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Watts, H Douglas; Wood, Andy; Wardle, Perry

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Supplier search in industrial clusters: Sheffield metal working in the 1990s

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SUPPLIER SEARCH IN INDUSTRIAL CLUSTERS: SHEFFIELD METAL WORKING IN THE 1990s

*H. D. Watts,
Department of Geography, University of Sheffield, Sheffield, S10 2TN, UK
e-mail: h.watts@sheffield.ac.uk

A. M. Wood
Department of Geography, University of Oklahoma, USA
e-mail: amwood@ou.edu

P. Wardle
Principal Economic Development Officer, East Staffordshire Borough Council, UK
e-mail: perry.wardle@eaststaffsbc.gov.uk

*** Please address all correspondence to the first named author.**

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H. D. Watts,
Department of Geography, University of Sheffield, Sheffield, S10 2TN, UK
e-mail: h.watts@sheffield.ac.uk

A. M. Wood
Department of Geography, University of Oklahoma, USA
e-mail: amwood@ou.edu

P. Wardle
Principal Economic Development Officer, East Staffordshire Borough Council, UK
e-mail: perry.wardle@eaststaffsbc.gov.uk

INTRODUCTION

The typical industrial cluster tends to be seen as a cohesive and harmonious community of firms working together, albeit within a wider competitive context. Within such spatial clusters we might anticipate high levels of personal interaction between the owners/managers of firms which might, in turn, have a bearing on intra-cluster trading patterns. As Grabher (1993, 4) observes 'social influences...(can act)...as contextual factors that support economic behaviour'. This paper explores the extent to which the personal networks of the managers of small firms in a cluster of traditional industries influence the identification and selection of suppliers from within the cluster. The particular contribution is to compare the role of personal networks within and beyond an industrial cluster. In short we seek to investigate clusters and purported cluster behaviour through a comparative research design that incorporates both clustered and non-clustered economic activity. This particular research design makes an attempt to address what Oinas (1999a, 364) termed 'the relative neglect of the role of non-proximate locations' in the analysis of cluster activity. The discussion is focused upon contemporary business patterns through measurement of the characteristics of recently established supplier links.

The paper is in seven parts. The first looks at our knowledge of the relationships between firms and new suppliers and the second outlines the methodology used in this research. After a third section which describes the firms and the nature of their material inputs, the fourth explores the processes involved in the identification of suppliers and the fifth those processes associated with the selection of suppliers. The sixth and penultimate section asks the key research question as to whether personal networks are more important in the establishment of local connections than in non-local connections. The final section draws together our findings and considers some of their implications for the understanding of the geographies of industrial clusters.

NEW SUPPLIERS

The establishment of a buyer-supplier link by a small firm (regardless of the supplier's location) can be deemed to be either reactive or proactive. In the former case the supplier makes the first approach to a firm while in the latter the firm itself initiates a search for a new supplier. We can conceptualise the proactive case as a three-stage process. The first is one of recognising the need for a new supplier of a specific input. The second stage involves identifying a pool of potential suppliers whilst the third and final stage is one of selecting from this set. These stages may not be as discrete as the threefold classification suggests but they provide a useful heuristic device for exploring the search and selection process.

Recognition of the need to take on a new supplier arises when it appears existing suppliers are unable to meet a firm's needs. This need may arise, primarily, in one of two ways. The first arises from dissatisfaction with a specific element in an already established material supplier linkage (e.g., price, quality, delivery or quantity constraint). The second arises when a firm requires a 'new' material input that cannot be effectively sourced through its existing set of suppliers. In both of these instances the onus to identify a new supplier rests with the owner/manager of a firm.

The second stage of the process, involving the identification of potential new suppliers, commonly begins with a search of publicly available information relating to potential suppliers, which we term *market contacts*. Important sources here are commercial directories and catalogues. Further, unless it is an unexpected need, the firm may have accumulated mail shot information from potential new suppliers. Although such a search could take place without the imposition of a spatial constraint these sources can be filtered to limit the search, at least initially, to those firms deemed to be within the local area.

