7 Summary and Interpretation

The study set out to explain differences among small firms in their level of product innovation, and to indicate how the regional location of firms might be involved in these differences. Product innovation was broadly defined to include incremental improvements in products as well as wholly new products.

A survey of 98 firms, in the size range 11-99 employees, was carried out in the East Midlands and North of Britain, within the mechanical engineering industry. This was compared with a survey of 42 firms, in the size range 1-250 employees, in two regions of the Federal German Republic (Nordrhein-Westfalia and Baden-Wurttemberg). In each country, the regions selected for study provided a contrast between economic buoyancy and economic depression.

The surveys were supplemented with more intensive case studies in each country, and by analysis of published information and statistics relating to the regional economic and industrial background.

The main findings

The findings of the study are first of all presented in summary form. This summary naturally omits many of the points of detail which are to be found in Chapters 2-6. The findings are stated as simply as possible, and without any attempt at interpretation, since this follows in the next section.

1 Widespread product innovation

The majority of firms in the British sample, and nearly all the firms in the German sample, were engaged in product innovation. This finding applied not only to the economically more successful regions (East Midlands, Baden-Wurttemberg) but also to the relatively depressed regions (North, Nordrhein-Westfalia). There were many innovators even among the smallest size group of British firms (11-20 employees).

2 Important differences in innovative intensity

Product innovation can be of various levels of intensity, and these can be distinguished by the presence or absence of patenting, by movement into new product-markets as opposed to incremental changes in existing products, and by the use of microelectronics in new product designs. Using distinctions of these kinds, we were able to show that although product innovation was widespread in the North, it was less intensive than in the East Midlands. In particular, most of the developments involving microelectronics were in the East Midlands part of the sample. Similarly, developments with microelectronics were more prevalent in the Baden-Wurttemberg part of the German sample.

3 Obstacles to product innovation are not financial

For those British firms not developing new products, lack of finance was hardly ever the obstacle. The usual obstacle was lack of demand for new products on the part of customers. However, lack of finance was the most common obstacle to process innovation.

4 Process innovation is weakly linked to product innovation

In the British sample, product innovators were also more likely than the remainder to be process innovators. However, the link was relatively weak: many firms were innovating in one way but not in the other. In the German sample, most of the firms were both product and process innovators.

5 CNC and computers support microelectronic-based products

Firms using microelectronics in their new products also had a strong tendency to install computer numerically controlled (CNC) machine tools and computers. In the German sample, use of microelectronics in

new products led to both immediate and continuing changes in process, and this led such firms to attach a high importance to process flexibility. Such German firms appeared far advanced in the use of computer integrated manufacturing (CIM) techniques.

6 Use of computers predicts innovation

One of the strongest links identified by the survey was between product innovation and the use of computers.

7 Internal and external ideas for product innovation

Ideas for product innovation arose both inside the companies and from external contacts, especially customers. The East Midlands firms used internal and external ideas in a 50-50 mix, while the Northern firms were much more dependent on internal ideas (a 75-25 mix). Innovators using microelectronics were much more likely than others to use external sources of ideas.

8 Diversity of originators inside the firm

The creators of new ideas inside the British firms were, in two thirds of cases, owners or directors. In the remaining one third of cases, ideas came from a wide spread of managers and workers within the firm. The qualifications of the originators were diverse, ranging from none (other than experience) to technical degrees.

9 Small groups do R & D

Half the British firms saw themselves as engaging in research and development (R & D) activities, and this was very strongly related to product innovation. (A few firms conducted R & D only for process development.) In most cases, R & D was carried out as a part-time activity by small groups (typically 2-4 people) rather than being the responsibility of a single individual. Firms using microelectronics in new products tended to have larger groups involved in R & D, and to organize these as departments. The East Midlands firms were much more committed to R & D activities than were those in the North.

10 Skill resources not linked to innovation

There were wide variations between firms in their complements of engineers, technicians, and skilled manual workers. But these variations did *not* consistently reflect differences in product innovation or in R & D activities. Also, Northern firms had as many employees in these categories as did the firms in the East Midlands. (However, the study did not attempt to measure differences in the qualifications of firms' work-forces.)

11 Microelectronics leads to high-level skill shortages

Firms with new products involving microelectronics were more likely to have experienced shortages of technicians and engineers, than were the remaining firms with or without new products. Skill shortages were more common for German than for British firms, and German firms with microelectronics in new products were also particularly short of technicians and engineers.

