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Abstract

This paper disentangles the effects of corruption on entry mode decision by carrying out an empirical analysis with rich, firm-level data on the activities of Swedish MNCs around the globe in manufacturing sectors from 1987 to 1998. A number of hypotheses emerge from a simple theoretical framework. The panorama of the results from the empirical part supports these hypotheses: (i) Corruption has a direct negative impact on greenfield investments and a weak positive impact on M&As. (ii). There are complex, asymmetric, secondary effects of corruption on the mode of entry. (iii). International experience dampens the effects of corruption on the choice of entry. (iv) The results are robust to differences in measures of corruption.

JEL Classification: *F23*
Keywords: *Corruption; Foreign direct investment, Multinational firms; M&As, Greenfield investments*

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1 Introduction

While foreign direct investment (FDI) flows have the potential to make significant contributions to economic and social development, there exist widespread perception and anecdotal evidence that these flows are often restricted by corrupt practices of local or national government officials in different countries around the globe. In effect corruption acts as a barrier to entry by multinational corporations (MNCs) into new markets.

Corruption is often defined as the misuse of public power for private benefit which includes bribing of the public officials, kickbacks in public procurement and the misappropriation of public funds. Corruption need not involve money changing hands; it may be observed in the form of "trading influences"or granting favors. The *level of corruption* has two dimensions: The frequency of corrupt undertakings and the total value of bribes paid -or the magnitude of influences traded- which go hand in hand, i.e. in countries where bribery is the rule of the game more than a trifling proportion of firm revenues tend to represent the bribes paid.

Until very recently the lack of systematic data on corruption, coupled with scarcity and confidentiality of firm-level data on FDI, have kept the connection between these two topics out of the research agenda of economists.

The objective of this paper is to fill this gap in the literature by offering a theoretical analysis that takes into consideration not just how corruption may restrict FDI flows, but also how corruption may facilitate these flows and then testing the findings of the theory on-site in Sweden by employing a rich, firm-level data on the activities of Swedish MNCs around the globe in manufacturing sectors from 1987 to 1998.

MNCs undertake foreign direct investment in different ways: Cross-border M&As, greenfield investments, joint ventures, partial acquisitions, and different forms of low-equity commitment such as sales offices, licensing, research centers, etc. In this paper, a multinational may enter a host market by acquiring/merging with an already existing local firm (cross-border M&As) or by establishing a new venture (greenfield investment). Alternative is not to enter at all.[1]

The traditional trade literature is still at its infancy on the subject of effects of corruption on FDI flows. Except for a few recent studies, this literature has considered the effects of corruption mainly in the context of whether or not to produce overseas, but has not differentiated specific types of FDI. This implicitly treats the different entry modes as perfect substitutes. However, for most firms seeking foreign market access, cross-border acquisitions and greenfield investments represent unlikely candidates for perfect substitution. While acquisitions provide rapid access to a foreign market with increased market power and a means of exploiting synergies -derived from the non-mobile skills such as knowledge of the local conditions- between the buyer and seller firms, greenfield investments offer the most profitable internal utilization of mobile firm-specific assets (R&D, marketing expenditures, scientific and technical workers, product newness and complexity

[1] Due to lack of data, the middle ground between wholly owned operations and no entry could not be included in the analysis in this paper.

and product differentiation) for reasons including moral hazard and technology diffusion.

In 2012, Transparency International conducted a survey on 105 MNCs which are worth more than $11 trillion. These firms touch the lives of millions of people across the globe. Of the 105 companies surveyed in the TI report, 50 do not disclose revenue/sales in any country of foreign operations, 85 do not disclose income tax in any country of foreign operations and 39 do not disclose any financial data (tax, revenue, sales, pre-tax income, capital investment, community contributions) in their countries of operation. Under these circumstances, it becomes absolutely necessary to rethink the effects of corruption not only on the national firms, but also on the FDI flows channeled through different modes of entry with mode-specific consequences for the countries hosting considerable amounts of FDI.

First, I offer a simple theoretical framework to motivate the empirical analysis. Four hypotheses are generated. The first two are related to the direct (primary) effect of corruption on the mode of foreign expansion: (i) Higher levels of corruption discourage greenfield investments and (ii) under certain circumstances encourage cross-border M&As. The last two hypotheses address the indirect (secondary) effects: (iii) Corruption reduces the likelihood of both M&As and greenfield investments for firms endowed with high levels of mobile skills and (iv) increases the likelihood of M&As more compared to greenfield investments for firms equipped with high levels of non-mobile skills.

Main innovations present in the empirical part are as follows: First, I include both foreign access strategies (cross-border M&As and greenfield investments) in the analysis, which differs from many studies that only include one of the strategies at a time. Second, I consider not only the primary but also secondary effects of corruption on the modes of foreign expansion. Third, I apply the multivariate probit model to account for the correlation between different entry strategies, which reduces the inconsistency of the estimators significantly.

Results of the empirical analysis show that corruption reduces the likelihood of foreign entry as conjectured by recent studies. Entry mode decision of an MNC is a complex one and there are many asymmetries involved when it comes to the impact of corruption on this decision. First, greenfield investments are always discouraged by higher levels of corruption. This is more so for firms with high levels of mobile skills. Second, M&As are encouraged by moderate levels of corruption as seen in the OECD countries. For firms with high levels of non-mobile skills this effect is stronger. However, when corruption levels are beyond a certain threshold as seen in non-OECD countries, M&As are deterredas well. Third, firms with a wider network of foreign affiliates are more immune to the effects of corruption, whereas small, single affiliate firms are severely affected. These results confirm the findings of the recent literature and add to it by testing a number of extensions of this view.

The paper continues as follows: In the next section, I present the related recent literature. In Section 3, I lay out a simple model and present the testable hypotheses generated from it. In section 4, I discuss the econometric analysis. Sections 5 reports the results and I conclude in Section 6.

2 The recent literature

There are two strands of literature that are relevant to the analysis of corruption and entry modes of multinational corporations. The first one is the literature on foreign direct investment, too vast to be addressed here at length (Markusen (2002) and citations therein). The second line of literature relevant for this paper is voluminous as well and considers the causes and consequences of corruption in general. The work spans many different areas such as the impact of corruption on regulatory discretion, existence of rents and opportunities for rent-seeking, and civil service wage policy. There are also studies that consider the impact of corruption on various aspects of economic systems such as growth, military expenditure and procurement, delivery of public services, and inequality. An excellent survey of this literature is provided by Jain (2001) and Aidt (2003).

There is a limited yet fast growing literature on corruption and FDI connection. The existing work is mostly empirical and can be summarized under two headings: (i) corruption acting as the "grabbing hand" in FDI: Corruption in a host country introduces additional direct or indirect costs for the foreign investor and therefore makes FDI less likely. This argument finds support in the works of Hines (1995), Wei (2000a, 2000b), Hellman et al. (2002), Habib and Zurawicki (2002), Busse and Hefeker (2007), Hakkala et al. (2008) and Javorcik and Wei (2009), and (ii) corruption acting as the "helping hand" in FDI: By greasing squeaky wheels of an inefficient bureaucracy and softening rigid regulations, corruption can reduce the obstacles in front of FDI and thus will not necessarily discourage it. The works of Lui (1985), Wheeler and Mody (1992), Saha (2001), Egger and Winner (2005), Bjorvatn and Soreide (2005), Wu (2006), Tekin-Koru (2006) and Barassi and Zhou (2012) are examples of this line of study.

The current paper builds on this earlier empirical work examining the effects of corruption on FDI. Many of these studies use aggregate cross-country data. The fewer ones using firm-level data usually take steps beyond investigating the effect of corruption on FDI. Some concentrate of the ownership structure of the firm and some on the different types of affiliate activity in host country and how they are affected by corruption in the host country or by the corruption distance between the parent and host countries. Two such recent studies which are more relevant for the current paper are contributions made by Javorcik and Wei (2009) and Hakkala, Norback and Svaleryd (2008).

Javorcik and Wei (2009) investigate how the volume of FDI and its ownership structure may be affected by the extent of corruption. They use firm-level data from 22 transition economies and find that corruption adversely affects the probability of foreign investments taking place in the host country. However, conditional on FDI taking place, their results suggest that joint ventures are more likely in corrupt environments unless the technological sophistication of the foreign firm is high. Different from Javorcik and Wei (2009) who bundle acquisitions and greenfield investments together as sole ownership, in the current paper I treat them differently since the motives for undertaking an M&A and a greenfield investment are not the same. Moreover, in the current paper data on global operations of Swedish multinational firms are used which provides a broader coverage of host countries.

The most relevant work for the current paper is by Hakkala et al. (2008) who consider the impact of corruption on FDI in two dimensions: (i) corruption may influence the probability that a firm chooses to invest in a foreign market but not the size of the affiliate activities once the investment is undertaken, and (ii) corruption may have different effects on different types of affiliate activities such as horizontal, vertical or export platform sales. Using Swedish firm-level data they find that firms are less likely to invest in corrupt countries and horizontal investments are deterred by corruption. There is no robust effect of corruption on vertical or export platform sales in their findings. This asymmetry is explained by greater costs incurred by the firm in case of production for local sales rather than production for exporting to other markets. They also find that R&D intensive or large firms weather corruption better compared to less technical or smaller firms. The current paper complements Hakkala et al. (2008) by using the same Swedish multinational firm data to examine another aspect of FDI, namely the effect of corruption on M&As and greenfield investments undertaken by Swedish MNCs.

