Cross-Border and Local Co-operation on the island of Ireland: An Economic Perspective

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Second draft: 4th March 2005

Abstract:

Cross-border and local co-operation can foster local learning and contribute positively to business performance and social cohesion. This paper considers firms' economic motivation for both types of co-operation around the Ireland-Northern Ireland border. This area, while inevitably impacted by civil unrest in Northern Ireland, shares many of the economic and developmental characteristics of border areas throughout Europe. Simultaneous probit models are used to examine the determinants of co-operation. Overall, around a third of firms in Ireland and Northern Ireland engage in local co-operation of some form; around one in six in Northern Ireland and one in twelve in Ireland also engage in cross-border cooperation. Proximity to the border, perceived barriers to cross-border co-operation and country uncertainty reduce the incidence of cross-border co-operation rates below that of local co-operation. Cross-border co-operation in Northern Ireland is more common because of small region size and fewer perceived barriers to cross-border co-operation.

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1. Introduction

There is now general agreement that inter-firm co-operation through networks, partnerships and supply-chains can, by facilitating knowledge exchange and reducing transaction costs, contribute both to innovation and company competitiveness (e.g. Oerlemans et al, 1998). Dense patterns of 'association', alongside links between firms and other support institutions, have also been linked to cluster and regional growth (Cooke and Morgan, 1998). Case-studies of areas with high levels of such inter-organisational co-operation have generally also been characterised by social and economic uniformity, geographical contiguity, high levels of social capital (i.e. trust), and stable and supportive governance and support institutions (e.g. Braczyk et al., 1998). Border regions are often characterised by exactly the opposite conditions: economic discontinuity, low levels of social capital, and governance which is at best divided, and at worst, antagonistic (e.g. Mitko et al., 2003). The result can be both a lack of knowledge sharing, diffusion and organisational learning (e.g. Petrakos and Tsiapa, 2001), and disproportionately low levels of trade[1]. In this context, cross-border co-operation can play an important role, countering the structural discontinuity of border regions and generating a potentially positive growth dynamic.

The Ireland- Northern Ireland border shares many of the economic characteristics of border areas in Southeastern Europe identified by Mitko et al. (2003), i.e. distance from the main urban centres (Dublin and Belfast), relatively low population densities, a lack of knowledge intensive industries, and weakly developed infrastructure. To these economic

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[1] Chionis and Liargovas (2002), for example, examine the level of trade between Greece and South-Eastern Europe. Over the 1990-99 period they note exports from Greece to these countries rose 28 per cent pa, compared to an overall increase in Greek exports of 11 per cent pa. Similarly, Greek imports from the SEE rose 17 per cent pa, compared to an overall increase of 12 per cent. Despite these increases they conclude, on the basis of a gravity model that: Greece is "undertrading" with all the countries in the reference sample. The ratio of actual over potential exports/imports is around 40 percent on average for both imports and exports. It is also striking that trade with Bulgaria, while still accounting for the largest share of the Greek–Balkan trade, remains below the predicted "normal" level, at 40 percent less for imports and 52 percent less for exports' (p.28).

and structural issues we have to add the cumulative impact of four decades of civil unrest in Northern Ireland, although as O'Dowd et al (1995) remark: 'the exceptionalism of the Irish case should not be overstated …. All borders have a security dimension as they mark the limits of the area in which a particular state can claim to legally monopolise the means of violence … Given the history of border creation in Europe it seems rather perversely ahistorical to suggest that contested borders are anomalous' (p. 275). Nonetheless, it could be argued that the Ireland-Northern Ireland is of unique interest, not least because it has been the subject of intense policy and political attention over the last decade. In policy terms, the Ireland-Northern Ireland border has been the focus of EU measures (e.g. INTEREG) alongside more specific and unique policy experiments (e.g. the Special Support Programme for Peace and Reconciliation). In constitutional terms, political agreements have also been reinforced by specifically targeted institutional developments (e.g. the cross-border 'institutions' and 'bodies' created by the Good Friday or Belfast Agreement) aimed to encourage cross-border co-operation and integration (e.g. Meehan, 2000).

This paper has two main aims. First, we aim to augment the relatively limited empirical literature on the economic determinants of the probability that firms will engage in cross-border co-operation. In particular, we adopt a transactions cost perspective, and seek to identify those factors which are either specific to, or disproportionately important in, shaping the probability of cross-border interaction relative to more local co-operation. Our second objective is to contribute some positive evidence to the knowledge base relating to the Ireland-Northern Ireland border. Specifically, we focus on identifying differences in the economic determinants of cross-border co-operation in Ireland and Northern Ireland. This provides some insight into current levels of co-operative activity as well as highlighting potential areas for policy intervention. In this sense our study is complementary to that of Tannam (1999) which focuses on governmental, administrative and security co-operation across the border and emphasises the lack of information on cross-border co-operation between businesses (see, for example, her Table 8.1).

The argument proceeds as follows. In section 2, we briefly describe the development and characteristics of the Ireland-Northern Ireland border region. This emphasises commonalities with other border areas as well as identifying some of the region's specific characteristics. Section 3 then focuses on our conceptual framework, emphasising the economic benefits for firms of engaging in local and cross-border co-operation. Section 4 describes the data we use and our empirical approach, and Section 5 outlines the key empirical results.

