

(Final version)

**Economists' Perceptions versus Managers' Decisions:
An Experiment in Transaction Cost Analysis**

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Acknowledgements. We are grateful to members of the Network of Industrial Economists who contributed to the experimental element of this paper, and for the constructive comments of an anonymous referee. Lisa Bradley provided excellent research assistance in the early stages of the empirical analysis.

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Abstract

Are the perceptions of professional economists on transaction costs consistent with make-or-buy decisions made within firms? The answer may have important implications for transaction cost research. Data on firms' outsourcing during the new product development process are taken from a large-scale survey of UK, German and Irish manufacturing plants, and we test the consistency of these outsourcing decisions with the predictions derived from the transaction cost perceptions of a panel of economists. Little consistency is evident between actual outsourcing patterns and the predictions of the (Williamsonian) transactions cost model derived from the panel of economists. There is, however, evidence of a systematic pattern to the differences, suggesting that a competence or resource-based approach may be relevant to understanding firm outsourcing, and that firms are adopting a strategic approach to managing their external relationships.

Key words: Transaction costs, outsourcing, economists' perceptions, experiment

JEL classification: D23, L22, O31

1. Introduction

There are now many empirical studies of transaction costs, with increasingly sophisticated analysis of, *inter alia*, the make-or-buy decision and incomplete contracts (see Groenewegen, 1996, and Ménard, 2000, for recent contributions). Much of this analysis is concerned with the process of objectively measuring transaction costs, or the elements believed to result in high transaction costs, such as asset specificity or the degree of uncertainty in a transaction.

Underlying this form of analysis there is an implicit assumption that managers actually make the choice between in-house versus external production based on an objective assessment of transaction costs, or at least that they behave as if they do so. However, another strand of literature suggests that this search for objectivity may not be very productive. Buckley and Chapman (1997), for example, argue that all transaction costs are ultimately matters of perception. What matters is not some objective measure of transaction costs in a given situation, but the perceptions of the relevant decision makers:

‘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)

Buckley and Chapman refer to this notion of perceived transaction costs as ‘a rich tautology’, to which empirical attention ought to be directed. In their own detailed research on cooperative strategies in R&D and innovation, 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.

In what follows we recognise the importance of perceptions in transaction cost analysis, but take a quite different approach. We ask: when economists apply transaction-cost reasoning, do they make decisions on outsourcing (i.e. make-or-buy) consistent with those made by managers? We are therefore not testing whether firms make decisions based on transaction-cost economising motives, but whether the outcome of firms' decision-making is consistent with transaction cost economics *as perceived by members of the profession which developed this form of analysis*. If the degree of consistency between economists' perceptions and firm behaviour is high, our confidence in transaction cost economics is maintained or enhanced. If, however, the degree of consistency is low, then there are two possible interpretations, both of which have implications for mainstream empirical research on transaction cost economics. First, the transaction cost 'rules' are wrong i.e. businesses do not use transaction-cost economising methods. Or, secondly, the transaction cost 'rules' are correct, but managers use them in a quite different way from those inferred by economists i.e. there are discrepancies either between the perceptions of economists and the objective reality of transaction costs, or between economists' perceptions and those of the managers making actual make-or-buy decisions.

It could, of course, be argued that it is of little importance if the transaction cost judgments of economists fail to coincide with decision making within firms; after all, marginal analysis was not abandoned because Hall and Hitch (1951) found that firms failed to equate marginal cost with marginal revenue in their pricing and output decisions. It might even be regarded as unreasonable to assume that managers make purposeful transaction cost decisions *ex ante*; following Friedman's (1953) defence of the assumption of profit maximising, perhaps it matters only that firms behave *as if* they minimise transaction costs in the make-or-buy decision. From this methodological perspective, the issue is not whether any individual manager makes explicit judgments on asset specificity or complexity before coming to a rational choice in any given situation, but that there exists some form of (Darwinian or other) selection process which allows transaction-cost minimisers to survive and prosper, while punishing the less proficient¹. To allow for this possibility our research differs

¹ Buckley and Chapman (1997, pp 130-132) cast doubt on whether Darwinian selection mechanisms can really be applicable in corporate decision-making. See also Hodgson (1994) for an analysis of

from much of the empirical transaction cost literature by focusing not on a small number of individual transaction made by one or a few firms, but by examining the outsourcing behaviour of an extensive sample of firms, sufficiently large to ensure that many will be ‘survivors’ in transaction cost terms even if their managers have failed to make purposeful transaction-cost minimising decisions.

To test the consistency of firms’ outsourcing decisions and economists’ perceptions we make use of a panel of (mainly academic) economists who have a shared interest in industrial economics. The use of expert panels in transaction-cost studies is not new, and such panels have been used in several empirical studies (e.g. Masten et al., 1991). The difference here is that the views being sought are not those of the decision-makers themselves, nor of external ‘experts’ thought to have some objective insight into the scale of transaction costs, but of economists. The perceptions of the panel are then compared with the actual outsourcing decisions made at around 2000 manufacturing plants in three European countries, within the context of new product development. We find that there is little consistency between the judgments of the panel of economists and actual outsourcing patterns, and that this remains true even after allowing for the effect of plant and sector-specific influences on firms’ outsourcing decisions. However, the inconsistencies between the predicted and actual levels of outsourcing do reveal a systematic pattern, suggesting an important role for a competence or resource-based view.

2. Transaction Costs and Outsourcing in New Product Development

Outsourcing in NPD

Considerable evidence now exists of the value of utilising external resources for promoting new product development (NPD)². Alongside their ability to release resource constraints on firms’ NPD activities, external linkages may also help in

Winter’s (1964) critique of Friedman, suggesting that, from an evolutionary perspective, the conditions under which the selection of profit maximisers might occur is far from obvious.