3 Corruption and foreign entry - A theoretical framework

This section presents a model of FDI with two countries, the host (H) and the parent (P). A MNC from the parent country considers entering the host country market. It can choose between building its own establishment (greenfield investments, g) or to acquire an already existing indigenous firm (mergers and acquisition (M&A), m). The outside alternative for the MNC is not to enter at all (n). Thus, $\Sigma = \{m, g, n\}$ represents the set of possible entry strategies (s). We assume, for the sake of simplicity, that exporting to H is not a feasible option due to transport cost reasons.[2]

Preferences. There exist two final goods sectors; X (increasing returns, imperfect competition) and Y (constant returns, perfect competition). Good Y is produced from a single factor L (Labor), where one unit of L produces one unit of Y. Good X, on the other hand, is produced using firm specific assets and factor L, both in fixed proportions. The linear demand functions are derived from the quasi-linear utility function maximized subject to a budget constraint. Income is derived from labor and profits.

$$\begin{aligned} \max U &= \alpha X - \left(\frac{\beta}{2}\right) X^2 + Y \\ \text{subject to } L + \Pi &= Y + pX \end{aligned} \tag{1}$$

where L and Y are numéraires. The inverse demand function for good X is as follows:

$$P = \alpha - \beta X \tag{2}$$

Firms. We assume that there are two (potential) firms producing X in country H, one from parent country p and one indigenous to host country h.

[2] The model could be broadened in such a way that the firm's choice extends to serving country L by exporting, which does not alter the principal insights. See Tekin-Koru (2012) for a model with exporting as as an alternate way of serving the potential host country.

Firms differ in their skills. As in Nocke and Yeaple (2004) there are two types of firm-specific skills: mobile (μ) and non-mobile (ν). The efficiency of a firm's production technology is assumed to travel internationally at little to no cost. On the other hand, the degree of familiarity with the local business conditions is assumed immobile. These non-mobile skills, including but not limited to the degree of influence on political process and of the strength of ties with local bureaucracy, marketing strategies geared towards the expectations of the host country and greater access to distribution channels affect both marginal production costs and the fixed entry costs as does the level of corruption (ζ) in country H. Variable production costs of firms p and h are given by c_p and c_h:

$$c_p(s) = \begin{cases} c(\mu_p, \nu_p, \zeta) & \text{if } s = g \\ c(\mu_p, \nu_h, \zeta) & \text{if } s = m \end{cases} \tag{3}$$

$$c_h(s) = c(\mu_h, \nu_h, \zeta) \qquad \text{for all } s \tag{4}$$

Due to investment in R&D and long term diverse experience in managerial practice, which are internationally mobile, firm p is endowed with an alternative technology which allows it to have greater cost advantages in producing good x compared to firm h in cases of both M&As and greenfield investments. On the other hand, if greenfield investment is the chosen mode of entry, then firm h enjoys greater cost savings due to being better acquainted with the local business conditions. Since firm p has access to the non-mobile skills of the indigenous firm (ν_h) in an M&A regime the size of the cost savings is as big as the ones enjoyed by firm h in greenfield and no entry regimes. Higher levels of corruption (ζ) in country H will increase the variable costs of production at an increasing rate. In countries with widespread corruption, for example, the variable costs may reach prohibitively high levels.[3]

I also consider the interactions of firm-specific skills with the level of corruption in country H. Mobile skills get less beneficial for the firm as corruption increases whereas non-mobile skills become much more valuable in the existence of corruption.[4] In other words, high degrees of mobile skills make the MNC less corruption tolerant whereas high degrees of non-mobile skills make it more corruption tolerant.

In addition to the variable costs, the multinational firm incurs fixed entry costs as well. First, there is a fixed greenfield establishment cost ($F(g)$). Second, there is an M&A cost ($F(m)$) if the indigenous firm is acquired.

Last but not least, there is a bureaucratic cost of entry ($F^b(s) = F^b(\nu_i, \zeta)$ for $i = \{h, p\}$) in the host country, H. This cost, F^b essentially measures the procedures, time, cost and paid-in minimum capital required for a firm to start-up and formally operate in the host country. The regulation of entry enables the regulators to collect bribes from the potential entrants and serves no social purpose. Therefore, in the model, it is

[3] The variable productions costs are concave both mobile (μ) and immobile skills (ν) and convex in the level of corruption (ζ): $\frac{\partial c}{\partial \mu_p} < \frac{\partial c}{\partial \mu_h} < 0$, $\frac{\partial c}{\partial \nu_h} < \frac{\partial c}{\partial \nu_p} < 0$, $\frac{\partial c}{\partial \zeta} > 0$ and $\frac{\partial^2 c}{\partial \mu_p^2} = \frac{\partial^2 c}{\partial \mu_h^2} > 0$, $\frac{\partial^2 c}{\partial \nu_h^2} = \frac{\partial^2 c}{\partial \nu_p^2} > 0$, $\frac{\partial^2 c}{\partial \zeta^2} > 0$

[4] The cross derivatives of cost functions with respect to different firm specific assets and the level of corruption are as follows: $\frac{\partial^2 c}{\partial \mu_p \partial \zeta} > 0$, $\frac{\partial^2 c}{\partial \mu_h \partial \zeta} > 0$, $\frac{\partial^2 c}{\partial \nu_h \partial \zeta} < 0$, $\frac{\partial^2 c}{\partial \nu_p \partial \zeta} < 0$.

assumed that F^b increases in corruption. More extensive regulation should be associated with socially inferior outcomes, particularly corruption. Djankov et. al (2002) finds evidence supporting the public choice view that entry regulation benefits politicians and bureaucrats. Since it is possible to avoid some if not all of these barriers, a higher degree of familiarity with the local business/governance conditions will help reducing these costs by itself and will do even more so in more corrupt environments.[5]

3.1 The game

Firm p's objective is to maximize profits in the host country through its choice of entry mode and the quantity supplied. In the first stage, the MNC chooses its entry mode and in the second stage makes its quantity decision in a usual Cournot setting by taking the entry mode from the previous stage as given.

A strategy for firm p has two elements: (i). the firm's entry mode choice, $s \in \Sigma$ where $\Sigma = \{m, g, n\}$ is the set of all possible entry nodes and (ii). the firm's quantity choice, $x^p(s)$ where $x^p(s) > 0$ indicates that firm p is active in the host country; $x^p(s) = 0$ indicates that firm p chooses n and thus not to produce in country H.

Aggregate supply to the consumers by firms $i = \{h, p\}$ in the host country given the entry mode choice s, is:

$$X(s) = \sum_i x_i(s), \qquad i = \{h, p\} \tag{5}$$

and the aggregate profits generated under each entry strategy s for firms p and h in country H are given by

$$\begin{aligned} \Pi_p(s, x_p(s)) &= [(P - c_p(s))x_p(s)] - F(s) - F^b(s) = \pi_p(s, x_p(s)) - F(s) - F^b(s) \quad (6) \\ \Pi_h(s, x_h(s)) &= [(P - c_p(s))x_p(s)] = \pi_h(s, x_h(s)) \end{aligned}$$

where $x_i(s)$, $c_i(s)$, $F(s)$ and $F^b(s)$ are the quantity choice, variable cost of production for each firm i, fixed costs associated with each entry mode s and bureaucratic costs of entry. π_i signifies the operating profits of firm $i = \{h, p\}$. The M&A cost $F(m)$ is endogenized through a simple bilateral Nash bargaining process.

Bargaining. In this game, the acquiring firm (firm p) and the target firm (firm h) seek to split a total value $\pi_p(m) - F^b(m)$ which they can achieve if and only if they agree on a specific division. If there is no agreement between the firm h and firm p, the latter opts for the next best alternative among no entry and greenfield investment. The following payoffs, thus, can be called backstop payoffs and be signified by a tilda:

$$\begin{aligned} \widetilde{\Pi}_p &= \max\{\Pi_p(g), \Pi_p(n)\} \quad (7) \\ \widetilde{\Pi}_h &= \max\left\{\Pi_h(g) \mid_{\widetilde{\Pi}_p = \Pi_p(g)}, \Pi_h(n) \mid_{\widetilde{\Pi}_p = \Pi_p(n)}\right\} \end{aligned}$$

[5] The official costs of entry are concave in immobile skills (ν) and convex in the level of corruption (ζ): $\frac{\partial F^b}{\partial \nu_h} < \frac{\partial F^b}{\partial \nu_p} < 0$, $\frac{\partial F^b}{\partial \zeta} > 0$ and $\frac{\partial^2 F^b}{\partial \nu_h^2} = \frac{\partial^2 F^b}{\partial \nu_p^2} > 0$, $\frac{\partial^2 F^b}{\partial \zeta^2} > 0$. The cross derivatives $\frac{\partial^2 F^b}{\partial \nu_h \partial \zeta}$ and $\frac{\partial^2 F^b}{\partial \nu_p \partial \zeta}$ are positive.

For the solution of this bargaining procedure, it should be assumed that there is a positive surplus ($\pi_p(m) - F^b(m) - \widetilde{\Pi}_p - \widetilde{\Pi}_h > 0$) from agreement. If this were not the case, the whole bargaining process would be unlikely because each side would just take up its outside opportunity and receives its backstop payoff. Next, consider the following rule coming from the solution of bilateral Nash-bargaining process.

Criterion 1 *Given $\theta \in [0,1]$ each party is to be given its backstop payoff plus a share of the surplus, a fraction θ for firm p and a fraction $(1-\theta)$ for firm h.*

Writing $\Pi_p(m)$ and $\Pi_h(m)$ for the amounts that firm p and firm h receive, the above stated bargaining criterion can be translated as

$$\begin{aligned} \Pi_p(m) &= \widetilde{\Pi}_p + \theta(\pi_p(m) - F^b(m) - \widetilde{\Pi}_p - \widetilde{\Pi}_h) = \pi_p(m) - F^b(m) - F(m) \\ \Pi_h(m) &= \widetilde{\Pi}_h + (1-\theta)(\pi_p(m) - F^b(m) - \widetilde{\Pi}_p - \widetilde{\Pi}_h) = F(m) \end{aligned} \tag{8}$$

Next, define the reservation price of the buying party as $R_p = \pi_p(m) - F^b(m) - \widetilde{\Pi}_p$ and that of the selling party as $R_h = \widetilde{\Pi}_h$. Then, one can arrive at the cost of M&A by solving the equations in (7) for $F(m)$:

$$F(m) = (1-\theta)R_p + \theta R_h \tag{9}$$

When $\theta = 1$ firm p has all the bargaining power implying that $F(m) = R_h$. When $\theta = 0$, on the other hand firm p has no bargaining power and thus the cross-border M&A price is the same as its reservation price, i.e. $F(m) = R_p$.