3. The Ireland-Northern Ireland Border

[Section omitted due to length constraint – please contact author for full version of paper]

2. Conceptual Framework

Our objective here is to delineate a framework which describes firms' key motivations for engaging in co-operation, and suggests where the factors which determine the probability of local and cross-border co-operation may differ. In general terms, we argue that firms' willingness to engage in co-operation will depend on their assessment of the perceived costs and benefits[2]. This focuses attention on firms' access to productive resources, risk reduction and cost reduction as the key determinants of co-operation, moderated in the case of cross-border co-operation by potential gains from market access, and the distance from potential partners (Figure 1). In addition, we envisage the choice to engage in cross-border and/or local co-operation as simultaneous, suggesting the potential for potential substitute or complementary relationships between the two activities (Figure 1). In fact, what we observe is firms' actual participation in cross-border (cxb) or local co-operation (cloc) which we interpret in structural terms as follows:

$$cxb_i = \alpha_1 + \beta_1 x_{1i} + \gamma_1 cloc_i + \varepsilon_{1i}$$
$$cloc_i = \alpha_2 + \beta_2 x_{2i} + \gamma_2 cxb_i + \varepsilon_{2i}$$

(1)

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[2] Buckley and Chapman (1997), summarise the situation as follows: 'Managerial perceptions matter, and transaction costs cannot be quantified or measured separately from these perceptions. Managers undertake a conscious (not random) selection from among arrays of potential transaction costs, and among the most important transaction costs are those which are avoided by this process. From the observer's point of view, transaction costs are thus difficult to measure in any objective fashion.' (p. 143)

Where x_{1i} and x_{2i} are vectors of possible determinants of co-operation.

Figure 1: Structural Relationships
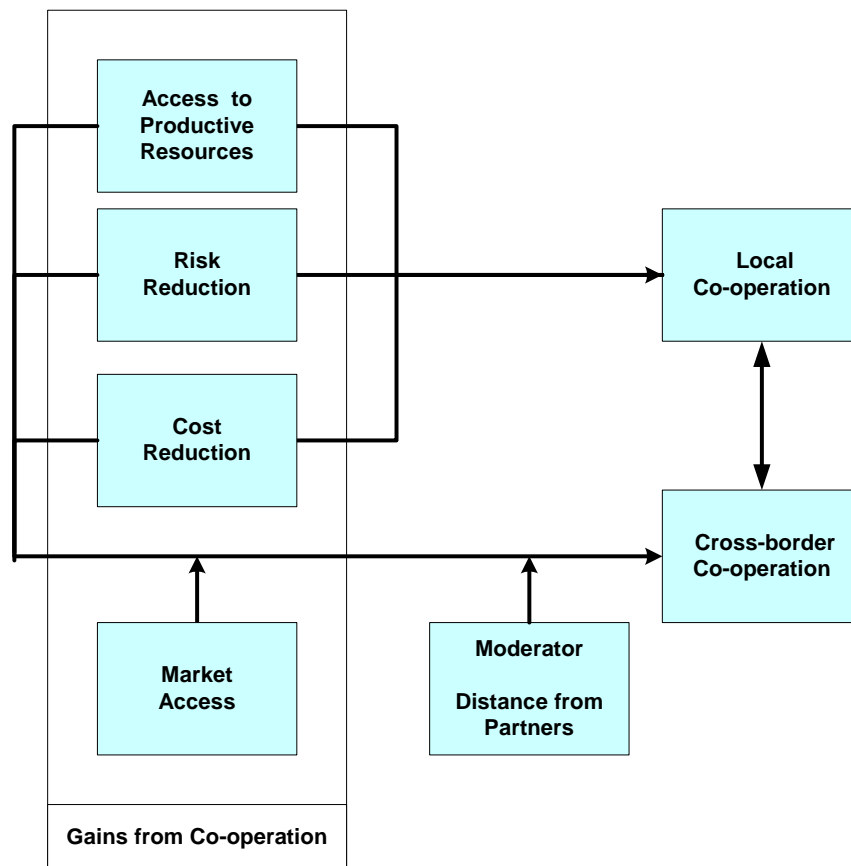
More specifically, we argue that firms will engage in co-operation where it is more cost-effective to acquire resources or assets through a cooperative agreement or arrangement than through a standard market transaction or internal development[3]. Co-operation may therefore be resource-enhancing or enriching, allowing firms to focus on their core competencies while also maximising returns from their own asset base. We therefore suggest that both local and cross-border co-operation will be positively influenced by the

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[3] Buckley and Chapman (1998) employ a social anthropology approach, and find that while transaction costs play an important role in shaping cooperative arrangements there is little attempt by managers to make any objective measurement of issues such as asset specificity or uncertainty. Where such issues are considered, they find that the emphasis is on linguistic rather than numerical expressions of transaction costs, with frequent reference to issues such as trust and commitment.

perceived benefits of the relationship, and discouraged by potential difficulties such as those related to asset specificity and the possibility of lock-in. Hence:

H1: Expected Returns - The probability of both local and cross-border co-operation will be related equally strongly to the expected net returns from the activity.

