)}^* \right) \times 2 = \frac{1}{1-\theta} q_{(11)}^{*2} \\
W_{(11)} &= CS_{(11)} + 2\pi_{(11)}^* = \frac{(k + \alpha - k\theta)^2 (5 - 6\theta + 2\theta^2)}{(1-\theta)(5 - 5\theta + \theta^2)^2} \quad (12)
\end{aligned}$$

Using the above measurements, I examine the total welfare in the three cases studied in the previous section. I set $W_{(00)} = W_{(11)}$ and draw the critical line for total welfare. The graphs are presented in Figure 3.

Case (a) Small size advertising market (set $k=1.3$), “No Ads”

The upper line in the graph represents the welfare curve, while the lower line represents the prisoner’s dilemma curve. On the northwest side of the welfare line, the orange region, $W_{(00)} < W_{(11)}$, while on the southeast side, $W_{(00)} > W_{(11)}$. As k is small, the whole θ, α space is dominated by “No Ads” strategy. However, from the social welfare’s perspective, everything to the northwest of the welfare line, where θ is relatively low and α is relatively high, if firms choose to “Both Ads”, the whole society would be better off. As this area is contained by the prisoner’s dilemma region, choosing to advertise also benefit the firms. So, if the firms are in this area, advertising is recommended and the mechanism is needed to be designed for the firms to cooperate. The next interesting region is between the critical line of welfare and the critical line of the prisoner’s dilemma, i.e., the green shaded area. In this region, firms might be better off if both choose to advertise, but it is not in the best interest of the society. Government needs to be cautious to the potential collusion of the firms, which will make the society worse off.

Case (b) Large size adverting market (set $k=4.0$), “Both Ads”

In this case, again, the upper line is the welfare curve and the lower line is the

prisoner's dilemma curve. Everything to the northwest side of the welfare curve, $W_{(00)} < W_{(11)}$, while to the southeast side, $W_{(00)} > W_{(11)}$. Recall, in the whole area, firms have only one equilibrium, "both ads". However, as shown in figure 3, when the parameter values make the firms in the green plus orange region, the total welfare in the society would be greater if both of them stop advertising. It is also interesting to know that the prisoner's dilemma area, shaded in orange, is fully covered by the region. Therefore, if firms are in the prisoner's dilemma area, to ban advertising will be a win-win result for both enterprises and the society.

Case (c) Middle size adverting market (set $k=2.0$)

This case has similar result to the previous one in the "Both Ads" region. Here, the green-shaded region indicates that portion of the parabola-shaped region of the parameter space in which both firms advertise but producer surplus would be larger if neither did. The large, orange-shaded portion then shows the portion of the shaded region for which this failure to maximize total producer surplus also means that the total surplus for welfare is not maximized. As the figure suggests, the region in which total welfare would be raised by a ban on bundled advertising is relatively large, especially in comparison with the region in which such a ban would raise producer surplus. This is a common feature of all the cases in which bundled advertising is excessive. It suggests that public policy to ban bundled advertising will very frequently be in the public interest.

5. Pricing

In discussing the various cases, I have not explicitly addressed the nature of the equilibrium product prices. In any equilibrium in which neither firm advertises, it is clear that products are goods and prices are positive. However, in an equilibrium in which at least one firm advertises, there is the possibility that the depressing effect it has on consumer product valuation could lead to the product being a “bad” and a negative product price. However, negative pricing should not be ruled out. Effectively negative pricing amounts to paying the consumer to “listen” to the bundled ads, and this phenomenon is frequently observed. For example, According to the *USA Today*, in early 2005, the Disney Company gave consumers free access to a number of on-line games that were based on Disneyland attractions (e.g., the Haunted Mansion) in an effort to lure consumers to the theme park in celebration of Disneyland’s 50th anniversary.⁴ Similar marketing strategy can also be seen in the wrapped cars industry. The so-called “wrapped” cars give consumers the free use of an automobile but one that is covered in advertising. The resort purchase program in Las Vegas offers yet another example. Some real estate firms there will pay consumers by giving them goods in return for listening to an hour-long presentation on a time-sharing opportunity for the resort near Vegas. Accordingly, I do not rule out equilibria that include negative product prices. Moreover as k gets large and entering the advertising market and selling a lot of bundled advertising becomes increasingly profitable, the portion of the θ, α parameter space that includes such negative pricing also

⁴ See Michael McCarthy “Disney plans to mix ads, video games to target kids, teens” *the USA today*, January 17, 2005 at http://www.usatoday.com/money/media/2005-01-17-disney-advergaming_x.htm

increases. If I restrict attention to only those equilibria with non-negative product prices, then the product becomes accordingly a free good in a great many cases.

6. Conclusion

In recent years, more and more traditional product-making firms bundle ads of other firm's product into their own products and act as media companies. In this paper, I use a simple duopoly model study this new trend of advertising strategy. I assume the two firms compete in price in the product market and compete in quantity in the advertising market. To incorporate advertising market can give firms extra revenues. However, it also hurts firm's product quality. When the product quality is reduced, consumers switch to the firm's competitor and the firm's product demand decreases accordingly.

I show that the equilibrium depends on three key parameters measuring, respectively, the relative size of the advertising market, the degree of substitution of the two goods or the size of the consumer base, and the impact that bundled ads has on product market demand. Among those Nash equilibriums, I also find that the prisoner's dilemmas exist in certain cases for certain values of parameters, k , α and θ . In the meantime, I analyze the total welfare of the society under different equilibriums. If the firms are in the dilemma region of "No Ads" and the welfare analysis shows that "Both Ads" will create more welfare to society, company cooperation is recommended. While if "Both Ads" only benefits the firms, government should be cautious about firms' collusion and the entry of advertising market should be banned. On the other hand, if the firms are in the dilemma region of "Both Ads", government bans bad advertising is definitely recommended, because both firms and consumers will be better off in such case. An interesting feature of

many equilibria in which the firms advertise is that product prices are negative, or constrained to be zero. The product firms have an incentive to pay people or to give their products away to use with a view toward increasing “circulation” and raising advertising revenue. This seems to be consistent with a number of real world cases involving such give-a-ways, such as those employed by real estate firms.

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8. Appendix

8.1 Proof for the optimal profit results solved in Stage 2

Take the first order condition of π_i with respect to p_i and solve the functions (3) and (4), I get the best response functions as follows:

$$2(1 - \theta A_1 A_2 + A_1^2) p_1 = [\theta - (1 + \theta^2) A_1 A_2 + 2\theta A_1^2] p_2 + 1 - (1 + k) A_1 + \alpha A_2 + (1 - \theta) A_1 A_2 + (3\alpha + \theta) A_1^2 A_2 - (1 + \theta\alpha) A_1 A_2^2 + 2A_1^2 - 2A_1^3 \quad (A1)$$

$$2(1 - \theta A_1 A_2 + A_2^2) p_2 = [\theta - (1 + \theta^2) A_1 A_2 + 2\theta A_2^2] p_1 + 1 - (1 + k) A_2 + \alpha A_1 + (1 - \theta) A_1 A_2 + (3\alpha + \theta) A_2^2 A_1 - (1 + \theta\alpha) A_2 A_1^2 + 2A_2^2 - 2A_2^3 \quad (A2)$$

Solve the functions (A1) and (A2) together, I get the Nash equilibrium in stage 2,

which is a set of prices (p_1^* , p_2^*) such that:

$$P_1^* = \frac{-2 - \theta + (-2\alpha + \theta + k\theta)A_2 + 2\theta(-1 + \alpha\theta)A_1^4 A_2 - 2(1 + \theta)A_2^2 - 2(\alpha - \theta)A_2^3}{-4 + \theta^2 - 2\theta(-1 + \theta^2)A_1^3 A_2 + 2(-2 + \theta^2)A_2^2 - 2\theta A_1 A_2(-3 + \theta^2 + (-1 + \theta^2)A_2^2) + A_1^2(2(-2 + \theta^2) + (-3 + 2\theta^2 + \theta^4)A_2^2) - A_1^3(-4 + 2\alpha\theta - 2\theta(1 + \theta)A_2 + (-3 + \theta^2 + \alpha\theta(1 + \theta^2))A_2^2) + A_1^2(-2(2 + \theta) + (-\theta + \alpha(-5 + 2\theta^2))A_2 - (3 + 3\theta + \theta^2 + \theta^3)A_2^2 + (\theta + \theta^3 + \alpha(-3 + \theta^2))A_2^3) + A_1(2 + 2k - \alpha\theta + (-1 + 3\theta + 2\theta^2)A_2 + (3 + k + \alpha\theta - 2\theta^2 - k\theta^2)A_2^2 + 2\theta(1 + \theta)A_2^3 + 2(\alpha - \theta)A_2^4)} \quad (A3)$$

$$P_2^* = \frac{-2 - \theta + (2 + 2k - \alpha\theta)A_2 - 2\theta(-\alpha + \theta)A_1^4 A_2 - 2(2 + \theta)A_2^2 - 2(-2 + \alpha\theta)A_2^3}{-4 + \theta^2 - 2\theta(-1 + \theta^2)A_1^3 A_2 + 2(-2 + \theta^2)A_2^2 - 2\theta A_1 A_2(-3 + \theta^2 + (-1 + \theta^2)A_2^2) + A_1^2(2(-2 + \theta^2) + (-3 + 2\theta^2 + \theta^4)A_2^2) + A_1^3(-2\alpha + 2\theta + \theta(1 + \theta)A_2 + (\theta + \theta^3 + \alpha(-3 + \theta^2))A_2^2) - A_1^2(2(1 + \theta) - (3 + k + \alpha\theta - (2 + k)\theta^2)A_2 + (3 + 3\theta + \theta^2 + \theta^3)A_2^2 + (-3 + \theta^2 + \alpha\theta(1 + \theta^2))A_2^3) + A_1(-2\alpha + \theta + k\theta + (-1 + 3\theta + 2\theta^2)A_2 + (-\theta + \alpha(-5 + 2\theta^2))A_2^2 + 2\theta(1 + \theta)A_2^3 + 2\theta(-1 + \alpha\theta)A_2^4)} \quad (A4)$$