Equilibrium. The game is solved in the usual logic of backward induction. I seek the subgame perfect equilibrium of this game. The second stage of the game involves the product market where firms compete á la Cournot. The equilibrium output levels and total profits of all firms are reported in the Appendix. Production and sales take place with firms moving simultaneously. The game is solved for Nash equilibria in pure strategies. Each equilibrium point is assumed to have equal probability.

Criterion 2 *Denote by $X_p(s)$ the set of possible quantity choices for form p in the host country market given entry mode choice s. The Nash equilibrium for the second-stage quantity sub-game for any s is the quantity choice $x_p^*(s)$ such that:*

$$\Pi_p(s, x_p^*(s)) \geq \Pi_h(s, x_p^*(s), x_p^{*-}(s)) \qquad \text{for all } x_p(s) \in X_p(s) \tag{10}$$

Denote by $\Pi_p^*(s^*)$ the profit to firm p from the Nash equilibrium quantity choice corresponding to the entry mode choice s. An equilibrium for the first-stage entry game is an entry strategy s^* such that:

$$\Pi_p^*(s^*) \geq \Pi_p^*(s, s^{*-}) \qquad \text{for all } s \in \Sigma \tag{11}$$

The MNC makes its entry decision in the following way. In the case where the best alternative to a negotiated agreement is no entry, firm p chooses cross-border M&A over no entry if the payoff from cross-border M&A is higher than zero. On the other hand, in the case where the best alternative is greenfield investment, firm p chooses cross-border M&A if the payoff from M&A is higher than that from greenfield investment. The final decision in regard to entry mode, henceforth, will be the outcome of the relative magnitudes of and the interrelations among country size, level of corruption in the country, firms' relative endowments of mobile and immobile skills, and the relative bargaining power of the parties.

Considering the current setup of the model, it would be natural to expect a negative impact of host country corruption on the FDI modes of entry. In other words, as the corruption level of the host country increases both the variable production costs and initial start-up costs will get higher and thus discourage the MNC from investing in the host country all together. However, this argument ignores both the changes in the acquisition price -which is endogenized in this model- with respect to changes in corruption and the importance of the MNC's relative endowment of mobile and non-mobile skills. The *corruption tolerance* -how well the firm copes with the potential negative impact of corruption on profitability- of a MNC with high levels of mobile skills will be quiet low compared to a MNC endowed with not to so strong mobile skills but with impressive levels of non-mobile skills. Therefore, to formalize this discussion I use comparative statics in the next section.

3.2 Comparative statics

In this section, I analyze the effects of corruption on the entry mode decision of a multinational firm to generate testable hypotheses.

3.2.1 Corruption

What is the impact of host country corruption on the equilibrium patterns of greenfield investments, M&As and no entry at all? To answer this question, I compare the effects of corruption level (ζ) in country H on the payoffs of firm p from different entry strategies.

For notational convenience I will henceforth use $\Pi_p(s)$ for $\Pi_p(s, x_p^*(s))$. Before the total derivative of $\Pi_p(s)$ for $\forall s \in \Sigma$ with respect to ζ is calculated two cases should be differentiated: The case where greenfield investment is the next best alternative to M&A and the case where no entry is the next best. The latter is trivial as both variable production costs and bureaucratic costs of entry will be higher for higher corruption levels. The payoff from greenfield investment to firm p is .

$$\Pi_p(g) = \pi_p(m) - F^b(g) - F(g) \tag{12}$$

First, take the total derivative of $\Pi_p(g)$ with respect to ζ and then substitute the explicit forms of the payoff functions given in Appendix in the general form equations. Finally by

applying the assumption that $\frac{\partial c_p}{\partial \zeta} = \frac{\partial c_h}{\partial \zeta}$, arrive at

$$\frac{d\Pi_p(g)}{d\zeta} = -\frac{2}{3\beta}\frac{\partial c_p}{\partial \zeta} - \frac{\partial F^b(g)}{\partial \zeta} < 0 \tag{13}$$

Given that $\frac{\partial F^b(s)}{\partial \zeta} > 0$ and $\frac{\partial c_p}{\partial \zeta} > 0$ for $s \in \{m, g\}$ the above derivative is negative.

Hypothesis 1 *Corruption in the host country reduces the likelihood of greenfield investments.*

Next, consider the M&A case. The payoff from M&A to firm p is given by

$$\begin{aligned} \Pi_p(m) &= \pi_p(m) - F^b(m) - F(m) \\ \text{where } F(m) &= (1-\theta)[\pi_p(m) - F^b(m) - \Pi_p(g)] + \theta\Pi_h(g) \end{aligned} \tag{14}$$

Notice that the cost of acquisition is determined by the other parameters of the model. Taking the total derivative of $\Pi_p(m)$ with respect to ζ one can find the impact of corruption on the profit of firm p in an M&A scenario:

$$\frac{d\Pi_p(m)}{d\zeta} = \theta\frac{d\pi_p(m)}{d\zeta} + (1-\theta)\frac{d\Pi_p(g)}{d\zeta} - \theta\frac{d\Pi_h(g)}{d\zeta} - \theta\frac{\partial F^b(m)}{\partial \zeta} \gtrless 0 \tag{15}$$

Hypothesis 2 *Corruption in the host country may increase the likelihood of M&As.*

For a larger subset of parameter space the derivative in equation (15) is negative. Given $\frac{d\Pi_p(g)}{d\zeta} < 0$ and $\frac{\partial F^b(s)}{\partial \zeta} > 0$ and $\frac{\partial c_p(s)}{\partial \zeta} > 0$ for $s \in \{m, g\}$ and the Cournot profits from the Appendix, it is trivial to find that $\frac{d\pi_p(m)}{d\zeta} = -\frac{x_p(m)}{\beta}\frac{\partial c_p}{\partial \zeta} < 0$ and $\frac{d\Pi_h(g)}{d\zeta} = -\frac{2x_h(m)}{3\beta}\frac{\partial c_h}{\partial \zeta} < 0$. However, there is also a possibility that M&A profits are increasing in the level of corruption. The very last term in equation (15) implies that the indigenous firm is also hurt by corruption and it works to the advantage of the MNC by reducing the acquisition price. Parameters may be such that, in equilibrium, this price reduction might be the dominant factor and corruption might increase the likelihood of M&As compared to the greenfield investments.

3.2.2 Corruption and mobile skills

I now turn to the issue that how the corruption tolerance of firm p changes as the level of mobile skills (μ_p) change. Specifically, how does the equilibrium pattern changes when the interaction of the mobile skills with the level of corruption is considered? As stated earlier, mobile skills provide production cost advantages to the MNC. However, the marginal impact of these skills gets lower in the existence of rising corruption levels for reasons such as poor intellectual property right protection. For formal derivation, first consider the cross derivative of $\Pi_p(g)$ given in equation (12) with respect to μ_p and ζ :

$$\frac{d^2\Pi_p(g)}{d\mu_p d\zeta} = \frac{4}{9\beta^2}\frac{\partial c_p}{\partial \mu_p}\frac{\partial c_p}{\partial \zeta} - \frac{4}{3\beta}x_p(g)\frac{\partial^2 c_p}{\partial \mu_p \partial \zeta} < 0 \tag{16}$$

Given that $\frac{\partial c_p}{\partial \mu_p} < 0$ and $\frac{\partial c_p}{\partial \zeta} > 0$ and $\frac{\partial^2 c_p}{\partial \mu_p \partial \zeta} > 0$, the above derivative is negative. Next, we consider the derivative of $\frac{d\Pi_p(m)}{d\zeta}$ given in equation (15) with respect to μ_p. To derive an expression for it, consider the components of equation (15) one by one. The derivative of the first component $\frac{d\pi_p(m)}{d\zeta}$with respect to μ_p is

$$\frac{d^2\pi_p(m)}{d\mu_p d\zeta} = \frac{2}{3\beta^2}\frac{\partial c_p}{\partial \mu_p}\frac{\partial c_p}{\partial \zeta} - \frac{1}{\beta}x_p(m)\frac{\partial^2 c_p}{\partial \mu_p \partial \zeta} < 0 \tag{17}$$

The derivative of the second component is already given in equation (16). Next, consider the derivative of $\frac{d\Pi_h(g)}{d\zeta}$

$$\frac{d^2\Pi_h(g)}{d\mu_p d\zeta} = -\frac{2}{9\beta^2}\frac{\partial c_p}{\partial \mu_p}\frac{\partial c_p}{\partial \zeta} + \frac{2}{3\beta}x_h(g)\frac{\partial^2 c_p}{\partial \mu_p \partial \zeta} > 0 \tag{18}$$

When all of the components are put together

$$\frac{d^2\Pi_p(m)}{d\mu_p d\zeta} = \frac{4}{9\beta^2}\frac{\partial c_p}{\partial \mu_p}\frac{\partial c_p}{\partial \zeta}(1+\theta) - \frac{1}{\beta}\frac{\partial^2 c_p}{\partial \mu_p \partial \zeta}\left[\theta x_p(m) + \frac{2\theta}{3}x_h(g) + (1-\theta)x_p(g)\right] < 0 \tag{19}$$

Given that $\frac{\partial c_p}{\partial \mu_p} < 0$ and $\frac{\partial c_p}{\partial \zeta} > 0$ and $\frac{\partial^2 c_p}{\partial \mu_p \partial \zeta} > 0$, equation (19) is negative. I summarize these results in the following hypothesis.

