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Abstract

Multinational enterprises frequently start, acquire, close and divest affiliates. There is a large literature on restructuring, which focuses on start-ups and acquisitions. The empirical literature on plant survival usually provides evidence from a single country. In contrast, this paper uses detailed survey data of Swedish multinationals to examine the characteristics that result in plant divestiture at the affiliate, firm, industry, country and regional level. We provide propositions drawn on a straightforward model from Berg et al (2012) in which the primary motive to divest an affiliate is to finance other investments in the network of the MNC. In line with conclusions from our model, we find that larger affiliates are more likely to be divested and these affiliates are small relative to the other operations of the firm in the same country or region. We also find that divestiture begets divestiture, but acquisition does not, thus casting doubt on the notion of footloose multinationals. Several firm, industry and country characteristics also matter.

Keywords: Foreign Direct Investment, Multinationals, Divestiture.

JEL Classification: F21, F23.

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1 Introduction

Traditional theories of foreign direct investment (FDI) shed light on trade and FDI flows, but they do not adequately address the fundamental issue of internalization which includes not only entry and exit but also the organizational form of a multinational corporation (MNC) across borders. In recent years, the literature has started filling this void and has brought in tools from the theory of the firm to study the boundaries of multinational firms.[1] Concurrently, as once unavailable, rich, plant/firm level survey data became available, we have seen a tremendous extension of micro data work exploring the behavior of multiplant firms in the US, Canada, Japan, Sweden, Portugal, Turkey, Indonesia and many others. Yet, there remains a gap in the existing empirical literature about the organization of multinational firms across boundaries, in particular about the decisions of multinationals to divest affiliates.

The dominance of MNCs in international trade and their presence in labor markets require a careful analysis of divestiture from different markets all around the world. There are at least two reasons to study plant sales of multinational corporations: (i) To understand why and how a multinational restructures its operations globally (Even though divestiture is a big part of restructuring, the literature heavily emphasizes acquisitions), (ii) To understand the impact of multinational restructuring on host economies. When foreign affiliates exit a country due to a shift of investment to another, the major policy challenge for that country is to maintain its relative attractiveness for FDI. This is especially important for investment that does not involve high sunk costs, and is thus more footloose in nature.

This paper studies the decision of a multinational firm to divest a foreign plant. This decision must be seen in the context of the firm's complex location strategies that involve all possible locations. Multinational affiliate divestiture is the result of a plethora of factors, some external and some internal to the firm. Some plant sales are a product of relocation of activities to low-cost production sites in order to cut costs in increasingly competitive world markets. Some are spurred by changes in the economic environment, which can affect specific industries. For example, in industries associated with the product life-cycle, plant divestitures may occur as a result of massive concurrent exits when the activity reaches maturity. Other sales are motivated by strategic considerations such as a decision to focus on core business and divest from non-core activities. Plant sales also take place when multinationals merge: some operations are eliminated to avoid duplication and to achieve the cost savings that often drive mergers in the first place.

A primary motive in the theoretical part of this paper to divest an affiliate is to finance other investments in the MNC's network. We adapt the model of Berg, Norbäck and Persson (2012), who analyze mergers and acquisitions with financial constraints, to a setting whith a given buyer and seller**.** The main assumption in their model is that financial constraints affect firms' cost of capital which, in turn, affects their ability to conduct investment after an ownership transfer. We examine an MNC with two affiliates which differ in quality. Each affiliate/firm produces a

[1] See Antràs (2003), Antràs and Helpman (2004), Grossman and Helpman (2004) and Grossman, Helpman and Szeidl (2006).

good under monopoly. At the outset, the MNC wishes to invest in order to increase its productive efficiency. Since financing costs increase in external borrowing, the MNC cannot finance investment to improve both affiliates. It can, however, reduce its costs for external financing by selling one of its affiliates, since this increases its cash holdings. At lower borrowing costs, the MNC will be able to invest and restructure the remaining affiliate. There is also another (foreign) firm which can potentially acquire one of the affiliates. Which affiliate is sold off and under what price is then determined through Nash-bargaining between the firms.

This simple model generates two distinct results: (i) The MNC can only sell an affiliate if the affiliate has sufficiently high quality assets. (ii) Given that both affiliates have assets of sufficient quality, the firms will agree to a deal where the MNC sells the affiliate which has the lowest quality assets among its other affiliates. If we assume that the quality of affiliate assets is correlated with the size of an affiliate, the first result implies that an MNC will only be able to sell an affiliate with sufficient size; but among the affiliates that have sufficient size, it will sell the smallest.

We then take these predictions to the data using confidential Swedish MNC data. The survey data of Swedish multinationals is uniquely suited to shedding more light on divestitures because it provides information along several important dimensions at the plant, the firm and the country level. In the 2003 survey, firms were specifically asked about plant divestitures and closures during the previous five years, as well as about start-ups and acquisitions. Moreover, they are asked to provide a complete list of affiliate operations worldwide, including Sweden. This enables us to investigate the decision to divest an affiliate in the context of the entire network of operations of the firm.

We do indeed find that larger affiliates as measured by employment are more likely to be divested. As expected, we do also find that when an affiliate increases in size relative to the size of other affiliates of the firm in the same country or region, the likelihood of being divested decreases. In addition, when adding variables which capture the global network of the firm, we find that the existence of more and geographically close affiliates increases the likelihood of divestiture. Finally, plant sales elsewhere increase the probability of divestiture, but acquisitions elsewhere, regardless of whether at the country, regional or global level, do not. This result counters the "footloose" multinationals argument.

The remainder of the paper is organized as follows: The next section discusses the recent literature on affiliate exit which lacks an analysis of divestitures. Section 3 describes the theoretical model. Section 4 lays out the empirical analysis and gives detailed descriptions of affiliate, firm, industry and country level variables used in the estimations. Section 5 reports the empirical results which are followed by conclusions.

2 Previous literature

The determinants of entry and exit dynamics of firms have been a lively area of theoretical and empirical research. The seminal theoretical analyses such as Nelson and Winter (1982), Jovanovic (1982), Hopenhayn (1992), and Ericson and Pakes (1995) have helped shape the recent empirical

work which was made possible by the availability of panel data on firms/plants in the last couple of decades. A great deal of stylized facts emerged from these empirical papers on the role of heterogeneous firms, international trade, foreign ownership, product markets, firm structure, geography and agglomeration in the survival and exit of plants.[2]

Firstly, Dunne, Roberts and Samuelson (1989) and Dunne, Klimek and Roberts (2005) emphasize the role of plant size as one of the determinants of plant exit. The selection models of Jovanovic (1982) or Pakes and Ericson (1998) suggest that newly born plants go through a process of learning including but not limited to acquiring capital, training the workforce, and establishing distribution networks. Small plants may not have easy access to labor, capital or resource markets, which in turn may increase their operating costs and force them to exit earlier than a larger firm. Therefore, as plants get older and bigger they are more likely to remain. There is an abundance of work confirming these findings.[3]

Secondly, producing multiple products plays an important role in determining plant survival. Multiproduct plants are larger and more productive than single-product firms. For example, Dunne et al. (1989) find that while 59% of firms produce a single product, multiproduct firms account for 91% of output in a sector. Moreover, there are sunk costs associated with producing multiple products which reduces the incumbent competition and thus the probability of plant exit. Bernard and Jensen (2007) find supporting evidence for this argument.

Thirdly, survival probability of a recently acquired plant is ambiguous. The acquisition can be a bad match or it may have been intended to allow the firm to reduce the capacity in the industry (horizontal acquisition). If the plant is acquired to strengthen the already existing plants of the parent through forward or backward linkages (vertical acquisition) then the odds of survival increase. Bernard and Jensen (2007) find that recently acquired plants are more likely to be closed.

Lastly, plant level productivity is an important determinant of plant exit. The recent heterogeneous firm models in international trade (Melitz, 2003 and Bernard, Eaton, Jensen and Kortum 2003) and their antecedents (Jovanovic, 1982; Ericson and Pakes, 1995 and Olley and Pakes 1996) all predict that low productivity plants are more likely to exit the industry.

In light of this earlier literature our paper's contributions are twofold: (i). While earlier work almost uniformly emphasizes plant exit, our data demonstrate the overwhelming importance of plant sales, in other words, divestitures, rather than complete shut-downs. Therefore, in this paper, we are able to investigate multinational divestiture dynamics. (ii). Different from the existing empirical work we are able to explore the global restructuring of multinational firms. Earlier work explores the exit of multiplant or multinational firms in one country. Granted, multiplant and multinational firms have many common traits, but they are not the same. Many multinational firms have operations in numerous countries, but also frequently start up or acquire new affiliates

[2]Interested readers can refer to the comprehensive surveys of this literature that date back to Audretsch and Siegfried (1992), Siegfried and Evans (1994), and Caves (2007).

[3]Bernard and Jensen (2007), Taymaz and Özler (2007) [Turkey], Alvarez and Görg (2009) [Chile], Greenaway, Gullstrand and Kneller (2008) [Sweden], Inui, Kneller, Matsuura and McGowand (2009) [Japan] and Baldwin and Yan (2010) [Canada] are the most recent examples. Some of these studies rely on qualitative choice models such as probit and multinomial logit while others use duration models.

as well as close or divest existing ones. Unlike many national firms that exit the market altogether, multinational firms sell or close plants even as their operations expand at home, in other countries and frequently even in the country of the affiliate in question. While there is a considerable literature on the determinants of plant location and the scope of a firm's operations abroad, relatively little is known about the determinants of a firm's decision to abandon a plant in a particular location, either via closure or divestiture. Our paper addresses this gap in the literature.

3 Theory

The model is a simplified version of Berg et al. (2012). Consider two firms, H and F. Firm H is a multinational firm which has two affiliates, a_1 and a_2. These affiliates may be located in the same host country or in separate host countries. There is also a foreign firm, F. For the sake of simplicity, the foreign firm is assumed to have only one affiliate f.[4]

Berg et al. (2012) analyze mergers and acquisitions with financial constraints. The main assumption is that financial constraints affect firms' cost of capital which, in turn, affects their ability to conduct investment after an ownership transfer. As shown in Kaplan and Zingales (1997), the capital cost is higher under external financing due to information, agency or risk aversion problems. For instance, if firm F *buys* affiliate a_1, this will reduce its cash holdings. The reduction in cash holdings will increase its investment cost as it will be more costly for firm F to finance new investments (as lenders will demand a higher interest rate). In contrast, firm H, the *seller* of affiliate a_1, will see an increase in its cash holdings, which reduces its borrowing costs for new investments.