Although these market-related search procedures are not difficult to implement, managers might also seek information and advice from others drawing on their *personal networks*. These networks of personal contacts and ties reflect each manager's unique experiences and opportunities. The network contacts might include individuals met in the work environment as well as business contacts encountered in wider social settings. Benassi (1993, 105), for example, recognised that 'long-term personal knowledge between key actors in functional areas was the spark that ignited subsequent relations between firms'.

An important distinction within personal networks can be drawn between a manager's own *primary network* (individuals known directly) and from an *auxiliary information network* (individuals known through third parties). It can be argued that these auxiliary networks are important in that: '[t]he web of bonds of an actor to others, important counterparts, provides a frame for knowledge development with respect to what exists and is happening beyond the horizon [of their own experience]' (Håkansson and Snehota, 1995, 200). The passage of information via third-party contacts is known colloquially of course as 'word-of-mouth'. In these cases the manager may lack personal knowledge of the potential supplier but have access to information from third-party sources.

The influence of personal networks on economic behaviour have attracted attention in studies of entrepreneurship (see, for example, McQuaid, 1996) but only a few studies appear to have explored the importance of personal networks in the development of supplier input linkages.

However, these tend to rely on the analysis of a limited sample of firms. Examples include a study of ten engineering firms of between 100 and 400 employees (Lorenz, 1988), and another of seventeen manufacturing firms and sixteen service sector firms, which in most cases had fewer than 50 employees (Malecki and Veldhoen, 1993). It seems that robust aggregate data on the role of personal networks in the development of buyer-supplier relationships is in short supply. Nevertheless, these smaller scale studies have cited friends, relatives and managers and employees of other firms as important sources of information. Current employees also appear to play a key role in the transfer of information about new suppliers via their work experience in other firms.

The third stage of the selection process centres on the selection decision itself, and involves the consideration and weighting of the variable factors which bear on the choice of supplier (such as product quality and/or reliability of supply), in the context of the goals/objectives of the decision maker (e.g. to set up a new supplier as rapidly as possible). It is difficult to explore empirically the way in which factors are weighted and to specify with precision the goals of the owner/manager but, as in the classic studies of the location decision (e.g. Moriarty, 1983), attention can be concentrated on those factors that are likely to influence decision-making. Conventional considerations include items such as price, quality and reliability in sourcing.

Much less attention has been directed at the means by which information about such factors is obtained and most particularly the extent to which information flows are mediated through direct inter-personal relations between buyer and supplier. In short we have little if any systematic evidence concerning the importance of the social networks through which economic activities might be structured. In the context of the cluster literature we might anticipate that these inter-personal or mediated relationships would have a particular significance given the density and strength of collective ties within a specified cluster. Indeed, it is sometimes argued that 'regional competitiveness...(is)...rooted in regional socio-economic systems...(characterised by)...interactions and interdependencies between local firms' (Lagendijk, 1999, 775). The importance of personal networks within clusters are emphasised in a number of studies. For

example, Beccatini (1990, 38) stressed that clusters were agglomerations where 'community and firms tend to merge' whilst Storper (1997) emphasised the role of untraded interdependencies within clusters which guided informal rules, habits and convention within a cluster. Similarly, it is within clusters that Brusco (1996, 150) claims 'people...swap news and experiences...(and)...local know how is passed on by doing things and..through informal chit-chat'. Contemporary studies, which focus on the 'learning capacities' of clusters, argue that knowledge cannot be isolated from the individual and social context in which it is produced (Asheim, 2000). Terms such as 'community', 'untraded interdependencies' and 'informal chit-chat' all seem to hint at the potential importance of personal networks and ties in structuring economic behaviour within industrial clusters.

In order to establish the significance of personal networks in producing and sustaining cluster linkages we need to do rather more than document cases in which personal relations are seemingly significant. Instead we need first, to assess in systematic fashion the *relative* significance of personal networks and contacts in shaping economic behaviour. Second, we need to compare cluster linkages with the broader universe of inter-firm linkages as a whole, that is to consider both intra-cluster and extra-cluster linkages. Only having done so, can we make a full and proper assessment of the extent and significance of personal relations in guiding economic activity as well as providing some measure of the extent to which these sorts of relations are relatively more (or less) important in a cluster context. With this requirement in mind our empirical work set out to answer three key research questions:

1. How do small firms in an industrial cluster identify potential new suppliers?

2. What factors influence these small firms in the selection of suppliers?

3. How do the means by which firms are identified and selected vary between local (intra-cluster) and non-local (extra-cluster) suppliers?