Hypothesis 3 *The likelihood of both greenfield investments and the M&As as equilibrium strategies will decrease as the cost savings through mobile skills shrink in more corrupt environments. However, the decline in the M&A profits will be more severe.*

In more corrupt environments, increases in both greenfield and M&A profits due to higher endowments of mobile skills will be lower than what they would be for lesser amounts of corruption. While mobile skills provide variable cost savings for firm p, increasing levels of corruption dampens the effectiveness of these cost savings. This in turn implies an advantage for the indigenous firm, which will exploit it at the negotiation table by demanding a higher acquisition price. Therefore, in case of an M&A, firm p will be hurt due to reduced effectiveness of its mobile skill coupled with an increase in the M&A entry cost.

3.2.3 Corruption and non-mobile skills

The analysis so far has highlighted the importance of increasing levels of corruption and the cross effects with mobile skills. I now investigate how the degree of non-mobile skills endowment with increasing levels of corruption affect the equilibrium mode of entry. For formal derivation, first consider the cross derivative of $\Pi_p(g)$ given in equation (12) with respect to μ_p and ζ :

$$\frac{d^2\Pi_p(g)}{d\nu_p d\zeta} = \frac{4}{9\beta^2}\frac{\partial c_p}{\partial \nu_p}\frac{\partial c_p}{\partial \zeta} - \frac{4}{3\beta}x_p(g)\frac{\partial^2 c_p}{\partial \nu_p \partial \zeta} - \frac{\partial^2 F^b(g)}{\partial \nu_p \partial \zeta} \lessgtr 0 \tag{20}$$

Given that $\frac{\partial c_p}{\partial \nu_p} < 0$ and $\frac{\partial c_p}{\partial \zeta} > 0$ and $\frac{\partial^2 c_p}{\partial \nu_p \partial \zeta} < 0$, the sign of equation (20) is ambiguous since the first term on the right hand side is negative whereas the last two terms are positive. Next, consider the derivative of $\frac{d\Pi_p(m)}{d\zeta}$ given in equation (15) with respect to $\nu_p = \nu_h$. Since firm p buys firm h, it adopts firm h's superior non-mobile skills. To derive an expression for it, we I examine the components of equation (15) one by one. The derivative of the first component $\frac{d\pi_p(m)}{d\zeta}$ with respect to ν_p is

$$\left.\frac{d^2\pi_p(m)}{d\nu_p d\zeta}\right|_{\nu_p=\nu_h} = \frac{2}{3\beta^2}\frac{\partial c_p}{\partial \nu_h}\frac{\partial c_p}{\partial \zeta} - \frac{1}{\beta}x_p(m)\frac{\partial^2 c_p}{\partial \nu_h \partial \zeta} \lesseqgtr 0 \tag{21}$$

The derivative of the second component is already given in equation (20). Next, we consider the derivative of $\frac{d\Pi_h(g)}{d\zeta}$

$$\frac{d^2\Pi_h(g)}{d\nu_p d\zeta} = -\frac{2}{9\beta^2}\frac{\partial c_p}{\partial \nu_p}\frac{\partial c_p}{\partial \zeta} + \frac{2}{3\beta}x_h(g)\frac{\partial^2 c_p}{\partial \nu_p \partial \zeta} \lesseqgtr 0 \tag{22}$$

Since all of the components of the second derivative of M&A profits with respect to non-mobile skills and corruption have ambiguous signs, the sign of $\frac{d^2\Pi_p(m)}{d\nu_p d\zeta}$ is ambiguous, too.

Hypothesis 4 *As long as* $\left|\frac{\partial^2 c_p}{\partial \nu_p \partial \zeta}\right| > \left|\frac{\partial c_p}{\partial \nu_p}\frac{\partial c_p}{\partial \zeta}\right|$ *the likelihood of both greenfield investments M&As will increase as the cost savings through non-mobile skills increase in more corrupt environments. However, for higher* θ *the rise in M&A profits will be higher.*

In an M&A what firm p buys is the non-mobile skills (ν) of the indigenous firm as well. These skills affect both marginal production costs and the fixed entry costs as does the level of corruption (ζ) in country H. These skills become more valuable in corrupt environments. If the discrepancy between the non-mobile skills of the MNC and the indigenous firm is very high, then the acquisition price will be higher too. Therefore, if the bargaining strength of the MNC is high then the multinational can negotiate a price lower than the reservation price of the indigenous firm and at the same time can make higher profits by using the newly earned superior non–mobile skills in an M&A scenario.

In a way, it is the relative rates of corruption tolerance between these firms which determines the equilibrium mode of entry. For instance, if the corruption tolerance of firm p is very high due to superior mobile skills and if it couples with low levels of non-mobile skill endowments, then the indigenous firm can enjoy a greater advantage. It might as well be the case that the indigenous firm has all the "right" contacts with the local bureaucracy and it is going to be costly for the MNC to buy these non-mobile skills. If the indigenous firm happen to have a high bargaining strength then it might prevent the entry of the MNC all together and stay as the national monopoly.

In summary, as corruption increases multinational entry gets discouraged. However, when the importance of skill endowments is considered, multinational firms with rich mobile and non-mobile skills would prefer greenfield investments in corrupt environments. MNCs with low levels of mobile and non-mobile skills would prefer no entry. Multina-

tionals with high levels of mobile, but low levels of non-mobile skills would prefer M&A if the bargaining strength is high. Otherwise, they would go with the greenfield choice or no entry.

The results of this section lend themselves to empirical testing and I now turn to a discussion of the empirical analysis and the data set.

4 Econometric analysis

The theoretical framework presented in the previous section suggests that corruption in a host country can have asymmetric effects on different ways of serving a foreign market. The following econometric analysis provides the impact of corruption on foreign entry modes by using a sample of Swedish multinational firms.

4.1 Econometric model

Hypotheses 1 and 2 in the previous section state that corruption in the host country has asymmetric effects on a multinational's mode of foreign expansion. While greenfield investments decline with higher levels of corruption, cross-border M&As can be encouraged under certain circumstances. I use the following specification to test these predictions:

$$y_{ikt;s} = \beta_{0;s} + \beta_{1;s}\zeta_{kt} + \boldsymbol{\beta}'_{2;s}\mathbf{x}_{it} + \boldsymbol{\beta}'_{3;s}\mathbf{x}_{kt} + \varepsilon_{ikt;s} \tag{23}$$

where $y_{ikt;s}$ is a binary indicator if firm i's entry into country k during time period t in the form of $s \in \{m, g, n\}$, ζ_{kt} denotes corruption, $\mathbf{x}_{it}$ is a vector of firm-specific variables (including mobile skills μ_{it}; non-mobile skills ν_{it}; bargaining strength θ_{it}) and $\mathbf{x}_{kt}$ is a vector of country-specific variables (including variable production costs c_{kt}; market size α_{kt}). I also include time and industry fixed effects in all specifications to account for the effect of unobservables. Due to data limitations of industry-specific variables for different countries, the regressions have no such variables.

Hypotheses 3 and 4 involve more complex, secondary effects of corruption on mode of foreign entry decision which act through mobile and non-mobile skill endowments of the multinational firm. To test the predictions of these two hypotheses I include interaction terms of corruption with mobile and non-mobile skills in expression (23):

$$y_{ikt;s} = \beta_{0;s} + \beta_{1;s}\zeta_{kt} + \beta_{2;s}\zeta_{kt}\nu_{it} + \beta_{2;s}\zeta_{kt}\mu_{it} + \boldsymbol{\beta}'_{3;s}\mathbf{x}_{it} + \boldsymbol{\beta}'_{4;s}\mathbf{x}_{kt} + \varepsilon_{ikt;s} \tag{24}$$

The most appropriate econometric method to use would be the nested logit model since the MNC first figures out the next best alternative to a negotiated agreement and then enters. However, due to lack of choice specific attributes in the data the nested logit model becomes useless. Therefore, the empirical part of the paper adopts to the most general setting where the firm decides if and how to enter. Under the circumstances, the next best econometric model is a multivariate probit because it allows a flexible pattern of conditional covariance among the latent utilities of alternatives.

In this paper, both the bivariate probit and the multivariate probit models are used. The bivariate probit model is useful in providing the marginal effects for each entry strategy. First, I estimate effects of corruption on FDI (M&A and greenfield together) versus no entry, because it would provide a useful comparison to some of the existing literature that does not take different entry modes into account. When the bivariate probit is used for the choice between FDI and no entry, there are two equations (one for FDI and one for no entry) and two binary dependent variables, $y_{ikt;fdi}$ (1 if there is FDI and 0 otherwise) and $y_{ikt;n}$ (1 if there is no entry and 0 otherwise). If the MNC chooses FDI, then $y_{ikt;fdi} = 1$ and $y_{ikt;n} = 0$. If the MNC chooses not to enter the host market, then $y_{ikt;fdi} = 0$ and $y_{ikt;n} = 1$.

Then, bivariate probit estimates of effects of corruption on new entry by Swedish multinationals through cross-border M&As and greenfield investments are estimated. Once more, there are two equations (one for M&As and one for greenfield investments) and two binary dependent variables, $y_{ikt;m}$ (1 if there is an M&A and 0 otherwise) and $y_{ikt;g}$.(1 if there is a greenfield investment and 0 otherwise). If the MNC chooses M&A, then $y_{ikt;m} = 1$ and $y_{ikt;g} = 0$. If the MNC chooses greenfield investment, then $y_{ikt;m} = 0$ and $y_{ikt;g} = 1$.

Lastly, when the multivariate probit is used there are three equations (one for m, one for g and one for n) and three binary variables, $y_{ikt;m}$, (1 if there is m and 0 otherwise) $y_{ikt;g}$ (1 if there is g and 0 otherwise) and $y_{ikt;n}$ (1 if there is n and 0 otherwise). If the MNC chooses m, then ($y_{ikt;m} = 1$, $y_{ikt;g} = 0$, $y_{ikt;n} = 0$), if the MNC chooses g, then ($y_{ikt;m} = 0$, $y_{ikt;g} = 1$, $y_{ikt;n} = 0$) or if the MNC chooses n, then ($y_{ikt;m} = 0$, $y_{ikt;g} = 0$, $y_{ikt;n} = 1$).

