AN ANALYSIS OF THE ROLE OF LINKAGES IN PERIPHERAL AREA DEVELOPMENT : THE CASE OF DEVON AND CORNWALL

STEPHEN MARK DOBSON M.A.

A thesis submitted to the Council for National Academic Awards in partial fulfilment of the requirements for the degree of Doctor of Philosophy.

Plymouth Polytechnic,
Department of Business Studies.

October 1984.

Collaborating Establishment:
University of Exeter.

AN ANALYSIS OF THE ROLE OF LINKAGES IN PERIPHERAL AREA DEVELOPMENT : THE CASE OF DEVON AND CORNWALL

STEPHEN DOBSON

ABSTRACT

The thesis examines the significance for economic development in Devon and Cornwall of the material and business service linkages of manufacturing establishments. Industrial linkages can play a key role in promoting regional growth, whilst the nature of the relationship between linkages and economic growth is further understood by focusing attention at establishment level. Thus, using data drawn from a survey of 366 manufacturing plants in Devon and Cornwall, the thesis considers the extent to which differing types of establishment possess local suppliers and markets. The primary focus is the importance of key variables as an indicator for variations in linkage patterns. It is found that local linkage is primarily a reflection of variations in ownership status, firm size, the degree of managerial autonomy in decision making, the nature of the product and the perception of the external environment by chief decision makers. Those plants where local linkage is most marked are the independent firms, relatively small plants and ones with decision making freedom at the local level. A move to self sustaining economic growth requires, therefore, a policy designed to mobilise the indigenous potential of the local area via encouraging growth in small and independent firms, where linkage potential is highest. This will result in more major corporate decisions being taken locally and will yield the benefit of technical advance, new firm formation and employment growth in the long period.

DECLARATION

I, hereby, declare that whilst registered as a candidate for the degree of Doctor Philosophy with the Council for National Academic Awards, I have not been a registered candidate for another award of the Council for National Academic Awards, nor of a University.

The following activities, comprising the programme of related studies, have been undertaken:

I. Attendance and participation at staff seminars.

II. Attendance at various Regional Economics Conferences.

III. Attendance at the Association of Polytechnic Teachers in Economics Conference, Bristol Polytechnic, April 1984.

IV. A schedule of guided reading compiled by the supervisors.

S.M. DOBSON

ACKNOWLEDGEMENTS

In carrying out this study I owe a good deal to a number of individuals and none more so than Peter Gripaios, whose advice and guidance throughout is very much appreciated. I would also like to thank Dr. David Dunkerley for his time and attention, especially during the writing up stage, and Dr. Gareth Shaw, of the University of Exeter, for valuable assistance. Thanks also go to members of the Economics Group at Plymouth for offering advice and help when needed. Finally, I would like to thank Marie Hull for her speedy and efficient typing of the thesis.

CONTENTS

LIST OF TABLES

I N T R O D U C T I O N

It has been widely suggested in the regional economics literature that industrial linkages play an important role in promoting regional growth (Hermansen, 1972). Induced growth theorists argue that regional economic development stems from technical progress in a leading industry which acts as a catalyst forother leading firms via the backward and forward links of the propulsive manufacturing sector (Hansen, 1972). However, the role of linkages in promoting growth has been questioned by a number of authors, with the argument essentially being that linkages are not a condition of operation and are of declining significance in determining the location of modern industries (Gilmour, 1974; Karaska, 1969; Moseley and Townroe, 1973). Even so, micro studies have shown that, for certain manufacturing industries and in certain locations of the United Kingdom (UK), linkages exert growth inducing effects in other industrial and geographical sectors (Keeble, 1969; Taylor and Wood, 1973).

This empirical work, however, has largely ignored those peripheral areas of the space economy, such as Devon and Cornwall, and it is suggested here that such areas need to seekto mobilise their own indigenous potential for growth, since in the current economic climate a transfer of resources from one region to another cannot be relied upon. Thus, for an area such as Devon and Cornwall, a mobilisation of indigenous potential and the attainment ofself sustained growth will, in part, involve promoting those local linkages which are spatially significant in terms of their potential spin-off effects. Given this, we need to focus upon the individual firm/establishment rather than a particular sector, since it is the decisions made at establishment/ firm level[1] which ultimately determine the nature of enterprise linkage patterns and, therefore, the potential for regional development (McDermott, 1976). In other words, given a desire to promote self

sustaining growth in Devon and Cornwall, and recognising that linkages may serve to generate such growth, then we need to consider those factors which may influence linkage patterns at manufacturing establishment level.