These three questions should provide us with a handle on the relative significance of personal networks in determining cluster and non-cluster linkages. Our analysis uses new quantitative data drawn from interviews with owner-managers of small firms in the Sheffield metal working cluster in the UK.

METHODOLOGY

Sheffield, a city of around half a million people in the north of the England, has a metal working sector employing over 25,000 people, just under two thirds of the city's entire manufacturing work force. Although Sheffield's manufacturing employment fell from around 120,000 employees in 1978 to around 40,000 some 20 years later, Sheffield is still a city in which manufacturing as a whole and metalworking in particular is of major importance. Indeed despite the dramatic decline in employment commentators note that 'in the 1980s Sheffield was making more steel than it had in the Second World War and early 1950s' (Tweedale, 1995, 392). Although the engineering and vehicles sectors are under represented in the city, employment in basic metals is five times and employment in metal products three times the national average.

This study is based on a sample drawn from 243 small *firms* in the Sheffield metalworking sector listed in the Dun and Bradsheet database. A small firm was defined as one with less than 50 employees (Department of Trade and Industry, 1997). Although comparison with official data on small *plants* in Sheffield suggests that Dun and Bradsheet understates the number of firms in the sector (particularly with less than ten employees) it was the most comprehensive list available. The data were cleaned (removing small firms which were defunct or subsidiaries of other larger organisations) which had the effect of reducing the sample frame to 214 firms. A random sample was drawn and 70 owner/managers agreed to a face-to-face interview using a semi-structured interview schedule. These firms represent a response rate of 75 per cent. Tests for response bias were possible on sector and size and no significant difference was found between the respondents and the original sample.

Attention was focused on the material inputs of the sample firms although any detailed investigation of the supplier search clearly required a focus on a subset of the population of suppliers. In the data set as a whole the median number of suppliers of material inputs per firm was 25. Ideally, perhaps attention should be focused upon the search for and selection of the largest suppliers but these supply links were commonly very well established. The median age of the relationship with the most important supplier was ten years, and the longest thirty. Well-established links with suppliers are typical of the manufacturing sector (see, for example, Lazerson, 1993). Responses to questions about the search for and selection of the most important supplier would have clearly tested the recall abilities of our respondents. Accordingly evidence was collected on the search and selection processes relating to the last new supplier.

The last new supplier (hereafter, "new supplier") was defined as the firm most recently used for the first time by the small metalworking firm. The recent nature of these linkages is indicated by the fact that well over half were initiated in the six-month period prior to interview while over three-quarters had been established for less than a year. Only 8 percent of linkages had been formed at least three years prior to the survey date. The investigation was simplified through its focus on small firms in that search and selection were usually conducted by a single individual rather than a buying team as is typical in the case of the large firm (Oinas, 1999b; Searls and Wilson, 1995). We should note that the focus on individual firm owner/managers is liable to truncate the full extent of personal networks that tie the firm to its potential suppliers. The possibility of personal linkages between firms involving non-managerial employees is a distinct possibility but one that lies beyond the scope of the current study. In discussing new suppliers and their relationship to them respondents were for the most part reflecting on contemporary events and decisions in which they had been centrally involved. The analysis is based on coding respondents' answers to open questions as to how they first became aware of the new supplier and why they chose that particular supplier.

Although there are clear advantages to limiting the study to the last new supplier we should note that such suppliers account for only a small proportion of total inputs, providing an average of 5

per cent of material inputs by value and a median 2 per cent. All respondents could recall why they had selected their supplier and virtually all (69 out of 70) could also recall how they had first identified them. Analysis of the relative importance of the factors influencing the selection decision is based on the overall frequency with which a respondent first mentioned a factor. Consideration of the actual decision making process itself falls outside the remit of this study.