² For a review of earlier studies see Freeman (1991). More recent survey-based evidence comes from the Netherlands (Oerlemans et al., 1998), Sweden (Karlsson, 1997), Germany and France, (Koschatzky, 1998) and the UK (Love and Roper, 1999). Other evidence of the positive innovation effects of firms’ networking activities comes from firm or industry case study evidence. Gemser and Wijnberg (1995), for example, consider the effect of horizontal networks among companies in Silicon Valley and in the Italian furniture industry, while Autio (1997) provides evidence for networking among new technology based firms. Contrary evidence is limited, although Gauvin (1995) finds no evidence of positive networking effects in a study of Canadian patents data.

reducing risk, accelerating or upgrading the quality of the products developed, signalling the quality of firms' activities (Powell, 1998) and even in increasing firms' ability to appropriate the returns from undertaking NPD (Gemser and Wijnberg, 1995).

For the individual firm, however, the potential importance of these boundary-spanning activities in NPD poses important strategic questions. Many of the issues involved reflect those in other forms of strategic alliances for marketing, sales or joint production operations (for example, the complementarity of competences, trustworthiness, partner quality etc.). However, the issue is more complex for the NPD process due to the uncertainty implicit in R&D contracts and the resultant difficulties in terms of contract formulation, property rights adherence and contractual compliance. Some researchers argue that, by allowing firms to access resources and talent outside the organisation, outsourcing innovation and NPD can be a major strategic tool, leading to enormous savings in NPD costs and risks, and leading to markedly decreased product cycle times (Quinn, 2000; Rubenstein, 1994). Others argue that the benefits of NPD outsourcing have been overstressed, and can be strategically dangerous if seen as a substitute for the development of long-term internal capabilities in core areas (Chesbrough and Teece, 1996).

The implication of this debate is that for new product development projects, transaction costs, broadly defined, may be a more significant element of the total cost bundle than in other business activities where the likely outcomes are more predictable and easily observed. Ironically, however, it might be thought that transaction cost analysis – at least of the standard Williamsonian type – is poorly equipped to deal with precisely this form of activity. In part, this is because the rather static models of transaction cost analysis usually employed in empirical studies fail to reflect the uncertain outcomes and dynamic character of the NPD process³.

This criticism may, however, underestimate the possible value of the transaction cost approach to certain specific aspects of the NPD process. While NPD as a whole may

³ Furthermore, decisions on outsourcing, especially in terms of NPD, may be determined not merely by transaction cost minimising, but also by firms' desire to leverage the resources and competences which can be devoted to the project.

appear to be dynamic and uncertain, it is also important to acknowledge that the process involves a sequence of separate activities, at least some of which may be considered relatively routine and mundane⁴. Product testing for standards compliance, for example, has more certain outcomes and may therefore involve lower transaction costs than, say, prototype development, and there may therefore be less incentive for firms to internalise such routine activities. This suggests the potential value of considering NPD as a series of separate activities, each of which has a different technological profile, involves different risks and transaction costs and may therefore have a unique risk/reward balance when outsourced. When broken down in this way, transaction costs analysis may be useful in considering why the extent of outsourcing varies at each stage of the NPD process.

The Transaction Cost Approach

“TCE (Transaction Cost Economics) argues and empirically finds that boundary choices are driven largely by the specificity of assets involved in an exchange ... Specific assets trigger a threat of opportunistic behaviour that requires costly contractual safeguards to deter. Hence, in the presence of exchange-specific assets, vertical integration may offer a preferred governance solution” (Poppo and Zenger, 1998, p. 853)⁵.

The above quotation refers clearly to Oliver Williamson’s (1975) version of transaction cost analysis. While many economists have been critical of this approach⁶, it is unquestionably the case that Williamsonian transaction cost analysis has become the mainstream version of the approach, and is the only version to have been subject to a significant amount of empirical testing in both the economics and strategic management literature (Shelanski and Klein, 1995). The empirical part of

⁴ Some companies treat new product development explicitly as a routinised procedure. For example, the lighting division of Philips, the electrical multinational, uses an ‘innovation manual’ to provide a step-by-step guide in developing new products from the initial concept to the finished marketable product, making the whole process as systematised as possible.

⁵ It is interesting in this context that Oerlemans et al., 1998 argue that although external actors may play a part in innovation ‘innovation in firms is primarily internal in nature’ (p. 300). Evidence for this is provided by Koschatzky (1998).

⁶ For example, Coase (1993: 68-71) discounts asset specificity as an important explanation for vertical integration, while Demsetz (1988, 1997) presents a model of vertical integration which does not rely on opportunism. And Langlois (1997) argues that even where opportunism is completely absent, divergent views of an uncertain future may be enough to lead to joint ownership between contracting parties.

our research is therefore restricted to the Williamsonian approach with its emphasis on asset specificity, opportunism, and uncertainty.

The NPD process involves a range of activities that differ both in their degree of asset specificity and in other dimensions which might shape the most efficient governance structure. Different types of asset specificity, i.e. physical asset specificity, human asset specificity, site specificity and dedicated assets may have specific consequences for the governance of the NPD process. For example, physical or human asset specificity is most evident in situations in which assets are exchange specific, so that investments are of little or no value in any other context. Examples would be bespoke machinery or equipment designed to produce some patented form of component or device. Or, in terms of human asset specificity, a firm may wish to access or develop specialist skills as part of the NPD process⁷. In either case, the crucial result of these forms of asset specificity – or more correctly Williamson's (1975) small numbers problem induced by specific assets – is the possibility of hold-up. This likelihood is increased by the inevitable incompleteness of contracts in the NPD process that arises from the combination of bounded rationality, complexity and uncertainty. Fear of exposure to the threat of hold-up may lead to a tendency to vertical integration, or make, rather than buy.