The thesis thus examines the possible significance of establishment linkage patterns for economic development in Devon and Cornwall. Using data from a survey of manufacturing plants, the linkage of differing types of local establishment are studied. Further, several factors are used to establish differences in firm linkage and these take explicit account of the impact of the corporate organisation upon linkage patterns. The results of the empirical analysis suggest that the degree of local linkage in these manufacturing plants is a reflection of variations in firm structure and strategy, and that attaining self sustained growth requires a policy geared to encouraging growth in small and independent plants, where linkage potential is highest.

This study is structured in the following way. Chapter 1 provides the theoretical framework for the thesis by focusing, at the conceptual level, upon the relationship between industrial linkages and regional economic development. Within this, we examine those conceptually appealing ways of defining and identifying linkages, before discussing the role that linkages may play in promoting induced economic growth. The chapter also considers examples of work which has attempted to subject these theoretical notions to empirical verification, and so illustrates some of the micro level studies of linkage in the UK. In essence, the chapter forms the basis of the study in that it discusses the role of linkages in economic growth theory.

Following on from this, Chapter 2 narrows the focus of attention to the manufacturing establishment, since it is believed that it is decisions taken at firm/establishment level which ultimately determine

linkage patterns. Here, we consider the way in which the nature of linkage patterns may affect development in a peripheral area. Thus, we examine the nature of the prevailing linkage structure within corporate organisations across the UK and offer an explanation for why this situation has arisen. The implications of this prevailing structure for peripheral development is then considered. From this discussion, a number of hypotheses relating to linkage determination are presented. It is these hypotheses which we subject to empirical analysis in Devon and Cornwall.

Having discussed those relevant theoretical aspects to the work, Chapter 3 considers in detail the nature of the Devon and Cornwall economy. That is, we focus upon trends in the local economy as measured by certain conventional indicators of economic prosperity. The purpose, then, is to provide a profile of the economy and so establish the context in which linkages are studied and economic growth is proposed. In Chapter 4, a discussion on the methodology adopted for data gathering and empirical analysis is presented. This involves a consideration of the original objectives of the research; an examination of the nature of direct surveys; the nature of the questionnaire used and the chosen sample; the method of analysing the data; a note on the application of non parametric statistical techniques; and some characteristics of the sampled firms. It forms, then, the Devon and Cornwall establishment survey.

The following two chapters report the findings of the empirical analysis. In Chapter 5, we discuss the relationship between material linkages and economic growth. Having illustrated the general linkage structure of local plants, we examine the tests of our hypotheses relating to those factors influencing linkage patterns. Thus, we consider whether our key operating variables, ownership status, firm

size, the degree of autonomy in decision making, the nature of the product and the perception of the external environment, influence the pattern of material linkage. Chapter 6 focuses upon business service linkage patterns and tests for the relevance of these operating factors in identifying variations in linkage. These two chapters, therefore, form the basis of our empirical investigation into the nature of establishment linkage patterns in Devon and Cornwall.

Finally we consider the policy implications of the work. In Chapter 7, this is couched in the context of public assistance already available to local firms; a new direction for regional policy in the light of economic recession; and an approach to growth in Devon and Cornwall. Thus, we advocate the targetting of policy at small and independent plants, since this is where linkage potential is greatest.

FOOTNOTES

1. Although reference is made to both establishment and firm level decision making, these terms should not strictly be used in the same context. This is because an establishment is an operating unit of a business and is to be distinguished from a firm which is a controlling unit. In British Industrial Censuses, an establishment is a reporting unit; thus a large firm may have several establishments, each of which may complete a census form but ultimately the establishment is controlled by the firm. For our purposes, however, we use the terms interchangeably.

1. INDUSTRIAL LINKAGES AND THE POTENTIAL FOR REGIONAL DEVELOPMENT

1.1 INTRODUCTION

Since the late 1960's, numerous micro level studies have attempted to measure the extent of industrial linkage in different areas of the UK (Keeble, 1969; Leigh and North, 1975; Marshall, 1979; McDermott, 1976; Taylor and Wood, 1973). The origins of this approach may be found in that part of the economic growth theory literature which makes reference to the concept of induced growth. In a regional context, academics have applied essentially macro economic concepts to the regional problem, so as to explain the existence of growth rate differences across regional economies. Thus, within the Keynesian tradition, emerged writings on the notion of unbalanced growth (Hirschman, 1958; Kaldor, 1970; Myrdal, 1957; Perroux, 1955), where inter-industry linkages and the theory of industrial interdependence are seen to play major roles. Hirschman (1958), has argued that economic growth occurs in certain leading firms and industries that induce growth in related industries through forward and backward linkages by means of investment incentives; whilst, for Myrdal, (1957) any initial growth advantage becomes cumulative and self reinforcing. At the conceptual level, then, it is argued that the comparative static approach of comparing an initial point of underdevelopment equilibrium with another point at which development is practically accomplished is irrelevant because we are in a dynamic world where it is the process of development which is important (Swales, 1981). Thus, the economy is 'led away from equilibrium', since each move in the process of development is induced by a previous disequilibrium and this, in turn, creates a new disequilibrium which requires a further move (Hirschman, 1958).

