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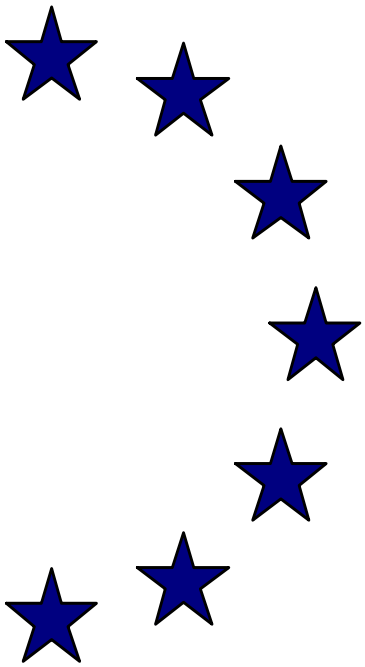

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CROSS-BORDER MERGERS & ACQUISITIONS AND THE ROLE OF TRADE COSTS

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Abstract

Cross-border mergers and acquisitions (M&As) have increased dramatically over the last two decades. This paper analyses the role of trade costs in explaining the increase in both the number and the value of cross-border mergers and acquisitions. In particular, we distinguish horizontal and non-horizontal M&As and investigate whether distance and trade policy barriers affect these two types of mergers differently. We analyse this question using industry data for 23 OECD countries for the period 1990-2001. Our findings suggest that while in the aggregate trade costs affect cross-border merger activity negatively its impact differs importantly across horizontal and non-horizontal mergers. The impact of trade costs is less negative for horizontal mergers, which is consistent with the tariff-jumping argument.

Keywords: mergers and acquisitions, international trade, trade costs, gravity, FDI

JEL: F02, F15, F21, F23

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Non-technical summary

Cross-border mergers and acquisitions (M&As) have increased dramatically over the last two decades. Given this rapid increase, fully understanding the determinants and implications of mergers and acquisitions has been high on the agenda for both policy makers as well as academics.

Traditionally, much of the FDI activity, be it M&As or greenfield investment, has been explained by the "tariff jumping" argument. This explanation for FDI posits that exporting and investing abroad are substitutes, and as trade costs increase (making exporting more costly), firms are more likely to choose investing abroad. More recently, studies focussing more on the industrial organisation aspect of firm behaviour, have provided alternative views. In these models, it is found that high trade costs do not necessarily induce foreign M&As, contrary to the tariff jumping argument.

These theoretical models implicitly relate to horizontal mergers, i.e., mergers between firms in the same industry. However, empirically much of international M&A activity involves mergers between firms in different industries, that is, vertical and/or conglomerate mergers. For such M&As predictions about horizontal mergers may not be straightforwardly applicable. This observation is one of the starting points for our paper.

We use micro level data on merger deals, which we aggregate to the industry level to study explicitly the impact of trade costs and impediments to trade and investment on M&As, paying particular attention to differences between horizontal and non-horizontal mergers. Horizontal M&As are defined as mergers between firms within the same industry, whereas non-horizontal M&As are defined as mergers between firms in different industries. Our data provide detailed information on the number and value of international merger deals for a number of OECD countries over the period 1990 to 2001.

The role of trade costs in determining international exchanges of capital and goods is far from negligible despite an increasingly globalised world. Hence, an analysis of the impact of trade costs on international merger activity is interesting not only from an academic point of view, but may also provide valuable information for policy makers.

In order to take account of the effects of trade impediments on cross-border M&As we consider two different types of measures of barriers to trade. The first one is the distance between the two countries; a variable commonly employed in gravity models of trade and investment. Apart from distance we also analyse the impact of trade policy on cross-border M&A via its impact on trade costs. We use detailed data on applied protection based on bilateral ad valorem equivalent data at the industry level.

The results suggest that distinguishing empirically between horizontal and non-horizontal M&As brings to the fore a number of differences in the determinants between the two types of mergers. While in the aggregate trade costs affect cross-border merger activity negatively its impact is significantly less pronounced for horizontal mergers than for non-horizontal mergers. Hence, treating heterogeneous mergers as a homogenous group at the country level may potentially bias results and lead to unreliable conclusions to be drawn from such estimations. The less negative effect on horizontal mergers provides support to the tariff jumping argument put forward in the literature on the determinants of horizontal FDI.

Our findings have important policy implications. The main findings in the paper that cross-border M&A respond negatively to trade costs in the aggregate and that the share of horizontal M&A increases in the level of trade costs provide an additional rational for free trade. To the extent that horizontal mergers are less likely to be associated with productivity spillovers and more likely with anticompetitive behaviour up freeing up trade not only increases the level of inward investment but also its composition in a way that is likely to benefit the economy. The trade regime might thus have important implications for attracting inward investment in terms of M&As, an issue that should be recognised by governments wishing to attract foreign investment in order to benefit from technology and spillovers.

1. Introduction

Cross-border mergers and acquisitions (M&As) have increased dramatically over the last two decades. In 1999, the value of completed cross-border M&As was around $720 billion. The value of all M&As, both cross-border and domestic, amounted to an equivalent of 8 percent of world GDP in the same year. For comparison, in 1980 this ratio was merely 0.3 percent (UN 2001). Also, over that period, most of the growth in foreign direct investment flows (FDI) has been attributed to M&As rather than greenfield investment (UN 2001). Given this rapid increase, fully understanding the determinants and implications of mergers and acquisitions has been high on the agenda for both policy makers as well as academics.

Traditionally, much of the FDI activity, be it M&As or greenfield investment, has been explained by the "tariff jumping" argument. In a nutshell, this explanation for FDI posits that exporting and investing abroad are substitutes, and as trade costs increase (making exporting more costly), firms are more likely to choose investing abroad.[1]

More recently, studies focussing more on the industrial organisation aspect of firm behaviour, have provided alternative views. Horn and Persson (2001) and Norbäck and Persson (2004) provide theoretical models where foreign firms may acquire domestic acquisition targets, with the acquisition price being determined endogenously in a bargaining process. In these models, they find that high trade costs do not necessarily induce foreign M&As, contrary to the tariff jumping argument.

Tekin Koru (2004) takes this issue further by providing an explicit model where a foreign firm chooses between M&A, greenfield investment or exporting as a means of foreign market entry. The acquisition price is again determined endogenously, similar to the models above. She shows theoretically that increases in trade costs may make M&As more costly vis-à-vis greenfield investment or exporting. She also shows empirically, using firm level data for Swedish firms that trade costs are negatively related to the choice of M&As as opposed to greenfield or exporting.

[1] For example, Markusen's (2002) knowledge-capital model implies this prediction that high trade costs encourage horizontal FDI. See Brainard (1997), Carr et al. (2001), and Blonigen et al. (2003) for evidence in line with this argument.

It is worthy of note that these IO models implicitly relate to horizontal mergers, i.e., mergers between firms in the same industry. However, empirically, as we show in Section 2, much of international M&A activity involves mergers between firms in different industries, that is, vertical and/or conglomerate mergers. Arguably, for such M&As predictions about horizontal mergers may not be straightforwardly applicable.[2] This observation is one of the starting points for our paper.

We use micro level data on merger deals, which we aggregate to the industry level to study explicitly the impact of trade costs and impediments to trade and investment on M&As, paying particular attention to differences between horizontal and non-horizontal mergers. Horizontal M&As are defined as mergers between firms within the same industry, whereas non-horizontal M&As are defined as mergers between firms in different industries. To the best of our knowledge, the present paper is the first to explicitly distinguish these two types of cross-border mergers. Our data, which provide detailed information on the number and value of international merger deals for a number of OECD countries over the period 1990 to 2001, come from the Thomson Financial Securities *Global Mergers and Acquisitions* database.[3]

That the role of trade costs in determining international exchanges of capital and goods are far from negligible despite an increasingly globalised world economy is made clear by Anderson and Van Wincoop (2004). They estimate that the tax equivalent of international trade costs for a typical industrial country is 74% (including domestic trade costs this rises to 170%). These consist of transportation costs (21%), tariff and non-tariff policy barriers (8%) and other border-related non-policy barriers (33%). Hence, an analysis of the impact of trade costs on international merger activity is interesting not only from an academic point of view, but may also provide valuable information for policy makers.