FIRMS AND INPUTS FROM NEW SUPPLIERS

The small firm has *always* been an important component of the Sheffield economy and more recently the contraction of employment in larger plants has enhanced their relative significance. Whilst acknowledging the distinction between small *plants* and small *firms* there seems little doubt as to the importance of the latter in the Sheffield case. These small firms are geographically clustered within an urban region of 10-15 kms diameter, and thus have a geographical extent similar to that of the individual industrial districts of the Third Italy (Pyke, Becattini and Sengenberger, 1990). The activities of the firms fell into two broad groups. The first manufacture particular products such as castings, forging, fastenings, cutting tools, hand saws and springs while the second undertake metal treatments of various kinds such as electroplating, grinding, heat treatment and shot blasting. The highly traditional nature of the industry is seen in the fact that only one quarter of the firms described their production process as a "high tech" one and more significantly barely a tenth described their product as "high tech". Overall, the majority of firms (72 per cent) were selling to intermediate markets.

The range of inputs provided by the 70 new suppliers are summarised in Table 1. Not surprisingly, almost two thirds of the inputs are provided by other metal using firms, while non-metal inputs included plastic handles, ceramic valves, paint and timber. A small group of inputs were consumables associated with the manufacturing process, such as welding rods, coolants and abrasives. A final miscellaneous group of inputs included items such as packaging for the firm's products. As might be expected from these input characteristics most firms were purchasing standardised products from their suppliers. Nevertheless almost one quarter of the

inputs (24 per cent) had been designed or modified specifically to meet the purchasers' needs. The dominance of standardised products amongst the inputs was reflected in the fact the largest proportion of the suppliers (57 per cent) were stockholders rather than manufacturers. Most supplies came from sites with less than 50 employees but over half these smaller sites were in turn part of larger organisations.

IDENTIFICATION OF NEW SUPPLIERS

A distinction was drawn earlier between potential suppliers identified through market contacts and those identified through personal networks. The relative importance of the two methods as indicated by the respondents is shown in Table 2. Inevitably the allocation of some of the specific open answers to the two categories is not straightforward but the overall pattern is clear. The key feature is the broadly equivalent split between the role of market contacts (55 per cent) and personal networks (45 per cent) in the identification of suppliers. The role of personal networks may be underplayed in these data as a contact was placed in the personal network only where the respondent could name a specific individual. Furthermore we have little or no information on the role of personal networks in accounting for supplier initiated linkages. In the case of cold-calls for example, the supplier may have personal ties to the firm of which the manager is unaware. Again the result is to underplay the potential role of personal networks although probably not significantly so. It should be noted that these are the sources used to identify successful suppliers only, rather than the population of potential suppliers from which one is subsequently selected.

Two specific and in a sense polarised forms of introduction dominate the market contact group. The first --'literature-based' marketing methods--account for just over a fifth of all new supplier contacts and these consist primarily of mail shots with a much smaller proportion coming from directory advertising. Almost of equal importance (just under one fifth of all introductions) were 'cold-calls' where the supplier contacted the small firm canvassing for orders. Overall, a 'cold' call from the supplier to the firms, the firm responding to a mail shot from the supplier or, less

frequently, obtaining the information from an advertisement/yellow pages or business directory accounted for over two thirds of identification through market sources. Managers cited both 'general knowledge' (resulting for example from the prominence of the new supplier in the metalworking sector) and the close spatial proximity of the new supplier on four occasions each. There is quite feasibly some degree of overlap between these two categories.

Turning to the role of personal networks in providing information about new suppliers the key finding to emerge here is the importance of transmission of information about potential suppliers from third parties. These contacts, through managers' auxiliary networks, accounted for two thirds of the new suppliers identified through personal contacts, compared with one third introduced by direct personal knowledge of the supplier, that is via the owner/manager's primary network.

The dominant source of information about new suppliers through the auxiliary network was the firm's existing suppliers, whilst customers also provided a significant route by which new suppliers are introduced. In other words, the existing suppliers and customers of the firm clearly help managers in identifying further contacts. More indirect auxiliary links are where the new supplier was 'tipped off' about the firms needs by an existing customer or supplier to the firm. Overall, existing suppliers are nearly twice as important as customers in identifying new suppliers. Presumably, this rather surprising result arises because the existing suppliers cannot supply the required inputs themselves or, although they could supply them, they are unable to do so because of capacity constraints.