In the remainder of the section the following timing of events is assumed: In the first stage firm H can sell one of its affiliates to firm F. In the second stage, firms decide on whether to make an investment in a new asset k to reduce their costs. The third and final stage is the product market interaction.

To highlight the main mechanisms and get predictions for our empirical analysis of divestitures of the affiliates of Swedish MNCs, we will further simplify Berg et al. (2012). Firm H decides on whether or not to sell and firm F decides whether or not to buy. Due to the sale of one of its affiliates, firm H increases its cash holdings and invests in a significant improvement of the remaining affiliate. Financing costs are assumed to be too high to improve both affiliates. On the other hand, since the acquisition reduces Firm F's cash holdings, Firm F cannot make such an investment.

In the next three subsections, we analyze under what conditions firm H will sell an affiliate to firm F and which of the two affiliates is sold. We rule out that firm H sells both affiliates, as the Swedish MNCs to remain in the data set need to have at least one producing affiliate (i.e. remain an MNC). To shed more light on the mechanisms, we assume that each affiliate holds a monopoly and that there are no network effects or spillovers between affiliates or competition effects between firms. We discuss a relaxation of these assumptions below.

[4]It is easy to extend this framework into a network of several affiliates.

3.1 Stage 3: Product market

The set of firms in the industry is $\mathcal{Z} = \{H, F\}$ and the set of affiliates is $\mathcal{A} = \{a_1, a_2, a_f\}$. Let the action of an affiliate $a_j \in \mathcal{A}$ be x_{a_j}. Let l_{a_j} denote the ownership of the affiliate a_j where $l_{a_j} = \{h, f\}$. Here, h is used to indicate that an affiliate is owned by firm H and f is used to indicate that an affiliate is owned by firm F. Let $\pi_{a_j}(x_{a_j}, l_{a_j})$ be the variable profit in an affiliate a_j when the ownership of affiliates is l_{a_j} and the affiliate action is x_{a_j}. From the simplifying assumption of monopoly, $\pi_{a_j}(x_{a_j}, l_{a_j}) = \left[P_{a_j} - c_{a_j}(l_{a_j})\right] Q_{a_j}$, where $P_{a_j} = \alpha - Q_{a_j}$ is the inverse demand. P_{a_j} is the price of the product made by affiliate a_j, Q_{a_j} is its output and $c_{a_j}(l_{a_j})$ is the marginal cost under the ownership l_{a_j}. The first-order condition is $P_{a_j} - c_{a_j}(l_{a_j}) = Q^*_{a_j}$ from which we have the optimal output and reduced-form profit for affiliate a_j as usual:

$$Q^*_{a_j}(l_{a_j}) = \frac{\alpha - c_{a_j}(l_{a_j})}{2}, \quad \pi_{a_j}(l_{a_j}) = \left[Q^*_{a_j}(l_{a_j})\right]^2 \tag{1}$$

3.2 Stage 2: Investment

At this stage, firm H decides whether or not to invest in a marginal cost reduction Δ in affiliate a_j at cost G . Formally, we assume that:

$$c_{a_j}(l_{a_j}|\Delta) = c_0 - k_{a_j} - \Delta < c_{a_j}(l_{a_j}|0) = c_0 - k_{a_j} \tag{2}$$

where $c_{a_j}(l_j|\Delta)$ is the marginal cost in affiliate a_j when the cost reducing investment is made and $c_{a_j}(l_{a_j}|0)$ is the marginal cost when no investment is made. Here, $k_{a_j} > 0$ represents the investment in firm-specific assets (such as human capital of employees, patents, blueprints and procedures) which provide cost savings to the firm.

As noted, we study firm H's decision to sell an affiliate and we assume that only a sufficient increase in cash-holdings allows a firm to invest in new firm-specific assets in order to significantly reduce its marginal cost. To capture this, let $G_z(l_{a_1}, l_{a_2})$ be the *investment cost* for firm z. We then assume that

Assumption 1 (i) $G_H(h, f) = G_H(f, h) = G < G_H(h, h)$ and (ii) $G_H(h, f) < G_F(h, f)$, $G_H(f, h) < G_F(f, h)$, $G_H(h, h) = G_F(h, h)$

Part (i) formalizes that investment costs are lower for firm H if it sells an affiliate. Again, this mirrors the assumption that financing is less costly when firm H sells one of its affiliates and increases its cash holdings (assuming a positive sales price which will be shown to hold below).

Part (ii) says that firm F as the buyer of one of firm H's affiliates will have a higher investment cost. Again, this arises because when paying a positive acquisition price, firm F faces a reduction in its cash holdings and therefore an increase in its financing costs. We further assume that

Assumption 2 (i) $\pi_{a_1}(h|\Delta) - G_H(h, f) > \pi_{a_1}(h|0)$, (ii) $\pi_{a_2}(h|\Delta) - G_H(f, h) > \pi_{a_2}(h|0)$ and (iii) $\pi_{a_j}(h|\Delta) - G(h, h) < \pi_{a_j}(h|0)$ for $j = \{1, 2\}$

Thus, firm H can always finance an investment in its remaining affiliate if it sells the other affiliate and cannot invest in both plants at the same time. We also assume that

Assumption 3 (i) $\pi_{a_1}(f|\Delta) - G_F(f,h) < \pi_{a_1}(f|0)$, (ii) $\pi_{a_2}(f|\Delta) - G_F(h,f) < \pi_{a_2}(f|0)$ and (iii) $\pi_{a_f}(h|\Delta) - G_F(h,h) < \pi_{a_f}(f|0)$

Firm F as the acquirer will see a reduction in its cash holdings which makes it impossible to invest in a cost reducing asset.

Finally, firm F incurs a transaction cost T when buying the affiliate. An acquisition is potentially profitable if and only if $\pi_{a_j}(f|0) - T > 0$, $j = \{1,2\}$. In order for a foreign acquisition of affiliate a_1 or a_2 to be potentially profitable, the product market profit under an acquisition $\pi_{a_j}(f|0)$ must exceed the transaction cost associated with a deal, T.

3.3 Stage 1: Divestment decision

We start our analysis by outlining the details of two cases: Divestment of affiliate a_1 and divestment of affiliate a_2. To proceed, let $\Pi_z(l_1,l_2) = \sum_{l_j \in z} \pi_{a_j}(l_j|.)$ be the aggregate product market profit for firm z, where (l_1,l_2) is the vector of ownership of the affiliates a_1 and a_2.

Affiliate a_1 is divested Given Assumptions 1-4, the Nash-Bargaining product in a negotiation over the sale of affiliate a_1 is:

$$\Omega_{a_1}(S) = [\Pi_F(f,h) - S - T - \Pi_F(h,h)]^{\theta} [\Pi_H(f,h) - G + S - \Pi_F(h,h)]^{1-\theta} \tag{3}$$

where $\Pi_F(f,h) = \pi_{a_1}(f|0) + \pi_{a_f}(f|0)$ is the aggregate variable profit for firm F when firm F buys affiliate a_1, $\Pi_F(h,h) = \pi_{a_f}(f|0)$ is the aggregate variable profit of firm F when no acquisition takes place (status quo profit), $\Pi_H(f,h) = \pi_{a_2}(f|\Delta) - G$ is the variable profit for firm H when it sells affiliate a_1 and invests in upgrading in its remaining affiliate a_2. Finally, $\Pi_H(h,h) = \pi_{a_1}(h|0) + \pi_{a_2}(h|0)$ is the status quo profit for firm H. Here, θ stands for the bargaining power of firm F.

The associated acquisition price of affiliate a_1 is given as $S_1^* = \arg\max_S \Omega_{a_1}(S)$, or:

$$S_1^* = (1-\theta)[\Pi_F(f,h) - T - \Pi_F(h,h)] - \theta[\Pi_H(f,h) - G - \Pi_H(h,h)] \tag{4}$$

From (3), it is then useful to define $R_F^*(f,h) = \Pi_F(f,h) - S_1^* - T - \Pi_F(h,h)$ as the *net gain* for firm F from agreeing to buy affiliate a_1 at price S_1^*. Furthermore, define $R_H^*(f,h) = \Pi_H(f,h) + S_1^* - G - \Pi_H(h,h)$ as the net gain for firm H from agreeing to sell affiliate $a_1$at price S_1^*. Inserting the acquisition price S_1^* from (4) in $R_z^*(h,f)$, we obtain:

$$R_z^*(f,h) = \begin{cases} R_F^*(f,h) = \theta[\Pi(f,h) - \Pi(h,h)] \\ R_H^*(f,h) = (1-\theta)\,[\Pi(f,h) - \Pi(h,h)] \end{cases} \tag{5}$$

where $\Pi(f,h) = \Pi_F(f,h) + \Pi_H(f,h)$ is the aggregate profit when firm H sells affiliate a_1 at S_1^* and $\Pi(h,h) = \Pi_F(h,h) + \Pi_H(h,h)$ is the aggregate profit when no deal is made.

Affiliate a_2 is divested Given assumptions 1-4, the Nash-Bargaining product in a negotiation over a sale of affiliate a_2 is:

$$\Omega_{a_2}(S) = [\Pi_F(h,f) - S - T - \Pi_F(h,h)]^{\theta}[\Pi_H(h,f) - G + S - \Pi_F(h,h)]^{1-\theta} \tag{6}$$

In (6), $\Pi_F(h,f) = \pi_{a_2}(f|0) - T + \pi_{a_f}(f|0)$ is the aggregate variable profit net of the transaction cost when firm F buys affiliate a_2, $\Pi_F(h,h) = \pi_{a_f}(f|0)$ is again the aggregate variable profit or firm F when no deal takes place. $\Pi_H(h,f) = \pi_{a_1}(f|\Delta) - G$ is now the aggregate variable profit net of the investment cost for firm H when it sells affiliate a_2 and upgrades its affiliate a_1, and finally, $\Pi_F(h,h) = \pi_{a_1}(h|0) + \pi_{a_2}(h|0)$ is the status quo profit for firm H.