Error terms $\varepsilon_{ikt;s}$ are distributed as multivariate normal, each with a mean of zero, and variance-covariance matrix V, where V has values of 1 on the leading diagonal and correlations ρ as off-diagonal elements. The multivariate probit model shows structural similarities to a seemingly unrelated regression model, except that the dependent variables are binary indicators.

The LR test is used to test the independence of residuals to explore the existence of nesting possibilities if any.

4.2 The dependent variable

This section provides detailed information on the dependent variable. The data set used in the paper covers information on the cross-border activities of Swedish MNCs in 42 countries during three distinct time periods: 1987-90, 1991-94 and 1995-98. The country coverage is determined by the availability of the corruption measure and control variables.

The firm-level data used in this paper is the product of a questionnaire sent to Swedish MNCs by the Research Institute of Industrial Economics (RIIE) in Stockholm, Sweden about every fourth year since 1960s. The data include all Swedish MNCs in manufacturing industry and contain detailed information on employment, production, R&D and entry modes of each majority owned foreign manufacturing affiliate. Only the most recent years are used in this paper due to pronounced changes in the survey questions over time. The

degree of multinationality varies significantly in the data. More than half of the firms are single affiliate multinationals. An overwhelming majority of firms have foreign operations in just a few countries. When a new opportunity to serve a host country arises, this chance may come to a multinational active in another market.

The definitions of cross-border M&As and greenfield investments are taken from the RIIE survey. The RIIE asks the following four questions to each foreign affiliate: (1) From what year has the affiliate been a production company of the group? (2) Was the affiliate a sales company of the group before the year mentioned above? (3) Did the affiliate operate as a production company of another group before the year mentioned above? (4) Was the affiliate a state-owned company before the year mentioned above? If the answers to last three questions are all negative, then the investment is classified as a greenfield investment. If the answer to question 3 is affirmative, then the mode of entry is a cross-border M&A. The frequency of new affiliates transformed from sales companies of the group and the state-owned enterprise acquisitions is low.

Table 1: Entry characteristics of Swedish MNEs by regions

	1987-1990		1991-1994		1995-1998		All periods	
	m	g	m	g	m	g	m	g
Western Europe	107	21	63	16	42	7	212	44
Major Non-European OECD	18	5	9	3	10	2	37	10
Eastern Europe and Russia	0	0	8	8	2	5	10	13
South and Central America	3	0	2	1	6	2	11	3
Asia / Africa	0	0	2	3	8	6	10	9

	1987-1990	1991-1994	1995-1998	All periods
Cross-border M&As	128	84	68	280
Greenfield Investments	26	31	22	79
No Entry	4676	5387	3690	13753
Number of Firms	115	131	90	330
Number of Countries	42	42	42	42

Table 1 summarizes the foreign expansion transactions by Swedish MNCs between 1987 and 1998. The numbers of cross-border M&As and greenfield investments as well as the location of these investments in broad regional categories are reported. When examining this table, several remarks can be made. First, as can be observed in the bottom half of Table 1, in each time period foreign entry is small when compared to no entry, which is true for an overwhelming majority of MNCs around the globe. However, among the two entry modes the total number of M&As is substantially higher than that of greenfield investment in all three time periods.

Second, observe the top half of Table 1. An overwhelming majority of investments are in Western Europe followed by major non-European OECD countries. Both M&As and greenfield investments in these two regions are higher than all the other regions together. The common denominator of all these countries is their level of development. FDI goes predominantly to advanced countries where corruption is relatively low, even

though the share of developing countries has been rising. Apart from lower corruption levels, developed countries offer a large and growing demand coupled with ease of finding sub-contractors and distribution channels all of which favor entry.

Third and last, developed countries supply a higher number of high quality acquisition targets. Table 1 shows that Swedish MNCs have considerably higher M&As in Western Europe and major non-European OECD countries. The preferred mode of entry in developing countries is not as clear, however. The share of greenfield investments in all entry modes (calculated by using the last two columns of the top half of Table 1) in developing countries is 45%, whereas it is only 18% in developed countries.

4.3 Measuring corruption

In this paper, I use corruption indices constructed from survey responses. Whether perceptions of corruption as enunciated by survey responses indeed reflect the reality is a commonly discussed issue. This paper is partial to the idea that although perceptions may deviate from reality at the margin, there will not be wide divergences.

There is a plethora of corruption indices made available by different institutions through surveys conducted. In this paper, I use two different corruption indices: One is the so called the Worldwide Governance Indicators (WGI), a long-standing World Bank research project to develop cross-country indicators of governance and the other one is the Corruption Perception Index (CPI) annually published by Transparency International (TI). Both are essentially polls of polls. I rescaled the values between 0 and 100 for comparison purposes, where higher values indicate higher levels of corruption in the host country.

The more widely known of the two is the CPI which collates results of up to twelve individual surveys conducted by the World Bank (World Business Environment Survey), the European Intelligence Unit, the World Economic Forum (Global Competitiveness Report), the Institute of Management Development, Political and Economic Risk Constancy in Hong Kong, etc. Many of the same sources used by the WGI are used by the CPI too, and thus not surprisingly the WGI and the CPI are highly correlated.

The WGI consist of six composite indicators of broad dimensions of governance covering over 200 countries: Voice and Accountability, Political Stability and Absence of Violence/Terrorism, Government Effectiveness, Regulatory Quality, Rule of Law, and Control of Corruption. The advantage of the WGI measure over others is its lesser susceptibility to poll -or question- specific idiosyncrasies due to its breadth of coverage and the variety of sources employed in compiling the index. The main sources for the WGI are polls conducted by various sources such as Standard and Poor's DRI (in conjunction with McGraw-Hill), the Economist Intelligence Unit, Political Risk Services (International Country Risk Guide), and the World Bank (in conjunction with the University of Basel). There are of course subtle differences between the questions asked by these sources. Country coverage is not exactly the same either. However, the survey respondents are divided between two groups: (i) business people and/or residents of a country, and (ii) experts (who are asked to rank countries on various dimensions). A composite index for each

Table 2: The sample of countries, 1987-1998

Country	*CC* 0-100 1998	*CPI* 0-100 1998	No. of firms 1998	No. of m	No. of g
Germany	6.7	21	28	42	11
UK	5.4	13	26	28	4
USA	19.0	25	26	29	6
Denmark	2.8	0	25	29	3
Poland	36.7	54	21	4	10
France	21.9	33	20	16	6
Finland	2.6	4	18	16	7
Netherlands	4.6	10	16	12	0
Spain	22.5	39	15	9	1
Italy	39.6	54	15	20	4
Norway	3.6	10	14	16	3
Belgium	23.6	46	14	8	1
Brazil	50.0	60	12	6	2
Canada	5.2	8	8	4	3
Austria	8.7	25	8	8	3
China	55.0	65	8	3	5
India	55.7	71	7	3	1
Mexico	57.6	67	6	5	1
Australia	14.7	13	4	3	0
Hungary	36.9	50	4	4	1
Russia	68.7	76	4	2	2
Malaysia	38.9	47	4	0	1
Japan	31.4	42	4	1	1
Czech Republic	39.1	52	4	0	0
Greece	28.9	51	1-3	1	0
Portugal	23.3	35	1-3	5	1
Korea	43.3	58	1-3	2	0
South Africa	37.0	48	1-3	1	1
Philippines	52.9	67	1-3	0	0
Ireland	18.4	18	1-3	2	0
Argentina	53.7	70	1-3	0	0
Thailand	50.0	70	1-3	0	0
Turkey	61.7	66	1-3	0	1
Colombia	59.0	78	1-3	0	0
Taiwan	37.3	47	1-3	0	0
Indonesia	71.6	80	1-3	1	0
Slovenia	24.0	48	0	0	0
New Zealand	3.7	6	0	0	0
Chile	22.8	32	0	0	0
Venezuela	69.1	77	0	0	0
Iceland	9.7	7	0	0	0
Israel	24.1	29	0	0	0

dimension of governance is constructed using these individual surveys through an unobserved components model.

In this paper, I use the Control of Corruption, *CC* from the WGI as the main corruption indicator. It captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests. The *CPI* is also used as a robustness check. In the following robustness exercises, I also use other very relevant dimensions of governance, namely Government Effectiveness, *GE* and Rule of Law, *RL*. The former captures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. The latter captures perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.

Table 2 lists all countries included in the sample, the Control of Corruption Index

in 1998, the Corruption Perception Index in 1998, the number of firms producing there in 1998, and the sum of all Swedish M&As and greenfield investments in the sample period. Table 2 does not reveal much about the relationship between corruption and form of FDI. The bottom of table shows many countries with very high corruption levels and low levels of Swedish entry. The top part shows low corruption levels coupled with high degrees of M&As and greenfield investments. However, this may simply reflect that Swedish multinationals mainly invest in developed European countries which also have lower corruption levels.

4.4 Firm characteristics

The model presented in Section 3 is a highly stylized one written to provide a framework for the empirical analysis. The controls used in the regressions hereafter are inspired both from this simple model and the broader FDI literature.

Firm-specific skills. As Markusen (2002) points out, multinationals arise from the use of knowledge capital, a broad term that includes human capital of employees, patents, blueprints and procedures, which are called firm specific skills.

Multinationals can reduce their production costs through extensive use of these skills some of which can be provided to additional plants without reducing their value in existing plants. I use R&D intensity as a proxy for mobile-skills. *Mobile* is the MNC's total R&D expenditures divided by total sales at the end of each time period. High-tech firms are more dependent on their own technology creation and production technology, and as a result are more likely to enter by greenfield FDI. Thus, I expect R&D to affect greenfield investments positively -pointed out by the theory in Section 3 as well.