Substitute the prices back into (3) and (4), I get the corresponding maximized profits:

$$\pi_1^* = \frac{(1+A_1^2 - \theta A_1 A_2)(2+\theta+(2\alpha-(1+k)\theta)A_2 - (\alpha(1+\theta^2)+\theta(-2+k-k\theta^2))A_1^2 A_2 + 2(1+\theta)A_2^2 + 2(\alpha-\theta)A_2^3)}{(-4+\theta^2 - 2\theta(-1+\theta^2)A_1^3 A_2 + 2(-2+\theta^2)A_2^2 - 2\theta A_1 A_2(-3+\theta^2 + (-1+\theta^2)A_2^2) + A_1^2(2(-2+\theta^2)+(-3+2\theta^2+\theta^4)A_2^2))^2} \\ - \frac{A_1(2-\alpha\theta+k(-2+\theta^2)+(1+\theta)^2 A_2 + (-1+k)(-1+\theta^2)A_2^2)}{(A_2^2)^2} \quad (A5)$$

$$\pi_2^* = \frac{(1+A_1^2 - \theta A_1 A_2)(2+\theta+2(\alpha-\theta)A_1^3 + (-2+\alpha\theta-k(-2+\theta^2))A_2 - (1+\theta)A_1^2(-2+(-1+k)(-1+\theta)A_2))}{(-4+\theta^2 - 2\theta(-1+\theta^2)A_1^3 A_2 + 2(-2+\theta^2)A_2^2 - 2\theta A_1 A_2(-3+\theta^2 + (-1+\theta^2)A_2^2) + A_1^2(2(-2+\theta^2)+(-3+2\theta^2+\theta^4)A_2^2))^2} \\ - \frac{A_1(-2\alpha+\theta+k\theta+(1+\theta)^2 A_2 + (\alpha(1+\theta^2)+\theta(-2+k-k\theta^2))A_2^2)}{(A_2^2)^2} \quad (A6)$$

8.2 Proof of proposition 1:

For critical line $\pi_{1(00)}^* = \pi_{1(10)}^*$

$$\left[\frac{1}{2-\theta} \right]^2 = \frac{2(2k + \theta + \alpha\theta - k\theta^2)^2}{(8-3\theta^2)^2} \quad (A7)$$

Set $\alpha=1$, yields

$$k = \frac{-32\theta + 32\theta^2 + 8\theta^3 - 16\theta^4 + 4\theta^5}{2(16-16\theta-12\theta^2+16\theta^3-4\theta^5+\theta^6)} + \frac{\sqrt{2}\sqrt{(1024-1024\theta-1536\theta^2+1792\theta^3+720\theta^4-1168\theta^5-44\theta^6+336\theta^7-48\theta^8-36\theta^9+9\theta^{10})}}{2(16-16\theta-12\theta^2+16\theta^3-4\theta^5+\theta^6)} \quad (A8)$$

or

$$k = \frac{-32\theta + 32\theta^2 + 8\theta^3 - 16\theta^4 + 4\theta^5}{2(16-16\theta-12\theta^2+16\theta^3-4\theta^5+\theta^6)} - \frac{\sqrt{2}\sqrt{(1024-1024\theta-1536\theta^2+1792\theta^3+720\theta^4-1168\theta^5-44\theta^6+336\theta^7-48\theta^8-36\theta^9+9\theta^{10})}}{2(16-16\theta-12\theta^2+16\theta^3-4\theta^5+\theta^6)} \quad (A9)$$

A9 is not a valid solution, as k is negative when $0 < \theta < 1$. Minimize k in A2 by taking

the first order condition with respect to θ and set it equal to 0.

$$\begin{aligned} \frac{\partial k}{\partial \theta} &= 0 \\ &= \frac{-348\sqrt{2}\theta^4 - 24\sqrt{2}\theta^5 + 96\sqrt{2}\theta^6 - 9\sqrt{2}\theta^8 + 4\theta^3(28\sqrt{2} - \sqrt{(32-16\theta-28\theta^2+14\theta^3+6\theta^4-3\theta^5)^2})}{2(-2+\theta)(-2+\theta^2)^2\sqrt{(32-16\theta-28\theta^2+14\theta^3+6\theta^4-3\theta^5)^2}} \\ &+ \frac{16(-16\sqrt{2} + \sqrt{(32-16\theta-28\theta^2+14\theta^3+6\theta^4-3\theta^5)^2}) - 8\theta(16\sqrt{2} + \sqrt{(32-16\theta-28\theta^2+14\theta^3+6\theta^4-3\theta^5)^2})}{2(-2+\theta)(-2+\theta^2)^2\sqrt{(32-16\theta-28\theta^2+14\theta^3+6\theta^4-3\theta^5)^2}} \\ &+ \frac{8\theta^2(64\sqrt{2} + \sqrt{(32-16\theta-28\theta^2+14\theta^3+6\theta^4-3\theta^5)^2})}{2(-2+\theta)(-2+\theta^2)^2\sqrt{(32-16\theta-28\theta^2+14\theta^3+6\theta^4-3\theta^5)^2}} = 0 \end{aligned} \quad (A10)$$

The numerical solution is around 1.36903, when $0 < \theta < 1$. This is the minimum value of k when the critical line $\pi_{1(00)}^* = \pi_{1(10)}^*$ enter the (0, 1) space of α and θ , i.e.,

the asymmetric equilibrium becomes available. Therefore, when $k < 1.36903$, “No

Ads'' is the only possible equilibrium in the market.

I get the other critical values of k in the similar way. Still working on equation

(A1) and Set $\alpha = 0$, I get

$$k = \frac{-16\theta + 16\theta^2 + 4\theta^3 - 8\theta^4 + 2\theta^5}{2(16 - 16\theta - 12\theta^2 + 16\theta^3 - 4\theta^5 + \theta^6)} \frac{\sqrt{2}\sqrt{(1024 - 1024\theta - 1536\theta^2 + 1792\theta^3 + 720\theta^4 - 1168\theta^5 - 44\theta^6 + 336\theta^7 - 48\theta^8 - 36\theta^9 + 9\theta^{10})}}{2(16 - 16\theta - 12\theta^2 + 16\theta^3 - 4\theta^5 + \theta^6)} \quad (A11)$$

or

$$k = \frac{-16\theta + 16\theta^2 + 4\theta^3 - 8\theta^4 + 2\theta^5}{2(16 - 16\theta - 12\theta^2 + 16\theta^3 - 4\theta^5 + \theta^6)} + \frac{\sqrt{2}\sqrt{(1024 - 1024\theta - 1536\theta^2 + 1792\theta^3 + 720\theta^4 - 1168\theta^5 - 44\theta^6 + 336\theta^7 - 48\theta^8 - 36\theta^9 + 9\theta^{10})}}{2(16 - 16\theta - 12\theta^2 + 16\theta^3 - 4\theta^5 + \theta^6)} \quad (A12)$$

A11 is not a valid solution, as k is negative when $0 < \theta < 1$. For A12, when $\theta = 1$,

$k = \frac{5}{\sqrt{2}} - 1 \approx 2.53553$. It is the maximum k when the critical line $\pi_{1(00)}^* = \pi_{1(10)}^*$ is still

in the (0, 1) space of α and θ . Any k larger than that will make the asymmetric equilibrium not possible in the market.

For critical line $\pi_{2(10)}^* = \pi_{2(11)}^*$

$$\frac{(4 + 4\alpha - k\theta)^2}{(8 - 3\theta^2)^2} = \frac{(2 - \theta)(k + \alpha - k\theta)^2}{(5 - 5\theta + \theta^2)^2} \quad (A13)$$

Set $\alpha = 0$, I get

$$k = \frac{-10\theta + 20\theta^2 - 9\theta^3 - 6\theta^4 + 6\theta^5 - 2\theta^6 + 2\theta^7}{72 - 80\theta - 80\theta^2 + 144\theta^3 - 48\theta^4 - 23\theta^5 + 26\theta^6 - 11\theta^7 + 2\theta^8} \frac{\sqrt{2}\sqrt{(230\theta^2 - 1440\theta^3 + 2448\theta^4 - 1608\theta^5 - 422\theta^6 + 1301\theta^7 - 694\theta^8 - 4\theta^9 + 150\theta^{10} - 672\theta^{11} + 12\theta^{12} - 9\theta^{13})}}{72 - 80\theta - 80\theta^2 + 144\theta^3 - 48\theta^4 - 23\theta^5 + 26\theta^6 - 11\theta^7 + 2\theta^8} \quad (A14)$$

or

$$k = \frac{-10\theta + 20\theta^2 - 9\theta^3 - 6\theta^4 + 6\theta^5 - 2\theta^6 + 2\theta^7}{72 - 8\theta - 8\theta^2 + 14\theta^3 - 48\theta^4 - 23\theta^5 + 26\theta^6 - 11\theta^7 + 2\theta^8} + \frac{\sqrt{2}\sqrt{(230\theta^2 - 1440\theta^3 + 2448\theta^4 - 1608\theta^5 - 422\theta^6 + 1301\theta^7 - 694\theta^8 - 4\theta^9 + 150\theta^{10} - 672\theta^{11} + 12\theta^{12} - 9\theta^{13})}}{72 - 8\theta - 8\theta^2 + 14\theta^3 - 48\theta^4 - 23\theta^5 + 26\theta^6 - 11\theta^7 + 2\theta^8} \quad (A15)$$

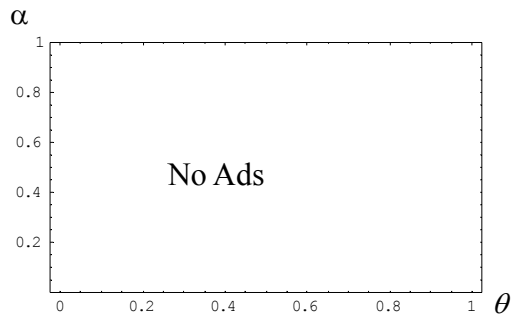
Only A14 is a valid solution for $0 < \theta < 1$. Minimize k by taking the first order condition with respect to θ and set it to 0.

$$\frac{\partial k}{\partial \theta} = 0.$$

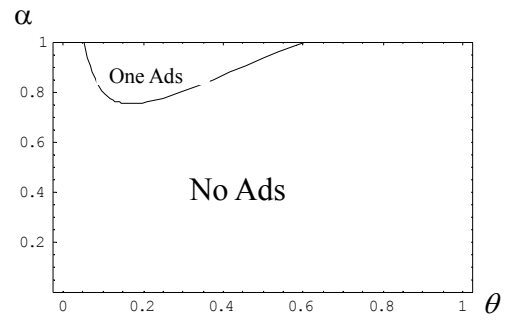
The numerical solution is around 1.741753, when $0 < \theta < 1$. This is the minimum value of k when the critical line $\pi_{2(10)}^* = \pi_{2(11)}^*$ enter the $(0, 1)$ space of α and θ , i.e., the “Both Ads” equilibrium becomes available. The point that “Both Ads” equilibrium dominates the whole $(0, 1)$ space of α and θ is when $\theta = 1$, where $k = 4$.