The associated acquisition price of affiliate a_2, $S_2^* = \arg\max_S \Omega_{a_2}(S)$, is then:

$$S_2^* = (1-\theta)[\Pi_F(h,f) - T - \Pi_F(h,h)] - \theta[\Pi_H(h,f) - G - \Pi_H(h,h)] \tag{7}$$

As above, define $R_F^*(h,f) = \Pi_F(h,f) - S_1^* - T - \Pi_F(h,h)$ as the *net gain* for firm F from agreeing to buy affiliate a_2 at price S_2^*. Furthermore, define $R_H^*(h,f) = \Pi_H(h,f) + S_1^* - G - \Pi_H(h,h)$ as the net gain for firm H to sell affiliate a_1 at price S_2^*. Inserting the acquisition price S_2^* in (7) in $R_z^*(h,f)$ we obtain:

$$R_z^*(h,f) = \begin{cases} R_F^*(h,f) = \theta[\Pi^*(h,f) - \Pi(h,h)] \\ R_H^*(h,f) = (1-\theta)\,[\Pi^*(h,f) - \Pi(h,h)] \end{cases} \tag{8}$$

where $\Pi^*(h,f) = \Pi_F(h,f) - T + \Pi_H(h,f) - G$ is the total aggregate profit when firm H sells affiliate a_2 at S_2^* to firm F, and $\Pi^*(h,h) = \Pi_F(h,h) - T + \Pi_H(h,h)$ is the aggregate profit when no deal is made.

3.4 When does a divestiture occur and which affiliate is divested?

To guide the empirical analysis, we investigate whether firm H divests an affiliate and if so which affiliate is sold. We then have the following proposition:

Proposition 1 *Suppose that the quality of affiliate assets a_1 and a_2 are such that $k_{a_2} > k_{a_1}$. Then, (i) firm F will only agree to buy affiliate a_j if the quality of its assets k_{a_j} are sufficiently high, iff $k_{a_j} > k^{\min} = \sqrt{T} - \Delta$ (ii) If both affiliates have a sufficiently high quality $k_{a_j} > k^{\min}$, firm H and firm F will agree on a divestiture of affiliate a_1 which has the lowest asset quality.*

Let us first prove Proposition 1(i).[5] Note that Firm F must obtain a positive net profit from acquiring affiliate a_j at a zero price at $S_j^* = 0$ in order to have an incentive to buy the affiliate (ruling out negative prices). This net profit is

$$\pi_{a_j}(f|0) - T \tag{9}$$

[5] **Proposition 1 builds on Lemma 1 in Berg et al. (2012) where the size of the investment is endogenous and where the roles as buyer and seller are endogenously determined.**

From (1) and (2), a strictly positive net profit $\pi_{a_j}(f|0) > T$ implies $k_j > k^{\min} = \sqrt{T} - \Delta$. Intuitively, in order to cope with the transaction cost inherent in an acquisition, the quality of the acquired assets must be sufficiently high.

Let us then prove Proposition 1(ii). Note that from (5) and (8) both firm H and firm F will prefer a divestment of the affiliate which gives the largest increase in aggregate profit. Both firms agree that it is in their interest to have firm H sell a_1 if and only if this will give rise to a higher aggregate profit than the sale of affiliate a_2, $\Pi(f,h) > \Pi(h,f)$.

We can rewrite the latter condition as follows:

$$\begin{aligned}
\Pi(f,h) - \Pi(h,f) &= \underbrace{\Pi_H(f,h) - \Pi_H(h,f)}_{\text{Firm H's incentive to sell } a_1 \text{ rather than } a_2} - \underbrace{[\Pi_F(h,f) - \Pi_F(f,h)]}_{\text{Firm F's incentive to buy } a_2 \text{ rather than } a_1} \\
&= \pi_{a_2}(h|\Delta) - \pi_{a_1}(h|\Delta) - [\pi_{a_2}(f|0) - \pi_{a_1}(f|0)] > 0 \\
&= 2(k_{a_2} - k_{a_1})\Delta > 0 \qquad (10)
\end{aligned}$$

Thus, aggregate profit will be higher if firm H sells affiliate a_1 and then invests in affiliate a_2. This happens because the quality of the assets in affiliate a_2 is, by assumption, higher, $k_{a_2} > k_{a_1}$. To see this, it is instructive to differentiate $\Pi(f,h) - \Pi(h,f)$ in the cost reduction Δ. Since $k_{a_2} > k_{a_1}$, output under an investment in a_2 must be higher, $Q^*_{a_2}(h) > Q^*_{a_1}(h)$.

$$\begin{aligned}
\frac{d(\Pi(f,h) - \Pi(h,f))}{d\Delta} &= \frac{d\left[\pi_{a_2}(h|\Delta) - \pi_{a_1}(h|\Delta)\right]}{d\Delta} \\
&= Q^*_{a_2}(h) - Q^*_{a_1}(h) > 0 \qquad (11)
\end{aligned}$$

In short, larger cost savings when investing in the larger affiliate a_2 financed from selling a_1 create the larger increase in aggregate profit. Since each firm gets a fixed share of this increase, both firms will prefer the divestiture of a_1.

Finally, it is also interesting to explore how firm F is able to benefit despite agreeing not to buy the best affiliate. To see how, rewrite the acquisition price for affiliate a_1 as follows:

$$S^*_1 = \pi_{a_1}(f|0) - T - (1-\theta)[\pi_{a_2}(f|\Delta) - \pi_{a_2}(f|0) - G - T] \qquad (12)$$

Firm F obtains $\pi_{a_1}(f|0) - T$ in net profit from buying affiliate $a_1$which from (12) implies a rebate on the acquisition price since $S^*_1 < \pi_{a_1}(f|0) - T$. The rebate is larger the larger is the increase in variable profit for firm H from investing in affiliate a_2, $\pi_{a_2}(f|\Delta) - \pi_{a_2}(f|0) > 0$.

3.5 Discussion and Extensions

Before turning to the empirical analysis, we briefly discuss major results and some extensions of the model.

The first result arises from the assumption of a transaction cost to be paid by the acquirer: unless the quality of the affiliate's assets are sufficiently high, there will be no surplus for the buyer and hence no incentive to negotiate a deal. The second result is a direct consequence of the assumption that financing costs are affected by wealth or cash holdings: selling an affiliate reduces

the costs for external finance which enables the MNC to invest in the remaining affiliate. We then show that if the investment increases, this reduces marginal cost and the MNC will sell the affiliate with assets of lower quality and then with cash received invest in the affiliate with assets of higher quality. This produces the largest gain in profits since the reduction in marginal cost affects more units in the larger affiliate. The buying firm will also agree to this deal, as the larger gain for the MNC from investing in the affiliate of higher quality will be mirrored by a lower acquisition price.

It is straightforward to extend the model to more than two affiliates. Let the set of firms be $\mathcal{Z} = \{H, F\}$ and the set of affiliates be $\mathcal{A} = \{a_1, ..a_t..., a_N, a_f\}$ where firm H initially owns affiliates $\{a_1, .., a_t, ..., a_N\}$, where each affiliate is a monopoly. Firms will then negotiate a price $S^*_{a_t}$ for affiliate a_t. As in (8), each potential deal will give rise to a net-profit for each firm which will be the status quo profit plus a share of the increase in aggregate profit when affiliate a_t is sold (where the share is given by the bargaining strength). Firms will agree on the price which gives rise to the largest increase on aggregate profits. With a transaction cost present, affiliate a_j needs to be associated with a sufficiently high quality of its assets k_{a_j} in order to give firm F an incentive to participate in the deal, in line with Proposition 1(i). However, it will also be the case that when the quality k_{a_j} increases even further, it is more likely that firm H will keep affiliate a_j and sell another affiliate, as it will be better to invest into an affiliate with higher quality assets in order to get a larger benefit from the investment, in line with Proposition 1(ii). This would be true even if we allowed for multiple sales of affiliates.

With several affiliates in a network we could also introduce synergies or network effects. Also in this setting, there must be an incentive for the buyer to participate: to be sold, the quality of the assets must again be sufficiently high. The seller will also invest in the affiliate that gives the highest synergy or strongest network effects. Through the Nash-Bargaining process, the buyer and seller would coordinate the outcome that increases aggregate profit the most. This implies that an affiliate with better quality assets or assets with the potential to generate larger synergies will not be sold. As shown in Berg et. al. (2012), this will be true even in a setting with product market competition, since the acquisition price will adjust to take into account how firms are affected in the post-acquisition market.[6]

4 Empirical analysis

There are several empirical implications emanating from the model. This subsection enumerates these. The assets, denoted by k_{a_j} in the model, are proprietary (or firm-specific) assets which represent knowledge about how to produce a cheaper or better product. This knowledge could take the specific form of a patented process or it might simply rest on know-how shared among the employees of multinational firms. In the MNC literature, the size of operations and extensiveness

[6] While our setting is very useful to derive prediction on how MNCs sell affiliates and how this is related to different characteristics of these affiliates, it is harder to apply in situation where there are multiple potential buyers. The reason is that there are no applied off-the shelf multi-firm bargaining models which easily handle the externalities that arise under ownership changes. For examples of bargaining with externalities, see Jehiel and Moldovanu (1995a,b).

of these firms-specific assets have proven to be highly correlated (Caves, 2007). Therefore, we will use affiliate/firm size as an indicator of the quality of firm-specific assets owned by the firm.

Proposition 1(i) then suggests that an affiliate is more likely to be divested when it increases in size: if an affiliate is too small and thus has low quality assets, its purchase will not give the acquirer a positive net return due to the transaction cost T. Moreover, Proposition 1(ii) shows that given that an affiliate is sufficiently large it will still be relatively small within the MNC's network to be a candidate for divestment. The intuition here is that when the MNC sells an affiliate in order to get resources to invest in another affiliate, it will obtain the highest return when investing in the affiliate with higher quality assets.

These results produce a tension between the effect of larger affiliate size on the divestment decision: One the one hand, a larger affiliate becomes a more likely candidate for a divestiture as size indicates that the quality of the assets inherent in the affiliate is sufficient to induce the acquirer to participate in a deal despite the transaction costs. One the other hand, if a larger affiliate size indicates higher quality assets, the MNC has an incentive to invest in that affiliate, making it less likely that the MNC would want to sell it.