12 Shortage of skilled manual workers not linked to innovation

Shortages of skilled manual workers were the most widely experienced, but this did not appear to be linked to innovation. Non-innovative firms most frequently reported this type of shortage, and these rarely considered that such shortages had stopped them from innovating.

13 Importance of external information

Getting technical information from outside sources was regarded as very important for product innovation, especially by firms which had introduced new products. Four in 10 of firms with new products had been helped by information and ideas from customers. Firms in the North considered external information to be important, but were less successful than the East Midlands firms in obtaining it. German firms appeared to have excellent access to external information.

14 External collaboration usually successful

About one third of the British sample had made use of external collaborative relationships, and in most cases reported these to have been successful. Product innovators, especially those using microelectronics, were much more likely than other firms to have had

external collaborators. This type of relationship was also widely used among the German firms.

15 Innovators not dependent on local suppliers

Availability of local suppliers did not seem to affect chances of product innovation. The only exception to this was with local supply of CNC machine tools for the small firms in the East Midlands. However, when all kinds of supplies were considered together, the Northern firms were more reliant on local sources than were the East Midlands firms. Also, most microelectronic supplies came from outside the small firm's region.

16 Innovators have widely dispersed customers

Customers were mostly outside the region of the small firm. The East Midlands firms were less reliant on local customers than were the Northern firms, and the innovators than the non-innovators. Firms using microelectronics in their new products tended to have sizable export markets, but the remaining small firms in Britain were with few exceptions confined to UK markets. German firms of all types had sizable export markets.

17 Innovators have large customers outside their region

Large customers (those taking 10 per cent or more of a firm's sales) took 25 per cent of all sales, on average, for the British sample. The Northern firms, and non-innovators, mainly had their large customers inside their region. The East Midland firms, and innovators, mainly had their large customers outside their region.

18 Innovators have a wide spread of customer industries

The major customer industries (those taking 25 per cent or more of a firm's sales) were usually outside the region in the case of innovators but inside the region in the case of non-innovators. Also, innovators were less likely to have such major customer industries, tending instead to spread their sales over numerous industries. Within the German sample, many firms in Nordrhein-Westfalia served the coal, iron and steel industries, and their sales were chiefly local.

19 Local customer industries and innovation

The mix of customer industries was considerably different in the East Midlands and the North. There was however no very clear link between type of customer industry and innovation, within the British sample. A clear link appeared within the German sample, where the use of microelectronics technology in new products was depressed among the Nordrhein-Westfalia firms which served the coal, iron and steel sector.

20 Regional background may affect supply of entrepreneurs

Several factors may lead to a better supply of entrepreneurs in the East Midlands than in the North. These include higher levels of qualifications and skill (fed by net inward migration and by higher entry to further education); higher levels of home ownership, providing an important source of start-up capital; and a higher proportion of small firms, affording more opportunities to gain relevant business experience.

Interpreting the findings

We now turn to a broader interpretation of the study, drawing upon its findings as a whole.

Innovation not a good in itself

Innovation is not a simple notion. It encompasses many different kinds of activities, and is pursued for varied reasons. The study has, we believe, contributed to a clearer understanding of what innovation means for small firms.

Distinctions between different levels or intensities of innovation were allowed for in the design of the surveys. Such distinctions, our findings have shown, are of crucial importance. One cannot sensibly describe small firm innovation, or make comparisons between groups of firms, without making these distinctions.

It was important to distinguish intensities of innovation because, with innovation broadly defined, it turned out to be more prevalent even among small firms than might be expected. Innovation, broadly conceived, was too commonplace an activity in our sample to serve as a way of separating winners from losers or thrusters from sleepers[1]. It

was widespread among British firms, and it was universal in the German sample of small-to-medium sized firms.

The most effective distinction, we found, was between firms using microelectronics in their new products, and the remainder. The firms using microelectronics were putting more effort into innovation (both in terms of internal resources and of searching externally for ideas) and they were also gaining on other firms in terms of sales and of access to national and overseas markets.