8.3 Figure 1 the results with respect to the changing value of k

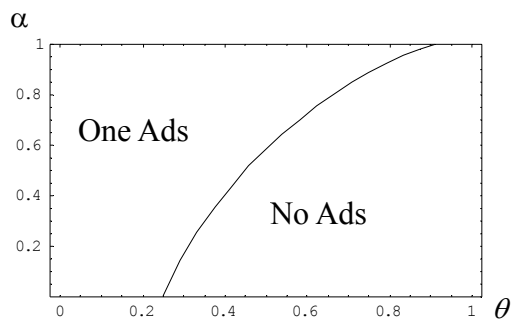
(a) $k \leq 1.36903$ No Ads



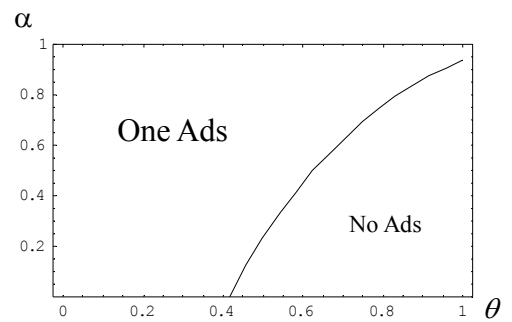
(b) $k=1.4$ One Ads & No Ads



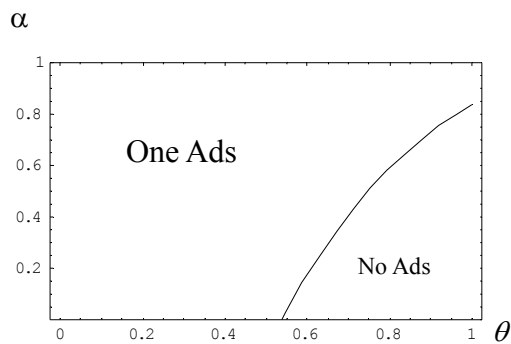
(c) $k=1.5$ One Ads & No Ads



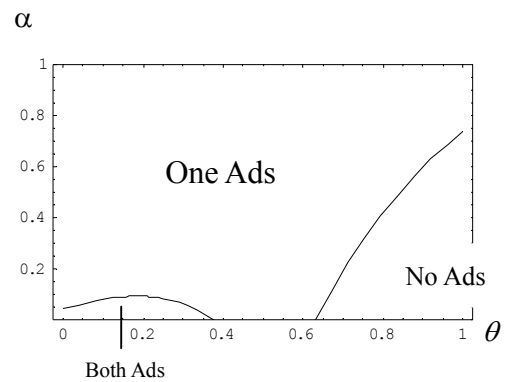
(d) $k=1.6$ One Ads & No Ads



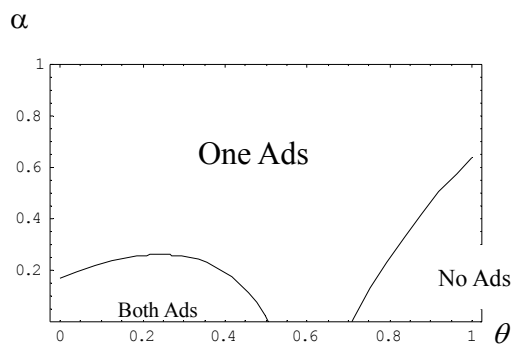
(e) $k=1.7$ One Ads & No Ads



(f) $k=1.8$ Both, One & No Ads



(g) $k=1.9$ Both, One & No Ads



(h) $k=2.0$ Both, One & No Ads

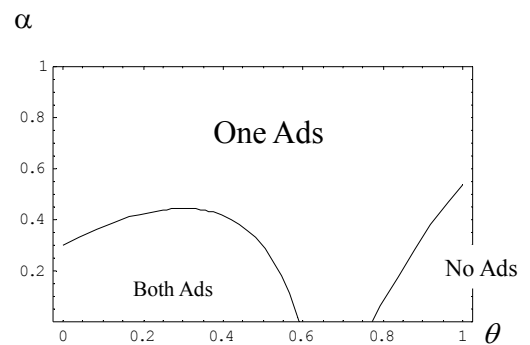
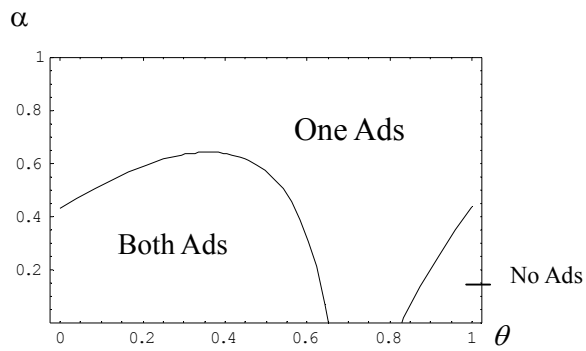
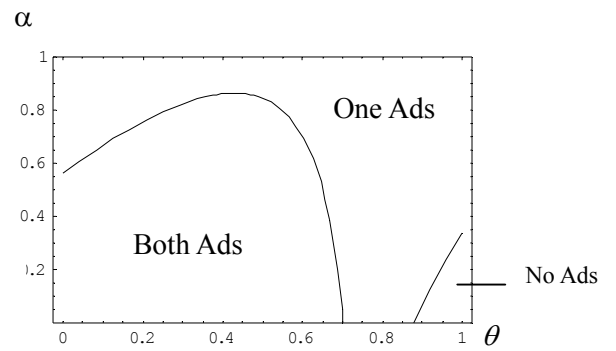


Figure 1 (Continued)

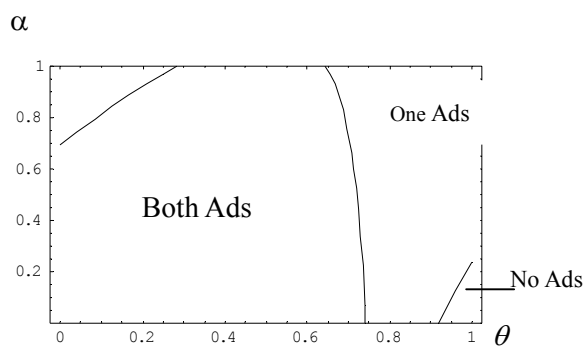
(i) $k=2.1$ Both, One & No Ads



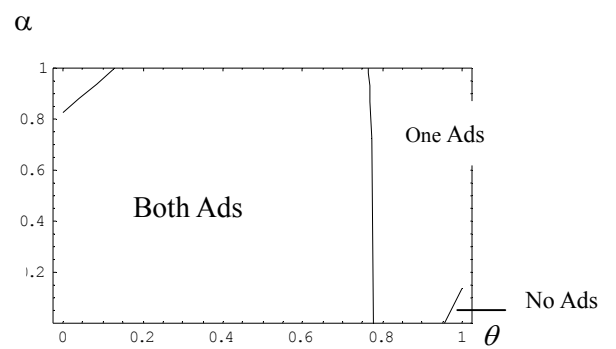
(j) $k=2.2$ Both, One & No Ads



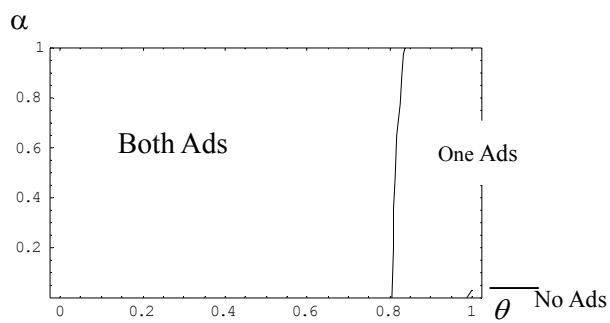
(k) $k=2.3$ Both, One & No Ads



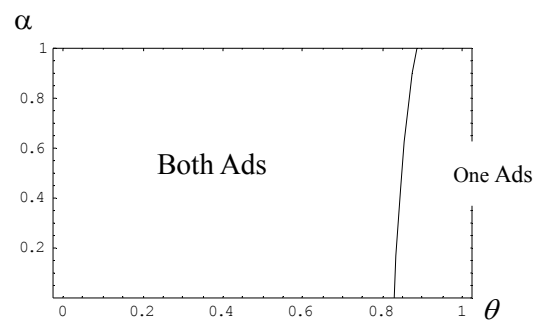
(l) $k=2.4$ Both, One & No Ads



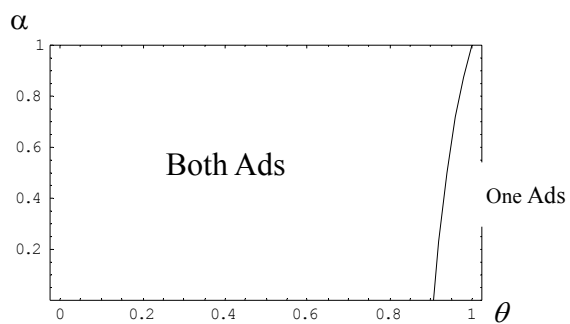
(m) $k=2.5$ Both, One & No Ads



(n) $k=2.6$ Both & One Ads



(o) $k=3$ Both & One Ads



(p) $k=3.3$ Both & One Ads

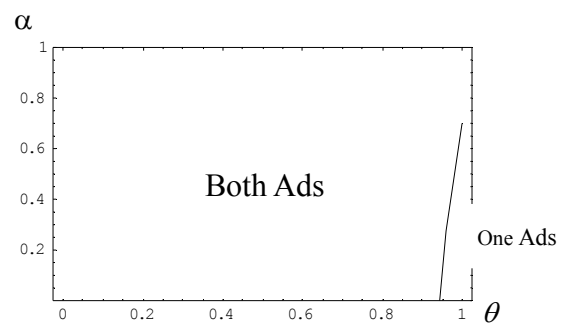
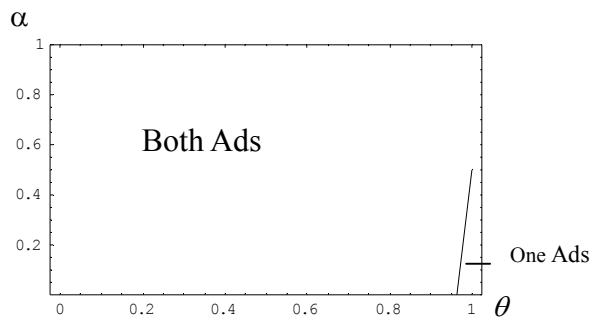
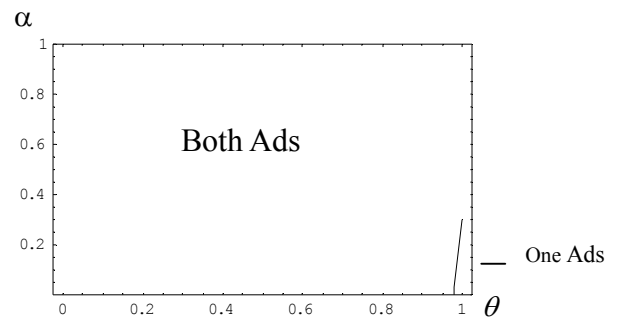


Figure 1 (Continued)