We attempt to capture these two opposing effects of affiliate size on the divestment decision using the following probit estimation model:

$$\Pr(Divest_{a_j} = 1 | size_{a_j}, rel\_size_{a_j}, \mathbf{X}) = \Phi\left(\beta_0 + \underset{(+)}{\beta_1} size_{a_j} + \underset{(-)}{\beta_2} rel\_size_{a_j} + \mathbf{X}'\boldsymbol{\gamma}\right) \tag{13}$$

where $\Phi(.)$ is the normal distribution, $size_{a_j}$ is the size of an affiliate and $rel\_size_{a_j}$ is the affiliate's size relative to other affiliates in the network, below defined as $rel\_size_{a_j} = Affiliate\ size/(Affiliate\ average\ size)$. Proposition 1(i) suggests that $\beta_1 > 0$ as affiliates require a minimum quality to be eligible for a deal. Proposition 1(ii) suggests that the MNC's sell their smaller affiliates that pass the minimum size. In order to capture this implication of the model, we calculate a relative affiliate size measure whose value increases when the affiliate becomes a larger one relative to other affiliates in the MNC's network and thus we expect $\beta_2 < 0$. That is, an increase in relative size reduces the likelihood of the affiliate being sold. We now turn to a description of our data used to estimate (13) as well as a discussion of additional control variables expected to affect the likelihood of divestiture.

4.1 Data

The core data come from surveys of Swedish multinational firms conducted by the Research Institute of Industrial Economics (IFN). These surveys were conducted in regular intervals since 1965, with the last one in 2003.[7] The survey provides detailed information on the operations of these firms in Sweden and abroad. It is unique in a number of ways. It provides a wealth of detailed information on sales, inputs, trade, etc. It also asks about any foreign affiliates and provides information for each affiliate as well as the economic relationship between the parent and the affiliate.

[7] With many Swedish multinationals now foreign-owned, the surveys were discontinued.

For the central purpose of this paper, we utilize a question that was asked for the first time in the 2003 survey. The question asks whether a firm has acquired, started-up, closed or divested an affiliate between the last survey year, 1998, and 2003. There are 1644 potentially usable affiliates in the 2003 survey spanning 77 countries and 21 industries, listed in Tables 1 and 2. Of those, 228 were acquired or started-up and 110 were closed or divested since 1998.[8] Our dependent variable $Divest_{a_j}$ takes on the value of one for each affiliate that was closed or divested and zero otherwise. In practice, only one affiliate was reported closed, all others were divested.[9] Similarly, most new affiliates were acquired, very few were started-up. For more details about the survey in general, see Ekholm and Hesselman (2000). For the 2003 survey, see Hakkala and Zimmermann (2005).

We supplement the survey data with industry and country level data from various sources. The industry level minimum efficient scale data come from Statistics Sweden and report sales, employees, the number of firms and other data for two-digit industries in Sweden. We have data on regulations, that vary by industry and country from the OECD, as collected by and described in detail in Conway and Nicoletti (2006). Data on GDP, labor and capital at the country level come from the Penn World Tables. Education data is from Barro and Lee (2010 update).

We now describe our variables in detail.

4.1.1 Affiliate-level variables

We start with the core variables, $size_{a_j}$ and $rel\_size_{a_j}$, that we are interested in from the theory.

Affiliate size: Ideally, $size_{a_j}$ in equation (13) should be measured by quantity produced or sold. However, consistent information on these variables is not available in the data set. Therefore, we proxy *size* by the current number of employees L_{a_j} for surviving affiliates and the number of employees at the time of exit for those that are divested. We use this variable in logarithmic scale since affiliates vary considerably in size:

$$size_{a_j} = \log(L_{a_j}) \tag{14}$$

where L_{a_j} is the number of employees in affiliate a_j.

A potential concern with measuring affiliate quality k_{a_j} in terms of the log employment size $\log(L_{a_j})$, is the labor saving effect of asset quality: one might worry that affliates with higher quality assets may generate large sales but then have very few employees. We do not believe this to be a large problem for a number of reasaons.

Even in the simple monopoly, the number of workers can increase in asset quality. To see this, note that the number of workers in an affiliate before a divestiture or investment is $L^*_{a_j}(z) = \left(c - k_{a_j}\right) Q^*_{a_j}(z)$. It can be shown that if the marginal cost is sufficiently low, $c \in (k_{a_j}, k_{a_j} + \frac{1}{2}\alpha)$, affiliate employment $L^*_{a_j}(z)$ increases in k_{a_j}. Note also that all results remain the same if we

[8] Unfortunately, only 261 can be linked to at least some information from prior surveys, thus constraining the use of other affiliate and firm level control variables.

[9] Results do not change when that affiliate is omitted from the analysis.

assumed that consumers' willingness to pay is $P_{a_j} = \alpha + k_{a_j} - Q_{a_j}$ and that marginal cost is $c_{a_j} = c$; in particular, Proposition 1 still holds. Then, since there is an increase in output resulting from higher asset quality, affiliate employment $L^*_{a_j}(z)$ will always increase in the quality of the assets k_{a_j} as well.

Whether or not asset quality indeed increases employment is an empirical question. We checked this by running regressions of the log of affiliate sales, $\log(P_{aj}Q_{a_j})$ on the log of affiliate employment $\log(L_{a_j})$ using affiliate fixed effects, country-industry pair fixed effects and numerous other specifications making use of the other survey years (which lack the divestiture information on affiliates, but have sales). These regressions consistently produce a positive and statistically significant elasticity ranging from 0.6 to 1. A signficant, strictly positive elasticity of sales with respect to employment, $El_{L_{a_j}} P_{aj}Q_{a_j}$, suggest that asset quality k_{a_j} drives both sales and employment, as suggested by the theory, and, therefore, that we can use affiliate employment to proxy for affiliate asset quality.

Affiliate relative size: Now we turn to $rel\_size_{a_j}$ in equation (13). Since it is not obvious how to measure relative size, we will do it several different ways.

First, we measure rel_size as the size of the affiliate relative to average affiliate size of the firm, in log terms,

$$rel\_size_{a_j} = \log\left(\frac{L_{a_j}}{\sum\limits_{a_j \in z} L_{a_j}/A_z}\right) \tag{15}$$

where $\sum\limits_{a_j \in z} L_{a_j}$ is the total number of employees in affiliates of firm z and A_z is the total number of affiliates of firm z. This measure adjusts for general size differences among firms. If $exp(rel\_size_{a_j})$ is greater than 1, then the affiliate is larger than average.

Alternatively, we consider the share of the affiliate's employment in total affiliate employment in the country (m) or region (r),

$$size\_share_{a_{jm}} = \frac{L_{a_j}}{\sum\limits_{a_j \in z_m} L_{a_j}} \text{ or } \quad size\_share_{a_{jr}} = \frac{L_{a_j}}{\sum\limits_{a_j \in z_r} L_{a_j}} \tag{16}$$

Irrespective of whether we calculate the size share in the host country or host region, the size share variable takes values between 0 and 1 naturally. As it gets closer to 1, the relative importance of the affiliate in the host country or in the host region increases for the firm.

4.1.2 Firm-level variables

Affiliate size, $size$, and affiliate relative size, rel_size or affiliate size share, $size\_share$, are the core variables in our analysis. These variables are generated from our theoretical model. To assess the robustness of these varaiables, we will also add a number of control variables. We first complement these variables with information on the firm's network of affiliates and other characteristics of the mother firm.

Figure 1 illustrates the nature of the data. It shows the network of firm z. Firm z is active in the home country and in four foreign countries, distributed over two regions. Firm z has five affiliates distributed over the four countries. We now turn to how we calculate different firm level variables for the firms in the data.

Other Affiliate(s): It may be the case that the probability of divestiture is higher for plants with geographically close or in firms with a greater number of other affiliates. Concentrating production in fewer plants may allow a firm to better exploit plant level scale economies. Moreover, when other plants are present in the same market, some divestiture does not equal leaving a market altogether. Bernard and Sjöholm (2003) [Indonesia], Mata and Portugal (2004) [Portugal], Görg and Strobl (2003) [Ireland], Bernard and Jensen (2007) and Alvarez and Görg (2009) report higher exit rates for multiplant firms. To assess the importance of having other affiliates in the same country/region, we construct a dummy variable which takes the value of one if the affiliate is part of a firm with at least one more affiliate in the same country/region,

$$oth\_aff_{zm} = \begin{cases} 1 & \text{if } \exists \text{ at least one other affiliate of firm } z \text{ in country } m \\ 0 & \text{otherwise} \end{cases} \quad (17)$$

$$oth\_aff_{zr} = \begin{cases} 1 & \text{if } \exists \text{ at least one other affiliate of } z \text{ in region } r \text{ but not in country } m \\ 0 & \text{otherwise} \end{cases} \quad (18)$$

Number of Other Affiliates: Rather than an indicator variable, we use the number of other affiliates of firm z in the same country/region, namely num_othaff_{zm} and num_othaff_{zr}.

Other Acquisitions: A firm can also restructure its operations by switching sectors or acquiring plants at the same time others are closed down or divested. This can happen in the same host country, in the same host region or anywhere in the world.

Related recent empirical studies conducted in the single country framework are Bernard, Jensen and Schott (2006) and Greenaway et al. (2008, 2009). The former authors consider the decision to cease production or switch sectors following being exposed to higher competition from low wage countries. They find that firms with low capital and skill levels are less likely to survive in the face of increased competition from abroad and firms switch to more capital and skill intensive sectors when exposed to lower levels of foreign competition. The latter authors consider firm choices between alternative exit strategies, namely, closedown, switching sectors or being acquired, using a multinomial probit model.

To assess the importance of whether or not having entry elsewhere, in the form of an acquisition or a start-up within the same firm z, affects affiliate a, we consider a dummy variable at the country,

regional and global level,

$$oth\_acq_{zm} = \begin{cases} 1 & \text{if } \exists \text{ at least one acquisition by firm } z \text{ in country } m \\ 0 & \text{otherwise} \end{cases} \quad (19)$$

$$oth\_acq_{zr} = \begin{cases} 1 & \text{if } \exists \text{ at least one acquisition by firm } z \text{ in region } r \text{ but not in country } m \\ 0 & \text{otherwise} \end{cases} \quad (20)$$

$$oth\_acq_{z} = \begin{cases} 1 & \text{if } \exists \text{ at least one acquisition by firm } z \text{ anywhere} \\ 0 & \text{otherwise} \end{cases} \quad (21)$$

Acquiring or opening a plant in another country could signal an intention to relocate production, for example to a lower-cost location, attesting to the 'footloose' nature of multinationals. It is also consistent with the spirit of the model. Since an acquisition depletes cash reserves and thus increases the financing constraint and prevents investing in existing affiliates, it should raise the probability of divestiture of another affiliate in order to ease the constraint and enable investments.