Some skills, on the other hand, are location specific and cannot travel across borders. I proxy these non-mobile skills by previous experience in the host country. *Non-mobile* is the number of the previous affiliates of the MNC in the host country. *Non-mobile* carries information about the local knowledge of the firm that is specific to the host country, such as distribution networks, connections to local bureaucracy, and knowledge of local business culture. Note that *Non-mobile* may also represent competitive effects or the bargaining strength. If the MNC already has affiliates in the host country, it may not want to hurt itself by increasing the competition through a new venture and thus may incline more towards M&As which eliminate rivals. There is a well-established international business literature drawing attention to the differential impact of this variable on entry modes. Previous experience increases the local knowledge and connections of the MNC and thus may foster greenfield investments over cross-border M&As. On the other hand, it may also promote M&As because experienced MNCs are able to monitor their partners more effectively. Therefore, the expected sign is positive for both entry strategies yet the strength of this effect on each entry mode is ambiguous.

Bargaining strength. Market share of the firm is the most widely used bargaining power measure in the empirical industrial organization literature. There is a lack of data with broad industry and country coverage for the market share of a multinational in industry j in country k in time t. The next best alternative is using the market concentration in

industry j in country k in time t. OECD STAN database offers concentration measures for a limited number of countries and sectors from 1980 to 2000. I used these in my early regressions without much success due to many missing observations and small sample sizes.

Starting back with Anderson and Gatignon (1986), in the international business and management strategy literatures, international experience has been cited as an indicator of low levels of internal uncertainty and greater confidence in business dealings and thus stronger bargaining positions around the negotiation table. Therefore, in this paper, I assume that multinationals with more international experience are stronger bargainers. *Affworld* is the number of the previous affiliates of the MNC all around the world and represents a broad international experience that fosters FDI by MNCs (Caves, 2007). The expected sign for this variable for both entry modes is positive. However, I expect a stronger positive for cross-border M&As since international experience is anticipated to boost the bargaining strength and thus the probability of M&As. I also use firm size measured by total employment or sales of the firm as an indicator of the bargaining strength (results not reported in the paper due to brevity but available upon request), since larger firms with deep pockets are considered to be more experienced and stronger bargainers (See Caves, 2007).

4.5 Country characteristics

Market size (measured by *GDP*), infrastructure (measured by telephone mainlines per one million people, *Tel*), skill level of the labor force in the host country (measured by the share of university graduates in the population, *Skill*), trade openness of the host country (share of trade volume in GDP, *Open*) and distance (measured by using the great circle formula that calculates the minimum distance along the surface of the earth between Sweden and the host country, *Distance*) are widely used determinants of entry and are expected to favor both kinds of entry (Brainard (1997), Carr, Markusen and Maskus (2001)).

GDP per capita is used to account for the availability of acquisition targets in the host country because it is a broad measure of general level of development. Even though it is easier to find sub-contractors and distribution channels in developed countries, which in fact favors entry, another important issue is that a developed country supplies a bigger number of more high quality acquisition targets. It is harder to find suitable acquisition targets in less developed countries. Therefore, acquisitions are expected to be more favorable in countries with high *GDP/capita*.

Direct costs of entry into the host country are not available in the RIIE data set. I use the official time it takes to start-up a new firm in the host country as presented in Djankov et al. (2002), *Time*, as proxy for fixed entry costs.

The country-level data are collected from the International Financial Statistics of IMF and the World Development Indicators Database of the World Bank. More information about variables as well as summary statistics and a correlations table are provided in the Appendix.

Table 3: FDI versus No Entry

	Bivariate Probit			
	Estimates		*Marginal effects*	
Entry mode	fdi	n	fdi	n
Corruption	-1.08**	1.94***	-0.096**	0.386***
	(0.543)	(0.367)	(0.043)	(0.132)
Mobile	0.165*	-9.259***	0.015**	-0.684***
	(0.982)	(1.128)	(0.006)	(0.302)
Non-mobile	0.095**	0.036	0.012**	0.022
	(0.042)	(0.056)	(0.059)	(0.019)
Affworld	0.022***	0.004	0.002***	0.003
	(0.0002)	(0.037)	(0.0001)	(0.025)
Time	-0.763*	0.523	0.021*	0.018
	(0.455)	(0.654)	(0.013)	(0.027)
GDP	0.075***	-0.067***	0.006***	-0.022***
	(0.036)	(0.016)	(0.002)	(0.008)
GDP/capita	0.004	0.045***	0.0003	0.016***
	(0.008)	(0.005)	(0.0005)	(0.003)
Open	-0.073	-0.154*	-0.006	-0.010*
	(0.151)	(0.086)	(0.013)	(0.061)
Tel	0.875**	0.934	0.056**	0.414
	(0.452)	(0.754)	(0.029)	(0.327)
Distance	-0.125**	0.168**	-0.134**	0.023**
	(0.059)	(0.081)	(0.061)	(0.009)
Skill	0.156***	-0.196***	0.015***	-0.073***
	(0.038)	(0.031)	(0.026)	(0.007)
Observations	13,258			
Wald χ^2	1354			
ρ	-0.854			
LR test of	548.5			
indep. of eq.	(0.000)			

Notes: Standard errors are in parentheses; ***, **, * denote significance at the 1, 5, and 10 percent level, respectively; all regressions include a constant, time, and industry fixed effects.

5 Results

5.1 FDI decision alone

Other than a few exceptions an overwhelming majority of the existing work on the effects of corruption on foreign direct investment makes no distinction between the modes of foreign entry. Therefore, in this subsection I begin with the bivariate probit estimates of the effects of corruption on both types of FDI by the Swedish multinational corporations to put the results in perspective with the existing literature. Another advantage of using the bivariate probit model because it comes with the benefit of being able to calculate the marginal effects for each entry strategy.[6]

The first two columns in Table 3 present the coefficient estimates while the last two

[6] The computationally cumbersome multivariate probit model module written by Capellari and Jenkins (2003) in STATA does not involve marginal effects computations. Capellari and Jenkins (2003) present a comparison of bivariate probit (maximum likelihood estimation) to their multivariate probit (simulated maximum likelihood estimation) analysis and come to a conclusion that as long as the number of random draws and the sample size are large enough the two methods yield very similar predictions. Since these two conditions are satisfied in the estimations in this paper, I use bivariate probit estimation to give a flavor of the economic size of the estimates.

columns report the marginal effects of explanatory variables on the success probability of each strategy. All regressions include a constant, time, and industry fixed effects. Wald χ^2 is 1354 indicating a good fit. Correlation coefficient ρ is significant revealing that fdi and n are not independent from each other as strategies.

Corruption proxied by the Control of Corruption measure from the WGI database is significantly negative in equation fdi (column 1) and positive and significant in equation n (column 2), revealing that higher levels of corruption in a host country discourage FDI by Swedish multinationals. This is in line with Hakkala et al. (2008) and Javorcik and Wei (2009) as well as the previous literature where researchers generally have found a significant negative effect of corruption on multinational entry without differentiating between different entry modes using aggregate data.

Turning to economic size of the estimated parameters, calculations of marginal effects show that a small increase in *Corruption* reduce the probability of FDI by 9.6%. Although this is not large in absolute magnitude, compared to the probability evaluated at the sample mean of 2.7% (the success probability of FDI in the sample), this is nevertheless economically meaningful.

Mobile skills of the multinational increase the likelihood of fdi with a small marginal effect but reduces the odds for n with a marginal effect of -68.4%. Experience in the host country (*Non-mobile*) measured as the number of previous affiliates in the host country have no effect on probability of no entry however, it increases the likelihood of FDI. The marginal effects are rather small.

International experience (*Affworld*), infrastructure (*Tel*), market size (*GDP*) and labor skill in the host country (*Skill*) increase the likelihood of FDI as expected while FDI declines in distance (*Distance*). Trade openness of the host country *(Open*) and time that its takes to start a new business (*Time*) are not significant.

5.2 M&As versus greenfield investments

Before the joint estimation of M&As, greenfield investments and no entry, I turn to the bivariate probit estimates of effects of corruption on new entry by Swedish multinationals. The first two columns in Table 4 present the coefficient estimates whereas the last two columns include the marginal effects of explanatory variables on the success probability of M&As and greenfield investments. All regressions include a constant, time, and industry fixed effects. Wald χ^2 is 452 indicating a good fit. Correlation coefficient ρ is significant revealing that A and G are not independent from each other as strategies.

Corruption is positive and significant at 10% in equation m (column 1) and negative and highly significant in equation g (column 2), revealing that higher levels of corruption in the host country may grease the squeaky wheels in case of M&As while discouraging greenfield investments conducted by Swedish multinationals. This significant and positive corruption effect on M&As is a new result.

None of the recent studies concentrates on M&As at the firm level, however, among recent studies focusing on joint ventures Javorcik and Wei (2009) find in highly corrupt

Table 4: MAs versus Greenfield Investments

	Bivariate Probit			
	Estimates		*Marginal effects*	
Entry mode	m	g	m	g
Corruption	1.43*	-2.14***	0.095*	-0.164***
	(0.816)	(0.719)	(0.054)	(0.047)
Mobile	-1.65	5.96***	-0.125	0.103***
	(1.56)	(1.56)	(0.093)	(0.028)
Non-mobile	0.106**	-0.128	0.005**	-0.002
	(0.042)	(0.099)	(0.002)	(0.002)
Affworld	0.015***	0.022***	0.001***	0.0003***
	(0.003)	(0.004)	(0.0001)	(0.00007)
Time	-0.254	-0.434	-0.011	0.008
	(0.389)	(0.527)	(0.017)	(0.021)
GDP	0.064***	0.039*	0.003***	0.0005
	(0.024)	(0.021)	(0.001)	(0.0004)
GDP/capita	0.018**	0.007	0.005**	0.0002
	(0.009)	(0.018)	(0.002)	(0.0003)
Open	-0.157	0.427*	-0.006	0.008*
	0.196	(0.258)	(0.007)	(0.005)
Tel	1.22*	0.035	0.057*	-0.0005
	(0.745)	(1.08)	(0.028)	(0.004)
Distance	-0.096*	-0.178**	-0.084*	-0.031**
	(0.057)	(0.075)	(0.051)	(0.015)
Skill	0.211***	0.184	0.020***	0.012
	(0.057)	(0.111)	(0.006)	(0.009)
Observations	13,258			
Wald χ^2	452			
ρ	-0.563			
LR test of	8.53			
indep. of eq.	(0.01)			

Notes: Standard errors are in parentheses; ***, **, * denote significance at the 1, 5, and 10 percent level, respectively; all regressions include a constant, time, and industry fixed effects.

environments conditional on entry joint ventures will be the chosen mode of entry rather than a wholly owned subsidiary. The initial result here is consistent with their finding.