Our study therefore tends to confirm that the use of microelectronics represents a watershed in the development of new products, as we had assumed. To see why this is so, it is necessary to turn to other research which has been concerned with the characteristics of microelectronic technology and with the reasons for its adoption[2]. The features alluded to in such research include the elimination of parts, especially mechanical parts, leading to reduced production costs and improved reliability in service; miniaturization and compactness, permitting radical changes in styling; and the possibility of products with more complex functions (or of 'systems' rather than conventional products). Although our surveys did not examine these aspects in detail, our case studies illustrated some of the important advantages of microelectronics. It seems reasonable to suppose that such fundamental advantages offer long-term opportunities for product-market development to the firms which can successfully adapt to them.

While our study confirms microelectronics to be the 'up side' of innovation, it also suggests that innovation can have a 'down side'. Innovation, broadly conceived, is not the sole preserve of successful, growing firms. Nor is it necessarily good in itself. It can either open doors into new areas of the market-place or help firms to lock themselves in. It can be linked with an outward-looking, diversifying approach to market development, but it can also represent the struggles of firms to keep alive an enclosed and shrinking market. In the latter case, it can be argued that innovation merely stretches the period of decline and delays the market adaptation which is required.

The clearest example of this concerns the German firms serving the coal, iron and steel industries of the Nordrhein-Westfalia region, industries which have been in serious decline for many years. These firms were as much involved in innovation as others in the German

study, and in a sense it is impressive that innovation can persist in such apparently unfavourable circumstances. But there appeared to be two repercussions which exposed the weakness of this type of innovation. One was the inward-looking marketing policy of these firms, for they seemed to be much less able than other German firms to trade outside their region. The other was their low use of microelectronics, relative to the other German firms, and hence their lack of access to all the competitive advantages which microelectronics can offer. By persisting in attaching themselves to a declining industry, they appeared to reduce their contacts with the opportunities which might lead into longer-term growth.

Although the problem was not as sharply focused as in the German case, many of the small firms in the North-East of England may have been in a similar position. They too were relatively inward-looking, by comparison with the East Midlands firms, being somewhat dominated by the heavy extractive and process industries of their region. They too had relatively little involvement in microelectronics. It is possible, then, that the prevalence of innovation (broadly defined) in the North-East flattered the prospects of these small firms. What matters is not so much innovation itself, as where it leads. Unless these small firms can connect their innovative efforts to wider markets beyond their depressed region, or to new technology, those efforts may lead nowhere.

Human resources: choices and constraints

It is trivial to say that innovation depends on the resources of skill and experience that are put into it. But is by no means obvious what human resources are most important for innovation in small firms, or how they are most effectively brought to bear. The present study has contributed some insights into these questions.

Innovation in small firms might be the work of isolated individuals, but we found that usually it was not: it was the joint work of small groups. There might be a key individual for development work (probably one of the firm's founders) but usually two or three others would provide support of various kinds. The human resources put into innovation (by those who did it successfully) were quite substantial relative to the size of firms in the British sample.

Innovation might be the result of unplanned efforts, of ideas coming up unexpectedly and being responded to in an *ad hoc* manner. To some extent this did take place, as some of the case studies illustrate, but it was not the whole story or even the most important part of the story. The existence of definable groups of people involved in R & D activities itself implied a degree of planned effort and organization. Moreover, a minority of firms either had formal R & D *departments* or had staff working *full-time* on R & D. In these cases, the effort of innovation was highly organized.

It seems, then, that many small firms acquire, commit and organize human resources for product development, in much the same way as large firms do, only on a smaller scale. But the shortcoming of explaining innovation in terms of human resources, within our sample of small firms, was the lack of difference in those resources between the innovators and non-innovators. When non-innovators have virtually the same proportion of engineers, technicians and skilled manual workers as do innovators, other factors than the sheer availability of human resources must be involved. In essence, it seems that many of the innovative firms *choose* to deploy human resources into product development work, while most of the non-innovators *choose not* to do so.

The questions this raises are as much to do with the non-innovators as with the innovators. If the non-innovators tended to operate with low-skilled work-forces, it could be understood that lack of human resources prevented them from working on product development. But as they do *not* seem to be faced by such a constraint, what stops them from trying to innovate? Or if they perceived no need to innovate (and most of them in fact stated that their customers made no demand for new products), then why did they need as high a complement of skills as the innovators?