In the case of cross-border co-operation the expected returns may, however, be moderated or shaped by proximity to the border (Figure 1). Although, in the context of co-operation between Austrian firms with Central and Eastern Europe, Huber (2003) finds only small distance effects on the probability of co-operation. Mitko et al. (2003) find more significant distance effects, finding that South-Eastern Europe firms located near the border are more likely to develop cross-border linkages than the national average (see also Petrakos and Tsaipa, 2001). We therefore suggest:

H2: Distance Effects – The probability of cross-border co-operation will be negatively related to distance from the border reflecting distance effects on the expected returns from cross-border co-operation. No distance effects are anticipated on the incidence of local co-operation.

The potential gains from co-operation, however, will depend not only on market conditions but will also be contingent on the characteristics and resources of the firm. Huber (2003), for example suggests that small firms are more resource constrained, may have more to gain from co-operation, but may have less specialist managerial resource to enable an appropriate level of investment. Other evidence on the functional capacity of firms also suggests the inter-relation between firms' internal resources and external co-operation, although evidence on the nature of this relationship remains somewhat ambiguous[4]. The possibility that co-operation is used to access resources or knowledge, however, suggests a substitution of external investment (i.e. co-operation) for internal

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[4] On the relationship between internal and external R&D, for example, see Veugelers and Cassiman, 1999; Love and Roper, 1999, 2001; Cassiman and Veugelers, 2002.

resources, a relationship we expect to apply equally strongly to both local and cross-border linkages. An essentially similar argument suggests the potential for substitution between cross-border and local co-operation as sources of resources or knowledge. Hence[5]:

> *H3: Resource Availability* - The probability of both local and cross-border co-operation will be negatively related to the strength of firms' internal resource base.

> *H4: Substitution* – The probability of local co-operation will be negatively related to the probability of cross-border co-operation and vice-versa.

In addition to the potential cost savings which might result from co-operation, it has been suggested that effective co-operation may also help firms to offset, or respond more effectively to, market ('primary') uncertainty[6]. Cross-border co-operation, in particular, may provide a mechanism by which firms can hedge uncertainty in either the Northern Ireland or Ireland markets. We therefore suggest that market uncertainty is likely to have a differential effect on the probability of local and cross-border co-operation. Hence:

> *H5: Market uncertainty* – The probability of cross-border co-operation is likely to be more strongly, and positively, influenced by market uncertainty than the probability of engaging in local co-operation.

Cross-border co-operation will, however, raise other issues related to uncertainty which will are less likely to arise in local co-operation, i.e. country uncertainty (e.g. Reddy et al., 2002, pp 763-764). At base, this reflects firms' asymmetric information about their home market and the cross-border market, which may increase the perceived risk of engaging in cross-border co-operation. In the context of the Ireland- Northern Ireland border, as in other border areas characterised by 'ethnic friction' (e.g. Mitko et al., 2003),

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[5] The same substitute relationship is clearly implicit in the resource-based view, as the firm focuses on developing 'core' and out-sourcing 'non-core' competencies (Principe, 1997; Takeishi 2001).
[6] Advantages may also arise from the development by partner organisations of routines designed to reduce secondary uncertainty, i.e. the risk that managers within the partner organisations will not co-ordinate knowledge in the optimum fashion (Koopmans, 1957; Buckley and Carter, 1999)

it may also be argued that, for at least some companies, the economic uncertainty implicit in cross-border co-operation may be exacerbated by a lack of trust linked to socio-political tensions. Following, Aulakh et al. (1996), low levels of trust are likely to reduce the incidence of cross-border partnerships, particularly where market conditions are uncertain. This suggests:

H6: Country uncertainty: The probability of cross-border co-operation is likely to be more strongly, and negatively influenced by country uncertainty than the probability of engaging in local co-operation.

4. Data and Methods

The data used here was collected by personal interviews with senior managers in firms throughout Ireland and Northern Ireland in 2003 and relates to firms' activities over the 2000 to 2002 period (Williams et al., 2004). The target group for the survey were firms or enterprises – as opposed to establishments or plants – employing 10 or more people at the time of the survey. The surveys covered firms in all sectors and were designed to be representative of the population of firms in each area. In total, data was provided by 824 firms in Ireland and 595 firms in Northern Ireland. This group of respondents represent around 7.2 per cent of firms in the target group in Ireland and around 9.9 per cent of those in Northern Ireland. Following Williams et al. (2004) we weight survey responses in the analysis to give regionally representative results[7].

Data was collected using the same survey instrument in Ireland and Northern Ireland, with some minor variations to reflect institutional and geographic differences. Firms were asked in particular about their co-operation activities during 2002, and whether these were local (i.e. within Ireland or Northern Ireland) or cross-border. Participation in nine specific types of co-operative activity was recorded (Table 1):

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[7] Weights were based on a population structure comprising sector (10 categories); size of company (2 categories) and area (3 categories in Ireland and three in Northern Ireland). This gave a total of 60 cells for re-weighting purposes in each jurisdiction. In Ireland, the population structure was based on data from the Census of Industrial Production and Annual Services Enquiry. In Northern Ireland, the population structure was provided by the survey company undertaking the original fieldwork.