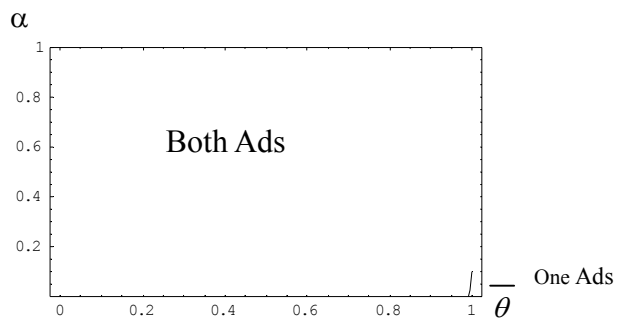
(q) $k=3.5$ Both & One Ads



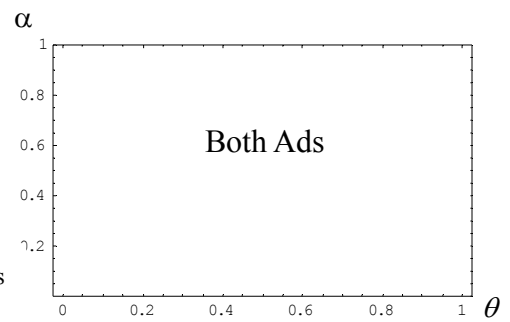
(r) $k=3.7$ Both & One Ads



(s) $k=3.9$ Both & One Ads



(t) $k=4.0$ Both Ads

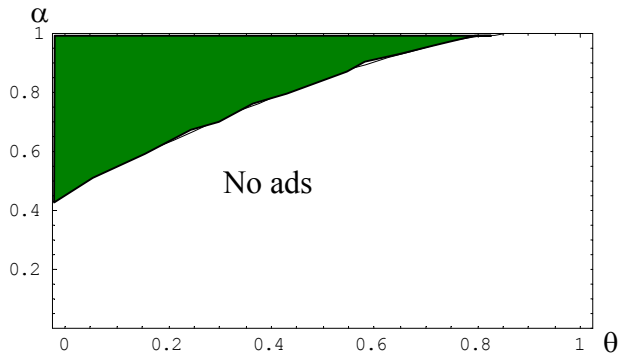


8.4 Figure 2 the prisoner's dilemma

Case (a) Small size advertising market

$k=1.3$ only "No Ads"

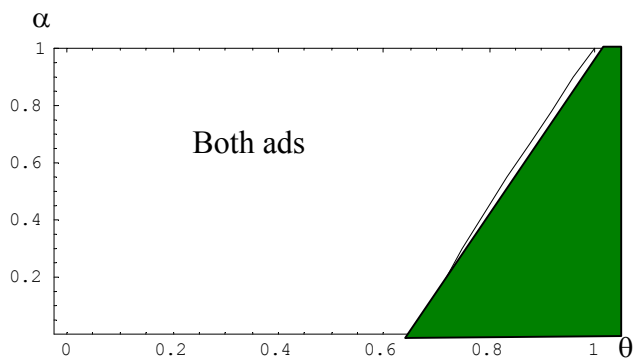
Green area reflects region of Prisoner's Dilemma—Neither Advertises but Both Should



Case (b) Large size advertising market

$k=4.0$ only "Both Ads"

Green area reflects region of Prisoner's Dilemma—Both Advertise but Neither Should



Case (c) Middle size advertising market

$k=2.0$ Mixed with "Both Ads" "One Ads" and "No Ads"

Green area reflects region of Prisoner's Dilemma—Both Advertise but Neither Should

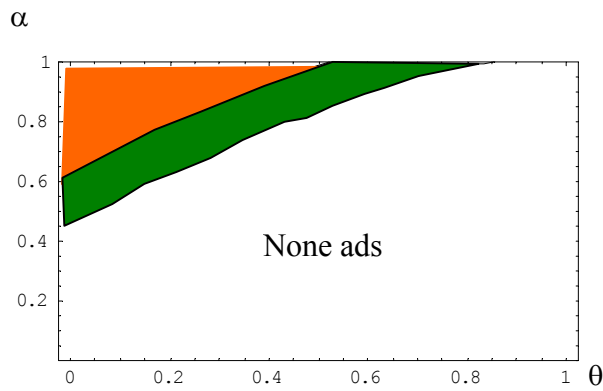


8.5 Figure 3 Welfare analysis

Case (a) Small size advertising market

$k=1.3$ only “No Ads”

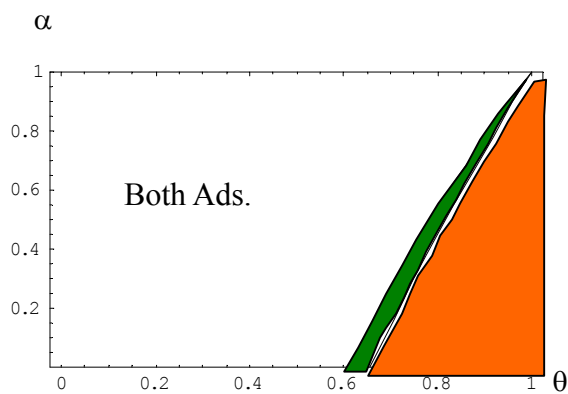
Potential for Market Failure Due to Insufficient Advertising.



Case (b) Large size advertising market

$k=4.0$ only “Both Ads”

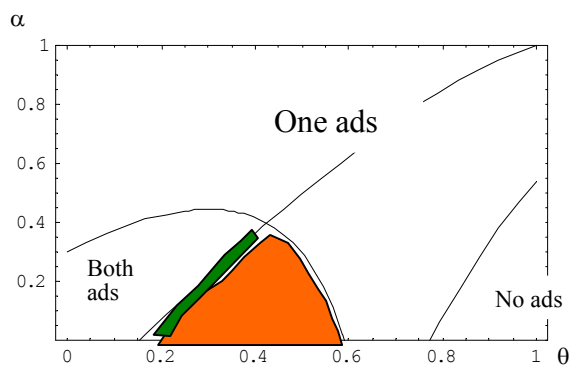
Potential for Market Failure Due to Excessive Advertising.



Case (c) Middle size advertising market

$k=2.0$ “No Ads”, “One Ads” and “Both Ads” mixed

Potential for Market Failure Due to Excessive Advertising.



8.6 Table 1

Case (a) Small size advertising market (k=1.3 “No Ads”)

i. Prisoner’s dilemma ($\theta=0.1, \alpha=0.9$)

		Firm 2			
		$A_2 = 0$		$A_2 = 1$	
Firm 1	$A_1 = 0$	0.277	0.277	0.878	0.243
	$A_1 = 1$	0.243	0.878	0.400	0.400

ii. Non Prisoner’s dilemma ($\theta=0.8, \alpha=0.2$)

		Firm 2			
		$A_2 = 0$		$A_2 = 1$	
Firm 1	$A_1 = 0$	0.694	0.694	0.382	0.403
	$A_1 = 1$	0.403	0.382	0.094	0.094

Case (b) Large size advertising market (k=4.0 “Both Ads”)

i. Prisoner’s dilemma ($\theta=0.9, \alpha=0.3$)

		Firm 2			
		$A_2 = 0$		$A_2 = 1$	
Firm 1	$A_1 = 0$	0.826	0.826	0.083	2.267
	$A_1 = 1$	2.267	0.083	0.314	0.314

Table 1 (Continued)

ii. Non Prisoner's dilemma ($\theta=0.2, \alpha=0.8$)

		Firm 2			
		$A_2 = 0$		$A_2 = 1$	
Firm 1	$A_1 = 0$	0.309	0.309	0.660	2.166
	$A_1 = 1$	2.166	0.660	1.765	1.765

Essay II: To Cross-list in the US or in the UK? – A Study of Cross-listing Premium and Corporate Governance

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 2,632 foreign listings in the world's 50 major stock exchanges. The total value of share trading for foreign firms has increased to \$4,987,018 million, which accounts 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.

In the mean time, this trend has caused tremendous competition among major stock exchanges around the world. They want to attract foreign companies to raise capital and trade in their own markets. In this competition, not all stock exchanges have equal appeal. 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). Figure 1 provides a close look at these three stock exchanges in the two countries. They had \$25,555,296 million value of share trading in 2004. This accounted for 61% of the total value of share trading around the world. 1,150 foreign companies were listing on these two destinations in 2004, which

accounts for 44% total foreign stock cross-listings.

Why some foreign firms want to cross-list their shares overseas and why do not all foreign firms want to do so? Are there any reasons other than location proximity that firms consider when choosing between the US and the UK as their cross-listing destinations? To address these questions, I first present a theoretical model, which studies the cross-listing decision process of a controlling shareholder in the firm. In the model, the controlling shareholder decides whether to cross-list and where to cross-list his stock on the international capital markets by choosing the optimal amount of the firm's value to expropriate. His purpose is to maximize his total gain from the firm during the whole process. On one hand, cross-listing can realize the firm's growth opportunity and help the firm to get access to a lower cost of capital through global risk sharing, as well as signaling to the market that it is a good firm where the investment is well protected. This increases the firm's valuation. The controlling shareholder benefits from the cross-listing because he can get more from the increased value through his equity ownership of the firm. On the other hand, because of the higher financial reporting standards and more stringent corporate governance arrangement in the cross-listing destinations, the controlling shareholder finds it more costly to divert the firm's value if the firm cross-lists. As a result, only a firm with better growth opportunities may cross-list, because the controlling shareholder finds the cross-listing benefit can offset the cost. The more stringent the corporate governance arrangements in the listing destination, the higher the increase in valuation it is for cross-listing firms. In particular, because the corporate

governance standards are higher in both the US and the UK than the rest of the world, firms choosing to cross-list to these two destinations have a higher increase in valuation, i.e., the cross-listing premium. Moreover, as evidence shows that the US has better investor protection than the UK, I predict that the cross-listing premium will be higher for US listing firms than those listed in the UK.

Based on a country panel dataset, which includes 4,504 firms' valuation observations from six Asia-Pacific countries, I test my hypothesis by univariate as well as multivariate analysis. In my regression, I try OLS, Random Effects Method and Treatment Effects Method. The evidence is consistent with my hypothesis.

The rest of the paper is organized as follows. In the next section, I review the previous research on international listing. In section 3, I compare the listing requirements and costs between the US and the UK. Then, I show a simple utility maximization model and develop my hypothesis in Section 4. Section 5 describes the data and the research design. The empirical results are presented in Section 6. The last section offers concluding remarks.

2. Literature Review: The reasons for international listing

Why firms want to cross-list? The literature till now has provided evidence for a number of reasons. I summarize four most popular explanations here. Karolyi (1998, 2005) did a thorough review on cross-listing literature.