To some extent, these questions may be misconceived, since they rest on the assumption that there is a fixed relationship between human resources and output. In reality, human resources are *flexible*, so that there may be scope for innovative firms to stretch themselves in order to reach out for new products. We are talking, in many cases, of the order of five per cent of a firm's skills being deployed into R & D, and

this would perhaps be within the scope of flexibility of the firm, and hence under the direct choice of its leadership.

The other possibility is that innovators pay a penalty somewhere else for what they put into R & D. As they meet that need, they run into pressures elsewhere. This seems to fit in with the study's observation that it was the innovators with the most intensive innovation, who experienced the greatest shortages of higher-skilled staff. Nor could this be attributed to lack of qualified people in the labour market, because even more severe shortages were experienced among the German firms, despite the high standards of vocational education and training in that country[3]. There may come a point, as firms progressively develop new technology, where resources are stretched to the utmost and further development begins to suffer because of skill shortages. But it seems unlikely that innovative firms run into skill constraints purely because of the need to staff R & D activities. It is also likely that the expansion to which successful innovation leads in its turn requires more human resources. Innovators tend to find themselves running into labour constraints, because they make greater than average demands upon the labour market.

The picture with which we end, then, is of differences in both choices and constraints between innovators and non-innovators (or, more precisely, between firms innovating at various levels of intensity). The more advanced innovators choose to stretch themselves and to put themselves in positions where they run into staffing constraints, which they cannot satisfy wholly through the job market. The firms operating in a more traditional mode avoid these problems by avoiding the initial choice; they are never stretched.

The fundamental question, then, is why different firms make or avoid the choice to innovate. And if innovation varies by region, then we must ask what it is about different regions which induces small firms to stretch their resources to different degrees. Differences in the types of entrepreneurs found in different businesses, and attracted to different regions, may be part of the explanation, although we cannot examine that directly in our study. Motivation to innovate at a high level could also be part of the explanation, and here market relations could be important in providing (or not providing) the impetus.

Connecting with a wider market

One of the crucial resources for innovation, we assumed when designing the study, is information. Through links with the outside world, and especially the market-place, small firms can increase their access to ideas, technical data, and business opportunities, all of which will facilitate product development. The findings of the study have confirmed this, to a degree which has exceeded our expectations. And it has also indicated that, for small firms in these regions, the most valuable connections are with widespread rather than local or specialized markets.

Relatively little needs to be said by way of explaining the importance of external links. It is sufficient to suggest that success in the market-place is more likely if the ideas have been originated and shaped through contact with the market. But it is, perhaps, worth emphasizing that, according to our study, it was precisely where innovation was more intensive and technologically more advanced that the external contribution was most important for small firms. New products involving microelectronics exemplified this. Not only did the great majority of such developments draw upon ideas provided externally (for example, by customers), but also it was far more common for these products to be developed through a collaborative external relationship, than was the case with development of conventional products.

It is not difficult to suggest why this should be so. Small firms cannot expect to have expertise spanning new fields of technology, especially in such a diverse and rapidly changing field as microelectronics. Their best chance of exploiting new opportunities from such a technology is by making use of outside information, ideas, and collaborative arrangements, to complement their own special skills. At the same time, it must be remembered that tapping into these external resources itself requires a commitment of internal resources. Outward-looking innovators in our study had more, not less, staff involved in R & D.

The more problematical aspect of our findings concerns the balance between local and widespread market links in fostering or supporting small firms' innovation. Much that has been written about innovation in recent years suggests that a strong local growth of

mutually related industries plays an important part in sustaining a high level of innovation. It should certainly be easier for small firms to find ideas and collaborators when there is an abundance of relevant industrial R & D on their own doorstep than when they have to look far from home. This has led to the notion of 'science parks', artificial conglomerations of high-technology research and industry, which are being created in many parts of the world[4]. Yet our study found that the innovators, to a greater extent than the non-innovators, tended to find both their suppliers and their customers outside the region where they were located. Moreover, those most closely tied to local customer industries, as in the case of certain firms within the German sample, seemed to have difficulty in finding a place for microelectronics technology in their products.

The reasons why our findings do not fit in with 'local linkage' models of innovation are both straightforward and important. The industry we looked at, known as mechanical engineering in Britain and as machine building in the FGR, is generally at a moderate rather than advanced level of technological development. Moreover, the regions which we looked at, in both countries, have large and mature manufacturing sectors, rather than being areas of new industrial formation. These characteristics make them quite different from areas such as Cambridge, or California's silicon valley, which have served as leading examples of self-contained local innovation.