Also affecting the governance costs of market versus self-supply is uncertainty about the outcome of a potential exchange. Where, as in the NPD process, there is a high degree of uncertainty over the outcome of an exchange, parties are induced to spend resources on *ex ante* and *ex post* contract compliance mechanisms in order to protect against opportunistic behaviour. And, even where opportunism is not a threat, and the parties trust each other completely, intense outcome uncertainty may result in market failure because the parties genuinely have unbridgeably different views of appropriate outcomes, and therefore find it impossible to agree when satisfactory contractual compliance has occurred (Langlois, 1997; Love, 1995). Such an outcome is most likely where the exchange revolves around the transfer of tacit or embedded knowledge which cannot readily be presented as plans or blueprints, precisely the situation which may obtain in the early stages of the NPD process.

⁷ Transaction cost economics here comes closest here to resource-based models of the firm. For comparisons see Langlois, 1997; Poppo and Zenger, 1998.

The make or buy decision is not, however, based solely on transaction costs, but will also take into account relative production costs: this, in turn, is related to the potential for external contractors to obtain economies of scale or scope. By aggregating demands, external suppliers may be able to achieve economies of scale unattainable to any individual firm engaging in self-supply. The ability to achieve economies of scale is also linked, however, to the degree of asset specificity. Empirical support for this relationship comes from Lyons' (1995) analysis of subcontracting in UK manufacturing industry. Lyons explicitly deals not merely with the trade-off between governance costs and production costs, but with the links between them, finding that specific assets tend to encourage 'make' decisions only where there are economies of scale, and that economies of scale (and scope) have a greater 'buy' effect where specific assets are absent.

Empirical tests of the predictions of transaction cost economics typically involve developing measures of asset specificity and other determinants in the context of specific contractual conditions, and regressing these transaction cost determinants on some measure of make-or-buy in a reduced form estimation. Suppose, following Masten *et al* (1991), that for any anticipated level of output the respective costs of firm (C_f) and market (C_m) organisation are given by:

$$C_f = \alpha Z + e \quad (1.1)$$

$$C_m = \beta Y + u \quad (1.2)$$

where Z and Y are (non-mutually exclusive) vectors of the determinants of cost, and α and β are coefficient vectors. A typical way to operationalise such a system is to express it as a reduced form probabilistic function using probit or logit, i.e.

$$\Pr(C_f < C_m) = \Pr(e - u < \beta Y - \alpha Z). \quad (2)$$

The key elements here are the (transaction) cost vectors Y and Z , and several studies go to considerable lengths to derive 'objective' measures of *inter alia* physical and

human asset specificity, sometimes using the judgment of expert panels⁸. However, if the transaction cost rationale has general predictive power within the context of NPD, we would expect the broad pattern of outsourcing to reflect the predictions of transaction cost theory in a large enough sample. We therefore try a quite different approach towards testing, comparing the observed pattern of outsourcing found in a large sample of firms with the general predictions of transaction cost theory based on the *a priori* expectations of a panel of professional economists. If the fit between the observed and predicted pattern of outsourcing is good, this suggests that transaction cost analysis – at least as understood by our panel – has some predictive power, even in an activity as potentially fraught with uncertainty as NPD. If the fit is poor, this may suggest that firms do use transaction-cost minimising behaviour, but do not employ the algorithms or rhetoric of professional economists, or that transaction cost analysis is a poor predictor of the outsourcing decisions of firms.

3. Judgments of the Panel of Economists

In the empirical analysis we identify seven activities which form part of the NPD process, ranging from the conceptual stage to market introduction:

- Identification of new products
- Prototype development
- Final product development
- Product testing
- Production engineering
- Market research
- Developing a marketing strategy

Each activity can be ranked in terms of the likely presence of asset specificity (and the associated threat of hold-up), in terms of the uncertainty of outcomes, and in terms of the likelihood of external scale economies, as outlined in the previous section. The

⁸ In a study of the make-or-buy decision in naval shipbuilding, Masten *et al* (1991) make an interesting use of the expert panel approach. Having obtained estimates from relevant managers of the asset specificity, complexity etc involved in 74 components made or bought in naval shipbuilding, these were then compared to estimates for the same components made by a naval architect formerly employed by the shipbuilder. When the correlations between the two sets of estimates were found to be

ranking was carried out by asking members of the Network of Industrial Economists for their views. As its name suggests, the Network is “a forum for interchange among university economists in the UK, and for interaction between academia, business, and government on topics of industry economics” (www.jiscmail.ac.uk/lists/INDECON). The Network has an electronic discussion list (INDECON) to which around half the network members subscribe, and through which members were sent a short questionnaire by e-mail (see Annex). The purpose of the questionnaire was to elicit the responses of economists to the sort of questions typically asked of managers or expert panels in empirical transaction cost studies of the make-or-buy decision. Respondents were therefore asked to rate on a scale of 1 to 5 the levels of asset specificity, uncertainty and economies of scale which they would associate with each of the seven activities of the NPD process⁹. The questions were deliberately kept simple and acontextual. The respondents were not asked for their views on transaction cost analysis: the intention was to elicit the views of a group likely to be knowledgeable on mainstream transaction cost theory, not to determine their degree of adherence to (Williamsonian) transaction cost analysis.¹⁰ No attempt was made to remove outliers, as there was no clear rationale for doing so.