The less important, but still significant, primary network works in a numbers of ways. Although the number of observations in each category is small they provide an indication of the diverse ways in which primary contacts helped in the identification of new suppliers. In a number of cases a contact at the new supplier had previously worked for a current or former supplier to the metalworking firm. As individuals move between firms they commonly seek to take with them an existing portfolio of business contacts and supplier relationships. These strategies can

be successful for a variety of reasons including: the possession of an enviable insight into the technical requirements and financial position of the metalworking firms; established trust or rapport between the contact and the manager; and the related desire for continuity in the metalworking firm's supplier relationships. As one manager notes:

> 'The guy did have his own company prior but he went skint. I helped him start up again. I bought tools from his previous firm and now buy from his new one.'
>
> (Source: Interview notes, toolmaker)

Other potential suppliers were identified through the manager's earlier business activities. In some cases the owner/manager had a contact with the new supplier via a trading relationship with the manager's previous firm (i.e. a firm he had previously owned) or one in which he had been employed prior to setting up his own. In one case the new supplier had previously worked directly for the manager.

All the above channels are derived essentially from work based relationships; there appears to be little direct evidence of the role of wider social links in generating trading relationships. More general links are seen in the citation of friends and relatives as sources of information BUT these occur in only two cases. Despite the primacy given to social relationships in the discussion of some industrial clusters the word "friend" was rarely used in open response to questions about the ways in which new suppliers were identified.

The processes of supplier identification described above are, of course, a picture of general patterns within the data for all seventy sampled firms. Accordingly, we might anticipate variations in the general pattern on the basis of the different characteristics of these firms and their managers. Despite a range of measures employed to capture various facets of firm size (employees, annual turnover, annual material expenditure) and the relative importance of the new input, cross tabulations using dichotomised data indicate that firm size and relative size of input are not significantly related to whether the new suppliers are identified through personal

networks or markets contacts. In addition, neither the distinction between product manufacturers and metal treatment firms, nor the influence of markets (intermediate versus final/retail markets) are, in statistical terms, significantly related to the ways in which suppliers were identified. Clearly, the usefulness of firm characteristics as variables in explaining the extent to which new suppliers are identified through personal networks is thus limited. Similarly manager characteristics offered poor insight into the differential use of personal channels to identify suppliers. Across a wide range of manager variables cross-tabulations based on dichotomous data indicate that there were no significant differences in the extent of reliance on personal versus market sources in the identification of new suppliers.

However, one firm related characteristic did stand out from the analysis in identifying dependence on personal sources as a means of identifying new suppliers. The data in Table 3 indicate a positive relationship between product technology and the use of personal networks as a means of introducing the new supplier. Firms were asked to rank their outputs on a one (low technology product) to four (high technology product) scale. Evidence drawn from these self ratings shows that firms with a low-tech output rely much more heavily on market sources in identifying new supplier linkages. High-tech firms tend to rely more heavily on personal sources of information to identify new suppliers. This finding clearly fits existing work on inter-firm relations and innovation which suggests that high-tech products tend to draw heavily on specialist inputs that are less readily available. Furthermore the complexity and information-intensive nature of high tech products might demand a more thorough and intricate knowledge of suppliers and supplier reputations.

SELECTING NEW SUPPLIERS

Having demonstrated the relative significance of personal and market factors in identifying new suppliers, we now consider the relative importance of different factors in the selection process. These factors have been grouped into three broad categories of product related, market related and personal factors. Whilst again there are questions concerning the exclusivity of these

categories the three broad groups provide a useful framework with which to organise the results.

The dominance of market factors as the principal consideration in the selection of new suppliers is unquestionable. Table 4 shows that well over two-thirds of all selections (70 per cent) were primarily governed by market criteria. In disaggregating the market group, the primacy of price competitiveness in the selection decision is apparent and is quoted as the chief consideration for over one third of all managers (36 per cent). When coupled with the one-fifth (20 per cent) citing availability (and resultant speed of delivery) as the crucial component, these combined market-related factors account for well over one half of all responses.