We suggest that small firms in long-established industries, located in areas of mature manufacturing, may generally need to look to remote and widespread markets for encouragement and opportunity to innovate. In the mature industry and area, too large a proportion of resources are already committed to maintaining the existing structure, to provide much support for innovation[5]. There is not enough room in the local market (whether in terms of physical or other resources) to accommodate new high-technology industries on the scale necessary to create self-contained innovation. If the small firm adopts a local outlook towards its product development and marketing, it may find that the outlets for new products are too slight. However, firms can still innovate successfully by developing widespread links with the market, so sidestepping the limitations of the local industrial structure.

The advantage of widespread markets in stimulating innovation becomes still more apparent when the region in which the small firm is operating is in depressed economic circumstances. Static or declining local industries are particularly unlikely to have either the ideas to stimulate new products among their suppliers, or the growth potential which would encourage suppliers to invest in innovation. Stagnation and decline may also reflect, in some cases, attitudes which are unreceptive to new products. For such reasons, firms locked into the local region are likely to face difficulties in innovation. Developing markets away from the region, and in industries other than those which are locally dominant, is likely to help small firms to keep in touch with new opportunities not reflected in the local economy.

To summarize, we believe that in a wide range of commonly encountered circumstances, small firms are more likely to innovate if they are outward-looking and have widely spread markets. Of course, this is a generalization which goes beyond our immediate findings, and will need testing through further research. It is also possible to think of some important exceptions, apart from the case of new, highly-concentrated, high-technology areas of development. In particular, if a small firm is serving a highly innovative local customer, or one which takes pains to encourage its suppliers to develop improved products, then it may find itself in a good position to innovate, even if other local circumstances are unfavourable. It probably remains true, nevertheless, that such customers are easier to find in an area of new industry than in the kind of areas covered by our study.

Why regions differ

The aim of our study was to shed light on the reasons for differences in product innovation between regions. The main contribution of the study has been in showing that innovation differs by region because of different characteristics and practices of the firms in those regions, and in identifying which characteristics and practices are most important. To show how those different characteristics and practices of the firms may be influenced by differences in the regions where they are located, is a much more difficult task. However, we believe that we have made some progress in that respect also.

The most important differences, by region, in the characteristics and practices of small firms, have already been highlighted in this chapter. We will briefly note the main points again.

- Innovation depended crucially upon a commitment of staff resources to R & D activities; and the East Midlands firms were more likely to make such a commitment than those in the North.
- Innovation *with microelectronics* tended to be supported by investment in flexible manufacturing with CNC machines and computers; and this complex of developments was more prevalent in the East Midlands than the North.
- Innovation was strongly linked with the use of external ideas, and external collaboration; here again, the East Midlands were in practice more outward looking than the North.
- Innovators tended to have widespread markets, and to avoid being dependent upon local major customers or local industries; this pattern was more characteristic of the East Midlands firms than those in the North.

These differences in the practices of firms might result from differences in the resources available to them, and the availability of resources could differ between regions. That would constitute a straightforward explanation of why regions differ in innovation. But in several respects, the evidence of the study showed that regional differences in resources were unlikely to provide the answer we are seeking. The East Midlands firms devoted more staff resources to R & D, but they did not have higher proportions of engineers, technicians, or skilled manual workers. Microelectronics components chiefly came from outside the region of the small firm using them, so there was no special advantage for firms in the East Midlands in this respect. The most important external sources of ideas were customers, and East Midlands firms did not draw upon local customers to a greater extent than the firms in the North. Indeed, if local markets can be thought of as a resource, then it was the Northern firms which had more resources in this respect; but it seems likely that in this case they were a hindrance to innovation rather than an advantage.

But the more buoyant economic environment of the East Midlands, compared with that of the North, might feed through in other

ways than a superiority of resources. Part of the explanation we seek may lie in the effects of the regional economic environment on the initial formation of small businesses and on the quality of local entrepreneurship, each of which eventually contributes to innovation in small firms. We assembled published evidence to show that the North had been experiencing outward migration and a net decrease in the numbers of businesses (with deaths of firms outstripping births). This probably means that the supply of actual and potential entrepreneurs has been decreasing. Not only would this reduce the flow of new ideas coming into the market-place, but in addition it could lessen the competitive pressures upon existing small businesses. Those that have survived may have relatively little incentive to innovate, or to find markets outside the locality, because of the lack of new small firms coming through to compete with them. In the East Midlands, on the other hand, there has been net inward migration and a net increase in the number of businesses. Moreover, the East Midlands has a distinct advantage in its high level of house ownership, which provides an important source of start-up capital.