1. Collaboration on Research & Development or the development of standards.

2. Purchase of raw materials, services or equipment as part of a larger group.

3. Participate in any joint marketing effort or share the cost of trade shows with other companies.

4. Bid on contracts or prepare joint tenders with other companies.

5. Share any technical capabilities with other companies.

6. Co-operate with other companies in meeting the design or quality requirements of customers.

7. Co-operate with other companies in staff training programmes.

8. Participate in joint distribution network with other company.

9. Co-operate with other companies in the production of your goods or services.

Across the whole range of activities 15.4 per cent of Northern Ireland firms, and 8.1 per cent of firms in Ireland were engaged in cross-border co-operation, while about a third of companies were engaged in local co-operation (Table 1)[8]. It is hard to compare these levels of cooperative activity will those elsewhere given differences in the size of geographical regions. It is striking, however, that the levels of local co-operation identified here (31-32 per cent) are broadly in line with the proportion of Austrian firms undertaking local co-operation (35.6 per cent) found by Huber (2003, p. 950, Table 1).

To reflect the potential benefits to firms of co-operation we include two variables reflecting firms' perceptions of high labour and energy costs. We also include here two variables relating to the (non-specific) barriers which firms perceived in developing cross-border co-operation, and firms' perception of high local business tax rates. Responses to this question may reflect the marked difference between corporation tax rates in Northern Ireland (30 per cent) and Ireland (12 per cent), creating potential incentives for cross-border co-operation and integration to allow transfer pricing.

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[8] In fact, given the relative sizes of the NI and Ireland economies this ratio is what we should expect if all cross-border links were on a dyadic basis

To reflect distance effects we consider a series of dummy variables which reflect firms' distance (in miles) from the border by the shortest road route. Resource availability is reflected by two variables reflecting whether the firm had in house R&D and had faced any labour shortages over the previous year. Variables reflecting firm size are also included to reflect the stronger resource base of larger firms. Market uncertainty is reflected in two variables reflecting the strength of local competition and two other dummy variables indicating whether or not firms perceived unfair competition in their home market from local or international competitors. Country uncertainty is reflected in a variable reflecting firms' perception of exchange rate difficulties, and two variables reflecting the extent of firms' cross-border sales and the number of years for which they had been engaged in cross-border trading. In addition, we include in the models a range of control variables relating to sectoral differences, exporting outside Ireland and firms' sales growth over the 2000-2002 period.

Two issues arise in the empirical estimation of equation 1. First, as we regard the decision to engage in local and cross-border co-operation as simultaneous, and as we observe only the actual ex post decisions to engage in co-operation, this suggests a simultaneous probit formulation, as discussed by Madalla (1983, p. 246). Appropriate estimation for this model is in two-stages, estimating first reduced form models, and then substituting the fitted values produced into the structural equation estimates (see Madalla, 1983, p. 246-247). Derivation of the variance/covariance matrices for the structural equations is then standard, correcting for correlation between equation errors. A second issue which arises in the estimation is the relatively 'unbalanced' nature of the sample, with only a small proportion of firms engaging, in particular, in cross-border co-operation. In this situation, standard measures of 'fit' for Probit models are relatively poor indicators of model quality, and Greene (2002) discusses the potential for using alternative 'limits' in the predicted probabilities in this type of situation, depending on the empirical objective, i.e. the overall predictive power of the model, or its ability to identify participants in, say, cross-border co-operation. We return to this issue in the next section.

5. Empirical Results

Simultaneous probit models of the probability of engaging in local and cross-border co-operation were estimated separately for Ireland and Northern Ireland (Table 2). Each model included a series of variables chosen to reflect each of the hypotheses outlined earlier together with a series of controls (e.g. exporting, growth, sectoral dummy variables). Overall, the equation $\chi^2(.)$ statistics suggest the validity of the models. Using conventional limits for the predicted probabilities (i.e. 0.5), however, the models were poor at identifying those firms engaging in both local and cross-border co-operation despite high levels of correct predictions. This issue is discussed in detail in Section 5.2 following a review of the evidence for each of the hypotheses identified earlier.

5.1 Determinants of Co-Operation

Consistent with our argument that firms' participation in cooperative relationships will depend on their assessment of the costs and benefits of the activity, Hypothesis 1 suggests that both local and cross-border co-operation will be related to the perceived returns. We find no consistent evidence, however, that expected returns significantly influence the probability of local co-operation in Northern Ireland or Ireland (Table 2). In Ireland, however, there is some evidence that perceived barriers to cross-border co-operation may be encouraging firms to substitute local co-operation. This may reflect the historical difficulties of cross-border trading due to the Northern Ireland troubles underlying the discussion in O'Dowd et al. (1995) and Wilson (2000). Cost factors also seem to be important in shaping firms' participation in cross-border participation, with high labour costs discouraging cross-border co-operation by firms located in Northern Ireland but encouraging cross-border co-operation by firms in Ireland. This is consistent with an interpretation that cross-border labour cost differentials – i.e. higher labour costs in Ireland - are attracting Southern firms to engage in cross-border co-operation but discouraging Northern firms from forming links to firms in Ireland. Similarly, perceptions of high energy costs are also discouraging Northern Ireland firms from engaging in cross-border co-operation, although no such effect is evident in Ireland. Less easy to explain is the result that perceptions of high corporation tax rates are encouraging

11

firms in Ireland to engage in cross-border co-operation when, as indicated earlier, corporation tax rates are actually lower in Ireland. As expected, then our results suggest some support for Hypothesis 1, with higher costs, or lower expected returns discouraging, cross–border co-operation.