Twenty-seven responses were received from an INDECON mailing list of 177 (15.2 per cent). The respondents comprised 23 academic economists, two government economists and two others (one academic accountant and one economist employed in the private sector). The academics were split almost equally between those employed in economics departments and those employed in business or management schools. Although the network is UK based, three of the respondents came from outside the UK (one each from France, Spain and the United States).

The mean scores given by respondents to each activity are shown in Table 1¹¹. Asset specificity reflects the extent to which the human or capital assets being used or developed are exchange specific. The panel expects ‘high’ asset specificity to occur

low for several key elements (especially asset specificity), Masten et al simply drop the ‘expert’ opinion and use those of the managers ‘on a priori grounds’ (p. 12 fn 20).

⁹ In order to keep the questionnaire as simple as possible, we tested only for the physical and human elements of asset specificity.

¹⁰ Even if they are not Williamsonian adherents, the Network members are likely to know enough about the ‘standard’ approach to make informed estimates in the questionnaire.

¹¹ Using median values resulted in unchanged rankings.

in prototype and final product development where (especially human) assets are highly specific to the product under development and the firm undertaking the development. ‘Low’ asset specificity indicates the possibility of exchange based on more generic techniques and resources such as the more routine activities involved in market research and evaluation. Product-related activities such as production engineering and testing are likely to have both generic and product specific elements, and are regarded as an intermediate group. The level of uncertainty or unpredictability of outcomes is also regarded as varying markedly between the different activities, high for those activities which are clearly non-routine (i.e. product identification and prototype development), and low for the more routine activities. In these more generic testing, manufacture and market research activities, contractual arrangements are likely to be more straightforward and contract compliance (and policing) costs are therefore likely to be lower, making outsourcing more likely.

Alongside these transaction cost issues, production cost differences will exist between in-house and external production, reflecting firms’ ability to generate economies of scale. In the case of NPD, the potential for economies of scale are judged to be least evident where (human) asset specificity and uncertainty are relatively high (e.g. in product identification and prototyping) but also in the development of a marketing strategy, an activity not judged to be asset-specific or having a high degree of uncertainty. By contrast, economies of scale are judged most likely to be significant in more generic activities such as production engineering or market research. Other activities such as final product development and product testing involve a more mixed range of generic and specific knowledge, and again form an intermediate group.

In order to achieve an *ex ante* ranking of the likelihood of outsourcing, the scores on governance costs and the potential for an external (specialist) provider to achieve economies of scale are summed (Table 1)¹². For example, prototype development exhibits high (human) asset specificity and uncertainty, with low prospects for scale

¹² For the summing process the scores for economies of scale are rescaled in reverse order to ensure that a low score equals a high likelihood of outsourcing, consistent with the transaction cost determinants.

economies, leading to the hypothesis that this function is, *in general*,¹³ relatively unlikely to be contracted out. This is also true of new product identification, where the capacity for economies of scale is particularly low. By contrast, the market research function exhibits the reverse characteristics, suggesting it is highly likely to be contracted out. Other activities fall somewhere between these two extremes.

The scores shown in Table 1 display considerable spread around the mean values, with coefficients of variation ranging from 0.16 to 0.50. The rankings derived from the panel process are also potentially sensitive to the weighting of the three elements in the overall outsourcing 'score'. In Table 1 all elements receive equal weight. But it could be argued, for example, that in an intrinsically unpredictable activity such as NPD, the uncertainty element should be given more weight than either asset specificity or economies of scale in determining the likelihood of outsourcing. In practice this makes little difference: weighting uncertainty twice as heavily as the other two elements did not affect the *ex ante* rankings of the likelihood of outsourcing.

4. Comparing Predictions with Actual Outsourcing Patterns

Data on NPD outsourcing are taken from the Product Development Survey (PDS), a postal survey which provides comparable information on the new product development activity of 1700 UK manufacturing plants, 1300 German plants and 500 Republic of Ireland businesses (see Roper et al., 1996; Love and Roper, 2001a)¹⁴. Plants responding to the PDS provided background information on the plant and detailed data on their product development activities during the 1991-94 period. Plants that had introduced either new or improved products over this period also responded to a question relating to whether the plant was undertaking any outsourcing in seven activities which form part of the NPD process¹⁵.

¹³ Clearly the extent to which different functions are contracted out or not will depend to some extent on firm and industry characteristics. This point is developed further below, but the purpose of Table 1 is to develop general and testable hypotheses from the transactions cost framework.

¹⁴ This was equivalent to a response rate of 23.7 per cent in Germany, 32.0 per cent in Ireland and 20.6 per cent in the UK (Roper et al., 1996, Table A1.1).

¹⁵ See Roper et al. (1996) and Love and Roper (2001a) for a discussion of the factors that determine the probability of innovating using PDS data.

Table 2 summarises the proportion of innovating plants in each of the three countries outsourcing in each activity. Overall, a quarter to a third of plants were outsourcing with significant differences evident between countries for all activities excepting prototype development and final product development (Table 2, Part A). In the UK, the extent of outsourcing was typically above the average level for the sample as a whole, the exception being plants' market research activity. For Germany, the opposite was true with below average levels of outsourcing, again with the exception of market research.

In their analysis of Belgian innovation data, Veugelers and Cassiman (1999) find a significant positive link between plant size and the probability of outsourcing in the innovation process. In Table 2 we therefore distinguish between small plants (i.e. those with less than 100 employees) and larger businesses. Like Veugelers and Cassiman we find outsourcing to be more common among larger plants in each country with significant differences again evident between the proportions of plants outsourcing in each activity (Table 2, Parts B and C). The only exceptions relate to production engineering in the UK and Germany where only 1 in 6 larger UK plants and 1 in 12 larger German plants were outsourcing, less than their smaller counterparts in both cases.