In order to take account of the effects of trade impediments on cross-border M&As we consider two different types of measures of barriers to trade. The first one is the distance

[2] As an illustration, the Markusen (2002) model arrives at different predictions for horizontal vs. vertical FDI in relation to trade costs and other variables.

[3] These data have been used in a limited number of recent studies that investigate specifically the determinants of international cross-border M&As (e.g., Di Giovanni, 2005, Bertrand et al., 2004). Di Giovanni (2005) uses M&A data at the country level. Bertrand et al. (2004) use industry level data but do not distinguish vertical and horizontal mergers. Also related to our work are empirical papers on the

between the two countries; a variable commonly employed in gravity models of trade and investment. Apart from distance we also analyse the impact of trade policy on cross-border M&A via its impact on trade costs. We use detailed data on applied protection based on bilateral ad valorem equivalent data at the industry level. These data are available from a new unique data set called Market Access Map (MacMap), developed jointly by the ITC (UNCTAD-WTO, Geneva) and CEPII (Paris).

Using explicit information on the level of applied protection on trade rather than just distance is interesting because the former explicitly relates to the cost of exporting unlike distance which may capture informational barriers in addition to pure trade costs (Portes and Rey, 2001). Thus, even when distance affects various types of cross-border mergers differently we can a priori not be sure whether this is due to the theoretical argument based on the interdependence between trade and FDI. Including explicit information on the trade policy stance should help to address this problem.

Moreover, using trade policy indicators of imports from the target country by the acquisition country in addition to those for imports from the acquisition country by the target country allows one to assess to what extent non-horizontal mergers reflect mergers of the vertical type, i.e. mergers that are motivated by the desire to exploit international differences in factor prices by moving the production of certain parts or components to affiliates abroad. Vertical mergers thus tend to be associated with imports by foreign affiliates in the target country that are subsequently re-exported to the home country. We therefore expect that vertical mergers are negatively affected by trade policy barriers in both the acquisition and the target country.

Finally, it may be useful for policy makers to realise that changes in the trade policy stance may not only affect the pattern of trade but also the level and composition of inward investment. Given the importance policy-makers have attached to attracting foreign multinationals this may be an important side-effect of trade policy worth taking into account.

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determinants of cross-border equity flows (portfolio investment), see, e.g., Portes and Rey (2005), Portes *et al.* (2001).

The results suggest that distinguishing empirically between horizontal and non-horizontal M&As brings to the fore a number of differences in the determinants between the two types of mergers. While in the aggregate trade costs affect cross-border merger activity negatively its impact is significantly less pronounced for horizontal mergers than for non-horizontal mergers. Hence, treating heterogeneous mergers as a homogenous group at the country level may potentially bias results and lead to unreliable conclusions to be drawn from such estimations.

The remainder of the paper is structured as follows. Section 2 describes the database on M&As and describes the pattern of merger activity in the data. In section 3 we develop a simple theoretical model of cross-border M&A. Section 4 introduces the empirical model, describes the variables and discusses the econometric methodology used to investigate the role of trade costs in explaining cross-border mergers. Section 5 presents and analyses the estimation results of the basic model. Section 6 extends the basic model to assess to what extent and how trade policy affects cross-border M&A through its impact on trade costs. Section 7 provides some conclusions.

2. Definitions and Patterns

Given the close link between the present paper, which focuses on cross-border M&A, and the FDI literature, which resolves to an important extent around the role of trade, it is worthwhile making clear to what extent cross-border M&A and FDI actually are one and the same phenomenon.

Firstly, cross-border M&A is typically considered to be a subset of FDI ranging from about 50% to 90% depending on the source that is consulted. The remainder of FDI is generally considered to be realised through greenfield investment. Thus, a majority of FDI tends to occur through cross-border M&A. Secondly, while thinking of cross-border M&A as simply a component of FDI may be useful, strictly speaking the relationship between cross-border M&A and FDI is much more complicated as is made clear in UNCTAD's *World Invest Report* for 2000, which is specifically dedicated to the issue of cross-border mergers and acquisitions. FDI, in contrast to cross-border M&A, solely refers to transactions between parents and affiliates. Cross-border M&A includes also investments that are financed via domestic and international capital markets. It is not always possible to trace the country from which these funds originate. Moreover, FDI refers to net

investments whereas M&A refer to gross transactions (acquisitions and divestments). Due to those differences, it is therefore well possible that cross-border M&A exceeds the documented value of FDI.[4]

Data on mergers and acquisitions originate from the Global Mergers and Acquisitions database included in Thomson Financial Securities. It is claimed that this dataset includes all domestic and cross-border mergers and acquisitions worldwide in excess of one million dollar. This dataset has been used relatively little in previous research, although a number of studies have used these data to analyse the nature of primarily domestic mergers (for example, Gugler et al. 2003). Manchin (2004) and Di Giovanni (2005) appear to be the only studies to have used these data to explicitly analyse patterns in aggregate cross-border mergers and acquisitions.

For the present analysis we use a fairly restrictive definition of M&A which excludes portfolio investment. More particularly, we include all M&As in which the acquirer obtains a majority interest in the target by either

- acquiring an interest of 50% or over in the target
- raising its interest from below to above 50%, or
- acquiring the remaining interest it does not already own.[5]

Moreover, we concentrate on announced rather than actual M&A. This allows us to analyse the desire to merge, which is not necessarily the same as actual mergers due to, for example, the impact of merger policy. A large merger may be desired and announced by the acquirer (and target) but the competition authority may not allow this transaction to go ahead. This instance would, however, still be recorded in the data. The vast majority of announced mergers is consummated though.

The database allows us to determine the main industry of the acquirer as well as of the target company. Hence, we can determine whether two firms within the same industry merge, or whether the merger takes place across industries. The former case is a standard

[4] The statistical difference between M&A and FDI explains why the literature on M&A pays more attention to its financial characteristics. However, in the present paper we will ignore the potentially important role of financial variables (see Giovanni, 2005).
[5] The analysis excludes minority stake acquisitions, repurchase programs, self-tender offers, recapitalisation, and exchange offers.

horizontal merger whereas the latter combines both vertical and conglomerate mergers. More specifically, horizontal M&A is defined as the activity of M&A that takes place within the same 4-digit US SIC industry. It is thereby assumed that 4-digit industries represent homogenous groupings of firms.[6] The main motivation to engage in horizontal cross-border M&A is market access. Non-horizontal mergers are those that take place across 4-digit industries.[7] The main question is to see whether horizontal and non-horizontal mergers are driven by different factors, and particularly to what extent horizontal and non-horizontal mergers behave differently in the presence of trade costs.

Table 1 summarises the number of deals and the average value of deals for different types of mergers over the 1990s. We distinguish between horizontal and non-horizontal transactions as well as between domestic and cross-border deals. When comparing cross-border M&A with domestic mergers a number of points can be made. First of all, the average value of cross-border transactions is substantially higher than that of domestic merger transactions. This may reflect the higher fixed cost associated with investment abroad.

Second, both in terms of the number of deals as well as their average value the relative importance of cross-border mergers in global merger activity is on the increase. The number of cross-border deals increased by 146% from 1990/1991 to 2000/2001, while the number of domestic deals increased by 116% over the same period. Also in terms of the value per merger the importance of cross-border merger activity has increased relative to domestic M&A. In particular, the average value of cross-border deals has increased by 18% relative to 12% for domestic deals. These findings on the development of the number

[6] Classifying horizontal and non-horizontal mergers on the basis of their 4-digit SIC code may in some cases be too restrictive as some 4-digit industries can be very similar. However, classifying mergers using at higher levels of aggregation is likely to contaminate the group of horizontal mergers with non-horizontal mergers. As our main focus is with horizontal mergers we prefer a conservative definition of horizontal M&A. Our measure horizontal M&A may also underestimate the importance of horizontal M&A in the context of multi-product firms. Unfortunately, we do not have any information in the data to satisfactorily resolve this issue.