Other Divestiture(s): In the model, we could have multiple divestitures (as long as not all affiliates are sold). However, the model is too simple to capture the entire set of dynamics which link multiple divestitures. We also note that in this paper the effect of divestitures or exits in other regions or countries has not been examined in the single country framework of previous literature. To control for these, we define a dummy variable for other divested affiliates within the same firm z, again at the country, regional and global level,

$$other\_divest_{zm} = \begin{cases} 1, & \text{if } \exists \text{ at least one other divestiture within firm } z \text{ in country } v \\ 0, & \text{otherwise} \end{cases}$$

$$other\_divest_{zr} = \begin{cases} 1, & \text{if } \exists \text{ at least one other divestiture within firm } z \text{ in region } r \text{ but not in country } v \\ 0, & \text{otherwise} \end{cases}$$

$$other\_divest_{z} = \begin{cases} 1, & \text{if } \exists \text{ at least one other divestiture within firm } z \text{ anywhere in the world} \\ 0, & \text{otherwise.} \end{cases}$$

Controlling for other divestitures is important as firms often face negative shocks that affect multiple plants similarly. As a result, closures or divestitures are likely to be correlated across the firm's affiliate network. Alfaro and Charlton (2009) offer a complementary explanation for a positive correlation of the existence of affiliates within a country. They find evidence of what they call intra-industry vertical FDI. At the four-digit industry level, there exist affiliates of an MNC that produce specialized inputs for other affiliates in the same industry, thus making it more likely for an affiliate to be divested when there are other divestments.

Degree of Internationalization: This variable measures the relative importance of foreign sales of firm z in total sales,

$$for\_sale\_share_z = \frac{\Omega_z^F}{\Omega_z}$$

where $\Omega_z^F = \sum_{m \neq Swe,} \sum_{a_j \in z_m,} P_{a_j} Q_{a_j}$ and $\Omega_z = \sum_{m,} \sum_{a_j \in z_m,} P_{a_j} Q_{a_j}$ denote the foreign and global sales of firm z, respectively. A higher value indicates a higher degree of dependence on international markets.

Labor Productivity: As has been shown in the burgeoning literature on heterogeneous firms (Melitz, 2003; Bernard et al., 2003), higher productivity firms are more likely to export and are more likely to be multinational and have a lower probability of leaving the market than lower productivity firms. Since a firm's productivity originates from firm-specific assets in, for instance, technology and managerial skills, and the services of these assets can be moved across locations of a firm at low cost, the mother firm's productivity may influence the decision to divest. As productivity is heterogeneous across industries, we measure a firm's productivity relative to its two-digit industry's average productivity. Firm z is said to have a higher than industry average labor productivity if

$$rel\_lab\_prod_z = \frac{(\Omega_z - \Omega_z^F)/(L_z - L_z^F)}{\Omega_l / L_l} > 1$$

where $L_z^F = \sum_{m \neq H,} \sum_{a_j \in z_m,} L_{a_j}$ and $L_z = \sum_{m,} \sum_{a_j \in z_m,} L_{a_j}$ and Ω_h / L_h is the two-digit industry's average productivity in Sweden for the industry l to which firm z belongs. Note that since our industry level information is from Sweden only, we use only the Swedish portion of sales to calculate this measure.

4.1.3 Industry-specific variables

Industry characteristics that we use in this paper are somewhat broader compared some used in previous empirical work due to the unavailability of sector level sunk costs and concentration ratios for a number of countries that the Swedish multinationals operate in.

***Sunk Costs*:** In general, high industry sunk costs should reduce the likelihood of affiliate exit, although it is less clear what the effect is for a divestiture. Hopenhayn (1992) shows that exit probability of existing plants in a sector is low if there exist high entry barriers or sunk costs since they face less fierce competition than otherwise, leading to hysteresis (Dixit and Pyndick, 1994). Dunne et al. (1989), Geroski (1991a,b) [UK], Bernard and Jensen (2007), Greenaway et. al (2008, 2009) and Inui et al. (2010) support this conclusion. Our measure of sunk costs is the minimum efficient scale (average firm size in number of employees) in the industry of the parent firm in Sweden. It is a stylized fact that large scale signals higher entry barriers and thus higher sunk costs. This measure varies by firm size categories. For example, if a firm has 200 employees, we use the average firm size of Swedish firms that have between 100 and 249 employees.

***Regulation*:** The degree of competition should have an effect on divestiture decisions as it directly affects an affiliate's profits. On the one hand, higher market concentration may lead to higher mark-ups in a sector, which should reduce the exit probability (Audretsch, 1995). On the other hand,

competitive pressure by rivals in highly concentrated markets can cause immature exit. While Burke, Görg and Hanley (2008) find a negative impact of concentration on plant survival, i.e., new plants are vulnerable to large incumbents with monopolistic power, Alvarez and Görg (2009), using Chilean data, find no significant impact of concentration on the probability of exit. As a proxy for concentration we use the potential costs of anti-competitive regulation in certain non-manufacturing sectors for sectors in the economy that use the output of non-manufacturing sectors as intermediate inputs in the production process. Although this is not a direct measure of concentration, it varies by industry and country and thus has broader international coverage than standard measures of concentration such as a Herfindahl index or a firm-concentration ratio. As we do have information on which industry firms belong to, we will in addition use industry specific effects.

4.1.4 Country-specific variables

Our country level variables are mainly drawn from the traditional FDI literature (for example, Brainard 1997; Markusen 2002; Carr et al. 2001; Blonigen et al. 2003) to control for the role of country specific attributes in multinational affiliate exits. To measure income and size, we use the log of real gross domestic product of country m , GDP. To measure openness to trade, we use the variable 'Trade Openness' which is the log of trade volume divided by GDP in country m. To control for the education level of the work force, we use the log of average years of secondary or tertiary education attained in country m, Skill.We also control for the productivity of the host country with the log of the capital-labor ratio in country m, K-L Ratio.[10] Finally, some specifications will only use country-specific effects.

5 Results

We start of by providing information on country and industry coverage as well as simple summary statistics for our basic sample of affiliates. As can be seen from Table 1, Swedish MNCs have operations all around the world and operate in all the major industries (Table 2). Recall that while the unit of observation is the affiliate and the basic question is what determines the survival or divestiture of an affiliate over a five-year period, many of these determinants are at the firm, industry or country level or a combination thereof. Therefore, we group the variables used in the analysis by their level of aggregation. Table 3 provides some basic summary statistics for the sample. We have at most 1559 usable observations. Of these, 110 are affiliates that exited between 1998 and 2003 while the rest did not.

[10] We tried a bevy of other country level variables, such as a more general market access variable as in Braconier et al. (2005), GDP per capita, capital and labor endowments. These generally proved statistically insignificant and in any case did not alter any of the main results.

5.1 Preliminaries

Before going into a detailed econometric analysis, we provide a couple of pieces of simpler information to characterize the data and the determinants of affiliate divestiture. We start with a mean-difference analysis of our data. Table 4 compares the means of characteristics for retained and divested affiliates. Note that some of these can be computed at the country or regional level, while others only exist globally. $*$ and $**$ indicate whether the means are statistically significantly different at the ten and five percent levels, respectively. We first note that divested affiliates tend to be larger, as measured by the number of employees, consistent with Proposition 1 (i). However, as with all the raw numbers in this table, we caution that only a conditional analysis will show whether these unconditional differences hold up once we control for the full set of determinants of affiliate divestiture.

Proposition 1 (ii) also asserts that an affiliate is more likely to be divested if it is small relative to other affiliates. Since it is not obvious how this should be measured, we construct two different measures, as discussed above. One is the size of an affiliate relative to the average size of a firm's affiliates ('Relative Size'); the other is the share of this affiliate in the affiliate network of a firm, either in the same country or region ('Size Share'). In this simple mean comparison, the two measures give conflicting results. According to the 'Relative Size' measure, divested affiliates are larger (recall, this measure is in natural logs), but the 'Size Share' indicates that divested affiliates are significantly smaller relative to other existing affiliates in the same country and the same region. It is important to note that Proposition 1 implies that in any regression, both absolute affiliate size as well as relative affiliate size must be included simultaneously. The two are of course also related. When the absolute size of an affiliate increases, its relative size rises as well, holding other affiliates' sizes constant.

Many firm characteristics differ significantly between retained and divested plants. Divestiture is more likely when there exists another affiliate and when the number and size of these other affiliates is large. This is consistent with the hypothesis that restructuring takes place and the divestiture of an affiliate is not symptomatic of general troubles faced by the firm. This is underscored by the fact that a sale is also more likely when there is an acquisition elsewhere, whether in the same country, the same region, or anywhere globally within the same firm. At the same time, restructuring does not appear to be limited to one affiliate, but affects multiple ones as divestiture is also more likely when there is divestiture elsewhere, again regardless of how we define the relevant geographic boundary. Finally, firms of divested affiliates are relatively less productive than those of retained ones.

Interestingly, neither industry nor country characteristics appear significantly different for retained and divested plants. For the latter in particular, however, we note that this may simply be due to the much smaller degree of variation as all affiliates located in the same country face the same values for any of the country level variables.

Next, we turn to a visual examination of plant sales at the firm, industry and country level. First, we define a compact measure of affiliate divestiture, namely the divestiture rate, at the firm,

industry and country level.[11]

The divestiture rate at the firm level is the number of divested affiliates of a multinational firm in a certain country divided by the total number of affiliates of the same firm in the same country, including both those retained and those sold. Figure 2 shows the divestiture rate drawn against their share of foreign sales, which can be viewed as the degree of internationalization of Swedish MNCs. As firms get more actively involved in foreign operations they start having access to external and internal resources to overcome negative shocks. However, these firms may also be "footloose" and have the flexibility to close or sell a plant. Figure 2 shows that as the foreign sales share rises, the divestiture rate falls. For example, among Swedish MNCs with a more than 80% foreign sales share, 58 affiliates were divested between 1998 and 2003. There were 508 retained affiliates of these firms in the same countries, giving an divestiture rate of 58/(58+508)=10%. In other words, 90% of the affiliates of Swedish MNCs with a very high degree of internationalization remained between 1998 and 2003. This preliminary result goes against the footloose MNCs arguments in the literature.

Figure 3 illustrates the divestiture rate at the industry level. In the automobile sector, for example, 32 left out of a total of 255 and thus the divestiture rate is 13%. In high sunk cost industries such as automobiles or fabricated metals the divestiture rates are low. However, there does not seem to exist a very clear pattern and further analysis is necessary.