Calculating the marginal effects shows that an infinitesimal increase in *Corruption* increases the probability of an M&A by 9.5%. Again, although this seems small in absolute magnitude, compared to the probability evaluated at the sample mean of 2% (the success probability of M&As in the sample), this is economically meaningful. The same marginal effect for a greenfield investment is 16.4%. In other words, a small increase in corruption reduces the likelihood of a greenfield project by about 16%.

Firm-specific assets measured by *Mobile* and *Non-mobile*. The results indicate that while *Mobile* increases the odds in favor of g with a marginal effect of 10.3%, *Non-mobile* increases the likelihood of m with a marginal effect of only 0.5%,

Turning to other coefficient estimates in the first two columns of Table 4, international experience (*Affworld*) and market size (*GDP*) increase the likelihood of both kinds of entry. The host country GDP per capita and the skill level, respectively proxied by *GDP/capita* and *Skill* increase the odds in favor of M&As only. All of these have relatively small marginal effects on the mode of entry. Trade openness of the host country *(Open*),

host country infrastructure (*Tel*) and time that its takes to start a new business (*Time*) are mostly insignificant for both types of entry.

5.3 Joint estimation of M&As, greenfield investments and no entry

Table 5 presents the results of the multivariate probit estimates of effects of corruption on the probability of conducting m, g or n. The first three columns report the baseline specification without the interaction terms as in Equation (23), whereas the last three columns present results with the interaction terms as in Equation (24). Wald χ^2 for the first specification is 1051 and for the second is 1167 indicating a good fit.

Also notice that the correlation coefficient between m and g (ρ_{mg}) is almost insignificant, whereas that between m and n (ρ_{mn}) and g and n (ρ_{gn}), are both significantly different from zero. This suggests a nested structure where foreign entry decision is made first and then the mode of entry is chosen. However, due to the lack of choice specific attributes in the data set, the use of a nested logit models is not possible.

In Table 5, in line with Hypotheses 1 and 2, the variable of interest, *Corruption*, increases the likelihood of cross-border M&As and reduces the odds of greenfield investments. The probability of no entry also goes up in *Corruption*, which suggests that cross-border M&As and no entry have a complementary response to changes in corruption. The results in Table 5 are broadly consistent with the results in Tables 3 and 4.

Most of the other covariates exhibit their expected signs, though some are insignificant. Throughout almost all equations *Affworld* have significant positive signs for both cross-border M&As and greenfield investments, pointing out that Swedish MNCs with a wider network and more international experience have a higher chance of entering new markets to serve those markets. In short, broad international experience matters.

Swedish MNCs with high *Mobile* skills favor greenfield investments. On the other hand, *Non-mobile* always favors cross-border M&As and reduces to odds against greenfield investments, which suggests that Swedish MNCs endowed with stronger connections to local bureaucracy or knowledge of local business culture prefer cross-border M&As to greenfield FDI. This may also be interpreted as Swedish MNCs with more bargaining power derived from their previous experience in the host market acquire local firms rather than establishing wholly owned subsidiaries.

In the baseline specification, the effect of corruption on greenfield investments is significant and negative as expected by the FDI literature. The same variable has quite a different effect on cross-border M&As; it is significant only at 10% nonetheless positive. On the one hand, it is highly preferable to overtake a local firm with all its knowledge about the host country conditions particularly in countries with high levels of corruption. On the other hand, if the MNC is endowed with high levels of mobile skills such as technological sophistication then a local partner may open the door for leakage of these valuable mobile skills when corruption is high. This necessitates the introduction of interaction terms of *Corruption* with *Mobile* and *Non-mobile* skills in the regressions.

In the last three columns of Table 5, I examine whether effects of corruption vary across the skills set of the MNC to test Hypotheses 3 and 4 of the theory. To this effect I add

Table 5: No Entry versus MAs versus Greenfield Investments

	Multivariate Probit					
	Baseline			*Interactions*		
Entry mode	m	g	n	m	g	n
Corruption	1.38*	-2.26***	1.94***	1.12*	-2.12***	1.82***
	(0.804)	(0.711)	(0.354)	(0.652)	(0.702)	(0.394)
Corruption x *Mobile*				-0.821**	-1.85***	0.564
				(0.392)	(0.254)	(0.483)
Corruption x Non-mobile				1.36***	0.962*	-0.129
				(0.254)	(0.562)	(0.268)
Mobile	-1.03	4.66***	9.42***	-1.07*	4.39***	9.24***
	(1.43)	(2.06)	(1.27)	(0.650)	(1.03)	(1.25)
Non-mobile	0.097**	-0.194**	0.029	0.168***	-0.130*	-0.028
	(0.043)	(0.092)	(0.027)	(0.042)	(0.071)	(0.087)
Affworld	0.017***	0.022***	-0.004	0.126***	0.025***	-0.004
	(0.003)	(0.004)	(0.003)	(0.024)	(0.008)	(0.003)
Time	-0.215	-1.32*	0.532	-0.218	-1.27*	0.596
	(0.365)	(0.742)	(0.682)	(0.305)	(0.709)	(0.736)
GDP	0.063***	0.029*	-0.067***	0.062***	0.032*	-0.066***
	(0.024)	(0.016)	(0.016)	(0.021)	(0.017)	(0.012)
GDP/capita	0.017**	0.007	0.040***	0.018**	0.007	0.048***
	(0.008)	(0.018)	(0.008)	(0.008)	(0.018)	(0.008)
Open	-0.147	0.458	-0.144*	-0.095	0.362	-0.109*
	0.245	(0.395)	(0.086)	0.129	(0.347)	(0.059)
Tel	1.27*	0.042	0.987	0.925*	0.028	0.832
	(0.735)	(0.095)	(0.765)	(0.534)	(0.084)	(0.782)
Distance	-0.085*	-0.172**	0.188**	-0.087*	-0.170**	0.176*
	(0.059)	(0.071)	(0.081)	(0.052)	(0.075)	(0.098)
Skill	0.225***	0.144	-0.173***	0.212***	0.104	-0.164***
	(0.043)	(0.165)	(0.047)	(0.037)	(0.171)	(0.059)
Time effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations		13,258			13,258	
Wald χ^2		1051			1167	
Correlation.						
ρ_{mg}		0.125			0.143*	
		(0.089)			(0.086)	
ρ_{mn}		-0.945***			-0.866***	
		(0.068)			(0.058)	
ρ_{gn}		-0.397***			-0.399***	
		(0.062)			(0.041)	
LR test of		347			362	
indep. of eq.		(0.000)			(0.000)	

Notes: Standard errors are in parentheses; ***, **, * denote significance at the 1, 5, and 10 percent level,respectively; all regressions include a constant, time and industry fixed effects.

the interaction of corruption variable with mobile and non-mobile skills to the previous specification. As expected in Hypotheses 3 and 4, the negative impact of corruption on greenfield investments gets stronger with higher levels of mobile skills and weaker with higher levels of non-mobile skills. In other words, a multinational with sophisticated technology or novel marketing ideas is affected much more severely by corruption than a less sophisticated one. If this same multinational has rich knowledge of local conditions through its previous affiliates in the host country then the adverse effects of corruption shrink for this firm.

In case of M&As the direct and weak positive impact of corruption gets lower if high levels of mobile skills are involved. This may be due to leakage of technology when the multinational acquires or merges with a local firm. However, the favorable impact of corruption on M&As gets even stronger if the multinational is already endowed with a good knowledge of local conditions. In other words, in corrupt environments, a multinational with high non-mobile skills chooses to enter the host country through an M&A because

that way it can employ its own knowledge of that market -if any and internalize the local knowledge of the acquired local firm as well.

One important remark here is that it is obvious that corruption has direct effects on a firm's mode of foreign entry, however, these effects gain more depth and meaning when the indirect or secondary effects of corruption realized through mobile and non-mobile skills of the firm are brought into the picture.

5.4 Robustness

Table 6 reports the specification with interactions using different measures of corruption. For brevity only the corruption terms are reported. Estimated values of the other variables are broadly consistent with Table 5.

The first three columns report the multivariate probit results with widely used CPI of Transparency International. The next three columns present the results with Government Effectiveness measure from WGI and the last three columns show the regressions with Rule of Law measure again from WGI. Results are very similar to the ones in Table 5. If anything, estimates with Government Effectiveness and Rule of Law exhibit stronger secondary effects.

Next, I turn my attention to OECD countries as Swedish MNCs mainly invest in developed countries which also have lower corruption levels than average country. Swedish MNCs invest in nearby developed countries because they have lots of potential M&A targets, and these countries just happen to have low levels of corruption cross-sectionally. Even though there are country-level regressors to control for level of development of a country in previous estimations, a more compelling experiment is to restrict the sample to these developed countries only to avoid potentially spurious results. The first three columns of Table 7 report these results. *Corruption* is again proxied by Control of Corruption measure from WGI. Notice that even though the signs remain the same there is a marked decline in the significance of the estimated corruption parameters for the sub-sample of OECD countries.