Allied to these notions of price competitiveness and availability is the small number of selections which are primarily related to the need to purchase limited input quantities. The costs involved in purchasing excess amounts of inputs which may not be used again in the short-to-medium term (or which may never be used in the case of very specialised contracts) serve to raise the price of the inputs thus eradicating expected profit margins in relation to existing trade or blunting the firm's competitive edge when tendering for new contracts. In the case of the small firms that constitute our sample, a number search for and select suppliers that allow them to purchase small quantities.

Personal and product related factors collectively accounted for the remaining third of all explanatory factors - both accounting for roughly equal proportions. Product-related factors form the principal reason for selection in around one sixth of cases (16 per cent). Of this group the experience of product trials is quoted most frequently, with product reputation and the need to purchase a specified part both proving important on a fewer, though equal, number of occasions.

Personal reasons appear to have only a minor influence on the selection decision but trust and reputation are important, especially when passed on through word of mouth in a manager's

auxiliary network. While trust in the actual supplier contact is cited in only two cases (3 per cent), one tenth of managers claimed that the trust they had in a third-party contact was the most important factor in the selection of their new supplier.

The limited influence of personal familiarity in the selection processes is effectively captured by one of the metalworking managers:

> 'You move and have contacts which lead to opportunities. At the end of the day it's price and delivery.'
>
> (Source: Interview notes, toolmaker).

In fact personal factors (such as friendship, dislike and mistrust) which could potentially influence the selection of a supplier tend to be overridden by more "objective" and "rational" criteria:

> 'It's the quality of the product. He sources from a single place while other suppliers use different sources, so you don't get the continuity. I don't like him personally though.'
>
> (Source: Interview notes, metal component manufacturer).

In short it should be clear that market factors are the primary concern in the selection of suppliers and, as a single specific factor, price competitiveness is consistently dominant.

> 'They're very good on delivery. Personal contact doesn't come into what it costs. I go on price.'
>
> (Source: Interview notes, fabricator).

This reflects quite clearly that price driven considerations are at the core of inter-firm transactions in this particular case.

The role of personal networks in the identification of suppliers and their role (albeit limited) in the selection of suppliers provides a setting in which to explore whether these personal elements are more prevalent in the identification and selection of new suppliers drawn from firms in close proximity rather than from those beyond the industrial cluster.

THE ROLE OF PROXIMITY

Industrial clusters are normally associated with strong local supply links and the Sheffield metalworking cluster is no exception. Around half (46 per cent) of the new suppliers were local plants. Here local is defined as within the South Yorkshire/North Derbyshire region. Of the non-local new suppliers, three (4 per cent) were based overseas (France, Italy and Hong Kong) while the remaining 35 plants (50 per cent) were distributed throughout the rest of Britain. The strong showing by local new suppliers is comparable with data presented elsewhere (Wardle, 2001) on the overall extent of local purchasing within the Sheffield cluster. This seems to be a cluster associated with important localised input links.

The dichotomisation of new suppliers into local (within cluster) and non-local (outside cluster) plants provides a basis for exploring whether or not there are systematic differences in the use of personal networks to identify and select new suppliers based on the proximity of the supplier firms. The expectation of greater personal influences on within cluster links was suggested in the literature reviewed in the first part of this paper. Clearly the local versus non-local distinction provides a relatively rough-and-ready way to identify a cluster. Yet arguably, more sophisticated techniques are liable to produce tautological forms of reasoning such that the cluster is defined by the very attributes that we seek to investigate, such as the presence of dense localized personal linkages. Conflating local versus non-local with cluster versus non-cluster allows us to explore the relative significance of spatial proximity in generating networks of personal contact – or their absence.