In terms of the overall rankings of outsourcing between activities there is little difference between smaller and larger plants, but rather more difference in the rankings between large and small plants *within* nations. For example, identifying new products is not only more likely to be outsourced by large than small plants in absolute terms, but in relative terms is the second most likely activity to be outsourced by large plants. By contrast, in the UK and Ireland, the most heavily outsourced activity for small plants is product testing, which is relatively unlikely to be outsourced by large plants. Overall, there is much greater variation in the extent of outsourcing between countries and between large and small plants than in the relative rankings.

A formal test of the consistency of the predicted ordering is derived by comparing the overall rankings of Table 2 with those derived from the economists' panel in Table 1. Spearman's rank correlation test statistics are $\rho = -0.107$ for the UK, $\rho = 0.321$ for

Ireland and $\rho = -0.214$ for Germany: all are highly statistically insignificant, indicating no correlation between the predicted and actual ordered rankings. However, contrasts between the actual and predicted rankings are revealing. As predicted, market research is the function most likely to be outsourced. However, production engineering, an activity which the panel predicts to be highly likely to be outsourced, is consistently retained in-house by plants in all three countries. By contrast, the identification of new products and prototype development – activities judged by the expert panel to be highly uncertain, likely to use specific human capital and unlikely to benefit from the existence of economies of scale, and therefore poor candidates for outsourcing – have in reality relatively high levels of outsourcing. This suggests that while the panel was able to predict accurately the relative degree of outsourcing of some activities, especially those which have intermediate levels of outsourcing, other factors are of importance in determining the levels of outsourcing in key activities in the early stage of the new product development process, and in the actual manufacturing of new products.

One possibility is that for a sample of enterprises of different nationalities, sectors and sizes, the ‘raw’ rankings may be heavily conditioned by plant-specific and market-specific factors which also affect the probability of outsourcing. To correct for this possibility we estimated logit models for the probability of outsourcing including these conditioning factors as explanatory variables. This allowed us to derive revised estimates of the likelihood of outsourcing purged of the influence of sector, size and other plant-specific determinants of outsourcing. If a ranking of these derived probabilities is not significantly different from the hypothesised rankings (i.e. those in Table 1), this provides a stronger test of the consistency of firms’ outsourcing decisions with transaction-cost theory as viewed by the panel of economists. In addition, by including in the logit equations variables which reflect the existence of other outsourcing activity within the new product development process, we were able to derive a test of the existence of economies of scope in outsourcing as part of firms’ NPD activities.

We therefore estimated a series of logit equations of the form:

$$\Pr(O_{ij}) = \alpha + \beta_1 O_{ik} + \beta_2 R_i + \beta_3 M_i + \beta_4 P_i + \varepsilon_i \quad (3)$$

where $\Pr(O_{ij})$ is the probability that plant i outsources activity j , O_{ik} is the probability that plant i outsources other activities in the new product development process for $j \neq k$, R_i is a vector of resource-based variables, M_i is a vector of market descriptors, and P_i is a vector of other plant characteristics. Parameter β_1 , which reflects potential economies of scope in the governance of outsourcing, is expected to have a positive coefficient. Parameters β_2 , β_3 and β_4 reflect the impact of other conditioning variables.

For present purposes our concern is not with the results of the logit estimations *per se*, but with the revised rankings of outsourcing likelihood which they can provide.

Details of the logit analysis for the UK and Germany are reported elsewhere (Love and Roper 2001b)¹⁶. We use the logit estimations of equation (3) to calculate predictions of the percentage of plants in each country with given characteristics that are likely to be involved in outsourcing a given element of NPD. Table 3 therefore gives the predicted percentage of plants that would be outsourcing standardising on a set of common (i.e. mean) plant, market, and locational characteristics for each country, purged of the effects of the conditioning factors discussed above. The rankings thus derived show relatively few differences from the ‘raw’ rankings shown in Table 2. Outsourcing is predicted to be most common for market research in each country, followed by product identification in the UK and Ireland and prototyping in Germany. At the other extreme, outsourcing is predicted to be least common in production engineering in each country.

There are elements of both consistency and inconsistency between the predicted probabilities and those suggested by the theoretical transactions cost arguments reflected in the perceptions of the panel. Market research, for example, a largely generic activity with a relatively low level of uncertainty, has the predicted high level of outsourcing. By contrast, production engineering has a very low predicted level of outsourcing despite its theoretically high outsourcing ranking in Table 1, while the reverse is true for new product identification and prototype development. As with the ‘raw’ rankings discussed earlier, a formal test of consistency is derived by comparing

¹⁶ Results for Ireland are available on request from the authors. Variables included in the logit equations included: plant specific factors (e.g. R&D, plant size, ownership, skill levels), market factors

the ranking of probabilities of outsourcing derived from the logit models (Table 3) with that predicted by the panel of economists and summarised in Table 1. Spearman rank correlation tests suggest $\rho = -0.143$ for the UK, $\rho = 0.00$ for Ireland and $\rho = -0.107$ for Germany. As before, all these are statistically insignificant. Thus even when the extent of outsourcing in each phase of the product innovation process is purged of scale, sector, country and other potential effects, the predicted ranking derived from the judgment of the panel remains inconsistent with the empirical evidence.