2.1 Market Segmentation Hypothesis

Market segmentation hypothesis is the most often cited reason for cross-listing. It says that cross-listing allows investors to avoid cross-border barriers to investment. These barriers may come from regulatory restrictions, information problems such as uninformative accounting information or simply come from lack of knowledge about a security (Merton 1987). It is hypothesized that removing the barriers and integrating markets will allow for more efficient diversification and lower the risk of a security. Based on this hypothesis, scholars predict that firm's stock price will rise and 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 ("ADR⁵") program. The results find that firms cross-list through ADR issuance experience an unexpected increase in their stock price of 10% in the year before the listing. However, this unexpected increase is followed by a decrease of 9% in the year after listing. Miller (1999)'s study focuses on the 80 days around the cross-listing event and finds a positive 1.15 percent average abnormal return for 183 ADRs

⁵ ADR program permits individuals in US markets to invest in non-US firms in US dollar-denominated receipts redeemable by specialized US financial institutions (Depositaries) in the underlying shares.

between 1985 and 1995. Other studies, like Alexander, Eun and Janakiramanan (1988), Foerster and Karolyi (1993), Jayaraman, Shastri and Tandon (1993), all use the similar approach to examine the stock price reaction when firms cross-list to the US. The evidence generally finds positive price reaction to listing. In addition, Alexander, Eun and Janakiramanan (1987), Foerster and Karolyi (1993, 1999), Jayaraman, Narayanan, 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 for Cross-listing

Cross-listing can also be explained by the improvement of liquidity. From a stock trader's perspective, the greater the liquidity, the smaller the spread is. 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 could help firm to get access to more investors, which will 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. It measures illiquidity as the cost of immediately executing a trade. In their empirical test, they find evidence consistent with increased liquidity from multiple exchange listings. Foerster and Karolyi (1998), Domowitz, Glen and Madhavan (1998), 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) investigate 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 are 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 could overcome the market segmentation and improve liquidity, which lower the cost of capital and bid-ask spreads, every foreign firm should choose to do so. However, in reality, we just observe some cases. Still, the majority part of the public traded firms does not cross-list their shares overseas. As a result of the difficulties, cross-listing research move forward and raises several new initiatives.

2.3 Changes in the 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 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 quality than others.

Early studies on this direction are Cantale (1996), Fuerst (1998) and Moel (1999). They develop theoretical models, which establish signaling equilibrium in which firms that list on markets with high disclosure standards signal that they are

high-value firms. Fuerst's (1998) model predicts that firms that cross-list in the US will experience abnormal operating performance, especially from less strict regulatory regimes and the market reactions to cross-listing announcement will be associated with the expected improvement in operating performance. Moel (1999) develops a two-country and two-security market equilibrium model where the security prices increase as a function of the level of information disclosure. This model predicts that firms with higher volatility, firms operating in a low disclosure quality and low information trading environment will disclose more information.

Evidence from empirical study generally supports the predictions of these theoretical works. Baker, Nofsinger and Weaver (2002) find that NYSE listings are associated with greater analyst coverage and media hits, especially for those equity offering listings. 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 analysts' coverage, which is 2.64 more than non cross-listed firms and the accuracy of forecasts increases by 1.36 percent. Moreover, they find that Tobin's q is much higher for cross listed firms and is significantly and positively associated with the increased analyst coverage and improved accuracy. Bailey, Karolyi and Salva (2005) use event study to investigate 427 firms' cumulative absolute abnormal returns and abnormal trading volume before and after US listings. They show that the three-day abnormal return volatility increases from 2.75 percent to 3.38 percent. 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 “Bonding” Hypothesis

Coffee (1999, 2002) and Stulz (1999) are the first to point out the corporate governance implication or the so-called “bonding” hypothesis for cross-listing. They argue that firms with poor home country corporate governance quality 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 capital costs and increases firm value. Firms outside US are generally controlled by large shareholders. From the controlling shareholder’s perspective, there are costs as well as benefits for cross-listing. Cross-listing limits the ability of controlling shareholders to take private benefits from their firms but it also provides external finance and funds firm’s investment opportunity. Controlling shareholders are willing to “bond” themselves to not take private benefits when the value of having access to external capital is large relative to the size of private benefits. And in such circumstances, firm often has superior investment opportunities that require external financing.

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: (1) Equity issues increase following all cross-listings, regardless of shareholder protection. (2) The increase should be larger for cross-listings from countries with weak protection. (3) 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, Karolyi and Stulz (2004) take another approach. They examine firms' valuation premium with and without cross-listing using Tobin's q as the measure. Using the valuation samples of 714 cross-listed and 4078 non-cross-listed firms in the 1997 from 40 countries, they find that significant 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 1994-2001. 137 of these firms are cross-listed on the US markets. He finds that private benefits to insiders are negatively related for certain US cross-listed firms.

The corporate governance implication for cross-listing and the cost benefit analysis for controlling shareholders have become more and more popular in explaining cross-listing activities nowadays. This paper adopts the idea of "bonding" and presents a theoretical model followed by empirical test to further explain how firms make the cross-listing decision and where to cross-list.

3. Comparison of listing requirements and Costs between US and 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 disclosure.

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 and Morgan Guaranty. These financial intermediaries hold the foreign shares denominated in the foreign currency and issue the US shares denominated in the US dollars, which is called the ADRs. ADRs could be traded freely, just like any other security, either on an exchange or in the over-the-counter market. It alleviates certain obstacles associated with investing directly in the home markets 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 US. Each of them represents a different level of disclosure requirement and costs. Table 2 shows the basic differences among the three. Level I ADRs are only traded over-the-counter as Pink Sheet issues. It does not require 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 large 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), I focus my study on these two types only.

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, including Global Depositary Receipts (GDRs) and American Depositary Receipts (ADRs), and Euro Depositary Receipts (EDRs), which are denominated in euro. The disclosure requirements are much flexible compared with those in the US. Firms can adopt IAS, US or UK 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 that 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 actively involve in the foreign listing process. These 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. These factors included statutory reporting requirements, exchange reporting requirements, capital market expectations, and overall disclosure levels (Table 3). This study shows that the US has the highest disclosure level, which is higher than the UK.

As shown in the literature review, previous studies exclusively focus cross-listing on the US market. There is little evidence for cross-listing outside US, like the London Stock Exchange, which 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. In the meantime, the difference in the premium and the cost for cross-listing between US and UK can help us to explain firm's cross-listing location preference.

4. Model and Hypothesis

The effect of cross-listing on firm's valuation and management decision making can be illustrated by the following model. Recent ownership structure studies have shown that the ownership structure of firms is more concentrated in countries other than US around the world (e.g. Prowse, 1992; Edwards and Fischer, 1994; La Porta *et. al.*, 1998). In many countries, especially developing ones, the primary agency conflict for large corporations is that of restricting expropriation of minority shareholders by the controlling shareholders, rather than that of restricting empire building by unaccountable managers (Claessens *et. al.*, 2002). In this model, it is assumed that a firm is fully controlled by a single shareholder, called controlling shareholder, which is consistent with the available literature. The controlling shareholder has the power to expropriate values of minority shareholders of the firm. I assume the controlling shareholder has cash flow ownership α in the firm. 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 of the firm's cash flow. Because expropriation is costly, it has a deadweight cost to firm's cash flow (La Porta *et. al.*, 2002). This cost is increasing in both the level of investor protection and the fraction of cash flow that is expropriated. Following Doidge *et al.* (2004), I further assume that the cost function takes the quadratic form of v and is given by $\frac{1}{2}bv^2p$, where b is a constant and p 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 $\alpha(1 - v - \frac{1}{2}bv^2p)CF + vCF$, 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.

Assume the firm has a growth opportunity, denoted by g . the distribution of growth opportunities across firms is the same in each country and is given by a uniform distribution over the interval $(0, g^{\max})$. When the controlling shareholder makes the cross-listing decision, he always meets a tradeoff problem. On one hand, the firm will fulfill its growth opportunity and get access to a lower cost of capital through global risk sharing. 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 firm's value in a more stringent corporate governance regime than in the firm's own country. It decreases the controlling shareholder's utility. I model this trade off as follows.

The controlling shareholder maximizes its total gain from the firm by choosing the share of v to divert.

$$\text{Max}_v U = \alpha \left(1 - v - \frac{1}{2}bv^2 p\right) CF + vCF \quad (1)$$

Take the first order condition of U with respect to v and set it equal to zero.

$$\frac{\partial U}{\partial v} = \alpha(-1 - bpv)CF + CF = 0 \quad (2)$$

Rearranging the terms, I get the optimal proportion of cash flow to divert,

$$v = \frac{1 - \alpha}{abp} \quad (3)$$

Now, I can calculate the firm's valuation using Tobin's q as measurement. It is measured from the minority sharehold's perspective. If the firm is not cross-listed, I get

$$q = (1 - v - \frac{1}{2}bv^2 p)CF. \quad (4)$$

If the firm is cross-listed to a more stringent corporate governance regime,

$$q_{CL} = (1 - v_{CL} - \frac{1}{2}bv_{CL}^2 p_{CL})(CF + g) \quad (5)$$

, where the firm realizes its growth opportunity g and $p_{CL} > p$. Subtract (4) from (5)

and substitute (3) into (5), I get the optimal cross-listing premium,

$$\phi = g + \frac{1 - \alpha^2}{2\alpha^2 b} \left[\frac{1}{p} CF - \frac{1}{p_{CL}} (CF + g) \right] \quad (6)$$

Differentiate Φ with respect to p_{CL} , I get

$$\frac{\partial \phi}{\partial p_{CL}} = \frac{1 - \alpha^2}{2\alpha^2 b} (CF + g) \frac{1}{p_{CL}^2} > 0 \quad (7)$$

Specifically, if I focus the cross-listing destinations on only the US and the UK, the two most popular places for cross-listing, as $p_{U.S.} > p_{U.K.}$, $\phi_{U.S.} > \phi_{U.K.}$.

Thus I get my hypothesis as follows:

Hypothesis 1: 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.

5. Data and Research Design

5.1 Definition of Key Variables

To study the above hypothesis, I define the following variables. The most important variable is the TOBIN_Q. It measures the valuation of firms and serves as my dependent variable. Following Doidge *et al.* (2004), I calculate the TOBIN_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 constraint, this measure does not use the market value of debt in the numerator and does not substitute replacement cost with total assets, which is the formal definition of Tobin's q. It is difficult to know how this imperfect measurement of q will affect the analysis. Another concern for the q measurement is that because fast growing firms are more likely to acquire assets, they tend to have a relatively high book value of total assets. If this is the case, it will lead to a biased result.

My key independent variables are the two cross-listing dummy variables, CL_US and CL_UK. They take the value of 1 if cross-listed, 0 otherwise. The estimated coefficient will represent the cross-listing premium in each destination. I also include several firm-level and country-level variables as my control variables. 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 of the selected firms in a certain

industry, which is defined by 2-digit SIC code. These two firm level variables are used to control firm's growth opportunity. 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. It captures the firm's size. GDPG is the GDP growth rate of the selected countries in year 2004. It captures how fast growing the selected economies is. Table 4 describes the definitions of all the variables used in my regression models.

5.2 Research Design

5.2.1 Ordinary Least Square and Country Random Effects

Hypothesis1 predicts that firms cross-listed in the US should have a higher valuation than firms cross-listed in the UK and all the cross-listed firms have higher valuation than those not cross-listed. I test this hypothesis using both OLS and country random effects by estimating the following regression model:

$$\begin{aligned}
 TOBIN_Q_{ic} = & \beta_0 + \beta_1 CL_US_{ic} + \beta_2 CL_UK_{ic} \\
 & + \beta_3 SG2Y_{ic} + \beta_4 INDUS_Q_i + \beta_5 COM_LAW_c + \beta_6 LIQ_c + a_c + \varepsilon_{ic}
 \end{aligned} \tag{8}$$

My primary focus is to examine the signs and size on coefficient β_1 and β_2 . The 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 et al. (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 I should observe a positive sign for β_5 . The variable *LIQ* is used to control for liquidity factor of the selected countries. The more liquid a country's capital market, the higher the valuation of the firms that listed in that country. So I predict a positive sign for β_6 .