[7] As regards non-horizontal M&As, vertical mergers are mergers that take place across 4-digit industries, and reflect mergers between firms that are related through buyer-supplier links. Conglomerate mergers also take place across 4-digit industries, but are not associated with input-output linkages. In order to distinguish these two types of mergers directly one would need detailed input-output tables for a large number of countries in our data, which we do not have available. However, using the Input-Output table for 1992 for the US, while assuming that these relationships are representative for the OECD as a whole, and combining the IO with bilateral trade data suggests that the actual number of vertical cross-border M&A is very small. This is also confirmed by Gugler *et al.* (2003) who suggest that most mergers across 4-digit industries are unrelated to input-output linkages.

and the value of cross-border deals are in line with the evidence provided by OECD (2001) and Di Giovanni (2005).[8]

Third, horizontal M&A accounts for about 42% of total global M&A.[9] However, the share of horizontal mergers in total cross-border M&A is substantially smaller (at 32%) than that of horizontal mergers in domestic M&A (45%). There may be a number of reasons for this. On the one hand, the scope for strategic behaviour within one's own industry may be limited at the international level as it may be more difficult to acquire market power. Hence, the possibility of strategic horizontal mergers may be restricted. On the other hand, non-horizontal mergers may be more frequent in an international context as the potential gains from diversification are expected to be larger thus encouraging conglomerate mergers, and more related to the theory on foreign direct investment, factor endowments and hence prices may differ across countries which makes it interesting to establish international production networks through vertical mergers (see Markusen, 2002).

Table 2 focuses solely on cross-border mergers, which are the main interest of this paper. It provides details on the number of deals by broad industrial category. Manufacturing is the largest acquiring industry, followed by the financial sector. The former is, also, by far the most important target industry for mergers. More precisely, manufacturing accounts for approximately 40% of cross-border acquirers and targets. The dominance of manufacturing in cross-border M&A may be explained by the strong pressure in developed economies to restructure its manufacturing activities due to increased foreign competition or technological progress. This dominance provides a justification for concentrating on manufacturing in the empirical part of this paper. Another reason to focus on this sector is that manufacturing is a traded sector, whereas other sectors are less tradable. Hence we would expect the role of trade costs to be most visible in manufacturing.

Table 3 reports the number of cross-border merger deals by region of origin of acquiring and target firms. The dataset distinguishes the following regions: Africa/Middle East

[8] UN (2000) does not report an apparent increase in the importance of cross-border M&A in total M&A either in terms of the number or their size. This difference results from the different starting point used in the World Investment Report (1987 rather than 1990). Di Giovanni (2005) reports larger total numbers, although the average values are similar to ours. This may be explained by the more restrictive definition of M&A employed in the present paper.

(AE), North America (AM), Asia-Pacific (AP), Europe (EU), Japan and South-East Asia (JP), and supranational (SN).[10] From the data it follows that by and large the majority of M&A activity occurs within the same geographic region. This is in line with the frequent finding that international investment, whether FDI, portfolio or M&A, decreases with distance (e.g, Carr et al., 2001, Portes and Rey, 2005; Di Giovanni, 2005). We also find, however, that a substantial amount of European firms acquire US firms and vice versa. Finally, it is apparent that most cross-border M&A take place between developed countries. Roughly, 70% of all cross-border deals involve only Europe and North-America. This number is likely to be even higher when looking at deal values.

3. A Simple Model of Cross-Border M&A

In this section we develop a simple theoretical model of cross-border M&A in order to provide a background for our empirical analysis below. The model is based on discrete choice theory and the dartboard model recently proposed by Head and Ries (2005). We extend their model by distinguishing between different types of cross-border M&A, namely horizontal and non-horizontal mergers.

The probability of a cross-border acquisition of a given unit in industry j and country l by a bidder in industry i and country k is denoted by π. The expected level of bilateral cross-border M&A, m, is then given by:

$$m_{ijkl} = \pi_{ijkl} Y_{jl} \tag{1}$$

where Y refers to the total number of assets available in industry j and country l. We assume that the valuation of potential targets is independently and identically distributed across bidders.[11] Everything else equal all bidders have an identical probability of winning a bid. We further assume that the number of bidders in each industry is proportional to the size of its industry. In a frictionless world, the probability of a firm in industry j in country l being acquired by a firm in industry i in country k is given by the share of the number of bidders in industry i and country k over the total number of bidders in the world.

[9] Gugler et el. (2003) provide very similar figures on the importance of horizontal M&A activity.
[10] Transactions involving supranational firms are not recorded in the same way as other transactions as such firms have no formal base country.
[11] This represents a strong departure from the theoretical M&A literature (Horn and Persson, 2001; Tekin-Koru, 2004) in which the price of the bid is endogenously determined in a bargaining game.

$$\pi_{ijkl} = \frac{Y_{ik}}{\sum_{i=1}^{I}\sum_{k\neq l}^{K} Y_{ik}} \tag{2}$$

As we are only interested in cross-border M&A in this paper we exclude the possibility of bidding on a firm in the same country.

In order to take account of transaction costs consider a firm g's private valuation, v^*, of a potential target, h,

$$v_{gh}^{*} = X_{gh}\beta + \varepsilon_{gh} \tag{3}$$

which is a function of observed, X, and unobserved characteristics, ε. The last term is a random term with Type I Extreme Value distribution with cumulative distribution function: $CDF(\varepsilon) = \exp[-\exp(-\varepsilon)]$. The error term refers to the base valuation in a frictionless world (Head and Ries, 2005).

In a world where frictions are important the valuation of the firm will be dependent on transaction costs. However, the role of transaction costs on its private valuation depends on the objective a potential take-over is supposed to fulfil, i.e., whether it is a horizontal or a non-horizontal cross-border merger. Transaction costs can play a role in different ways. There may be informational barriers which increase the cost of transaction and thereby reduce a firm's private valuation (Portes and Rey, 2005). Though there does not seem any reason to believe that informational barriers affect horizontal and non-horizontal mergers differently.

However, transaction costs in the form of trade costs may also affect the relative attractiveness of alternative modes of entry such as exports and greenfield investment, and thereby affect the desire to engage in M&A. For the moment, we solely concentrate on the relationship between trade and M&A, and assume that M&A and greenfield investment are independent. The latter assumption is admittedly quite restrictive, but allowing for this interdependence is beyond the scope of this paper. Theoretical contributions emphasising

the interdependence of those two modes of entry are provided by Ferret (2003) and Nocke and Yeaple (2004).

A horizontal merger is typically assumed to be driven by market access considerations as such mergers may be seen as an alternative to supplying a foreign market through exports. In the FDI literature it is generally asserted that the incentive for a profit-maximising firm to engage in a horizontal merger increases in the level of trade costs (Markusen, 2002; Brainard, 1997).[12] However, Horn and Persson (2001) show that this is not necessarily the case in the presence of pre-emptive domestic mergers when the acquisition price is determined endogenously in a bargaining process.[13]

To the extent that mergers across different industries are driven by vertical linkages, mergers facilitate the development of international production networks and are likely to complement trade in a way similar to (vertical) greenfield investment (Markusen, 2002). Trade costs reduce the cost-saving potential of vertical mergers provided by international factor price differences. However, as stated in the previous section the actual number of cross-industry mergers driven by input-output linkages is likely to be very small in practice. The majority of cross-industry mergers are likely to represent conglomerate deals which cannot be assumed to be related to trade costs in any systematic way.

Thus, we assume that a firm's private valuation depends on transaction costs, either in the form of informational barriers or trade costs. However, we only expect a differential effect of trade costs across horizontal and non-horizontal mergers. A firm will adjust its private valuation by:

$$-(\alpha_1 \ln \tau_{kl} - \alpha_2 \sigma \ln \tau_{kl}) \qquad (4)$$

where α_1 refers to the impact of transaction costs for non-horizontal mergers, particularly informational barriers but possibly also trade costs when the merger is motivated by vertical linkages. The second term represents an interaction term between the share of

[12] We would expect the same if the merger were intended for establishing an export platform for exports to third countries, While such an option is not included in the standard theories of vertical and horizontal FDI (e.g., Markusen, 2002), it has recently been analysed by Ekholm et al. (2004).
[13] See also Norbäck and Persson (2004) and Tekin-Koru (2004) for related arguments.

horizontal mergers over the total number of cross-border mergers, σ, times the level of bilateral transaction costs, τ. The second term thus gives the differential impact of trade costs across horizontal and non-horizontal mergers. A priori we would expect this to be positive under the "tariff jumping" argument, albeit Horn and Persson (2001) argue that this does not necessarily need to be the case. The total impact of transaction costs on a bid leading to horizontal M&A (for $\sigma=1$) is given by $-\alpha_1+\alpha_2$.