Hypothesis 2 relates to the effect of distance from the border on firms' propensity to engage in cross-border co-operation. Following Huber (2003), we expect firms more distant from the border to be less likely to engage in cross-border co-operation, but that firms' location will have no effect on the extent of local co-operation. In table 2, where the omitted reference group are those firms located more than 60 miles from the border, this suggests we expect to find positive coefficients in the cross-border co-operation model. In Ireland, our evidence is consistent with this expectation; the distance variables are seen to have no significant effects on the probability that firms will engage in local co-operation; distance has significant effects on cross-border co-operation; and, cross-border co-operation is significantly more likely among firms within 10 miles of the border (Table 2). For Northern Ireland we also find no evidence that distance from the border influences the probability of local co-operation. The pattern of distance effects for Northern Ireland is not as anticipated, however, with distance from the border having no consistent or significant effect on participation in cross-border co-operation across the whole range of dummy variables reflecting distance, a reflection perhaps of the relatively small size of Northern Ireland itself. There is, however, some evidence of a decline in firms' propensity to engage in cross-border participation between those firms located 1-10 miles from the border and those located 11-30 miles away (Table 2). This provides partial support for the type of distance effects hypothesised in Northern Ireland. In summary, therefore, we conclude that Hypothesis 2 is supported, with distance effects both having more effect on cross-border co-operation than local co-operation, and evidence of a gradient of propensity to participate in cross-border co-operation related to distance from the border.

Hypothesis 3 relates to the strength of firms' resource base, and argued that the probability of co-operation – both local and cross-border - will be negatively related to

the strength of firms' resource base. In the estimation, we would therefore expect larger firms – typically regarded as having a stronger internal resource base – to have less need for either form of co-operation[9]. In fact, we observe a more complex pattern with three key elements. First, the probability of local, and in Ireland, cross-border, co-operation is positively related to situations where firms have in-house R&D, and only weakly related to other resource availability (e.g. labour shortages, Table 2). This suggests the complementarity of in-house R&D and external co-operation, reflecting other studies which have suggested the role of R&D as an important element of firms' absorptive capacity (e.g. Cohen and Levinthal, 1989, 1990). Veugelers and Cassiman (1999), for example, in their analysis of Belgian data suggest that firms undertaking in-house R&D benefited more from external information sources than companies which had no in-house R&D activity. Cassiman and Veugelers (2002) also emphasise the complementarity between internal and external R&D activity, and demonstrate that firms engaging in both activities introduce more innovative products than firms engaged in either external or internal R&D alone. Second, contrary to our expectations, there is little evidence of any significant relationship between firm size and propensity to engage in local co-operation. Third, there is evidence of a firm size effect on the probability of engaging in cross-border co-operation but this is non-linear having a 'U' shape, i.e. the probability of engaging in cross-border co-operation is greatest for small (10-20) and larger (100 plus employee) companies. One possible explanation for this non-linear pattern is that the motives for cross-border co-operation may differ between larger and smaller firms and that these motives may be differently related to resource availability. Our survey data, however, provides no information on firms' motives for cross-border co-operation. We do, however, as in Table 1, have information on the type of co-operation in which firms engage which we might expect to differ between larger and smaller firms if their motives for co-operation were different. In fact, there are no significant differences in the proportion of small (10-20) and larger (100 plus employee) firms engaging in any of the different forms of co-operation[10].

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[9] Hewitt-Dundas et al. (2002), for example, identify significantly higher adoption rates for a range of advanced manufacturing techniques among larger and externally-owned plants in Ireland.
[10] Comparing the proportions of small and larger firms undertaking each form of co-operation suggests the following test statistics for the whole sample: Collaboration on Research & Development or the

Hypothesis 4 relates to the potential for substitution or complementary relationships between local and cross-border co-operation. Substitution may arise, for example, if, for example, firms treat local and cross-border co-operation as alternative methods of knowledge gathering (e.g. Love and Roper, 1999, 2001). Complementarity is perhaps more likely to relate to the internal costs of co-operation where firms achieve economies of scope in the management of external relationships (e.g. Cassiman and Veugelers, 2002) or through undertaking one form of co-operation gain in terms of absorptive capacity (e.g. Cohen and Levinthal, 1989). In fact, our evidence points to a weak complementary relationship between local and cross-border co-operation with positive but insignificant coefficients on the substitution terms in Table 2. The implication is that firms in both Ireland and Northern Ireland are deriving some enhanced benefit from cross-border co-operation if they are also involved in local co-operation and vice-versa. In neither case, however, is this beneficial effect particularly strong.