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

$$\begin{aligned}
 TOBIN_Q_{ic} = & \beta_0 + \beta_7 DIFF_{ic} + \beta_3 SG2Y_{ic} + \beta_4 INDUS_Q_i \\
 & + \beta_5 COM_LAW_c + \beta_6 LIQ_c + a_c + \varepsilon_{ic}
 \end{aligned} \tag{9}$$

If the valuation increasing effect is significantly different between the two destinations, I will observe a positive sign on β_7 .

For each specification, I first try the OLS regression, and then use the country random effects method, where, in the regression model, *c* indexes country and *i* indexes certain industry within the country. The variable a_c captures all unobserved country factors that affect $Tobin_Q_{ic}$, which does not change across industries. For panel data analysis, it is often a controversial question on choosing fixed effects

versus random effects method. However, the fixed effects method is not applicable for my dataset. Because the two country characteristic variables COM_LAW_c and LIQ_c are constant within a certain country, if the fixed effects method is used, the two variables will be “differenced away”.

To apply random effects, according to Wooldridge (2003), I need to assume a_c is uncorrelated with each explanatory variable in all industries, i.e., $Cov(x_{ic}, a_c) = 0$, 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. In fact, there is a positive serial correlation in the error term, where

$$Corr(v_{ic}, v_{is}) = \frac{\sigma_a^2}{\sigma_a^2 + \sigma_\varepsilon^2}, \quad c \neq s, \quad \sigma_a^2 = Var(a_c), \quad \sigma_\varepsilon^2 = Var(\varepsilon_{ic}) \quad (10)$$

To fix this problem, I apply the GLS transformation. Define

$$\lambda = 1 - \left[\frac{\sigma_\varepsilon^2}{\sigma_\varepsilon^2 + T\sigma_a^2} \right]^{1/2} \quad (11)$$

Then, the transformed regression is

$$\begin{aligned} TOBIN_Q_{ic} - \lambda \overline{TOBIN_Q}_c &= \beta_0(1 - \lambda) + \beta_1(x_{ic1} - \lambda \overline{x}_{c1}) + \dots \\ &+ \beta_k(x_{ick} - \lambda \overline{x}_{ck}) + (v_{ic} - \lambda \overline{v}_c) \end{aligned} \quad (12)$$

, where the overbar 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 .

5.2.2 Self-selection and the Treatment Effects

In my regression, the firm’s Tobin’s q is explained by whether or not the firm is cross-listed. However, because firms with better growth opportunity are more likely to

list and better growth opportunity means 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 the estimation bias.

To fix this self-selection problem, I apply the treatment effects method, which is explained thoroughly in Greene (1997). In particular, we can think of cross-listing as a treatment for firm's valuation. Each firm has a valuation outcome with and without this treatment. 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:

$$q_i = \beta' \underline{X}_i + \delta CL_i + \varepsilon_i \quad (\text{Valuation equation}) \quad (13)$$

$$CL_i^* = \gamma' \underline{w}_i + u_i \quad (\text{Cross-listing decision equation}) \quad (14)$$

, where the letters with underlines denote vectors or matrix. Equation (13) is called the valuation equation. It is the model that I use to do estimation in the previous section by OLS and random effects, 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 q , CL_i and ε_i are correlated. Equation (14) is called 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. \underline{w}_i and \underline{X}_i may include common variables or even be identical. I assume that the cross-listing decision is determined by

$$\begin{aligned} CL_i &= 1, \text{ if } CL_i^* > 0, \\ CL_i &= 0, \text{ if } CL_i^* \leq 0, \end{aligned} \quad (15)$$

Also, I 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.

$$\begin{pmatrix} \varepsilon \\ u \end{pmatrix} = N \left(\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} \sigma_\varepsilon & \sigma_{u,\varepsilon} \\ \sigma_{\varepsilon,u} & 1 \end{pmatrix} \right) \quad (16)$$

And ρ is the correlation.

First, let us see what happens if we just estimate the valuation equation directly.

The expected valuation for the firms that choose to cross-list will be

$$\begin{aligned} E[q_i | CL_i = 1] &= \underline{\beta}' \underline{X}_i + \delta + E[\varepsilon_i | CL_i = 1] \\ &= \underline{\beta}' \underline{X}_i + \delta + \rho \sigma_\varepsilon \lambda_{i1}(\underline{\gamma}' \underline{w}_i) \end{aligned} \quad (17)$$

, where $\lambda_{i1}(\underline{\gamma}' \underline{w}_i)$ is called the ‘‘inverse Mills’ ratio’’ and is computed as $\frac{\phi((\underline{\gamma}' \underline{w}_i))}{\Phi(\underline{\gamma}' \underline{w}_i)}$,

where $\phi(\cdot)$ and $\Phi(\cdot)$ 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

$$\begin{aligned} E[q_i | CL_i = 0] &= \underline{\beta}' \underline{X}_i + E[\varepsilon_i | CL_i = 0] \\ &= \underline{\beta}' \underline{X}_i + \rho \sigma_\varepsilon \lambda_{i2}(\underline{\gamma}' \underline{w}_i) \end{aligned} \quad (18)$$

, 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

$$E[q_i | CL_i = 1] - E[q_i | CL_i = 0] = \delta + \rho\sigma_\varepsilon \left[\frac{\phi_i}{\Phi_i(1-\Phi_i)} \right] \quad (19)$$

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

To correct the problem, I use the treatment effects two-step method to estimate (13)-(14) together. In the first step, the treatment effects method will use the probit estimation to estimate $\underline{\gamma}'$ in equation (14). These consistent estimates can be used to compute value for λ_{i1} and λ_{i2} . Then, in second step, it applies OLS to estimate equation (13) 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 correct valuation equation should be estimated as follows:

$$q_i = \underline{\beta}'\underline{X}_i + \delta CL_i + \delta_\lambda \lambda_i + v_i \quad (\text{Corrected valuation equation}) \quad (20)$$

Specifically, I will use the treatment effect two-step method to investigate the valuation effect of cross-listing in the two destinations separately. I compare the US cross-listing group with the non cross-listing group to see the treatment effects of the US cross-listing. Then I compare the UK cross-listing group with the non cross-listing group to investigate the cross-listing effect in the UK.

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

Step 1: (Probit)

$$CL_US_{ic} = \gamma_0 + \gamma_1 TOBIN_Q_{ic} + \gamma_2 SIZE_{ic} + \gamma_3 COM_LAW_c + \gamma_4 GDPG_c + u_{ic} \quad (21)$$

$$CL_UK_{ic} = \gamma_0 + \gamma_1 TOBIN_Q_{ic} + \gamma_2 SIZE_{ic} + \gamma_3 COM_LAW_c + \gamma_4 GDPG_c + u_{ic} \quad (22)$$

The independent variables included here are the key firm-level as well as

country-level characteristics that influence the cross-listing decision. The firm with higher valuation (TOBIN_Q) should be more likely to cross-list. Also, larger firms, proxied by SIZE, are more likely to cross-list. So, I predict positive signs on parameters γ_1 and γ_2 . In the mean time, firms from common law country have better investor protection, thus are more likely to cross-list. And firms from a fast developing country will have better growth opportunity. They are more likely to cross-list. Again, I 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:

Step 2: (OLS)

$$TOBIN_Q_{ic} = \beta_0 + \beta_1 CL_US_{ic} + \beta_3 SG2Y_{ic} + \beta_4 INDUS_Q_i + \beta_5 COM_LAW_c + \beta_6 LIQ_c + \beta_8 \lambda_{ic} + v_{ic} \quad (23)$$

$$TOBIN_Q_{ic} = \beta_0 + \beta_2 CL_UK_{ic} + \beta_3 SG2Y_{ic} + \beta_4 INDUS_Q_i + \beta_5 COM_LAW_c + \beta_6 LIQ_c + \beta_8 \lambda_{ic} + v_{ic} \quad (24)$$

All the parameters have the same predicted signs as those in the random effect model.

5.3 Data Collection

My 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.

I focus my study on firms from the six Asia-Pacific countries, including Australia, China, India, Japan, Korea and Taiwan. The reason to choose these six countries is because they are all in the Asia-Pacific region, which controls for the

proximity factor for cross-listing decision and because they have cross-listed firm samples in both the U.S. and the U.K. There are 9,656 such firms in the *WorldScope* database in 2004.

To make my firm characteristic variables more comparable, I set up several rules on sample selection. First, I only study large firms, which have total assets greater than 100 million (in US\$). According to LaPorta *et al.* (2002), shares of large firms are the most liquid, which undermines the concern that the differences in valuation are due to differences in liquidity. 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. By applying this rule, the sample decreases to 5,963 firms. Then I 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 me 5,318 observations. Finally, firms should have financial statements in 2004 disclosed in the *WorldScope* database. It is the period that the Tobin's q is calculated. Firms should also have at least three years of sales data so that I can calculate the average two-year sales growth rate. An average of sales growth rate gives me a more reliable measure of sales growth than just have one year sales growth rate. After applying all these rules, I got my final sample, which contains 4,504 firms. Then I select the necessary financial information from each firm in the database to

calculate *TOBIN_Q*, *SG2Y*, *INDU_Q*, and *SIZE*.

My U.S. cross-listing information comes from the website of Bank of New York (the 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. I restrict my research in the Level II and III ADRs only, as 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 and Vaaler 2005). I match the ADRs list from the website with my 4,504 sample firms and work out the *CL_US* dummy. There are totally 68 US cross-listing observations. I then obtain the list of U.K. cross-listing firms from the London Stock Exchange. After applying the same match technique, I get the *CL_UK* dummy, which shows 54 cross-listing records.

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*, and LaPorta *et al.* (1998) and Djankov, La Porta, Lopez-de-Silanes, and Shleifer (2005) for the *COM_LAW* dummy.

To reduce the weight of outliers, I follow the way that is used in LaPorta *et al.* (2002). I censor *TOBIN_Q* at the 2nd and 98th percentiles by setting extreme values to the 2nd and 98th percentile values, respectively.

Table 5 shows the descriptive statistics about the sample. Table 6 provides the Pairwise Correlation Coefficients of the variable.

6. Empirical Results

6.1 Univariate Analysis

Table 7 reports the mean 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 4,504 firms in the dataset. Japan has the largest sample observations, which are 2,552 firms. Australia companies account for the smallest proportion, which are 198 firms.