When I restrict the sample to non-OECD countries (columns 4-6 of Table 7), strong direct effects of corruption are observed for all entry strategies while secondary effects realized through mobile and non-mobile skills remain important. One very notable change in this set of regressions is the flip in the sign of *Corruption* in the m equation (Column 4) which suggests that higher levels of corruption reduce the likelihood of M&As in non-OECD countries. In other words, as corruption levels pass a certain threshold the multinational's likelihood of both kinds of entry declines. This result is in line with Javorcik and Wei (2009).

Table 6: Robustness, Different Corruption Measures

	Multivariate Probit								
	CPI			*Government Effectiveness*			*Rule of Law*		
Entry mode	m	g	n	m	g	n	m	g	n
Corruption	1.09	-1.95**	1.93***	1.15**	-2.18***	1.85***	1.14*	-2.15***	1.87***
	(0.958)	(0.965)	(0.617)	(0.543)	(0.695)	(0.394)	(0.652)	(0.702)	(0.389)
Corruption x *Mobile*	-0.618*	-1.53***	0.329*	-0.913**	-1.96***	0.954	-0.902**	-1.91***	0.966
	(0.322)	(0.376)	(0.189)	(0.426)	(0.261)	(0.723)	(0.409)	(0.243)	(0.703)
Corruption x Non-mobile	1.42**	0.818*	-0.119	1.52***	1.02**	-0.452	1.45***	1.12**	-0.466
	(0.263)	(0.429)	(0.154)	(0.396)	(0.452)	(0.485)	(0.315)	(0.521)	(0.471)
Time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations		12,719			13,258			13,258	
Wald χ^2		928			1167				

Notes: Standard errors are in parentheses; ***, **, * denote significance at the 1, 5, and 10 percent level, respectively; all regressions include a constant, time, and industry fixed effects.

Table 7: Robustness, Different Subsamples

	Multivariate Probit								
	OECD Countries			Non-OECD *Countries*			*Large Firms*		
Entry mode	m	g	n	m	g	n	m	g	n
Corruption	0.805	-1.73*	1.56*	-0.265**	-3.34***	2.59***	0.525	-1.41*	1.85***
	(0.725)	(0.989)	(0.932)	(0.124)	(0.952)	(0.527)	(0.402)	(0.814)	(0.364)
Corruption x *Mobile*	-0.615*	-1.32*	0.369	-0.765***	-1.73***	1.47*	-1.01**	-2.16***	0.349
	(0.363)	(0.782)	(0.443)	(0.122)	(0.302)	(0.793)	(0.452)	(0.428)	(0.389)
Corruption x Non-mobile	1.62*	0.815*	-0.113	1.06*	0.824**	-0.365	1.67***	1.14***	-0.103
	(0.867)	(0.472)	(0.191)	(0.618)	(0.399)	(0.298)	(0.342)	(0.264)	(0.218)
Time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations		7824			5434			1689	
Wald χ^2		801			648			216	

Notes: Standard errors are in parentheses; ***, **, * denote significance at the 1, 5, and 10 percent level, respectively; all regressions include a constant, time, and industry fixed effects.

The very final exercise is restricting the sample to large firms only, although this limits a lot of the time series variation in the sample. For the purposes of this exercise a large firm is defined as a firm with 10 or more affiliates around the globe.[7] The results are reported in the last three columns of Table 7. The direct effects of corruption are smaller both in size and significance. Secondary effects are still strong. Multi-affiliate MNCs have better and wider distribution networks around the globe and most importantly more international experience. Therefore, the M&As and greenfield investments conducted by these firms might be less prone to changes in corruption. In short, endowment of mobile and non-mobile skills as well as the degree of multinationality matter for how profound the effect of corruption will be on the mode of entry.

6 Conclusion

In the last decade, corruption has become an eminent item on the agenda of the international institutions. The UN Convention against Corruption, adopted in Mexico in December 2003 is the first global instrument embracing a comprehensive range of anti-corruption measures to be taken at the national level. According to the OECD Convention of Combating Bribery of Foreign Public Officials in International Business Transactions, which was signed in 1997, and went into effect in 1999, bribery of foreign officials by firms from member countries is a crime. The 15th International Anti-Corruption Conference (IACC) was completed in November 2012 with record participation from 140 countries and the main message of the conference was ending impunity.

In this paper, I attempt to disentangle the effects of corruption on entry mode decision by carrying out an empirical analysis with rich, firm-level data on the activities of Swedish MNCs around the globe in manufacturing sectors from 1987 to 1998. A number of hypotheses emerge from a simple theoretical framework. As corruption increases multinational entry gets discouraged. Corruption reduces the likelihood of greenfield investments while increasing the odds in favor of cross-border M&As. Multinational firms with rich mobile and non-mobile skills would prefer greenfield investments in corrupt environments. MNCs with low levels of mobile and non-mobile skills would prefer no entry. Multinationals with high levels of mobile, but low levels of non-mobile skills would prefer M&As if the bargaining strength is high. Otherwise, the greenfield investments or no entry will be chosen.

The panorama of the results presented in the previous section shows the following: (i) Corruption has a direct negative impact on greenfield investments and a weak positive impact on M&As. (ii). There are complex, asymmetric, secondary effects of corruption on the mode of entry. (iii). International experience dampens the effect of corruption on the mode of entry. (iv) The results are robust to differences in measures of corruption.

[7] Other thresholds (2 or more and 5 or more) are used in the estimations and the results are qualitatively similar.

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Appendix

Aggregate profit to firms p and h from sales in the host country for entry mode s and quantity choice $x_i(s)$ can be expressed respectively as follows:

$$\Pi_p(s, x_p(s)) = [(\alpha - \beta X(s) - c_p(s))x_p(s)] - F(s) - F^b(s) \tag{A.1}$$

$$\Pi_h(s, x_h(s)) = [(\alpha - \beta X(s) - c_h(s))x_h(s)] \tag{A.2}$$

where $X(s) = x_p(s) + x_h(s)$. When $s = m$, $x_h(s) = 0$ and when $s = n$, $x_p(s) = 0$. Maximizing (A.1) and (A.2) with respect to $x_p(s)$ and $x_h(s)$ in that order and solving for $x_p(s)$ and $x_h(s)$ in the first order conditions gives the equilibrium profit levels for each firm as

$$\Pi_p(s, x_p(s)) = \beta[x_p(s)]^2 - F(s) - F^b(s) \tag{A.3}$$

$$\Pi_h(s, x_h(s)) = \beta[x_h(s)]^2 \tag{A.4}$$

where

$$x_p(s) = \frac{\alpha - 2c_p(s) + c_h(s)}{3\beta} \tag{A.5a}$$

$$x_p(s) = \frac{\alpha - 2c_h(s) + c_p(s)}{3\beta} \qquad \text{if 2 firms are active} \tag{A.5.b}$$

or

$$x_i(s) = \frac{\alpha - 2c_i(s)}{2\beta} \qquad \text{if only 1 firm is active} \tag{A.6}$$

where $i = (p, h\}$.

Table A1: Summary statistics

	Units	Mean	Standard Deviation	Minimum	Maximum
CC	number	36.5	21.4	1.72	82
CPI	number	44.4	25.3	0	89
GE	number	36.1	18.9	2.05	77
RL	number	35.7	19.3	5.09	80
Mobile	number	0.021	0.034	0	0.262
Non-mobile	number	0.118	0.646	0	14
Affworld	number	6.14	15.2	1	125
Time	days	32.26	28.50	2	128
GDP	in trillions of USD	0.741	1.44	0.008	8.79
GDP/capita	in thousands of USD	16.3	11.1	0.426	39.0
Open	number	0.611	0.383	0.110	2.93
Tel	per one million people	0.378	0.189	0.022	0.684
Distance	in thousands of kms	4.66	4.42	0.4	17.0
Skill	percentage	2.91	1.25	0.437	6.33

Table A2: Correlation table

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
(1) *m*	1.000																
(2) *g*	-0.011	1.000															
(3) *n*	-0.829	-0.549	1.000														
(4) *CC*	0.064	0.025	-0.068	1.000													
(5) *CPI*	0.058	0.023	-0.061	0.966	1.000												
(6) *GE*	0.063	0.029	-0.069	0.959	0.921	1.000											
(7) *RL*	0.065	0.023	-0.067	0.968	0.941	0.958	1.000										
(8) *Mobile*	-0.013	0.039	-0.011	0.001	0.000	0.001	0.000	1.000									
(9) *Non-mobile*	0.208	0.071	-0.213	0.096	0.088	0.100	0.096	0.029	1.000								
(10) *Affworld*	0.120	0.119	-0.167	0.003	0.000	0.003	0.000	0.120	0.235	1.000							
(11) *Time*	0.009	0.024	-0.021	-0.405	-0.447	-0.392	-0.403	0.000	-0.015	0.000	1.000						
(12) *GDP*	0.095	0.043	-0.103	0.065	0.011	0.088	0.073	0.000	0.111	0.001	0.001	1.000					
(13) *GDP/capita*	0.079	0.021	-0.078	0.888	0.850	0.889	0.909	0.001	0.116	0.003	0.002	0.229	1.000				
(14) *Open*	-0.034	-0.014	0.036	0.277	0.296	0.313	0.302	0.000	-0.036	0.002	0.001	-0.280	0.272	1.000			
(15) *Tel*	0.073	0.021	-0.073	0.893	0.854	0.881	0.900	0.001	0.105	0.005	0.004	0.144	0.956	0.206	1.000		
(16) *Distance*	-0.079	-0.049	0.093	-0.360	-0.299	-0.346	-0.363	-0.000	-0.067	-0.000	-0.000	0.029	-0.354	-0.058	-0.446	1.000	
(17) *Skill*	0.062	0.036	-0.072	0.774	0.792	0.778	0.799	0.000	0.083	0.002	0.002	0.184	0.797	0.172	0.789	-0.169	1.000