Hypothesis 5 relates to local market uncertainty and suggests that the more uncertain or competitive the local market, the more likely it is that firms will engage in co-operation, both local and cross-border. In fact, we do find that market uncertainty has significant effects on each type of co-operative activity. Our data suggests that firms respond differently to local market competition originating from local and externally-owned companies. In each case, however, firm's response to competitive pressure is to seek to develop co-operation with its competitors – either at home or abroad. For example, market uncertainty due to competition from local firms tends to encourage local co-operation in both Northern Ireland and Ireland. Market uncertainty due to local market competition from foreign competitors, however, actually discourages local co-operation

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development of standards. ,t=-0.585, ρ= 0.558); Purchase of raw materials, services or equipment as part of a larger group. ,t=-0.721, ρ= 0.471); Participate in any joint marketing effort or share the cost of trade shows with other companies. ,t=-0.812, ρ= 0.416); Bid on contracts or prepare joint tenders with other companies. ,t=0.337, ρ= 0.735); Share any technical capabilities with other companies. ,t=-0.461, ρ= 0.644); Co-operate with other companies in meeting the design or quality requirements of customers. t=-0.695, ρ= 0.487); Co-operate with other companies in staff training programmes. ,t=0.643, ρ= 0.520); Participate in joint distribution network with other company. ,t=-1.1503, ρ= 0.250); Co-operate with other companies in the production of your goods or services. ,t=0.689, ρ= 0.4902); All forms of co-operation ,t=-0.148, ρ= 0.882);

14

but has a positive and significant effect on cross-border co-operation, at least in Ireland (Table 2).

Hypothesis 6 relates to country uncertainty, which is linked to currency fluctuations or the uncertainty implicit in trading in a market which is not a firm's home market (e.g. Reddy et al., 2002). Country uncertainty, the hypothesis suggests, is likely to have a more negative effect on cross-border co-operation than local co-operation. Variables included in the models will directly reflect country uncertainty (exchange rates), and the reduction in uncertainty due to learning effects due to firms' knowledge of the other Irish jurisdiction through their prior experience of cross-border trading. In the estimation, we find strong support for the structural element of the hypothesis with none of the country uncertainty variables having any significant impact on local co-operation (Table 2). As expected, however, firms with a history of cross-border trading - and therefore more knowledge about market conditions in the other Irish jurisdiction - are more likely than others to be engaging in cross-border co-operation. Contrary to expectations, however, we find a strong positive effect from exchange rate uncertainty on cross-border co-operation in both Ireland and Northern Ireland, The suggestion is that far from discouraging cross-border co-operation, firms may be using cross-border co-operation to hedge against currency fluctuations by balancing their exposure to Northern and Southern markets.

5.2 Identifying Co-Operating Firms

As indicated earlier, convention in binomial probit estimation is to use 0.5 as the cut-off, or limit, for allocating the predicted values to either the '0' or '1' categories. In situations like that considered here, however, where the proportion of firms participating in cross-border and local co-operation is low, this convention generally tends to lead to low levels of correct classification for those firms engaging in co-operation. This is very evident in Table 2, where the models identify 6-30 per cent of co-operating firms, compared to 90-99 per cent of non-co-operating firms. To improve the proportion of co-operating firms identified, one possibility is to change the limit values (see the discussion in Greene, 2003, pp 685-686). This is considered in Table 3 which summarises the results of this

15

procedure, reporting the overall percentage of correct predictions and each model's ability to correctly identify firms participating in cross-border or local co-operation[11]. What is immediately clear is that the overall percentage of correct predictions and models' ability to correctly identify firms participating in either local or cross-border co-operation are inversely related. For example, for Northern Ireland a limit of 0.1 results in 86.2 per cent of all firms engaging in cross-border co-operation being correctly identified, falling to 44.8 per cent with a limit of 0.3. The same change in the limit increases the overall percentage of correct predictions from 61.8 per cent to 84.5 per cent. Choosing limit values to maximise the percentage of firms engaging in co-operation therefore generates false 'positives' reducing the overall predictive accuracy of the models (see also the case cited by Greene, 2003, pp. 685-686). This may itself be of some value, however, in helping in targeting policy interventions on those firms which share the characteristics of cooperating firms but are not currently engaged in cross-border co-operation.

5. Conclusions

While around a third of all firms in Ireland and Northern Ireland engage in local co-operation, a smaller proportion – one in six in Northern Ireland and one in twelve in Ireland - engage in cross-border co-operation. Firms' participation in both types of networking can be explained in terms of the costs and benefits of each activity, suggesting a range of hypotheses related to the expected returns from co-operation, resource availability and uncertainty. Our results suggest three main reasons why firms in Ireland and Northern Ireland may be more likely to engage in local rather than cross-border co-operation. First, distance from the border does turn out to be a significant factor in determining the probability of cross-border co-operation while it has no effect on the probability of engaging in local co-operation (see also Huber, 2003). This means that cross-border co-operation is less common in areas more distant from the border reducing

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[11] In fact, as the estimates derived from the first stage reduced forms are the fitted values it is only at the second stage – the structural form estimation – that the different limit values have any impact on the estimation. This also means that the impact of the alternative limit values on the two equations is independent.