In order to operationalise the model we utilise the insights of MacFadden (1974), who demonstrated that the probability that a target will yield an investor the highest profits within its choice set is given by the logit expression:[14]

$$\frac{\exp[-(\alpha_1-\alpha_2\sigma)\ln\tau_{kl}]}{\sum_{i=1}^{I}\sum_{k\neq l}^{K}\exp[-(\alpha_1-\alpha_2\sigma)\ln\tau_{kl}]} \tag{5}$$

Since all bidders have an equal probability of procuring the bid the aggregate probability of any firm in industry i of country k taking over the firm in industry j in country l as:

$$\pi_{ijkl}=\frac{Y_{ik}/\tau_{kl}^{(\alpha_1-\alpha_2\sigma)}}{\sum_{i=1}^{I}\sum_{k\neq l}^{K}Y_{ik}/\tau_{kl}^{(\alpha_1-\alpha_2\sigma)}} \quad \text{if } -(\alpha_1-\alpha_2\sigma)\ln\tau_{kl}+\varepsilon>a \tag{6}$$

For a cross-border merger to actually occur the highest bid needs to be profitable: $-(\alpha_1-\alpha_2\sigma)\ln\tau_{kl}+\varepsilon>a$ which states that the winning bid should exceed the level of expected additional earnings, a. In the present model the presence of transactions costs explains why it is possible to observe no cross-border merger activity across two industries.

The expected number of bilateral cross-border M&A is then given by substituting (6) in equation (1):

[14] Strictly speaking this is only true if, and only if, ε, is distributed as a Type I Extreme Value independent random variable.

$$m_{ijkl} = \frac{\rho_l Y_{ik} Y_{jl}}{\tau_{kl}^{(\alpha_1 - \alpha_2 \sigma)}} \tag{7}$$

where $\rho_l = 1/(\sum_{i=1}^{I}\sum_{k \neq l}^{K} Y_{ik} / \tau_{kl}^{(\alpha_1 - \alpha_2 \sigma)})$. Head and Ries (2005) label ρ the bid potential, which is essentially an index of proximity of bidding teams for a given unit in industry *j* and country *l*. This measure corresponds to the measure of remoteness sometimes used in the trade and geography literature when we assume that $\alpha_1 - \alpha_2 \sigma = 1$ (Helliwell, 1998).

4. Empirical Methodology

Having established in a simple theoretical set-up that trade costs may affect horizontal and non-horizontal mergers in different ways, we now present the empirical model, describe the variables and the data sources used for the analysis, and discuss the econometric methodology.

Empirical Model and Data

Given the multiplicative nature we log-linearise equation (7) to obtain the following estimable model of cross-border mergers (*m*) of acquirers in industry *i* in country *k* with target in industry *j* in country *l* at time *t*:[15]

$$\ln m_{ijklt} = \alpha_0 + \alpha_1 \ln Y_{ikt} + \alpha_2 \ln Y_{jlt} - \alpha_3 \ln \tau_{klt} + \alpha_4 \sigma \ln \tau_{klt} + \alpha_5 \ln \rho_l + D_t + \varepsilon_{ijklt} \tag{8}$$

where *Y* is the economic size of the industry in each country (measured in terms of value-added obtained from OECD STAN database), ρ is an indicator of bid potential for country *l*, τ is a proxy for transaction costs and $\sigma \ln \tau$ the interaction term between the share of horizontal mergers over total mergers and transaction costs. In addition, we also include a full set of time dummies *D* in order to control for global macro-economic influences and asset market bubbles. Initially, we use distance, δ, as a measure of transaction costs.

[15] This effectively represents a standard gravity model applied to cross-border M&A. Gravity models have had a long history in the empirical analysis of trade flows and, more recently, have also become popular in the analysis of foreign direct investment flows (e.g., Carr et al., 2001), equity capital flows (Portes and Rey, 2005) and M&A activity (e.g., Di Giovanni, 2005). While gravity models based on general equilibrium theory (Carr *et al.,* 2001) are conducted at the country level, the present analysis essentially adopts a partial equilibrium approach as it is conducted at the industry level.

Subsequently, we extend the analysis by adding bilateral data on the level of applied protection between country *k* and *l* in industry i,τ.[16]

In a trade context distance has been interpreted as a measure of trade costs consisting of both trade restrictions and transportation costs. Recently, Portes and Rey (2005) show using data on bilateral telephone traffic that informational barriers are important in determining cross-country capital flows. Consequently, assuming that informational barriers to investment increase in distance, it may also proxy for informational barriers. As noted before, there seems no reason to assume that informational barriers affect horizontal and non-horizontal mergers differently. However, distance may also proxy for trade costs. Thus, while the impact of distance for the volume of trade and non-horizontal mergers is unambiguously negative, its impact on horizontal M&A is ex ante unclear. Data on distance are obtained from CEPII.

Apart from distance, we also include a variable as a proxy for the bid potential for the target country. This variable can also be interpreted as a measure of remoteness (Helliwell, 1998; Head, 2003). Remoteness captures the set of alternative locations from which a country may import. The availability of nearby alternatives is important as it reduces its dependence on a particular closely located exporting country. For instance the amount of trade between Australia and New Zealand is likely to be much larger than that between two countries in continental Europe with similar sizes and distance. Consequently, ignoring this source of heterogeneity may bias estimates for distance, one of our key variable of interest.

Following the theoretical model, the bid potential is defined analogously to remoteness in Head (2003) as $\rho_l = 1/(\sum_{i=1}^{I}\sum_{k\neq l}^{K} Y_{ik} / \tau_{kl})$. Rather than using output-weighted trade costs we use the inverse of the trade costs-weighted industry size which drives the size of far away countries to insignificance. Generally, we would expect that the higher the bilateral trade costs between target country *l* and potential investing countries *k* compared to that between country *l* and country *m*, the higher will be the probability that a firm in country

[16] We do not include bilateral country-partner fixed effects in the estimation. This is mainly because we are interested in the coefficient on distance, which is a country-partner time invariant variable and would not be

m will make an acquisition in country *l*. As we implicitly assumed here that $\alpha_1 - \alpha_2\sigma = 1$ we also experiment with interacting the share of horizontal mergers with the bid potential as our model suggests that the role of bid potential varies with the type of merger. Specifically, we expect the impact of the bid potential to be more positive for non-horizontal than for horizontal M&A.

Finally, we extend the basic gravity model to see to what extent policy affects cross-border M&A through its impact on trade costs. The most obvious way to address this question is by including trade policy variables in the form of tariffs. More specifically, we use bilateral tariff at the sectoral level to measure the tariff rate to which exports of good *i* from country *k* to country *l* are subjected. Adding tariffs as an explicit proxy for trade costs allows one to assess to what extent the differential effect of distance on horizontal and non-horizontal mergers is indeed driven by the presumed interdependence of trade and horizontal M&A. In order to assess to what extent non-horizontal mergers are associated with re-exports back home we also include a tariff variable to measure the level of protection on good *i* from country *l* to country *k*.

Data on the bilateral level of applied protection are obtained from a new dataset called Market Access Map (MAcMap), developed jointly by ITC (UNCTAD-WTO, Geneva) and CEPII (Paris).[17] It provides detailed information on highly disaggregated bilateral applied tariff duties. The tariff data represent equivalent *ad valorem* tariffs taking into account *ad valorem* and non *ad valorem* tariffs, quotas, antidumping measures and preferential trade agreements. For a detailed description of this dataset see Bouët et al. (2004). As these data are only available for the year 2000 we assume that the level of protection is constant throughout the sample period.