5.2 Probit Results

We turn now to our probit results, which can be found in Tables 5-7, as enumerated in (13). We start off simply in Table 5 by only including the variables suggested directly by the theoretical model, absolute and relative affiliate size. Recall that Proposition 1 stipulates that (absolutely) larger affiliates are more likely to be divested, but those that are small relative to other affiliates in a firm's network. We measure this relative size either relative to the average size of an affiliate or relative to the size of the affiliate network in the same country or the same region. The results in Columns (1)-(3) are as predicted by theory. Divestiture is more likely the larger the affiliate, but the smaller it is relative to other affiliates. Since the measure of relative size does not affect the results, we will subsequently focus on results using the 'Relative Size' variable. We emphasize at this point already that the signs and significance of the two central variables remain robust to the inclusion of other controls, as discussed subsequently.

In Figure 4, we translate these estimates to the to the simple model with two affiliates in Section 3. Using specification (i) in Table 5 (without calculating marginal effects) the probabality to divest affiliate a_1 is $\Pr(Divest_{a_1} = 1|size_{a_1}, rel\_size_{a_1}) = \Phi\left(-3.6 + 0.41 size_{a_j} - 0.26 rel\_size_{a_j}\right)$. We then let the size of these two affiliates run from 1 to 6000 employees and calculate $size_{a_1}$ and $rel\_size_{a_1}$ over this range using (14) and (15). The resulting probabality to divest a_1 is shown as the surface in Figure 4.

[11] We are unable to report our country level figures for confidentiality reasons. In these figures we observe that countries with bigger markets and stronger demand experience a lower degree of affiliate divestiture.

Several things can be noted. Holding the size of affiliate a_2 constant at the average number of emplyees in the data (255 employees) and increasing the number of employees in affiliate a_1, increases the probabality of divesting a_1. This is consistent with Proposition 1(i), which conjectures that the acquiring firm - in order to recover transaction costs - will be interested in targets of higher quality (as measured by larger size). However, the increase in the probability to divest a_1 is decreasing in the size of a_2 . The concavity in the probabality to divest comes in part from the functional form of the size variables but also reflects Proposition1(ii) in that the MNC will want to sell the least productive affiliate in order to invest in the more productive one.

To illustrate the latter effect more clearly, we then hold the size of affiliate a_1 constant at the average number of employees in the data (255 employees) and then increase the number of employees in affiliate a_2. As can be seen, making the affiliate a_2 larger will also increase the probabality of divesting a_1. An increase in the size of a_2 - and hence a decrease in the relative size of a_1 - signals that a_2 is the more productive one, and hence that a_2 is the affiliate that the firm will want to keep and invest in.

Let us now turn to controls calculated from the network of the firm. The first set of additional variables included is the presence of another affiliate as well as whether there is another divestiture or an acquisition. Column (4) shows results for measuring these at the country level, Column (5) at the regional level. Another divestiture robustly raises the probability of divestiture, but an acquisition elsewhere does not. This indicates that restructuring does not occur via shifting affiliates around, but by generally decreasing the number of affiliates. These are the first set of empirical results about global restructuring of a multinational without ignoring plant divestitures.

Replacing the dummy for the presence of another affiliate with the number of other affiliates does not change the result with respect to other acquisitions and divestitures, although the number of affiliates does not appear to matter for the divestment decision, only whether there remains a presence in a country. As a final check of the robustness of our central results, Columns (8) and (9) include both measures of relative size and both measures of the presence of other affiliates. Absolute affiliate size remains robustly positively correlated with divestiture, relative size negatively. Divestiture still begets divestiture, but acquisition elsewhere does not.

In Table 6, we successively add other firm, industry and country level variables. The basic variables that proved robust in the previous set of results is included every time. For the variables that can be computed at either the regional or the country level, the latter was chosen. None of the results would change if we instead chose the regional level ones.

The degree of internationality is negatively correlated with divestiture, as expected, although it is not consistently statistically significant.[12] The industry level variables, on the other hand, do not show any significance. This could be because there is less variation at that level. Including the regulation measure (in Column (3)) reduces the number of observations significantly, since it is only available for OECD countries, eliminating most developing countries from the sample. Since it also turns out to be statistically insignificant, as in Alvarez and Görg (2009), indicating no major

[12] Including instead or additionally the square of this variable also does not affect the results and does not produce consistent statistical significance either.

impact of concentration on divestiture, we omit it in subsequent regressions.

Country level variables show some statistical significance. When they are included, standard errors are adjusted for clustering. Divestitures are somewhat less likely in larger markets. Greater openness to trade weakly appears to raise the likelihood of an affiliate sale, although replacing this variable with a market access measure results in no significance of the coefficient. Other country characteristics, including capital and labor endowments, results of which are not shown for space reasons, are not statistically significant.

In Table 7, regressions (1)-(3) include various types of fixed effects. Naturally, when we include these, we have to omit some variables. For example, the inclusion of country fixed effects in column (1) necessitates the omission of all country level variables as we have no time variation in the sample. Nonetheless, all prior results hold. Likewise, the inclusion of industry or region fixed effects changes none of the basic results, making us confident of their robustness. Finally, regression (4) includes an additional dummy for the firm that has the most affiliate divestitures in the sample. While this weakens some results, for example other divestitures are no longer significant, many of the results hold up. In particular, the absolute and relative affiliate size remain significant with their signs as predicted from the model.

6 Conclusion

In this paper, we have studied the decision of a multinational firm to close or divest a foreign plant. We drew on conclusions from a straightforward model building on Berg et al (2012) in which the primary motive to divest an affiliate is to finance other investments in the network of the MNC.

Using data on the global operations of Swedish MNCs, we were able to analyze the divestiture decision in the context of firms' complex location strategies that involve all possible locations. This is in contrast to the existing literature that has focused on firm operations in a single country to study the characteristics that affect the survival probability of plants.

In line with conclusions from our model, we find that larger affiliates are more likely to be divested and these affiliates are small relative to the other operations of the firm in the same country or region. These two results show that transaction costs matter and exit from a market is the product of a complex restructuring effort within the multinational. Furthermore, our results indicate that affiliates of more productive, more internationally engaged MNCs are less likely to be divested. The latter may be explained by the fact that having access to a large production network makes MNCs less vulnerable to negative shocks.

Our findings suggest that a number of country characteristics matter. Affiliates are more likely to be sold in small markets and in those with low GDP per capita. The finding that a higher level of education increases the odds in favor of divestments may be due to this measure acting as a proxy for labor costs, which negatively affect plant operations. Better access to foreign markets reduces the probability of divesting, as expected, and in accordance with the observation that MNCs account for a large share of global trade.

There are important and novel policy implications from the results. The lack of evidence on

the footloose nature of multinational firms suggests that successful efforts by countries to attract them may be a good long-run strategy. The importance of foreign market access underscores the importance of complementary policies, i.e. not only those focused on investment, but also on trade. Finally, it is in countries' best interest to attract experienced multinationals with large international networks as they are more likely to weather negative shocks.

While we have linked plant divestiture to a large number of plant, firm, industry and country characteristics, there are several extensions of this work that are worth pursuing. Firstly, the model can be extended to more than two affiliates to address synergies or network effects. Secondly, in the empirical part one could link divestiture to firm characteristics and the firm's affiliate network in prior years. This is in principle doable as the survey of Swedish MNCs has been carried out every few years since 1965. However, only a subset of the responding firms in 2003 were surveyed in earlier years, and similarly, a number of firms that were surveyed earlier are not in the 2003 sample. Thus, the sample size for such an exercise will be somewhat smaller.

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Table 1: List of Countries by Region

Western Europe	Major Non-European OECD Countries	Former Eastern Europe and Russia	South and Central America	Africa	Asia and Pacific
Belgium	USA	Poland	Argentina	South Africa	Saudi Arabia
France	Canada	Czech Republic	Brazil	Namibia	Bahrain
Italy	Japan	Slovakia	Chile	Botswana	Israel
Netherlands	Australia	Hungary	Colombia	Zimbabwe	India
Germany	New Zealand	Romania	Bolivia	Zambia	Sri Lanka
Luxembourg		Bulgaria	Peru	Tanzania	Thailand
United Kingdom		Slovenia	Uruguay	Kenya	Vietnam
Ireland		Croatia	Venezuela	Ghana	Malaysia
Denmark		Bosnia & Herzegovina	Paraguay	Morocco	Singapore
Spain		Yugoslavia	Mexico	Egypt	Indonesia
Portugal		Serbia & Montenegro			Philippines
Greece		Estonia			Brunei
Finland		Latvia			China
Austria		Lithuania			Taiwan
Switzerland		Russian Federation			Hong Kong
Norway		Ukraine			South Korea
Turkey		Kazakhstan			
Cyprus					
Malta					

Table 2: List of Industries

SNI92	Industry
10	Mining and quarrying of energy producing materials
15	Food products
17	Textile
18	Wearing apparel, fur
19	Tanneries, luggage, handbags, footwear etc.
20	Wood and products of wood, cork, cane etc. , except furniture
21	Pulp, paper and paper products
22	Publishers and printers, recorded media
24	Chemicals and chemical products
25	Rubber and plastic products
26	Other non-metallic mineral products
27	Basic metals
28	Fabricated metal products, except machinery and equipment
29	Machinery and equipment
32	Radio, television and communication equipment and apparatus
33	Medical, precision and optical instruments, watches and clocks
34	Motor vehicles, trailers and semi-trailers
36	Furniture
45	Construction
51	Wholesale and retail trade
85	Health and social work establishments

Table 3: Summary Statistics and Expected Signs

	Expected Sign	Unit	Mean	Median	Standard Deviation
Dependent Variable					
Divest (Affiliate Divestiture)		dummy	0.067	0	0.250
Affiliate Characteristics					
Affiliate Size	+	employees, ln	4.328	4.248	1.531
Relative Size	- (given size)	ln	-0.875	-0.896	1.353
Size Share (Country)	- (given size)		0.403	0.203	0.404
Size Share (Region)	- (given size)		0.122	0.017	0.250
Firm Characteristics					
Other Affiliate (Country)		dummy	0.762	1	0.426
Other Affiliate (Region)		dummy	0.928	1	0.259
Number of Other Affiliates (Country)		count	5.647	3	6.854
Number of Other Affiliates (Region)		count	37.24	22	36.81
Other Acquisition (Country)		dummy	0.408	0	0.492
Other Acquisition (Region)		dummy	0.735	1	0.441
Other Divestiture (Country)		dummy	0.233	0	0.423
Other Divestiture (Region)		dummy	0.446	0	0.497
Degree of Internationalization		share foreign sales	0.707	0.749	0.209
Labor Productivity		see text	1.111	0.951	1.082
Industry Characteristics					
Sunk Costs	-	see text	1,030	836.8	551.3
Regulation		see text	0.100	0.101	0.036
Country Characteristics					
GDP		Real $, ln	13.20	13.32	1.488
Trade Openness		trade/GDP, ln	4.128	4.065	0.541
Market Access		see text	26.73	27.10	1.873
Skill		years school, ln	-0.720	-0.618	0.608
K-L Ratio		ln	10.97	11.29	0.782