the overall level of co-operation in the population, particularly in Ireland. Second, in Ireland at least, perceived barriers to cross-border co-operation are discouraging this type of co-operative activity with firms substituting instead more local co-operation. Third, country uncertainty also influences cross-border co-operation with exchange rate uncertainty encouraging cross-border co-operation, perhaps as a means of currency hedging. In fact, however, the period covered by the survey (2000 to 2002) was a period of relative stability in the Euro-Sterling exchange rate which varied only +/- 2 per cent from 2000-2002, following a 7.5 per cent fall in 1999-2000 and followed by a 10 per cent appreciation in 2002-2003[12]. It is therefore likely that the relative stability of exchange rates over this period may actually have been reducing the incentives for firms to engage in cross-border co-operation. Resource effects, and the effects of local market uncertainty are also significant in the estimation but have a broadly similar effect on the probability that firms will engage in cross-border and local co-operation. Essentially similar factors explain the higher incidence of cross-border co-operation in Northern Ireland: a larger proportion of the population firms in Northern Ireland are proximate to the border than in Ireland; and, there is no evidence of any perceived barrier to cross-border co-operation in Northern Ireland as there is in Ireland.

Our results clearly suggest the economic motivations which shape firms' decisions to engage in local and cross-border relationships, and the links between these relationships and firms' other attributes, e.g. whether or not they have in-house R&D. In Ireland, too, our results suggest some perceived – although unspecified – barriers to the development of cross-border co-operation, an issue perhaps worthy of further investigation. What is less clear, however, is exactly what further policy actions could be undertaken to boost levels of cross-border co-operation if this is felt to be desirable given the dominance of distance, perceived barriers and country uncertainty in shaping levels of cross-border co-operation. Two avenues are possible, however. First, steps could be taken to increase firms' understanding of cross-border market opportunities and business culture. Our results suggest this would reduce country uncertainty – in much the same way as participation in cross-border trading would work – and increase the extent of cross-border

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[12] The Sterling-Euro exchange rates were: 1999, 0.6587; 2000, 0.6095; 2001, 0.6219; 2002,0.6288; 2003, 0.692. Source: CSO, Dublin

co-operation. Second, our results suggest that current policy initiatives to increase business R&D activity in Ireland and Northern Ireland, and strengthen firms' skill base are both likely to have indirect benefits in terms of increased cross-border co-operation.

While our study sheds some light on the economic reasons for local and cross-border co-operation in Ireland and Northern Ireland it is subject to a number of important limitations. First, unlike Huber (2003), we have very little information on the organisational forms which firms develop to facilitate co-operation. Huber (2003), for example, considers separately the factors which determine ownership relations, incentive contracts and more informal business relationships, and finds some differences between the determinants of the various forms of co-operation. Second, in our analysis we implicitly assume that the impact of factors such as country uncertainty on firms of different sizes is the same. It is possible, however, that differences in firms' internal resources – in particular the presence of a specialist treasury department in larger firms – may ameliorate the negative effects of currency uncertainty. Future work might consider the importance of these contingent effects.

A third limitation of our analysis is its essentially static treatment of the stock of co-operative activity at the time of the survey. As Reuer and Ariño (2002) suggest, co-operative partnerships may often be short-lived and change in nature due either to the firms' competitive environment or internal inconsistency (e.g. when there is poor alignment between the governance structure of the cooperative relationship and its functional objectives) (Williamson, 1985). One potentially interesting avenue for future research would therefore be to investigate whether the more complex regulatory and market context for cross-border co-operation agreements between firms in Ireland and Northern Ireland means they have shorter duration than similar agreements within a single jurisdiction[13]. Such an approach may also shed light on the 'churn' in firms' co-operative relationships as co-operations develop and dissolve (e.g. Reddy et al., 2002).

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[13] It is notable, however, that in their analysis of strategic alliances by Spanish firms Reuer and Ariño (2002) found alliance specific (e.g. age, asset specificity) and firm specific (e.g. strategy) factors to be more important than environmental change in determining the probability of contractual re-negotiation. Indeed,

Table 1: Proportion of Firms Engaging in Local and Cross-Border Co-operation

Focus of Co-operation	Type of Co-operation	Northern Ireland	Ireland	All Firms
		%	%	%
Collaboration on Research & Development or the development of standards.	Local	7.2	10.1	9.1
	Cross-Border	3.0	2.4	2.6
Purchase of raw materials, services or equipment as part of a larger group.	Local	10.3	9.1	9.5
	Cross-Border	5.9	2.3	3.6
Participate in any joint marketing effort or share the cost of trade shows with other companies.	Local	7.0	11.2	9.8
	Cross-Border	3.4	1.8	2.4
Bid on contracts or prepare joint tenders with other companies.	Local	6.4	5.8	6.0
	Cross-Border	4.0	1.0	2.0
Share any technical capabilities with other companies.	Local	8.3	6.3	7.0
	Cross-Border	2.9	2.0	2.3
Co-operate with other companies in meeting the design or quality requirements of customers.	Local	11.1	12.3	11.9
	Cross-Border	3.6	2.2	2.7
Co-operate with other companies in staff training programmes.	Local	13.1	12.6	12.8
	Cross-Border	2.4	0.8	1.4
Participate in joint distribution network with other company.	Local	4.7	4.7	4.7
	Cross-Border	2.8	0.9	1.5
Co-operate with other companies in the production of your goods or services.	Local	10.9	9.2	9.8
	Cross-Border	5.1	2.4	3.3
All forms of co-operation	Local	32.1	31.5	31.7
	Cross-Border	15.4	8.1	10.6

Source: Survey of Cross-Border Co-operation (Williams et al., 2004).

their results suggested: 'no evidence that cross-border ventures are more likely to experience contractual renegotiations than domestic alliances' (p.62).