5. Discussion and Conclusions

This research has combined data from a large-scale survey of outsourcing in the new product development process with the insights gained from a panel in order to judge the consistency of transaction-cost perceptions of economists with the actual pattern of outsourcing exhibited by manufacturing plants. Rankings derived from the views of the panel were compared with the actual patterns of outsourcing exhibited by the sampled plants, both in their 'raw' form and purged of exogenous factors influencing the outsourcing decision.

The predicted relative likelihood of outsourcing in each activity is not consistent with that suggested by the panel's perceptions of transaction cost issues. This finding persists after standardising for different plant and sectoral characteristics. However, there is a strong positive correlation between the raw and adjusted rankings for all three countries,¹⁷ suggesting that the relative rankings of outsourcing reflect underlying strategic choices of the firms concerned, and are not simply artifacts induced by variations in sector, scale and other features of the sampled plants.

Earlier we suggested that if the fit between the economists' and actual rankings of outsourcing activity was poor, this would suggest one, or a combination, of two possible interpretations:

- i) transaction cost analysis is simply a poor predictor of the outsourcing decisions of firms;

(e.g. market share, R&D intensity), and locational variables (e.g. population density, government R&D spending).

¹⁷ Spearman rho values of 0.661 for the UK, 0.804 for Ireland, and 0.893 for Germany.

- ii) managers do apply transaction cost analysis, but in a different way to that imagined by economists.

Arguably the first of these is the more acute problem, but we first address the second potential explanation. This hinges on the issue of perceptions, and in turn has two elements. The first implies that there is some objective measure of transaction costs, which the panel of economists is unable to discern accurately. By contrast, managers are able to make accurate judgments of these issues, and base outsourcing decisions on these accurate perceptions. The second element favours the Buckley and Chapman (1997) approach; there are indeed transaction costs ‘out there’ which are relevant to firm boundaries, but differences in the ways that managers judge and weigh these implicit costs are important. The *real* transaction costs here are those perceived by managers, and differences thus exist not between the perceptions of the expert panel and objective reality, but between the panel’s perceptions and those of the managers making outsourcing decisions. If either of these explanations is true – and assuming that our panel is typical of the views of professional academic economists – then there may be cause for concern that the perceptions of those who research into and teach transaction cost economics are either objectively ‘wrong’, or are at least out of step with the perceptions of those who make outsourcing decisions.

We must be cautious, however, in claiming that the views of our panel are truly representative of economists as a whole, or even of those adhering to the Williamsonian version of transaction cost analysis. While the panel clearly represents a small cross-section of (mainly) UK academic economists who have an interest in the area, it is impossible to be certain that a different panel might not have produced different views on the determinants of transaction costs and so different hypothetical rankings¹⁸. The present study can claim only to be preliminary in this respect – all we can say with certainty is that the collective perceptions of *this* panel bear little relation to the actual outsourcing decision made at the plants in our sample. Nor do we claim any knowledge of the decision-making processes of the plant managers. Our postal

¹⁸ It is worth pointing out, however, that our panel included several people who have published extensively in the field of transaction cost economics. It also seems likely – although we have no means of confirming this – that those members of the NIE who responded to the questionnaire are among those most likely to be sympathetic to the transaction cost approach. The possible sample selection issues this raises are beyond the scope of the present study.

questionnaire is useful in obtaining information from a large number of plants on the extent and pattern of their NPD outsourcing, but is obviously not designed to discern the process of decision making which led to these outcomes. All we can claim is that there are clear differences between these economists' judgments and the outsourcing decision of firms, and this may imply some difference in perceptions between the two groups.

This brings us to the other possible explanation for our results; that transaction cost analysis is, in general, ill-equipped to predict the relative level of outsourcing in the NPD process. In this case even if economists and managers had identical perceptions of transaction costs issues, there would still be disparities between their judgments because the outsourcing decisions of firms are based on a different set of criteria.

In considering this possibility it should be noted that the rank correlation tests employed above represent a very strict test for the predictions of the panel. This is because the actual percentages of firms engaging in outsourcing in each phase of the NPD process are relatively bunched. For example, in Table 1, while the rankings for all plants show a very marked difference between the highest and lowest levels of outsourcing (32.8% and 14.1% respectively), the activities ranked second to fifth have percentages of outsourcing ranging only between 22.5% and 29.2%. Accurately predicting rankings within this relatively narrow range is clearly very demanding. This suggests that we should focus not simply on the rank correlation coefficients, but on the pattern of results. In this respect the differences between the panel's rankings of the likelihood of outsourcing and those actually displayed by the plants reveals a consistent and informative pattern. In particular, two areas stand out. First, production engineering is less commonly outsourced than predicted: this is by far the area of activity least likely to be outsourced among all countries and sizebands¹⁹, despite being regarded as a strong candidate for outsourcing in transaction cost terms. Second, the early stages of the new product development process (identification and prototype development) exhibit rather more outsourcing than predicted, at least in ranking terms.

¹⁹ The sole exception is UK plants employing less than 100, where it ranks fourth. (Table 2)

It seems likely that this pattern of behaviour has more to do with the core competences of the plants than with transaction costs *per se*. For many of these plants, especially the smaller ones, the production engineering and manufacturing parts of the business are where their basic skills and activities lie. All plants in the survey were directly involved in manufacturing and for many of these plants production engineering and manufacturing activities are fundamental core competences. While contracting out such production operations may be relatively simple in transaction-cost terms, it would mean eliminating a core area of activity, possibly resulting in a loss of key tacit skills. By contrast, while new product introduction is a relatively routine activity for some plants, this is not the case for most; they require, or at least are happy to accept, the input of other organisations in the process of identifying and prototyping new products. For many plants, therefore, the transaction-cost and property rights issues arising from the involvement of outsiders in the early stages of the new product development process are more than offset by the benefits obtained from engaging with experienced outsiders who bring unique skills. It therefore seems likely that resource and competence-based explanations have a key role to play in certain aspects of the outsourcing decision.