We are suggesting, therefore, that regional differences in the practices of the small firms may *partly* be shaped by the general entrepreneurial climate of the region. We are also suggesting that the rate of new firm formation is important for establishing the climate. We would expect a region with a high rate of new business formation to foster an outward-looking, competitive kind of small business, while a region which has been experiencing business contraction will tend to foster an inward-looking, defensive approach to business. These ideas are speculative and will need to be tested by further research.

Of more importance in shaping the practices and outlook of small business entrepreneurs, however, is the experience that they have previously gained. Most small businesses are set up in the home area of the founder; subsequently there may be relocation to a different region, but this rarely takes place until the business has matured[6]. Hence the background of the people running small businesses is likely to be in the local industry, and it is from there that they will have learned many of their business practices. The history and structure of local industry are likely to be reflected, to some extent, in the small businesses which have grown out of that background.

It might seem reasonable to expect small businesses in economically declining areas to be more, rather than less, outward looking than elsewhere, since the local markets will offer them relatively poor chances for the future. But this may be unlikely to happen in practice, if the owners have previously worked in inward-looking local industries and acquired their approach to business from that experience.

To try to explain why industries in one region, such as those of the North, might be expected to be more inward-looking than those of another region, such as those of the East Midlands, lies outside the scope of our study. But it is not at all implausible that regions of economic decline should have different entrepreneurial and managerial practices than regions of economic resilience. It is also quite plausible that the practices of the declining region should be less adapted to change than those of the growing region.

Our study has shown that, more than anything else, small firms in regions of economic decline need to look outward, to break away from dependence on local markets, and to connect with wider market and technological opportunities. This is easier said than done, because they have already been shaped by the constricting problems of local industry, from which they should be breaking free. But there is no need for pessimism, unless instant solutions are expected. The firms which we studied, including those in the economically depressed regions, certainly did not lack the capacity to innovate. Moreover, even in the North of England, or among the firms of Nordrhein-Westfalia which served the coal, iron and steel industries, there were still substantial connections with wider markets. These connections may grow with time, and a more complete adaptation to the possibilities of modern technology and markets will follow.

Small-firm innovation and public policy

Finally, we consider what bearing our findings about small-firm innovation may have for public policy. There are several ways of approaching this. One can ask what kinds of policies might be pursued to encourage innovation in small firms (and also, perhaps, what kinds of customary policies seem likely to be ineffectual, in the light of our evidence). Or one can ask whether policies towards small firms and

entrepreneurship could usefully be reviewed from the particular standpoint of innovation. To put it bluntly, should small firm policy give priority to the innovators? Returning to the regional standpoint of the study, one should also consider how far regional or local development policies can accommodate or nurture small-firm innovation.

Our discussion of these questions will be at a rather general level. That is to say, we will not consider current detailed provision (which, in any case, experience shows to be somewhat ephemeral). Nor will we propose specific policies. Instead, we will consider in a broad way what the role of various types of policy might be.

Regarding policy to encourage innovation in small firms, the evidence of this study has been rather negative. It is difficult to see how government policy could play anything more than a minor role in direct support of these small firms' innovative activities.

Direct financial assistance for product development appears to be irrelevant, since hardly any firms were prevented from innovating by lack of finance. Under these circumstances, financial support schemes for innovation may only serve to distort commercial decisions and divert energies from their most productive paths.

Nor does there seem to be much of a role for government agencies in providing technical support, advice, or information. The innovative firms were already getting information and ideas from customers, suppliers and technical collaborators - sources which are likely to be the best guarantee of commercial relevance.

Improving the supply of engineers and technicians is one way in which a positive contribution could apparently be made by government policy. This would particularly help small engineering firms developing the use of microelectronics in their products. But of far greater importance for innovation is the way in which the small firms deploy their existing resources of skill, and especially whether or not they use them to establish an organized R & D activity. Non-innovators in the British survey often had staff resources on a par with innovators, but chose not to use them for product development. It is hard to see how government policy can influence such choices within small firms; by far the greatest influence is likely to be the market opportunities for new products, together with entrepreneurs' own outlook.