The first column reports the number of firms that are not cross-listed to either the US or the UK and their mean Tobin's q by each country. The mean 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 Tobin's q for firms that cross-listed in the US. There are 68 US cross-listed firms in this sample. The proportion of firms that are listed in the US varies widely across-countries, from 7 firms in both Korea and Taiwan, respectively to 27 firms in Japan. It then shows the difference in q between the US cross-listed firms and the non cross-listed firms. The difference in each country is positive, except -0.04 in China, which is a small amount of negative figure. The total difference is 1.52. 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 I have 54 UK cross-listing observations. Again, Japan has the largest proportion, 18 of them. Australia has only 3 firms. Two countries have negative q difference, China and India. Others have

positive q . The total difference is 0.83. It is smaller than the total difference in the US's case, which is 1.52.

In order to test the hypothesis that the cross-listing premium exists, I perform the one-tailed mean difference test. 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=3.715) than that for non-cross-listed firms. The mean q for firms that cross-listed in the UK is also significantly higher at the 0.05 level (with t -statistic=2.450) than that for the non-cross-listed firms.

6.2 Results from OLS and Random Effects Regressions

The univariate statistics strongly support my hypothesis. Now, I will determine whether the cross-listing premium can be explained by firm and country level characteristics. Table 8 provides the regression results. In each specification, I use both OLS and Random Effects method. The inferences on the coefficients that test the hypothesis do not vary by changing from OLS to Random Effects method. The R^2 is 0.09 in the OLS regression and 0.08 in the Random Effect regression.

In specification (1), I regress Tobin_ Q on the two cross-listing dummies and the set of control variables. The regression shows that the US cross-listing premium is significantly positive (at the 0.01 level). The UK cross-listing premium is positive, but not significant. This result provides some evidence on the valuation effect for cross-listing. For the control variables, except the LIQ, all the coefficients of control variables are significantly positive (at the 0.01 level) and the estimated signs are consistent with the predictions. In particular, fast growing firms and firms in fast

growing industry have higher Tobin's q. Tobin's q increases with the liquidity of the domestic stock market. And firms have higher q in common law countries because of the better investor protection.

In specification (2), I run the regression model (9) 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. They are significant at 0.01 level and 0.1 level, respectively. It demonstrates that the cross-listing location matters in firm's valuation.

6.3 Results from Treatment Effect Regression

After the above analysis, I try to fix the self-selection problem by applying the Treatment Effects method. Table 9 presents the results using the Treatment Effects regression. I investigate the treatment effects of the US cross-listing and the UK cross-listing separately. In each treatment effect regression, I also provide the results of the first stage probit regression.

The probit model results demonstrate that large firms, firms with better valuation, firms from countries which has better investor protection and firms from fast growing countries are more likely to cross-list their shares to oversea capital market, such as the US and the UK.

The specification of Treatment Effects corresponds to specification (1) in Table 8. After applying the treatment effects technique, the cross-listing premium in the US is still positive and significant at the 0.01 level and the cross-listing premium in the UK

becomes significant at the 0.05 level. The empirical findings from the Treatment Effects regressions confirm my hypothesis—cross-listing in the US or the UK has a positive effect to firm's valuation. In addition, the size of the coefficient is larger for the CL_US than that for the CL_UK. All the control variables, except LIQ are significant and predict the expected sign.

6.4 Test for the Slope Effects of Cross-listing

Previous regressions focus on the cross-listing dummies, which show the intercept difference in firm's valuation due to the cross-listing. In table 10, I re-estimate the model (21)-(24) using the treatment effects regression, but this time, I add several interactive variables. I interact the cross-listing dummies with all the other control variables. This allows me to see whether there are any differences in slopes due to the cross-listing.

For the US listing regression, the cross-listing is still significantly positive at the 0.01 level. The interactive variables for the sales growth rate with the listing dummy and for the industry q with the listing dummy are significantly positive. This means there are valuation differences between the listing and non-listing firms, but the gap increases as the growth opportunity increases. The governance interaction and the liquidity interaction are all significantly positive. The signs of the results are not consistent with those in the previous literature. Doidge (2004) argues that firms listing in the US are more valuable, the lower the corporate governance quality are in the home countries and the less active is the home market trading environment. There should be negative coefficients for the variables. And their empirical tests confirm it.

The reason is that the firm in a lower governance quality or less liquid capital market home country has a lower valuation. Everything equal, the firm will have a higher premium if it chooses to cross-list. For my UK listing regression, I got the similar results. The cross-listing is continuously positive and significant. The signs for the growth interaction variables are positive, but not significant. The signs for governance interaction and liquidity interaction are positive, and again are not consistent with the results from the literature. One reason could be that the regression is not well specified and further research could focus on the test in this direction.

Generally speaking, this test shows that after including several interactive variables, the cross listing premium is still evident and there are also some slope effects on valuation due to the cross-listing.

7. Conclusion

In this paper, I present a simple theoretical model to try to explain how firm makes cross-listing decision and its listing location choice. The model adopts the idea of corporate governance role and valuation effects for cross-listing, or the so called “bonding” hypothesis. It models a trade-off situation faced by a firm’s controlling shareholder. On one hand, because the signaling effect and global risk sharing, the controlling shareholder benefits from the cross-listing. However, on the other hand, cross-listing also put more costs on firms. I let the investor protection quality vary for listing locations and derive my hypothesis: Everything else equals, the higher the corporate governance quality in the target location, the higher the cross-listing premium for a firm. More specifically, valuation for the US cross-listings should be higher than that for the UK cross-listings, because the corporate governance arrangements are generally considered higher in the US than that in the UK. And both cross-listing firms have higher valuation than non cross-listing ones.

I test the hypothesis using data of 4,504 public traded firms from six Asia-Pacific countries. I perform the mean difference test, OLS and the random effects regression. Because of the potential self-selection problem in the model, I also try the treatment effects model. The results generally confirm my hypothesis, i.e., firms cross-list to a country with higher corporate governance standard will have higher increase in valuation.

The main contribution for this paper is that it provides evidence on the valuation effect of cross-listing on a major non-US market and compares the result with the US

market. And the difference in the value increase effect on the two markets can be used to explain firm's listing location choices. According to my model and the empirical results, best firms, which have enough high growth opportunity, will choose to list in the US. Firms in the middle range may choose to list in the UK. And firms without enough growth opportunity may stay in the home countries, because their benefits from the cross-listing cannot offset the costs.

This research also has implication for policy making. The pattern for cross-listing in the paper shows that best firms enjoy the benefits from bonding and like to cross-list to overseas stock exchanges, such as the US and the UK. Then, the growth in their home country capital markets will suffer. Policy makers should be aware of this trend and try to develop regulations and policies to reinforce the corporate governance arrangements in their domestic markets. The development of governance standards may help to develop local capital market and prevent domestic firms to cross-list shares and drain liquidity of the markets.

The study also has its limitation. To better study the value increase effect of cross-listing, ideally, we should get the Tobin's q before and after cross-listing for a specific firm⁶. In such cases, the self-selection problem will be eliminated. However, this attempt is limited by the data availability. *WorldScope* database only keeps the financial information of public traded firms. The financial data before listing is hard to get and also difficult to track for more than four thousands observations. It leaves space for future work when richer dataset is available.

⁶ I appreciated the guidance from Professor Florencio Lopez-de-Silanes during his seminar visit at Tufts in fall 2005.

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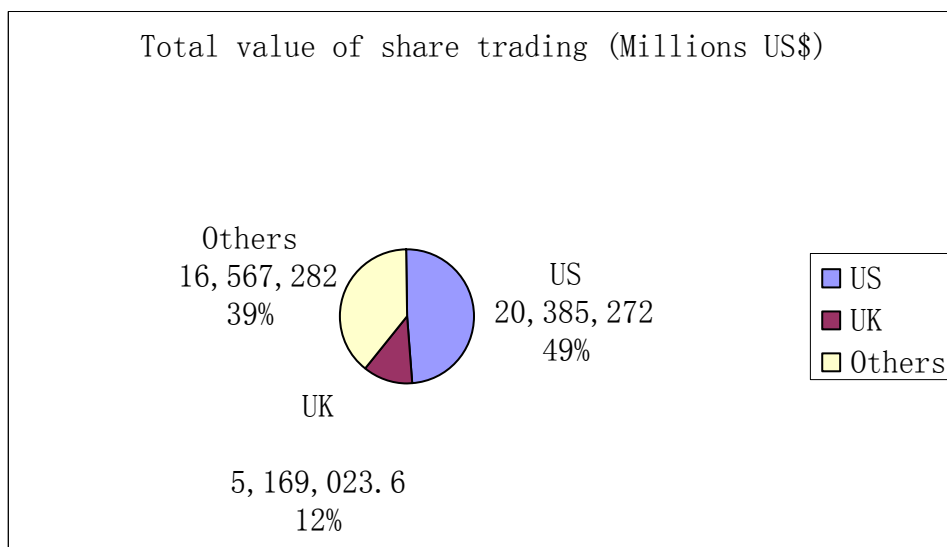
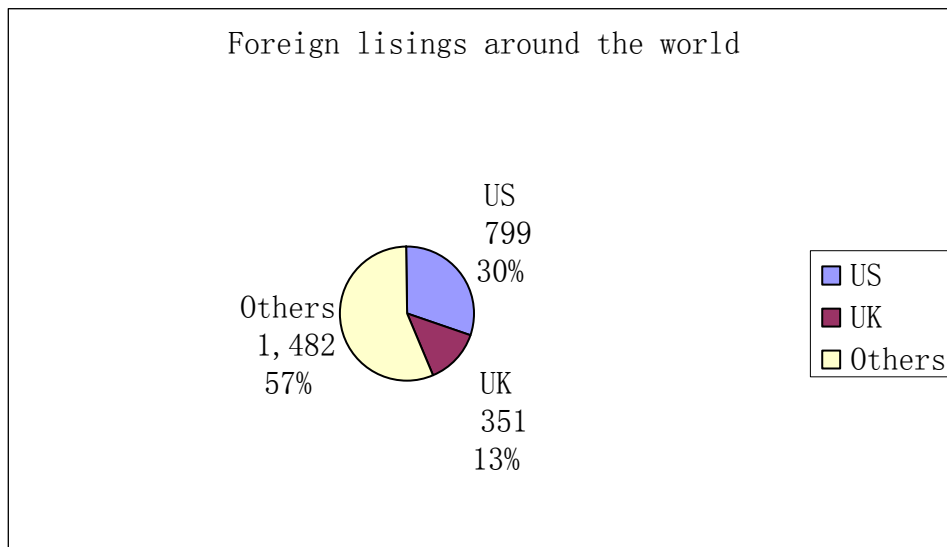
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9. Appendix

Figure 1. Foreign Listings and Total Value of Share Trading Around the World



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

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	2,293	1,834	459	11,618,150.7	976,385.2	8%	20	12,707,578.3	46,103.8
Nasdaq	3,229	2,889	340	8,767,121.2	617,773.5	7%	23	3,532,912.0	34,790.2
TSX Group	3,604	3,572	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	4,832.1	238.5	5%	-	40,593.8	19.2
Colombia SE	106	106	-	2,079.6	-	0%	-	25,222.9	8.5
Lima SE	224	192	32	1,560.4	238.1	15%	-	17,974.8	6.2
Bermuda SE	58	21	37	67.6	-	0%	6	1,852.0	0.3
Regional Total	11,150	9,995	1,155	21,797,025.1	1,596,759.3	7%	181	18,205,881.5	86,502
EUROPE-AFRICA-MIDDLE EAST									
London SE	2,837	2,486	351	5,169,023.6	2,228,931.5	43%	10	2,865,243.2	20,350.5
Euronext	1,333	999	334	2,472,131.7	47,561.9	2%	12	2,441,261.4	9,544.9
Deutsche Borse	819	660	159	1,541,122.7	137,001.0	9%	-	1,194,516.8	5,996.6