Table 4: Means of Characteristics for Retained and Divested Affiliates

	Country			Region			Global		
	Retained	Divested	Diff	Retained	Divested	Diff	Retained	Divested	Diff
Affiliate Characteristics									
Affiliate Size							4.263	5.199	0.936**
Relative Size							-0.906	-0.462	0.444**
Size Share	0.409	0.328	-0.081*	0.127	0.060	-0.067**			
Firm Characteristics									
Other Affiliate	0.751	0.918	0.167**	0.926	0.945	0.019			
Number of Other Affiliates	5.527	7.318	1.791**	36.09	53.23	17.14**			
Other Acquisition	0.400	0.518	0.118*	0.726	0.873	0.147**			
Other Divestiture	0.214	0.500	0.286**	0.417	0.855	0.438**			
Degree of Inernationalization							0.707	0.743	0.036
Labor Productivity							1.123	0.944	-0.179**
Industry Characteristics									
Sunk Costs							1,027	1,082	55
Regulation							0.100	0.104	0.004
Country Characteristics									
GDP							13.20	13.18	-0.02
Trad Openness							4.124	4.187	0.063
Market Access							26.74	26.58	-0.16
Skill							-0.725	-0.654	0.071
K-L Ratio							10.96	11.01	0.05

Notes: Variables as defined in the text. An empty cell indicates that the level of (dis-)aggregation is not applicable. For example, there is no country and regional detail on size. A *, ** indicate that the means are statistically significantly different from each other at least with a p-value of 0.10 and 0.05, respectively.

Table 5: Probits of Plant Divestiture on Basic Affiliate and Firm Characteristics

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Affiliate Size	0.051***	0.031***	0.034***	0.046***	0.045***	0.043***	0.045***	0.045***	0.047***
	(0.008)	(0.004)	(0.005)	(0.008)	(0.009)	(0.008)	(0.009)	(0.008)	(0.010)
Relative Size	-0.032***			-0.027***	-0.026***	-0.025***	-0.025**	-0.029***	-0.020*
	(0.008)			(0.009)	(0.010)	(0.008)	(0.010)	(0.010)	(0.011)
Size Share		-0.064***						0.032	
(Country)		(0.018)						(0.034)	
Size Share			-0.186**						-0.186***
(Region)			(0.073)						(0.063)
Other Affiliate				0.051**				0.071**	
(Country)				(0.021)				(0.030)	
Other Acquisition				-0.008		0.001		-0.001	
(Country)				(0.013)		(0.014)		(0.014)	
Other Divestiture				0.053***		0.066***		0.061***	
(Country)				(0.014)		(0.015)		(0.015)	
Other Affiliate					-0.049				-0.151***
(Region)					(0.032)				(0.042)
Other Acquisition					0.009		0.003		-0.004
(Region)					(0.019)		(0.019)		(0.019)
Other Divestiture					0.111***		0.103***		0.101***
(Region)					(0.017)		(0.017)		(0.017)
Number Oth. Aff.						-0.0003		-0.0004	
(Country)						(0.001)		(0.001)	
Number Oth. Aff.							0.000		-0.000
(Region)							0.000		0.000
Observations	1,559	1,559	1,559	1,559	1,559	1,559	1,559	1,559	1,559
Pseudo R^2	0.07	0.07	0.08	0.11	0.15	0.10	0.15	0.11	0.17

Notes: Standard errors are computed using the delta method (in parentheses). *, **, *** denote significance at the 10%, 5%, 1% level, respectively.

Table 6: Probits of Plant Divestiture on Affiliate, Firm, Sector and Country Characteristics

	(1)	(2)	(3)	(4)	(5)	(6)
Affiliate Size	0.051***	0.054***	0.056***	0.058***	0.061***	0.060***
	(0.009)	(0.009)	(0.012)	(0.011)	(0.010)	(0.011)
Relative Size	-0.032***	-0.036***	-0.041***	-0.037***	-0.040***	-0.042***
	(0.010)	(0.010)	(0.012)	(0.011)	(0.011)	(0.011)
Other Affiliate	0.056**	0.058**	0.055*	0.068***	0.062**	0.089***
(Country)	(0.023)	(0.023)	(0.033)	(0.023)	(0.024)	(0.029)
Other Acquisition	-0.009	-0.007	0.013	0.011	0.016	0.014
(Country)	(0.014)	(0.014)	(0.018)	(0.013)	(0.015)	(0.015)
Other Divestiture	0.054***	0.055***	0.059***	0.053***	0.057***	0.056***
(Country)	(0.014)	(0.014)	(0.018)	(0.014)	(0.015)	(0.015)
Degree of Inter-	-0.051	-0.070*	-0.121***	-0.052	-0.064*	-0.063
nationalization	(0.034)	(0.036)	(0.046)	(0.039)	(0.038)	(0.041)
Labor Product.	-0.009	-0.012	-0.011	-0.009	-0.010	-0.019
	(0.006)	(0.008)	(0.020)	(0.006)	(0.008)	(0.013)
Sunk Costs		-0.000	-0.000	-0.000	-0.000	-0.000
		(0.000)	(0.000)	(0.000)	(0.000)	0.000
Regulation			0.248			
			(0.258)			
GDP				-0.012*	-0.013*	-0.019***
				(0.007)	(0.008)	(0.006)
Trade Openness				0.023	0.032*	
				(0.017)	(0.010)	
Market Access						-0.005
						(0.004)
Skill				0.012	0.027*	0.015
				(0.013)	(0.015)	(0.016)
K-L Ratio					-0.018	-0.005
					(0.012)	(0.014)
Observations	1,526	1,525	1,056	1,518	1,420	1,339
Pseudo R^2	0.11	0.11	0.11	0.13	0.13	0.13

Notes: Standard errors are computed using the delta method (in parentheses).
*, **, *** denote significance at the 10%, 5%, 1% level, respectively.

Table 7: Probits of Plant Divestiture on Characteristics - Unobserved Heterogeneity

	(1)	(2)	(3)	(4)
Affiliate Size	0.058***	0.069***	0.059***	0.032***
	(0.010)	(0.015)	(0.011)	(0.008)
Relative Size	-0.037***	-0.050***	-0.039***	-0.015*
	(0.010)	(0.015)	(0.011)	(0.009)
Other Affiliate	0.067***	0.083**	0.092***	0.065**
(Country)	(0.024)	(0.028)	(0.029)	(0.025)
Other Acquisition	0.027**	0.014	0.019	0.017
(Country)	(0.013)	(0.016)	(0.015)	(0.015)
Other Divestiture	0.042***	0.033**	0.056***	0.014
(Country)	(0.015)	(0.015)	(0.015)	(0.017)
Degree of Inter-	-0.060*	-0.203***	-0.059	-0.156***
nationalization	(0.037)	(0.057)	(0.040)	(0.037)
Labor Productivity	-0.011	0.001	-0.017	-0.031*
	(0.008)	(0.021)	(0.012)	(0.018)
Sunk Costs	-0.000		-0.000	0.000*
	(0.000)		(0.000)	(0.000)
GDP		-0.017***	-0.022***	-0.013**
		(0.006)	(0.006)	(0.006)
Market Access		-0.006	-0.004	-0.003
		(0.004)	(0.006)	(0.004)
Skill		0.013	0.030*	0.019
		(0.016)	(0.017)	(0.016)
K-L Ratio.		-0.000	-0.005	-0.003
		(0.013)	(0.014)	(0.013)
Country Fixed Effects?	Yes	No	No	No
Industry Fixed Effects?	No	Yes	No	No
Region Fixed Effects?	No	No	Yes	No
Most Exits Fixed Effect?	No	No	No	Yes
Observations	1,523	1,340	1,339	1,339
Pseudo R^2	0.17	0.18	0.15	0.18

Notes: Standard errors are computed using the delta method (in parentheses).
*, **, *** denote significance at the 10%, 5%, 1% level, respectively.