We estimate the model using data for 23 OECD countries and 19 manufacturing industries for the period 1990-2001. In order to enhance the manageability of the dataset we use 2-year averages except for the last year. This gives us 23 source countries * 22 target

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estimated if fixed effects were included. To the extent that country-partner effects are important, they should be captured by the distance variable.

[17] The MAcMap database differs from the TRAINS database provided by UNCTAD by its more comprehensive treatment of preferential trade agreements and by proposing ad valorem equivalent calculations. It thus provides a unique resource that is well equipped to the analysis of applied protection at the disaggregated level.

countries * 19 source industries * 19 target industries * 6 periods = 1,095,996 observations. The actual number of observations in the dataset is somewhat smaller due to the presence of missing values in the OECD STAN data. In order to analyse the impact of the right-hand side variables on different types of cross-border mergers we interact them with the share of horizontal mergers in total mergers.[18]

Econometric Issues

The data provide us with information on both the number and the value of the merger deals. The choice of dependent variable depends on the specific context and has important implications for the estimation procedure. The value of the deal reflects the economic importance of cross-border M&A. This would therefore be the most appropriate measure of M&A activity from a policy perspective. Using deal values as the dependent variable also allows one to compare the results with those obtained from trade flows. Di Giovanni (2005) uses deal values. However, if one is interested in specific firm decisions such as the choice to invest or not to invest, or alternatively, in the choice of location, the number of transactions may be more interesting. Bertrand *et al.* (2004) study the locational choice of multinationals using the number of transactions. Using the number of transactions further provides a useful robustness check as the count data are not obscured by mega-deals. In the present paper we use both definitions of the dependent variable, namely, the number of deals as well as the total value of deals alternatively.[19]

A key issue one needs to address irrespective of the definition of the dependent variable is how to account for the presence of zero observations. Whilst the full sample used for econometric analysis consists of more than half a million observations the majority of those are zero. In fact, the proportion of zero observations is much larger than in previous studies since the current analysis is conducted at the industry level. It, thereby, accounts for merger deals across industries as well as within industries and, hence, enlarges dramatically the number of possible cells compared to standard cross-country analyses of investment flows and industry/country level studies of trade flows. Still, the issue of zeros

[18] As mergers are classified at the 4-digit level but the analysis is carried out at the 2-digit level the share varies between zero and unity for observations within the same 2-digit industry and always equals zero for observations across different industries.

[19] Note that for a number of transactions the deal value is missing in the dataset. In these instances the transactions were removed from the sample. Similar to Di Giovanni (2005) we assume that missing values are randomly distributed.

comes up in all gravity studies albeit often less pronounced. Nevertheless, the issue appears to have been ignored in most studies.

In the majority of cases zero observations are not related to data availability, but reflect the optimal choice of profit maximising firms. Zero cross-border investment may be optimal for example in the presence of fixed cost to international investment (Razin et al., 2004). The zero observations can therefore be considered corner solution outcomes and should be addressed in what Wooldridge (2002) appropriately terms corner solution models, a subset of censored regression models.

Linear estimation procedures such as OLS are problematic in this setting, because zero cross-border investment has a positive probability, but can be considered a continuous random variable for strictly positive values. A linear model would produce biased estimates underestimating the coefficients for strictly positive values and predicting negative values for observations where actual investment is zero.[20] Non-linear models equally suffer a number of drawbacks (see Wooldridge, 2002). The approach used to control for such censored observations depends on whether M&A activity is specified in terms of its value or the number of transactions. We first discuss the issue in the context of the value of M&A and subsequently turn to the issue when using the number of transactions.

Recently, a number of papers that look at the value of trade or cross-border capital flows have explicitly taken account of zero observations. Di Giovanni (2005) and Felbermayr and Kohler (2004) use Tobit estimations to allow for the presence of the limited dependent variable. The paper by Felbermayr and Kohler (2004) is particularly interesting in that it explicitly adopts the corner solution model as described in Wooldridge (2002) while embedding it in a compelling theoretical structure. In our analysis we follow this approach and use a Tobit model when using the logarithmic value of the merger as the dependent variable.

[20] It can be shown that using a simple OLS on only the positive observations leads to biased results, as the conditional expectation of y on x, given that $y > 0$, $E[Y|X,Y > 0] = \beta'X + \sigma f(\beta'X/\sigma)/F(\beta'X/\sigma)$, where F and f are the distribution function and the density, respectively, of the standard normal distribution.

The Tobit model allows cross-border M&A to be zero with positive probability and the conditional expectation of M&A to be non-linear for positive values of M&A. Specifically, the estimation considers the following latent variable model:

$$y^* = \beta' X + u \quad \text{where} \quad u|X \sim N(0, \sigma^2) \tag{9}$$

where y^*, in our case is the latent value of M&A conditional on the covariates X that would be optimal in the absence of any binding constraints. In reality, profit maximisation leads to either positive M&A, $y^*>0$, or no M&A, $y=0$, which can be summarised by:

$$y = \max(0, y^*) \tag{10}$$

In order to evaluate the magnitude of the estimated coefficients one has to calculate the partial effects (signs remain the same).[21]

In a locational choice model with the number of deals as the dependent variable (not in logs) the Tobit model is no longer appropriate. While it appears to be a reasonable assumption to treat the value of deals as a continuous variable (and hence employ Tobit estimation) this is arguably not the case for the number of deals. Standard OLS (or Tobit) would produce biased estimates unless the mean counts are very large. Given that the dependent variable, the number of deals, is a non-negative integer we employ count model techniques.[22]

In the Poisson model one assumes that the variable is generated by a Poisson distribution of the form

[21] In order to deal with the fact that the log of zero is not defined we use $ln(v+1)$ as the dependent variable in the Tobit estimations where v is the value of cross-border merger activity.

[22] Most research that focuses on the locational choice of multinationals has typically adopted the conditional logit model. This model is attractive as it is directly derived from the profit maximisation problem faced by investing firms based on McFadden (1974). However, estimating the model with a large choice set as in the present case becomes very cumbersome. Previous research has dealt with this issue either by selecting a random sample for the large choice set, or by ignoring all zero-observations. Guimaraes *et al.* (2003) show that under certain circumstances the count model is equivalent to the conditional logit. However, in contrast to the conditional logit model, count models can deal with large choice sets. Given this insight, Guimaraes *et al.* succinctly state that: *"Thus, many previous studies, (...), would have benefited if they had considered the Poisson regression as an alternative to the conditional logit model"*.

$$\Pr(n_{jt}^{f}) = \left(\mu^{n_{jt}^{f}} e^{-\mu}\right) / n_{jt}^{f}! \qquad (11)$$

where μ is the conditional mean of the distribution. It is then assumed that the expected value of n, μ, is log linearly dependent on some explanatory variables. Parameter estimates of these variables can be obtained using maximum likelihood techniques. The Poisson model imposes the restriction that the conditional mean of the dependent variable equals its variance. If it is found that this restriction does not hold in the data, one may employ a negative binomial distribution, which allows for overdispersion in the data, i.e., the variance of the dependent variable is allowed to exceed the mean. In our econometric analysis we test the validity of this restriction.

The simple Poisson and Negative Binomial models assume that there is no separate process for generating zero and non-zero counts. If, however, there were a separate underlying model for industries for which we did not observe any merger activity, then a zero-inflated Poisson model (ZIP) would be more appropriate.[23] The ZIP model has essentially a two stage interpretation. In the first stage, the probability of the outcome variable being zero is estimated conditional on a vector of observable covariates *X*. The second stage constitutes a truncated count model for the positive realisations (i.e., the outcome is conditional on being non-zero) conditional on observables *Z*. If the restriction of mean-variance equivalence is rejected one can resort to the negative binomial ZIP model (ZINB), which allows for overdispersion. As there are a priori no strong reasons to expect different variables to explain the decision not to undertake M&As (i.e., first step), we use the same vector of variables for *X* and *Z* in our estimation (Girma, 2002). We do, however, not include any interaction terms in the first stage.