In a cluster of well-established and traditional industries sufficient time has elapsed for the potential development of dense social networks. Indeed the local area has played a significant role in our sample managers' past employment and residential histories. Over four-fifths of managers were employed by firms in the local area prior to establishing their own, and just under three-quarters of the metalworking firms were operating in the same activity as their last

employer. This provides a forum within which managers are likely to have come into contact with a large number of existing and potential (local) suppliers. The managers also have a long and significant association with the metal working cluster in that nearly 9 out of every 10 were born and brought up in the city. The remarkable similarity of their residential and occupational histories is indicative of a strong local industrial culture. And many claimed to have been brought up in the metal working tradition. Evocative of Marshall's industrial tradition "hanging in the air" is the narrative of an owner-manager of a precision engineering shop:

> '...you heard it at home, you were brought up with it ... my granddad was a melter at Brown Bayleys and that was the only thing that you ever heard. That was the topic of conversation. His boss was Harry Brearley who invented stainless steel and, erm, and. you know Harry Brearley used to come to our house, you know, when I was a kid, I mean I can actually remember the guy coming. You were brought up in that kind of atmosphere'
>
> Source: Interview notes, precision engineer

This context is one in which we might expect personal ties and recommendations to play a key role in identifying and selecting supplier firms.

In order to explore the role of personal influences in the search for suppliers the data set was disaggregated into two groups based on whether or not the location of the new supplier was within or outside the cluster. The data relate to the information presented in Tables 2 and 4 dichotomised into local and non-local data sets. Despite using a variety of different ways of aggregating response categories our results produce a similar finding. Two typical sets of results are shown in Tables 5 and 6.

Table 5 shows a nearly identical pattern in the sources of information used to identify local (within cluster) and non-local (beyond cluster) suppliers. Similarly, Table 6 shows that personal factors appear as frequently in the selection of non-local suppliers as local suppliers. Despite the general discussion in the cluster literature emphasising the role of community and personal

interaction the empirical evidence for an enhanced and important role for personal contacts in the identification and selection of local suppliers is limited in this particular case. The key finding is that there is no substantial evidence that personal sources of information are any more important in the creation of within cluster links than those beyond.

The absence of statistically significant associations should not be seen to entirely preclude the influence of local factors in the identification and selection of new suppliers. Discussions with managers revealed that the 'local' can figure prominently in certain cases: One manager of a hand tool firm found difficulty expressing how the trading opportunity between his (inherited) firm and the last new supplier came into being:

> 'Common knowledge. He [the manager] was in my local [pub].
> My Dad knew him.'
> (Source: Interview notes, hand tool manufacturer).

This, of course, is the kind of informal contact expected within an industrial cluster. Furthermore "buying local" is a strategy that a number of managers actively pursue. Some hold notions of the superiority of locally produced goods (a product of Sheffield's deeply-inscribed metalworking traditions perhaps). Others sought to buy locally for more altruistic reasons. Here the support of the local economy is the prime example:

> 'We've kept with them because they're local. Most of our suppliers are local. I should just go on price but I like to support the local economy. I've seen Sheffield's demise.'
>
> (Source: Interview notes, fabricator)

However, these views seem to be a minority in the light of a much more substantial logic of pursuing competitively priced inputs. One manager claimed a loyalty to Sheffield suppliers but had recently opened an account with a rival Nottingham firm that had effectively halved his local account. The manager explains that:

> 'Oh, I go on price for standard stuff but I do stay local for
> Higher-grade materials'

(Interview notes, light engineering)

Again price concerns relegate the desire to source locally.

CONCLUSION

In drawing conclusions from our study it is worth reiterating a point made earlier that the study deals with a set of inputs that constitute only a small proportion of the overall inputs to these metal working firms. In most cases links with suppliers of larger inputs, including the most significant supplier, were well established. Recall of how these suppliers were first identified and then selected would have been sketchy at best. A strength of the focus on new suppliers is that it provides a clear view of contemporary factors in the identification and selection of suppliers by firms located in a cluster of traditional industries.

With this caveat in mind we can make three main conclusions from this study of the aggregate behaviour of seventy small metal working firms.

First, the small firms in the Sheffield metal working cluster identify potential new suppliers though a diverse mix of market contacts and personal networks and the two routes are of approximately equal significance. However, within the managers' personal networks direct contacts with potential suppliers are less important than third party (word of mouth) recommendations arising from an auxiliary network of contacts and relations.