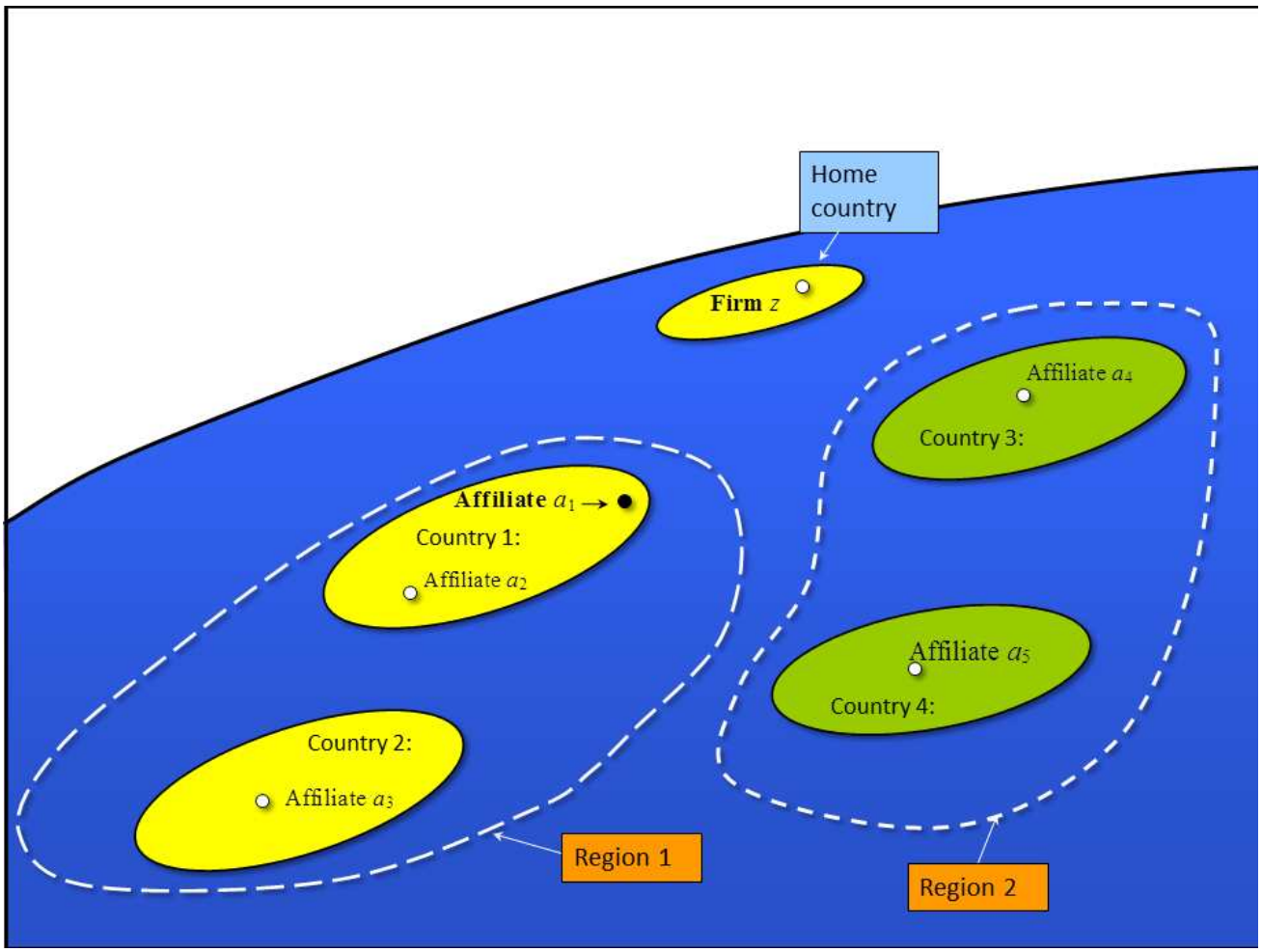

Figure 1: A firm's network of affiliates over countries and regions.

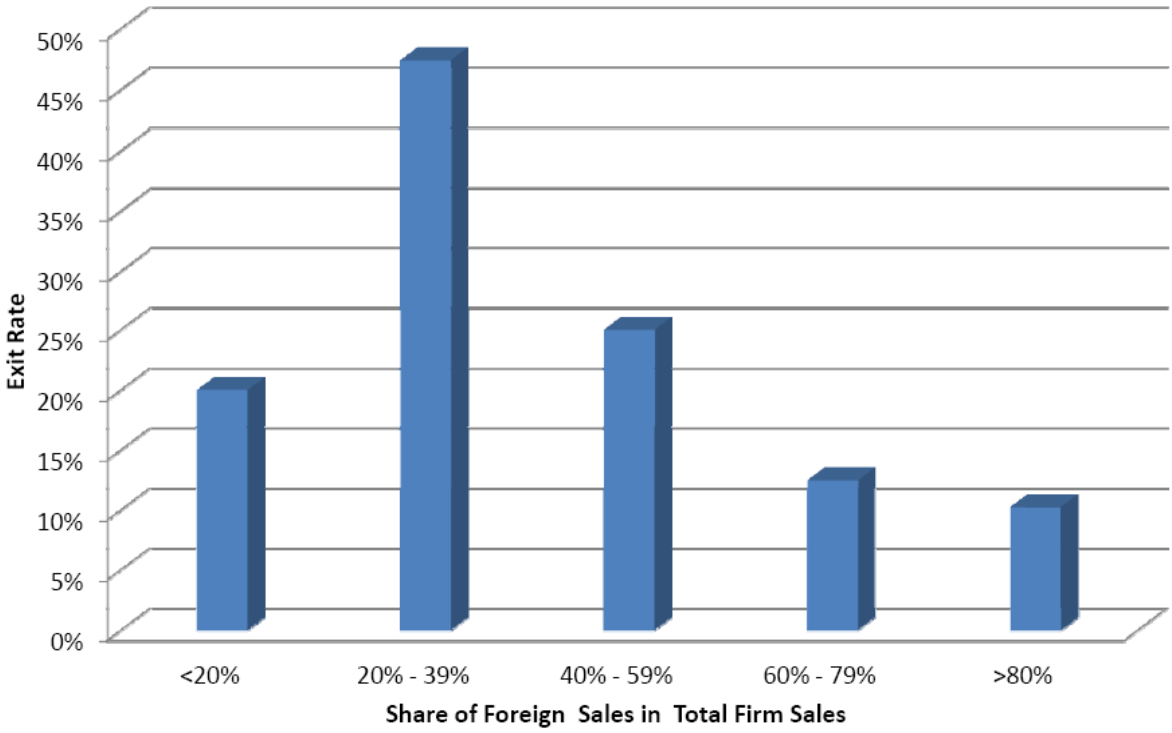

Figure 2: Divestiture and degree of internationalization

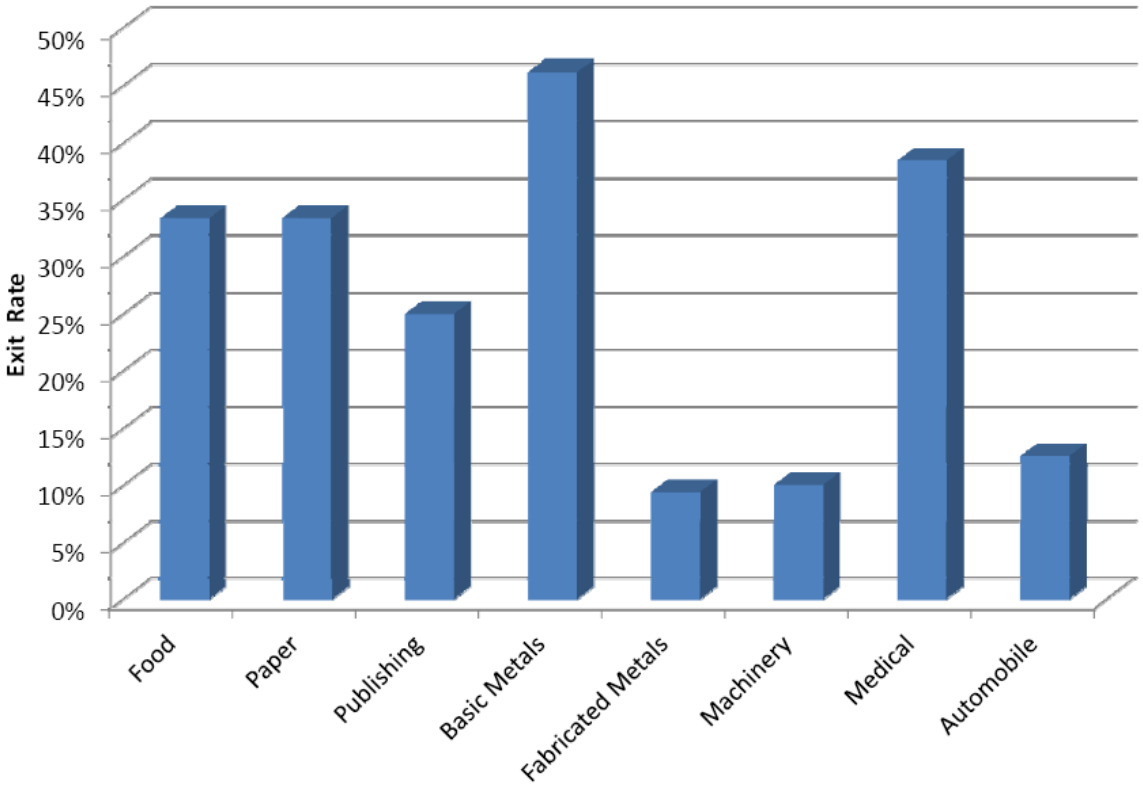

Figure 3: Divestiture by industry

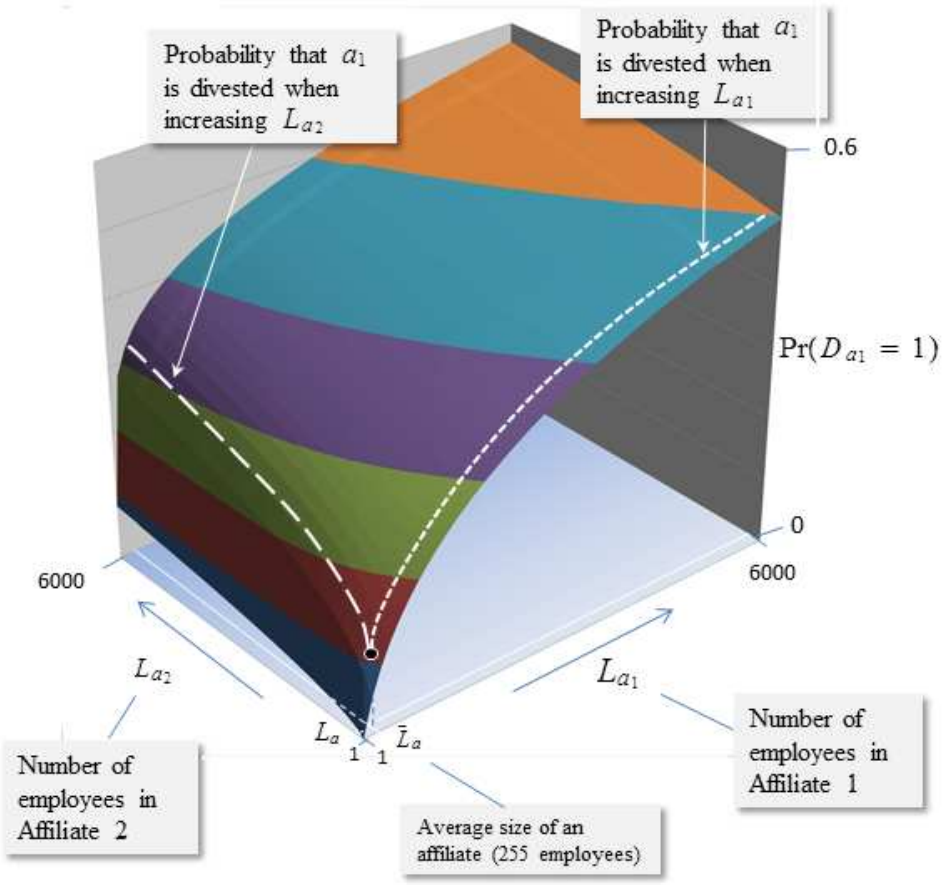

Figure 4: Divestiture and size