5. Results

Table 4 presents the results of the baseline gravity equation as specified in equation (8), excluding for the moment the tariff variables. In the first column we estimate this model with exports of good *i* from country *k* to country *l* in order to see whether our model and the data produce results that are in line with the literature. Reassuringly, they do. We find that market size in the home and partner country is positively associated with total exports,

[23] See Cameron and Trivedi (1998) for descriptions of ZIP models. See also Girma (2002) and List (2001) for application of ZIP models in the context of location of FDI.

while distance has a negative impact. Also, the remoteness indicator is positively related to exports. These results are as expected from standard gravity models.

We then re-estimate the model on the data for cross-border mergers, using the deal value as the dependent variable. Column (2) reports results for total bilateral merger activity. Results are similar to the trade model, with mergers increasing in market size and remoteness (which, in the case of mergers, is a proxy for the bid potential) but decreasing with distance between the home and partner country. Assuming that distance is an appropriate measure of trade costs, this result thus points against the "tariff jumping" hypothesis for aggregate merger activity.

In column (3) we allow the coefficient on the distance variable to differ between horizontal and non-horizontal mergers by including an interaction term defined as the share of horizontal mergers in total merger activity. This shows that the coefficients do indeed differ for horizontal and non-horizontal mergers; the effect of distance is less important the higher the share of horizontal mergers. Columns (4) and (5) provide alternative specifications varying the number of interaction terms as a robustness check. The results in column (5) show that all interaction terms (with the exception of acquisition country market size) are statistically significant and, hence, including them improves the model.

The average effect of distance on cross-border M&A is now given by the coefficient of distance plus the coefficient on the interaction term times the share of horizontal mergers in total mergers. The average value for the share of horizontal mergers is 0.32. The average effect of distance in columns (3) to (5) ranges from 0.05 to -0.02 depending on whether one includes the full set of interaction terms or not. Alternatively, one may calculate the critical value of HMA at which the marginal effect of distance switches signs. If the share of horizontal mergers in total mergers exceeds 0.21 (0.105/0.497) or 0.44 (0.087/0.197) in columns (3) and (5) respectively, then the impact of distance on bilateral merger activity will be positive. Conversely, for shares lower than the critical value the impact of distance will negative. The percentage of observations where the share of horizontal mergers exceeds the critical value of 0.21 is 32.4% and 29.5% for a critical value 0.44.

While a negative effect of distance on cross-border capital flows has been found in most previous work (see for example, Carr et al., 2001; Portes and Rey, 2005; Di Giovanni, 2005), those studies are all conducted at the country level. Using our sectoral data we show that the effect of distance differs between different types of merger activity. More particularly, while the estimated average effect of distance is negative it is positive for horizontal mergers alone. Assuming that distance is a proxy for barriers to trade, this is in line with the theoretical expectations of a tariff-jumping motive for horizontal mergers.[24]

Given that the database provides information not only on the total value of cross-border mergers but also on the number of deals an interesting extension to the analysis is to investigate whether there are differences in the determinants of the number as opposed to the total logarithmic value of deals. We therefore change the analysis towards the issue of locational choice. We re-estimate equation (8) with the number of deals as the dependent variable using different count models. A likelihood-ratio test for the restriction that the conditional mean of the dependent variable equals its variance rejects this assumption and points at over-dispersion for all estimations. Hence, we report the negative binomial results rather than the standard Poisson estimates. Furthermore, employing a test due to Vuong (1989) we find that a zero-inflated model better captures the underlying decision process. In our discussion we, therefore, focus on the results from the zero-inflated negative binomial estimations, which are reported in columns (5) to (8) of Table 5.

Columns (5) to (8) show that the results for total merger activity are qualitatively similar to the results obtained from the Tobit regressions above. The only significant differences are the statistically insignificant coefficient on Y_k in column (5), and the insignificance of the interaction terms in column (8). Hence, we prefer the models in columns (6) and (7) which only interact the share of horizontal mergers with distance and remoteness. Allowing for different coefficients on the distance and remoteness variables for the two types of merger activities shows again statistically significant differences. This therefore provides a further robustness check to the Tobit regressions.

[24] This is in contrast to the evidence provided by Tekin-Koru (2004), who uses firm level data on total merger activity and does not distinguish between horizontal and non-horizontal activities. Note that in the aggregate our results, like those by Tekin-Koru, point against the tariff-jumping argument. The present finding that the effect of distance is increasing in the share of horizontal mergers however is inconsistent

6. Cross-border M&A and Trade Policy

Above we assumed that the differential impact of distance and remoteness across different types of merges results from the interdependence between trade and cross-border M&A. We now re-examine the issue using industry level data on the bilateral level of applied protection. More precisely, we use a new dataset, which converts different types of tariffs, quotas, antidumping measures and preferential trade agreements into a single equivalent *ad valorem* tariff. As these data are only available for the year 2000 we assume that tariffs are, like distance, constant across time. [25]

Looking at trade policy indicators allows one to verify to what extent the reasoning that distance and remoteness proxy for trade barriers is indeed plausible as the trade policy variables included here refer explicitly to international trade and in principle have no bearing on international investment as long as investment abroad is independent of international trade. However, if trade and investment are interdependent changes in the trade policy stance may not only affect the pattern of trade but also the level and composition of inward investment. If this were indeed the case this may have to be taken into account by policy makers, given the importance that has been attached in the past to attracting foreign multinationals in the hope that these will stimulate jobs and/or generate productivity spillovers.

The estimations are thus extended by including the bilateral ad valorem equivalent tariff applicable to exports of good *i* from country *k* to country *l*. The results are reported in Table 6 using the Tobit model only. We start again with estimating the impact of trade policy on exports to check whether our results are plausible in the context of a standard gravity model of trade (column 1). As one can see from the table both distance and tariffs have a negative effect on exports, as would be expected. Interestingly, when comparing the coefficient on distance with that in Table 4 we observe that adding explicit information on the level of bilateral protection reduces the impact of distance on exports from -0.9 to -0.6 thereby suggesting that distance proxies to some extent for bilateral protection in addition to transportation and information costs.

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with the theoretical prediction by Tekin-Koru and others of a negative relationship due to the impact of distance on the acquisition price.

[25] The results remain qualitatively the same once one uses period averages.

We then turn to the effect of trade policy on cross-border merger activity. Column (2) shows that trade barriers negatively affect total M&As. However, allowing for different coefficients of trade policy for horizontal and non-horizontal mergers again highlights the heterogeneity between these two groups. From column (3) we find a negative coefficient on the term interacting the share of horizontal M&As and tariffs, which is perhaps unexpected. In principle, this would suggest that while protection tends to reduce cross-border merger activity in general the impact of protection would affect horizontal M&A by less than non-horizontal M&A.

However, note that in this regression distance is also statistically insignificant, perhaps reflecting the fact that the effect of distance on M&As mainly reflects trade costs, which are now better captured with the tariff variable.[26] Dropping distance from the estimations shows that we then obtain a negative sign on tariffs, and a positive sign on the interaction term for tariffs and horizontal M&As. This suggests that the impact of trade costs on cross-border M&A is less negative or even positive the higher the share of horizontal mergers in total mergers. This is in line with the argument emphasised throughout this paper that cross-border M&A in the same industries tend to substitute for exports. Indeed, we may interpret this as evidence in support of the tariff-jumping argument set out by Brainard (1997).

The tariff variable, as pointed out above, captures the tax equivalent of applied protection on exports from the acquisition to the target country. We argued above that this cost provides a rationale for exporting firms to look for takeover targets abroad. We did not however say much about the possible relationship between tariffs and non-horizontal merges even though it seems not unlikely that at least some part of non-horizontal M&A represents vertical mergers. These are likely not only to be more negatively affected by taxes on its exports but also on changes in the costs of re-exports from the target to the acquisition country. We now address this issue in more detail.

Instead of relying on direct information on trade patterns and input-output linkages, which suggests that vertical mergers are relatively unimportant, including ad valorem equivalent

[26] The pairwise correlation between the log of distance and the tariff on exports from the acquisition to the target country equals 0.37.

tariffs on imports from to the target to the acquisition provides an indirect method to infer to what extent the vertical motive is likely to play an important role in explaining non-horizontal mergers. We thus proceed by including a measure of the level of applied protection on exports from country *l* to country *k* in the estimation. As can be seen from columns (6) and (7), this variable is also negatively related with total M&A activity. This negative effect is again less for industries with higher levels of horizontal mergers, as indicated by the positive sign on the interaction term. In contrast to the direct estimates on the importance of vertical mergers in total merger activity, the indirect estimates based on regression analysis obtained here suggest that the share of vertical mergers in non-horizontal mergers may be substantial.