Second, these firms select new suppliers primarily on price and quality criteria such that a strict business ethic appears paramount, generally over-riding the value of personal contacts and recommendations. There is an immediate and interesting contrast here with our first claim in that whilst identification of suppliers offers reasonable scope for the influence of personal networks the actual supply decision itself is overwhelmingly price driven.

Third, and perhaps most important of all given the context of this paper, there is clear and strong evidence that personal sources of information play no more important role in the identification of within cluster suppliers than they do in the case of suppliers beyond the cluster. Similarly, personal loyalties (whether to place or to individuals) rarely over-ride the emphasis on price and quality in the selection of within cluster suppliers.

Cluster studies, almost by definition, tend to place boundaries around their subject matter and focus intensively on the nature of inter-firm linkages within cluster walls. In examining cluster links within a wider context of all inter-firm relations our study results shed a critical light on certain assumptions associated with the cluster literature. Specifically we find that personal networks figure in the selection of suppliers irrespective of location and that the notion of a cluster as a dense, tight and cohesive community of firms and individuals rooted in personal knowledge and experience can be seen to have been overplayed. This is not to deny that in a number of cases local personal links and networks guide the ways in which suppliers are identified and selected. Yet generalising from such cases to characterise cluster structures and forms more generally would be unwise. Furthermore the merits of arguments concerning the supply chain benefits of industrial clusters similarly rise on fall according to the care with which cluster structures and functions are specified. Our findings set out here point to a need for a rather more cautious and circumspect appraisal.

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Table 1 Inputs from new suppliers

Material inputs	*Example*	*Number*	*Percent*
Basic metals	Tool steel	34	49
Other metals	Springs	11	15
All metals		*45*	*64*
Non-metal components	Plastic handles	11	16
Consumables	Coolant	8	11
Other inputs	Packaging	6	9
		70	100

Source: Questionnaire survey

Table 2 Identification of new suppliers

Source	*Network*	*Channel*	*n*	*%*
Personal Networks	Primary	Supplier to manager's previous firm	2	3
		Customer of manager's previous firm	1	1
		Supplier contact moved to new firm	4	6
		Worked for manager in past	1	1
		Friend or relative	2	3
	Auxiliary	Word of mouth		
		from another supplier to manager	10	14
		from another supplier to new supplier	4	6
		from customer to manager	6	9
		from customer to new supplier	1	1
			31	*45*
Market Contacts		Sales Agent	1	1
		Close spatial proximity	4	6
		General knowledge	4	6
		Competitor	3	4
		Cold call from supplier	11	17
		Advertisement/directories	3	4
		Literature/mail shot	11	17
		Exhibition	1	1
			38	*55*
			69	100

Source: Questionnaire survey

Table 3 Product technology and the identification of new suppliers

Product Technology	*Information source*	
	Personal Networks	Market Contacts
	n	*n*
Low-tech	9	24
High-tech	20	14

Chi-square = 6.79 p = 0.009 n = 69

Source: Questionnaire Survey

Table 4 Specific factors in the selection of new suppliers

Group	*Primary Factor*	*Frequency*	*Percentage*
Personal	Trust/recommendation of person working at the Most Important Supplier	2	3
	Reputation of source of word-of-mouth	7	10
	Persistence	1	1
		10	14
Product	Reputation of product	3	4
	Trials	5	7
	Specified part	3	4
		11	16
Market	Cut-out intervening agent	1	1
	Price competitiveness	25	36
	Availability/speed of turnaround	14	20
	Locality	2	3
	Limited number of sources	4	6
	Willing to sell in small batches	3	4
		49	70
		70	100

Source: Questionnaire survey

Table 5 Identification and location of new suppliers

Location	*Information source*	
	Personal Networks	Market Contacts
	n	*n*
Local	15	19
Non-Local	16	19

Chi-square = 0.222 $p < 0.05$ n = 69

Source: Questionnaire Survey

Table 6 Selection and the location of new suppliers

Location	*Reason for selection*	
	Personal	Product & Market
	n	*n*
Local	5	29
Non-Local	5	31

Fishers exact p = 0.595 n = 70

Source: Questionnaire Survey