Table 2: Simultaneous Probit Models of Cross-Border and Local Co-Operation

	Northern Ireland				Ireland			
	Cross-Border Co-operation		Local Co-operation		Cross-Border Co-operation		Local Co-operation	
	Coeff	Z score	Coeff	Z score	Coeff	Z score	Coeff	Z score
Expected Returns								
Barriers to co-operation			0.110	0.780	0.372	1.547	0.387	2.557
High Labour Costs	-0.253	-1.717	-0.072	-0.474	0.403	1.759	0.062	0.377
High Energy Costs	-0.289	-1.986	0.180	1.185				
High Tax Rates	0.172	1.159	-0.121	-0.839	0.343	2.353	-0.100	-0.789
Distance Effects								
Border: 1-10 miles	-0.359	-1.138			0.357	2.245	0.145	0.989
Border: 11-30 miles	-0.644	-2.453	-0.322	-1.202	0.221	1.176	0.230	1.591
Border: 31-60 miles	-0.398	-1.648	-0.143	-0.712				
Resource Availability								
R&D in the firm			0.685	4.759	0.394	2.022	0.262	1.811
Size: 20-49 employees			0.336	1.743	-0.403	-2.333		
Size: 50-99 employees	-0.481	-2.745	-0.095	-0.533				
Size: 100 plus employees	0.630	2.793	0.093	0.286	0.182	1.070	0.108	0.774
Labour Shortages			-0.133	-1.063	-0.076	-0.519	-0.130	-1.330
Substitution								
Local Co-operation	0.259	1.523		1.177	0.302	0.753		
Cross-Border Co-op.			0.380				0.192	0.897
Market Uncertainty								
Low number of competitors			-0.136	-0.877	-0.226	-1.490		
High number of competitors	0.265	1.756						
Unfair local competition			0.286	1.993			0.248	2.231
Unfair international competition			-0.253	-1.708	0.355	2.106	-0.276	-2.124

Country Uncertainty

	Coef	z	Coef	z	Coef	z	Coef	z
Cross-border Selling (years)	0.025	4.322	-0.008	-0.776	0.013	4.169	-0.006	-1.331
Sales in other area (%)			-0.002	-0.503	0.022	5.375	0.001	0.090
Exchange Rates	0.867	5.976	-0.248	-0.804				

Controls

	Coef	z	Coef	z	Coef	z	Coef	z
Sales outside Island (%)	0.003	0.872			-0.005	-1.814	-0.002	-0.747
Sales increased	0.188	1.179					0.122	0.983
Sales decreased	-0.386	-1.470	-0.049	-0.202			0.333	2.385
Sector: Construction	0.427	1.718	0.281	1.014	-0.930	-3.392	-0.127	-0.448
Sector: Retail	-0.374	-2.021	0.193	1.023				
Sector: Property, Business Services	-0.197	-0.854	0.180	0.869				
Sector: Hospitality			0.324	1.540				
Sector: Personal Services					0.683	0.873		
Constant	-0.909	-3.136	-0.091	-0.216	-2.216	-5.898	-0.469	-0.745

N		574		574		790		790
Log Likelihood		-189.61		-318.870		-176.450		-464.22
Chi 2 (..)		107.20 (p=0.000)		82.87 (p=0.000)		94.33 (p=0.0000)		65.75 (p=0.000)
HL Chi 2		6.11 (p=0.634)		15.58 (p=0.0487)		13.49 (p=0.958)		12.53 (p=0.129)
Estrella		0.174		0.141		0.06		0.053
Correct Predictions		0.855		0.707		0.910		0.688
No co-operation (%)		0.975		0.900		0.990		0.919
Co-operation (%)		0.183		0.298		0.058		0.203

Table 3: Predictive Accuracy with Alternative Limit Values

Limit	Cross-border Co-operation		Local Co-operation	
	Overall % Correct	Cross-border % Correct	Overall % Correct	Local % Correct
A. Northern Ireland				
0.1	61.8	86.2	35.0	97.8
0.2	78.9	65.5	49.8	87.0
0.3	84.5	44.8	63.3	69.6
0.4	85.5	28.7	66.9	48.4
0.5	85.5	18.4	68.2	29.9
0.6	85.5	11.5	68.9	18.5
0.7	85.2	5.7	68.9	9.2
0.8	85.4	3.4	97.1	3.3
0.9	85.2	2.3	na	na
B. Ireland				
0.1	73.2	60.3	32.3	100.0
0.2	85.7	29.4	40.7	89.0
0.3	89.1	22.1	52.8	64.7
0.4	90.6	10.3	60.7	42.0
0.5	91.0	5.9	66.4	20.4
0.6	91.3	4.4	68.6	9.0
0.7	91.3	2.9	94.9	3.1
0.8	91.4	1.5	na	na
0.9	91.5	1.5	na	na

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