This interpretation is supported by previous research in the area. There is evidence from the empirical literature that far from being simply a cost-reducing or efficiency-enhancing policy, NPD outsourcing actually requires a significant internal effort. To succeed, firms need to invest in different kinds of capabilities, those concerned with effectively coordinating diverse activities both internally and externally (Takeishi, 2001). Further, the entire focus of transaction cost analysis is on efficiency enhancement (i.e. transaction cost reduction) in organisational design, while the emphasis in many NPD outsourcing venture activities may be on other factors, such as the acquisition of new knowledge. In a detailed analysis of 50 supplier-manufacturer relationships drawn from a variety of product development projects, Sobrero and Roberts (2001) show that there is a clear trade-off between efficiency and learning in such cases. Echoing the distinction of Chesbrough and Teece (1996) between autonomous and systemic innovation, Sobrero and Roberts find that there are two potentially optimal types of supplier-manufacturer relationships. The first involves using suppliers merely as subcontractors, and assigning them specific tasks in parts of the project exhibiting low interdependence. This approach is highly

efficient (i.e. low cost), but generates few opportunities for learning. The second optimal type of relationship involves “externalizing completely the conception, design and realization of highly interdependent parts, and jointly working on their overall integration with the rest of the system” (p 508). This involves higher coordination efforts and associated transaction costs, but supplies more opportunities to access tacit knowledge bases and so encourage learning. The preoccupation of transaction cost analysis with efficiency explanations may explain why it so markedly overestimates the likelihood of outsourcing in production engineering where there is tacit knowledge to be protected, core competences to leverage and few learning possibilities for the manufacturers, while systematically underestimating the likelihood of outsourcing in the early stages of the NPD process, where the activity is still relatively independent from the rest of the process, and where learning opportunities are high.

There is also evidence from the empirical analysis that the willingness to engage in outsourcing does not necessarily reflect a lack of internal resources at plant level. Table 2 shows that large (100+ employees) plants engage in significantly more outsourcing than smaller plants at every stage of the NPD process, except production engineering, which appears to be a special case as discussed above. In addition, the logit analysis reported in Love and Roper (2001b) indicates that where a plant is a member of a larger group of companies, outsourcing is more common. At first sight both findings may appear counterintuitive. Where a plant is relatively large or part of a group of plants under common ownership, it might be thought that this would reduce the need for extra-group linkages, because of the availability of expertise in-house or within the group. One potential interpretation of these results is that firms are in effect ‘managing’ their portfolio of external relationships alongside the development of in-house NPD competences. The existence of such a strategic approach is reinforced by the strong empirical support for the existence of economies of scope in the management or governance of outsourcing in the new product development process. The results of Love and Roper (2001b) show that plants engaging in outsourcing in one area of activity are significantly more likely to outsource other areas of the NPD process, even after allowing for market and plant-specific influences.

This strongly suggests that at least part of the explanation for the lack of agreement between the economists' panel and actual outsourcing behaviour lies in the limitations of transaction cost analysis: explanations of outsourcing in the NPD process lie beyond the limits of transaction cost analysis alone. While efficiency explanations can provide some understanding of the pattern of outsourcing in NPD, a full understanding of the extent to which manufacturing plants in three different countries engage in outsourcing at the various stages of the NPD process requires an appreciation of the resource-based issues which appear to be involved in outsourcing, and of the willingness of firms to manage strategically their portfolios of external relationships with other enterprises and organisations.

However, given the strong overall support for transaction cost explanations of the make-or-buy decision in the empirical literature, even in the context of NPD (e.g. Veugelers and Casiman, 1999), it seems unlikely that this is the whole story. Whether outsourcing decisions are governed by wholly objective analysis or by managerial perception, there are clearly crucial differences between the *ex ante* perceptions of professional economists and the actual NPD outsourcing decisions of UK, German and Irish plants. This in turn suggests that there might be merit in pursuing research which examines the importance not merely of *managerial* perceptions in transaction cost analysis, but of the perceptions of the economists who carry out the analysis. The present study represents no more than a preliminary stage of this research programme.

Table 1: *Transaction cost determinants and economies of scale estimates: views of the panel of economists*

		Transaction Cost Determinants		Production Cost Determinants	Likelihood Of	External Sourcing
		Asset Specificity	Extent of uncertainty	Economies of scale	Overall score	Predicted likelihood [Ranking]
1	Identification of new products	3.3 (1.5)	4.3 (1.2)	1.8 (1.2)	11.8 (1.9)	Low [7]
2	Prototype development	3.7 (1.1)	4.2 (0.7)	2.2 (1.0)	11.7 (1.9)	Low [6]
3	Final product development	3.8 (0.9)	3.5 (0.8)	2.4 (1.0)	10.8 (1.9)	Medium /Low [5]
4	Product testing	3.0 (1.1)	3.0 (1.0)	2.6 (0.9)	9.4 (2.0)	Medium [3]
5	Production engineering	3.4 (1.2)	2.4 (1.1)	3.5 (1.1)	8.3 (2.3)	High [2]
6	Market research	2.0 (0.9)	2.9 (1.4)	3.3 (1.4)	7.6 (1.8)	High [1]
7	Developing marketing strategy	2.6 (1.3)	3.1 (1.4)	2.1 (1.1)	9.6 (2.3)	Medium [4]

Note

Scores are means of 27 respondents on a scale of 1 (low) to 5 (high). Standard deviations in brackets. The overall score is formed by a simple addition of the three elements, after the scores for economies of scale have been recoded in reverse order (see text). A high score indicates a low likelihood of outsourcing the activity.