7. Conclusions

This paper analyses in detail the role of trade costs on bilateral cross-border M&As for 23 OECD countries over 1990-2001 using industry level data on merger activity and a new data source on with detailed information on the bilateral level of applied protection. In the aggregate, distance and tariff barriers have negative effects on cross-border M&A. An important finding of our paper is that the effect of distance and trade costs differs depending on whether mergers are horizontal (i.e., with acquirer and target in the same industry) or whether they span different industries. This suggests that results based on aggregate data which do not distinguish these types neglect an important source of heterogeneity. The less negative effect on horizontal mergers provides support to the tariff jumping argument put forward in the literature on the determinants of horizontal FDI.

Our findings have important policy implications. The main findings in the paper that cross-border M&A respond negatively to trade costs in the aggregate and that the share of horizontal M&A increases in the level of trade costs provide an additional rational for free trade. To the extent that horizontal mergers are less likely to be associated with productivity spillovers and more likely with anticompetitive behaviour up freeing up trade not only increases the level of inward investment but also its composition in a way that is likely to benefit the economy. The trade regime might thus have important implications for attracting inward investment in terms of M&As, an issue that should be recognised by governments wishing to attract foreign investment in order to benefit from technology and spillovers.

References

Anderson, J. and E. Van Wincoop (2004), "Trade Costs", *Journal of Economic Literature,* forthcoming.

Bertrand, O., J. Mucchielli and H. Zitouna (2004), "Location Choices of Multinational Firms: The Case of Mergers and Acquisitions", HWWA Discussion Paper 274.

Bouët, A., Y. Decreux, L. Fontagé, S. Jean and D. Laborde (2004), "A Consitent, ad valeorem equivalent measure of applied protection across the world: The MAcMap-HS6 database", *CEPII Working Paper*, No. 22.

Brainard, S. L. (1997), "An Empirical Assessment of the Proximity-Concentration Trade-Off Between Multinational Sales and Trade", *American Economic Review*, 87, pp. 520-545,

Cameron, A.C. and P.K. Trivedi (1998), *Regression Analysis of Count Data*, Cambridge: Cambridge University Press.

Carr, D.L., J.R. Markusen and K.E. Maskus (2001), Estimating the knowledge-capital model of the multinational enterprise, *American Economic Review*, 91, pp. 693-708.

Di Giovanni, J. (2005), "What drives capital flows? The case of cross-border M&A activity and financial deepening", *Journal of International Economics*, 65, pp. 127-149.

Ekholm, K., R. Forslid and J. Markusen (2004), "Export Platform Foreign Direct Investment", *NBER Working Paper*, No. 9517.

Felbermayr, G.J. and W. Kohler (2004), "Exploring the Intensive and Extensive Margins of World Trade", CESIfo Working Paper.

Ferrett, B. (2003), "Greenfield Investment versus Acquisition: Positive Analysis", GEP Research Paper 03/02, University of Nottingham

Girma, S. (2002), "The process of European integration and the determinants of entry by non-EU multinationals in UK manufacturing", *The Manchester School*, 71, pp. 315-335.

Gugler, K., D. C. Mueller, B. B. Yurtoglu and C. Zulehner (2003), "The Effects of Mergers: An International Comparison", *International Journal of Industrial Organization*, 21, pp. 625-653.

Guimaraes, P. O. Figueirdo, and D. Woodward (2003), "A Tractable Approach to the Firm Location Problem", *Review of Economics and Statistics*, 85, pp. 201-204.

Head, K. (2003), "Gravity for Beginners", UBC Working Paper

Head, K. and J. Ries (2005), "Judging Japan's FDI: The Verdict from a Dartboard Model," *Journal of the Japanese and International Economies*, forthcoming 2005.

Helliwell, J.F. (1998), *How Much Do National Borders Matter?,* Washington D.C.: Brookings Institution.

Horn, H. and L. Persson (2001), "The Equilibrium Ownership of an International Oligopoly", *Journal of International Economics*, 53, pp. 307-333.

List, J.A. (2001), "US Country Level Determinants of Inbound FDI: Evidence from a two step modified count data model", *International Journal of Industrial Organization*, 19, pp. 953-973.

Manchin, M. (2004), "Determinants of European cross-border mergers and acquisitions", European Commission, *European Economy Economic Papers*, No. 212.

Markusen, J.R., *Multinational firms and the theory of international trade*, MIT Press, 2002

Martin, P. and H. Rey (2005), "Financial super-markets: Size matters for asset trade", *Journal of International Economics*, forthcoming.

McFadden, D.L. (1974), "Conditional Logit Analysis of Qualitative Choice Analysis", in P. Zarembka (ed.), *Frontiers in Econometrics,* New York: Academic Press, pp. 105-142.

Nocke, V. and S. Yeaple (2004), "An assignment theory of foreign direct investment", NBER Working Paper 11003.

Norbäck, P.J. and L. Persson (2004), "Privatization and foreign competition", Journal of International Economics, Vol. 62, pp. 409-416.

OECD (2001), New Patterns of Industrial Globalisation, Cross-border Mergers and Acquisitions and Strategic Alliances.

Portes, R. and H. Rey (2005), "The determinants of cross-border equity flows", *Journal of International Economics*, Vol. 65, pp. 269-296.

Portes, R., H. Rey and Y. Oh (2001), "Information and capital flows: the determinants of transactions in financial assets", *European Economic Review*, 45, 783-796.

Razin, A., Y. Rubinstein, and E. Sadka (2003), "Which countries export FDI, and how much?", *NBER Working Paper*, No. 10145.

Tekin Koru, A. (2004), "Is FDI indeed tariff-jumping? Firm level evidence", mimeo, University of Oregon.

UNCTAD (2000), "Cross-border Mergers and Acquisitions and Development", *World Investment Report*, Geneva: United Nations.

UNCTAD (2001), "Promoting Linkages", *World Investment Report 2001*, Geneva: United Nations.

Vuong, Q.H. (1989), “Likelihood ratio tests for model selection and non-nested hypotheses”, *Econometrica*, Vol. 57, pp. 307-333.

Table 1: Summary statistics M&A, 1990-2001

	Domestic M&A			Cross-border M&A			All		
	Non-Hor	Horizontal	Total	Non-Hor	Horizontal	Total	Non-Hor	Horizontal	Total
				Number of deals					
1990/1991	55.36%	44.64%	6,281	70.15%	29.85%	2,161	59.14%	40.86%	8,442
1992/1993	58.01%	41.99%	7,575	69.24%	30.76%	2,123	60.47%	39.53%	9,698
1994/1995	53.58%	46.42%	10,245	68.16%	31.84%	2,921	56.81%	43.19%	13,166
1996/1997	53.73%	46.27%	13,760	66.82%	33.18%	3,668	56.48%	43.52%	17,428
1998/1999	53.19%	46.81%	17,586	67.91%	32.09%	5,042	56.47%	43.53%	22,628
2000/2001	59.46%	40.54%	13,557	68.75%	31.25%	5,319	62.08%	37.92%	18,876
Total	55.31%	44.69%	69,004	68.33%	31.67%	21,234	58.38%	41.62%	90,238
				Average deal value (mln $)					
1990/1991	50.95	41.04	46.53	61.37	54.49	59.32	54.11	43.56	49.80
1992/1993	40.45	38.82	39.76	48.71	44.05	47.27	42.52	39.71	41.41
1994/1995	38.71	44.19	41.25	45.92	49.09	46.93	40.63	44.99	42.51
1996/1997	49.35	55.10	52.01	59.35	63.83	60.83	51.84	56.50	53.87
1998/1999	51.45	52.55	51.96	64.67	70.70	66.60	54.99	55.53	55.23
2000/2001	48.66	57.62	52.29	69.80	71.33	70.28	55.26	60.80	57.36
Total	47.31	50.23	48.61	60.53	62.48	61.15	50.95	52.42	51.56

Table 2: Summary Statistics M&A by Acquirer and Target Industry, 1990-2001

Acquirer\Target	Agr. & Mining	Man.	Trans.	Wholes.	Finance	Other services	Health & Edu.	Total
Agriculture & Mining	1205	194	79	61	53	46	34	1672
Manufacturing	269	6597	180	636	162	412	178	8434
Transportation & Public Util.	64	150	1246	50	43	176	31	1760
Wholesale	48	346	49	831	42	107	20	1443
Finance, Ins. & Estate	233	859	309	248	2260	499	108	4516
Other services	46	232	107	146	108	1931	136	2706
Health & Education	47	142	27	36	27	87	277	643
Total	1909	8514	2005	2009	2695	3258	784	21174

Government sector excluded.