BME Spanish Exchange				1,203,360.2	8,093.0	1%		940,672.9	4,794.3
Borsa Italiana	278	269	9	969,234.2	94,532.0	10%	1	789,562.6	3,771.3
Swiss Exchange	409	282	127	791,371.5	737,999.0	93%	1	826,040.8	3,115.6
OMX Stockholm SE	276	256	20	462,501.3	50,282.6	11%	5	376,781.1	1,828.1
OMX Helsinki 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	2,243.9	2%	1	155,232.6	419.2
Irish SE	65	53	12	45,143.7	1,021.1	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	-	1,473.8	-	0%	-	9,676.8	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%	-	2,841.9	0.4
Regional Total	9,316	8,025	1,291	13,571,715.8	3,376,064.0	25%	54	11,074,907.2	53,230
ASIA-PACIFIC									
Tokyo SE	2,306	2,276	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	2,875.2
Australian SE	1,583	1,515	68	523,668.5	10,214.0	2%	8	776,402.8	2,053.6
Korea Exchange	683	683	-	488,408.3	-	0%	-	389,473.4	1,961.5

Hong Kong Exchanges	1,096	1,086	10	439,463.8	449.3	0%	-	861,462.9	1,764.9
Shanghai SE	837	837	-	322,828.6	-	0%	-	314,315.7	1,328.5
National SE India	957	957	-	260,409.2	-	0%	-	363,276.0	1,025.2
Shenzhen SE	536	536	-	194,457.7	-	0%	-	133,404.6	800.2
Osaka SE	1,090	1,090	-	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	4,730	4,730	-	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	1,134.7	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	1,473.0	9%	9	43,731.3	67.3
Philippine SE	235	233	2	3,681.2	14.9	0%	-	28,602.0	14.9
Colombo SE	242	242	-	575.2	-	0%	-	3,657.0	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	2,632	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)

Table 2. Comparison of the American Depositary Receipts by levels

	Level-I	Level-II	Level-III
Description	Unlisted in US	Listed on Major US Exchange	Offered and Listed on Major US Exchange
Trading Location	OTC Pink Sheet trading	NYSE, AMEX or Nasdaq	NYSE, AMEX or Nasdaq Registration
SEC Registration	Registration Statement Form F-6	Registration Statement Form F-6	Statement Form F-6 for initial public offering Form 20-F filed annually; short forms F-2 and F-3 used only for subsequent offerings
US Reporting Requirement	Exemption under Rule 12g3-2(b)	Form 20-F filed annually	Full GAAP reconciliation for financials
GAAP Requirement	No GAAP Reconciliation required	Only Partial reconciliation for financials	Full GAAP reconciliation for financials

Source: Karolyi (1998) Table II. 1

Table 3. Reporting and Regulatory Ranking of Eight Major Listing Locations Around the World.

	Mean Ranks				Disclosure Level Rank
	Statutory Reporting Requirements	Exchange Reporting Requirements	Capital Market Expectations	Overall Disclosure Levels	
United States	7.27	7.29	7.17	7.28	8
Canada	6.48	6.38	5.91	6.41	7
United Kingdom	5.84	5.87	6.09	6.02	6
Netherlands	4.68	4.80	4.50	4.75	5
France	4.11	4.50	4.13	4.17	4
Japan	3.82	4.04	4.22	3.83	3
Germany	3.96	3.90	4.04	3.81	2
Switzerland	2.70	2.78	3.17	2.60	1

Ranks are in descending order with 8 (1) indicating highest (lowest) disclosure level

Source: Saudagaran and Biddle (1995), Table 3.

Table 4. 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 at the fiscal year-end in 2004. For simplicity and data constraint, this measure does not use the market value of debt in the numerator and does not substitute replacement cost with total assets, which is the formal definition of Tobin's q. It is difficult to know how this imperfect measurement of q will affect the 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	the dollar value of shares traded in a country's equity markets divided by the country's average market capitalization for the time period
GDPG	the GDP growth rate of the selected countries 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.

**Table 5. Summary
Statistics**

Variable	Obs	Mean	Median	Std Dev	Min	Max
TOBIN_Q	4504	1.214	1.08	0.519	0.55	3.19
CL_US	4504	0.015	0	0.122	0	1
CL_UK	4504	0.012	0	0.109	0	1
SG2Y	4504	12.249	5.79	32.623	-77.56	960.56
INDU_Q	4504	1.153	1.1	0.262	0.81	2.22
COM_LAW	4504	0.090	0	0.287	0	1
LIQ	4504	1.208	0.99	0.775	0.69	4.62
GDPG	4504	4.698	2.7	2.780	2.7	9.5
SIZE	4504	12.887	12.67	1.404	8.09	18.93

Table 6. Correlation Matrix
(Pairwise Correlation Coefficients)
(Prob > |r| under H0: Rho=0)

	TOBIN_Q	CL_US	CL_UK	SG2Y	INDU_Q	COM_LAW	LIQ	GDPG	SIZE
TOBIN_Q	1.0000								
CL_US	0.0697 (0.0000)	1.0000							
CL_UK	0.0283 (0.0578)	0.2038 (0.0000)	1.0000						
SG2Y	0.2031 (0.0000)	0.0065 (0.6650)	0.0123 (0.4099)	1.0000					
INDU_Q	0.1064 (0.0000)	0.0241 (0.1054)	0.0173 (0.2470)	0.0140 (0.3489)	1.0000				
COM_LAW	0.1964 (0.0000)	0.0626 (0.0000)	0.0720 (0.0000)	0.0555 (0.0002)	0.0694 (0.0000)	1.0000			
LIQ	0.0028 (0.8505)	0.0320 (0.0317)	0.0576 (0.0001)	0.1072 (0.0000)	-0.0335 (0.0246)	-0.1315 (0.0000)	1.0000		
GDPG	0.2255 (0.0000)	0.0077 (0.6075)	0.0178 (0.2315)	0.2801 (0.0000)	0.0229 (0.1248)	0.0351 (0.0184)	0.1395 (0.0000)	1.0000	

SIZE	-0.0309	0.2324	0.1829	-0.0154	0.0018	-0.0273	0.0263	-0.3325	1.0000
	(0.0379)	(0.0000)	(0.0000)	(0.3014)	(0.9015)	(0.0666)	(0.0773)	(0.0000)	

Significance level in parentheses.

Table 7. Univariate Analysis

	<u>Not Cross Listed</u>		<u>Cross Listed in US</u>		<u>Diff</u>	<u>Cross Listed in UK</u>		<u>Diff</u>	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	11	1.36	(0.04)	6	1.37	(0.03)	983
India	189	1.56	8	2.19	0.63	12	1.33	(0.23)	209
Japan	2516	1.12	27	1.41	0.29	18	1.24	0.12	2,552
Korea	341	0.91	7	1.21	0.30	7	1.14	0.23	352
Taiwan	195	1.29	7	1.47	0.18	8	1.55	0.26	210
Mean q		1.21		1.51			1.35		
Total	4,395		68		1.52	54		0.83	4,504

Test of Difference Between Means

(one tailed two-sample t test with unequal variances)

<u>Comparison</u>	<u>t-statistic</u>
U.S. > Non cross listed	3.715***
U.K. > Non cross listed	2.450**

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

Table 8. The estimated coefficients from OLS and Random Effects regression

	Specification (1)		Specification (2)	
	OLS	Random Effects	OLS	Random Effects
CL_US	0.234 (0.062)***	0.159 (0.061)***		
CL_UK	0.000 (0.070)	0.007 (0.068)		
DIFF			0.134 (0.051)***	0.087 (0.050)*
SG2Y	0.003 (0.000)***	0.003 (0.000)***	0.003 (0.000)***	0.003 (0.000)***
INDU_Q	0.179 (0.028)***	0.324 (0.058)***	0.181 (0.028)***	0.328 (0.059)***
COM_LAW	0.320 (0.026)***	0.303 (0.026)***	0.327 (0.026)***	0.307 (0.026)***
LIQ	0.005 (0.010)	0.004 (0.010)	0.007 (0.010)	0.005 (0.010)
CONSTANT	0.932 (0.036)***	0.777 (0.069)***	0.93 (0.036)***	0.774 (0.070)***
Observations	4504	4504	4504	4504
R ²	0.09		0.09	
Overall R ²		0.08		0.08

* p < 0.10; ** p < 0.05; *** p < 0.01. Standard errors in parentheses.

Table 9. 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
CL_US		1.100 (0.122)***		
CL_UK				0.406 (0.174)**
SG2Y		0.003 (0.000)***		0.003 (0.000)***
INDU_Q		0.180 (0.028)***		0.179 (0.028)***
COM_LAW	0.586 (0.162)***	0.298 (0.027)***	0.867 (0.156)***	0.300 (0.027)***
LIQ		0.002 (0.010)		0.004 (0.010)
Lambda		-0.492 (0.056)***		-0.174 (0.080)**
TOBIN_Q	0.373 (0.107)***		0.119 (0.126)	
GDPG	0.114 (0.026)***		0.114 (0.027)***	
SIZE	0.553 (0.045)***		0.452 (0.042)***	
CONSTANT	-11.035 (0.762)***	0.923 (0.036)***	-9.351 (0.715)***	0.931 (0.036)***
Observations	4463	4463	4449	4449

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

Table 10. 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
CL_US		0.588 (0.216)***		
CL_UK			0.859 (0.214)***	
SG2Y		0.003 (0.000)***	0.003 (0.000)***	
SG_CL		0.004 (0.002)**	0.004 (0.002)	
INDU_Q		0.177 (0.029)***	0.179 (0.029)***	
IND_CL		0.455 (0.153)***	0.077 (0.122)	
COM_LAW		0.306 (0.028)***	0.311 (0.027)***	
COM_CL		0.646 (0.078)***	0.474 (0.090)***	
LIQ		-0.001 (0.010)	0.000 (0.010)	
LIQ_CL		0.078 0.028***	0.036 (0.031)	
Lambda		-0.683 (0.057)***	-0.173 (0.084)**	
TOBIN_Q	0.473 (0.100)***		0.265 (0.114)**	
GDPG	0.112 (0.025)***		0.107 (0.024)***	
SIZE	0.539 (0.044)***		0.41 (0.039)***	
CONSTANT	-10.872 (0.748)***	0.926 (0.037)***	-8.746 (0.665)***	0.927 (0.036)***
Observations		4463		4449
R ²				
Overall R ²				

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