Table 2: Raw percentages and rankings of plants outsourcing in NPD

	χ^2	Country Indicator			All Plants %
		UK %	Ireland %	Germany %	
A. All Manufacturing Plants					
Identifying new products	6.51**	27.0 (4)	30.6 (4)	26.4 (3)	26.7 (3)
Prototype development	0.24	30.9 (2)	26.6 (5)	28.3 (2)	29.2 (2)
Final product development	1.28	26.2 (5)	23.4 (6)	25.5 (4)	25.7 (4)
Product Testing	44.13**	31.1 (1)	34.2 (2)	14.1 (6)	20.9 (6)
Production Engineering	50.87**	22.1 (7)	19.3 (7)	9.8 (7)	14.1 (7)
Market Research	8.93**	30.3 (3)	34.9 (1)	34.2 (1)	32.8 (1)
Developing strategy	21.77**	25.6 (6)	32.3 (3)	20.4 (5)	22.5 (5)
B. Plants Employing less than 100					
Identifying new products	6.11**	21.2 (7)	24.4 (4)	24.0 (4)	23.2 (4)
Prototype development	1.38	27.9 (2)	22.1 (5)	26.4 (2)	26.8 (2)
Final product development	1.86	23.2 (5)	20.3 (6)	25.1 (3)	24.4 (3)
Product Testing	17.11**	30.1 (1)	31.2 (1)	13.1 (6)	19.1 (6)
Production Engineering	23.31**	24.0 (4)	16.1 (7)	10.5 (7)	14.5 (7)
Market Research	7.09**	24.6 (3)	27.0 (2)	32.3 (1)	29.8 (1)
Developing strategy	6.43**	21.6 (6)	25.5 (3)	19.0 (5)	19.9 (5)
C. Plants Employing 100 or more					
Identifying new products	19.26**	42.9 (2)	57.1 (2)	35.1 (3)	38.4 (2)
Prototype development	6.38**	36.1 (3)	48.1 (4)	35.2 (2)	35.7 (3)
Final product development	8.94**	30.2 (6)	41.0 (6)	26.9 (4)	28.3 (5)
Product Testing	33.31**	32.2 (5)	47.8 (5)	17.5 (6)	24.0 (6)
Production Engineering	55.23**	15.1 (7)	37.9 (7)	7.5 (7)	10.8 (7)
Market Research	18.84**	44.9 (1)	64.5 (1)	40.6 (1)	42.6 (1)
Developing strategy	37.98**	34.5 (4)	56.7 (3)	25.5 (5)	29.4 (4)

Notes

1. Figures in parentheses are ranks.
2. χ^2 tests given in table indicate the difference between Germany, the UK and Ireland in the proportion of plants outsourcing in each element of the new product development process. Asterisks indicate a statistically significant difference at 5 per cent.
3. Table relates to manufacturing plants introducing any new or improved product from 1991-94 with 10 or more employees. Survey responses are weighted to give nationally representative results. Sample sizes differ between elements of new product development process due to non-response to some questions. Average sample sizes for parts A, B and C of the table are respectively: UK, 861, 391 and 375; Ireland; 293, 167 and 97; Germany 840, 395, 445.

Source PDS

Table 3: *Predicted percentages and rankings of plants' outsourcing derived from logit models*

	UK %	Ireland %	Germany %
Product Identification	28.9 (2)	37.8 (2)	28.6 (3)
Prototyping	27.8 (3)	27.0 (4)	30.1 (2)
Final Product Development	16.9 (5)	18.1 (6)	13.6 (5)
Product Testing	22.1 (4)	35.5 (3)	13.8 (4)
Production Engineering	14.0 (7)	13.6 (7)	4.3 (7)
Market Research	31.1 (1)	46.1 (1)	38.3 (1)
Developing Marketing Strategy	16.0 (6)	26.8 (5)	13.6 (6)

Notes: Percentages are calculated using country logit equations for each activity. All calculations are made at variable sample means for each country. Rankings are given in parenthesis.

Source: PDS

Annex: Transaction Cost Survey Questionnaire

A Small Economic Experiment

We are carrying out research into outsourcing in the product innovation process, using a transaction cost perspective. As part of this research we would like to carry out a small experiment with the help of our fellow economists. We are keen to see whether it is possible to establish any consensual view (at least among industrial economists) as to the implications of transactions cost considerations for different activities involved in product innovation.

To do this we need to establish some *a priori* benchmarks. We are therefore asking members of the Network to provide their views on the relative levels of asset specificity, uncertainty and economies of scale that they would typically expect to characterise seven activities that are part of the product innovation process. Our broad working definitions are as follows:

Asset specificity – the extent to which the activity is likely to make use of specific physical or human assets.

Uncertainty – the extent to which there is likely to be uncertainty regarding satisfactory completion of the activity.

Economies of Scale – the extent to which there is likely to be scope for unit cost reductions resulting from increases in the scale at which an activity is undertaken.

On a scale of 1 to 5, where 1 is 'low' and 5 is 'high', please rate the relative levels of asset specificity, uncertainty and economies of scale that you would typically expect to encounter in each of the following activities in the product innovation process:

	Asset Specificity	Uncertainty	Economies of Scale
1. New product identification	___	___	___
2. Prototype development	___	___	___
3. Final product development	___	___	___
4. Product testing	___	___	___
5. Production engineering	___	___	___
6. Market research	___	___	___
7. Developing marketing strategy	___	___	___

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