Table 3: Summary Statistics Cross-Border M&A by Region, 1990-2001

Acquirer\Target	AE	AM	AP	EU	JP	SN	**Total**
AE	**170**	131	71	144			516
AM	209	**4,054**	814	2,337	68	2	7,484
AP	65	377	**2,083**	325	29		2,879
EU	237	2,398	729	**6,363**	44	2	9,773
JP	3	243	165	135	**21**		567
SN	1	1	8	5			15
Total	685	7,204	3,870	9,309	162	4	**21,234**

Table 4: Basic gravity model for trade and M&A, Tobit estimations

	(1) Exports	(2) M&A	(3) M&A	(4) M&A	(5) M&A
Y_k	0.173	0.271	0.184	0.187	0.189
	(0.009)	(0.010)	(0.007)	(0.008)	(0.008)
	***	***	***	***	***
Y_l	0.446	0.283	0.205	0.204	0.209
	(0.009)	(0.010)	(0.008)	(0.008)	(0.008)
	***	***	***	***	***
δ	-0.913	-0.142	-0.105	-0.083	-0.087
	(0.015)	(0.014)	(0.011)	(0.011)	(0.011)
	***	***	***	***	***
ρ	0.315	0.140	0.077	0.084	0.090
	(0.021)	(0.019)	(0.016)	(0.015)	(0.015)
	***	***	***	***	***
Y_k*HMA					-0.044
					(0.034)
Y_l*HMA					-0.154
					(0.038)
					***
δ*HMA			0.497	0.067	0.197
			(0.011)	(0.033)	(0.046)
			***	**	***
ρ*HMA				-0.213	-0.367
				(0.017)	(0.037)
				***	***
Constant	7.437	-10.565	-7.919	-8.000	-7.988
	(0.447)	(0.496)	(0.393)	(0.389)	(0.390)
	***	***	***	***	***
Obs.	37108	697970	697970	697970	697970
Pseudo R^2	0.04	0.06	0.20	0.20	0.20
Log Likelihood	-87952.7	-18711.0	-15975.7	-15891.7	-15880.0

The marginal effects are computed for the expected value of the dependent variable conditional on being uncensored. A full set of time dummies is included, all variables are in logs. Standard errors in parentheses, * significant at 10%; ** significant at 5%; *** significant at 1%, for industry *i* in acquisition country *k*, and industry *j* in target country *l*.

Table 5: Estimating the number of mergers, count data models

	Negative binomial				*Zero-inflated negative binomial*			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Y_k	0.580	0.494	0.504	0.502	-0.041	0.325	0.318	0.315
	(0.018)	(0.016)	(0.016)	(0.017)	(0.044)	(0.026)	(0.027)	(0.027)
	***	***	***	***		***	***	***
Y_l	0.603	0.558	0.563	0.558	0.606	0.570	0.582	0.576
	(0.018)	(0.016)	(0.016)	(0.017)	(0.029)	(0.020)	(0.020)	(0.021)
	***	***	***	***	***	***	***	***
δ	-0.263	-0.170	-0.138	-0.136	-0.180	-0.143	-0.094	-0.089
	(0.027)	(0.026)	(0.027)	(0.027)	(0.036)	(0.028)	(0.029)	(0.029)
	***	***	***	***	***	***	***	***
ρ	0.208	0.147	0.150	0.147	0.986	0.449	0.500	0.490
	(0.036)	(0.035)	(0.035)	(0.035)	(0.061)	(0.051)	(0.051)	(0.052)
	***	***	***	***	***	***	***	***
Y_k*HMA				-0.003				0.049
				(0.094)				(0.091)
Y_l*HMA				0.167				0.092
				(0.108)				(0.104)
δ*HMA		1.077	0.487	0.390		1.035	0.267	0.174
		(0.023)	(0.101)	(0.133)		(0.023)	(0.098)	(0.127)
		***	***	***		***	***	
ρ*HMA			-0.268	-0.138			-0.345	-0.239
			(0.047)	(0.100)			(0.046)	(0.098)
			***				***	**
Constant	-20.352	-20.210	-20.654	-20.593	2.551	-12.793	-12.453	-12.495
	(0.855)	(0.823)	(0.817)	(0.824)	(1.630)	(1.172)	(1.170)	(1.173)
	***	***	***	***		***	***	***
Obs.	699718	699718	699718	699718	699718	699718	699718	699718
Pseudo R^2	0.08	0.23	0.23	0.23				
Log Likelihood	-14049	-11865	-11849	-11848	-13837	-11790	-11762	-11762
LR-test α*=0:*	4642.64	2062.33	1596.60	1348.29				
	[0.000]	[0.000]	[0.000]	[0.000]				
Vuong					9.78	6.84	5.17	4.73

A full set of time dummies is included, all variables are in logs. Standard errors in parentheses, * significant at 10%; ** significant at 5%; *** significant at 1%, for industry *i* in acquisition country *k*, and industry *j* in target country *l*.

Table 6: Cross-border M&A and Trade Policy, Tobit estimations

	(1) Exports	(2) M&A	(3) M&A	(4) M&A	(5) M&A	(6) M&A	(7) M&A
Y_k	0.197	0.292	0.198	0.292	0.267	0.283	0.256
	(0.009)	(0.011)	(0.08)	(0.011)	(0.10)	(0.10)	(0.010)
	***	***	***	***	***	***	***
Y_l	0.507	0.291	0.210	0.291	0.270	0.304	0.278
	(0.009)	(0.010)	(0.008)	(0.010)	(0.010)	(0.010)	(0.010)
	***	***	***	***	***	***	***
δ_{kl}	-0.646	-0.001	-0.006				
	(0.016)	(0.015)	(0.012)				
	***						
ρ_l	0.231	0.090	0.044	0.089	0.090	0.234	0.228
	(0.020)	(0.020)	(0.016)	(0.016)	(0.015)	(0.017)	(0.017)
	***	***	***	***	***	***	***
τ_{kl}	-8.578	-6.146	-4.309	-6.146	-8.456	-4.450	-6.168
	(0.190)	(0.414)	(0.340)	(0.395)	(0.489)	(0.373)	(0.454)
	***	***	***	***	***	***	***
τ_{lk}						-5.886	-6.992
						(0.404)	(0.461)
						***	***
δ_{kl}*HMA			0.484				
			(0.011)				
τ_{kl} *HMA			-4.093		50.268		32.250
			(0.419)		(1.787)		(2.235)
			***		***		***
τ_{lk}*HMA							24.559
							(2.495)
							***
Constant	3.094	-12.568	-9.277	-12.406	-11.313	-9.959	-8.811
	(0.450)	(0.535)	(0.419)	(0.433)	(0.419)	(0.411)	(0.387)
	***	***	***	***	***	***	***
Observations	37108	648626	648626	648626	648626	602370	602370
Pseudo R^2	0.05	0.07	0.10	0.07	0.10	0.08	0.12
Log likelihood	-86933.1	-18265.3	-17711.4	-18265.3	-17711.4	-17675.4	-17068.5

The marginal effects are computed for the expected value of the dependent variable conditional on being uncensored. A full set of time dummies is included, all variables are in logs (except tariff variables). Standard errors in parentheses, * significant at 10%; ** significant at 5%; *** significant at 1%, for industry *i* in acquisition country *k*, and industry *j* in target country *l*.