This brings us again to market relationships, which have emerged from the survey as probably the most important influences upon product innovation. Government services and support certainly can play a role here, but it is a minor supporting role. Small firms, our evidence has indicated, need to develop widespread, outward-looking relations with customers and markets, and there is a variety of ways in which they can be helped to do so. Support for trade fairs, exhibitions and other kinds of technical and commercial gatherings is well established and, our evidence would suggest, is likely to be money well spent, helping small firms to make contacts and find new markets. Market information services, financial aid to make use of marketing consultants or export agents, and organization of inter-firm technical exchange networks, are all ideas which have been used in various countries. These are mentioned only as examples, rather than as specific recommendations. The general point is that government services can and do act within the market and can help to widen the market relations of small firms. Such government services seem in principle to be worthwhile aids to innovation and deserving of further attention.

None the less, all these forms of market support are likely to be ineffective in the case of firms which depend on highly local markets and lack motivation to diversify. The primary requirements appear to be entrepreneurial activity on the part of small firms together with market structures which are conducive to finding and developing widespread customer networks.

Approaching policy from a different angle, we suggest that the question 'Do these measures help to foster innovative small firms?' will often be a useful one. Innovative small firms are likely to be one of the springs of future economic vitality, and that is one reason why it is worth giving them special consideration when evaluating policy. It can also sharpen thinking about policy to stress the distinction between innovative and non-innovative small firms. The present study has indicated that, in many respects, a policy to help small firms in general may not be suitable to foster innovative small firms in particular, especially if one focuses sharply on product innovation. We have seen how great and systematic are the differences between the innovators and the non-innovators: what is good for one is not certain to be good for the other. Indeed, certain policies which may seem to benefit small

firms in general may, in reality, be of greater relevance to non-innovative small firms and so may work to the relative disadvantage of innovation. Two examples from this study illustrate the point.

Consider financial aid for small firms. As already noted, financial aid is largely irrelevant for product development, because finance is not a constraint. But financial aid could be relevant for a number of other purposes: investment in production equipment, loans to finance expanded order-books, and so on. Since these forms of financial aid (if provided) would be equally open to innovators and non-innovators, it seems possible that they would tend to *reduce* the relative advantage of product innovation. However, whether or not this happens in practice would depend upon the tendencies of innovators and non-innovators to take advantage of the various kinds of financial aid. Innovators might tend to be more aware of the possibilities of using financial aid, even though such aid would be of greater potential benefit to non-innovators. Detailed knowledge of the behaviour of small firms of various kinds seems essential to devise a financial aid policy which does not act to the competitive disadvantage of innovators.

An even clearer example concerns skill supply. The small firms engaged in new products involving microelectronics were often constrained by shortages of engineers and technicians. A better supply of skilled people in this group would help them to maintain the momentum of their innovation. But, among small firms as a whole, shortages of skilled manual production workers were much more common. In the British sample, it was the non-innovators which particularly experienced shortages of this group of workers. What, then, should the policy be on skill supply? At the least, it seems clear that policy cannot afford to ignore differences in needs between the advanced innovators and other small firms.

We return, in conclusion, to the regional dimension of policy. A highly localised approach to economic development, and to the encouragement of small firms, is currently fashionable in Europe, but it appears to offer little encouragement for innovation in our small firms. A local economic viewpoint is too narrow to encourage the widespread markets and outward-looking entrepreneurism which innovation seems to require. Bringing in large firms to provide custom for local small

firms may merely prolong the dependence which has previously weakened their capacity to innovate, and deter them from exploring the possibilities of more distant markets which would bring them into contact with fresh demands and ideas. For the same reasons, policies of fostering development which dovetails with the existing local industrial structure and skill base may be mistaken from the particular viewpoint of innovation. If local or regional economic development fails to focus upon the specific need to foster innovative small firms, the chances for long-term regeneration may be seriously reduced.

In short, the starting point for policy, whether national or regional, must be to understand the specific characteristics of innovative small firms. Increasingly, it seems, these small firms use advanced technology in both products and processes, operate with organized R & D activities, participate in joint technical ventures, have diversified product ranges, and sell their products and services in widespread and distant markets. Innovative small firms are thinking big, and that is the basis for their innovation.