The purpose of this chapter is, in essence, to examine, at the conceptual level, the relationship between industrial linkages and

regional economic development, so as to establish the theoretical framework within which this study on establishment linkages takes place. Initially, however, we need to consider the possible ways in which industrial linkage may be defined, since before we can discuss the role of linkages within the growth process, we need to be aware of what inter-industry linkages may be said to describe. Having done this, we then focus upon the main conceptual techniques that are available to identify industrial linkages; before discussing the relationship between linkage and regional growth. Finally, the chapter takes on a more empirical stance by examining micro level studies of industrial linkage in the UK since the late 1960's.

1.2 DEFINING INDUSTRIAL LINKAGE

In examining the literature, it becomes clear that there is no one generally adopted definition of industrial linkage. In other words, it has been defined in different ways by different writers, with some defining industrial linkage so that the terms of reference fall within the proposed area of empirical study (Keeble, 1969; Taylor and Wood, 1973) and others within a theory of growth framework (Hirschman, 1958). It is not the intention of this thesis to contribute to the debate by arriving at any new definition, but, instead, we merely consider ways in which industrial linkage has been defined and some of the salient factors which may be important in formulating any definition.

In a strictly manufacturing context, one could choose a definition which limits linkage to the flow of supplies, raw materials, semi-finished goods and components or finished products, between commercial concerns. In other words, industrial linkage may occur when "...one manufacturing firm purchases inputs of goods or services from or sells to another manufacturing firm" (Keeble, 1976 p.61). However, one may

view industrial linkage as comprising all the operational contacts, including flows of material and information, between the separate and functional elements of the manufacturing system. In this case, one may examine the locational attributes of particular plants and the way in which production processes may be organised between them (Taylor and Wood, 1973). Further, we may define an industrial link as something which incorporates "...product flows from factories to retailers, wholesalers and the public as well as to other industrial firms" (South-East Joint Planning Team, 1971 p.195). However, even employing a broad definition may not account for all aspects, since there may exist an association of industries with complementary labour requirements, exemplified "...by industries employing female workers in mining areas or the attraction of general urbanisation economies providing efficient public services" (Wood, 1969 p.33).

Despite the fact that the concept of industrial linkage has different interpretations, it has, for conventional purposes at least, been seen in the following way. In the first instance there is a process link. This is seen to describe the movement of goods between different firms as stages in the manufacturing process. Second there is a service link; and this refers to the supply of machinery and equipment and ancillary parts as well as repair and maintenance requirements when supplied by separate firms. Next, the marketing link is concerned with those ties with other firms which aid in the selling and distribution of goods; and finally, finance and commercial links describe ties with financial and advisory services such as banks, insurance companies and stockbrokers. Clearly, one may wish to include within the process and service link categories communication ties since these may induce or retard change (Wood, 1969).

When examining the concept of industrial linkage a number of

considerations may be important. For example, the geographical scale needs to play a part, since if linkage is worth discussing it should perhaps aim to provide an explanation for the distinctive industrial patterns or important locational trends in manufacturing. If we assume strong linkage ties to operate over limited distances, then the problem becomes one of, firstly, separating the effect of these from wider exchanges and, then, determining how much of the remaining regional pattern is attributed to operational linkage (Wood, 1969). We should also remember that linkage and agglomeration may imply something more than simply the existence of heavy industries close to raw material sources or the occurrence of industrial estates (Wood, 1969). Traditionally, linkage has been seen to be significant because of the distinctive regional or metropolitan 'communities' of industry that it was assumed to create. However, we should not expect a simple answer, since "...there is no single touchstone capable of intelligently and precisely explaining industrial concentration" (Pred, 1965 p.132).

If one incorporates into the discussion at least three further elements of linkage, then the traditional view of industrial linkage and agglomeration may be further questioned. First, a distinction between material and information flows. Next, an identification of those strong connections which are acknowledged as having a prime importance in making locational decisions; and third, one should distinguish between simple communication patterns with relatively few linkages and complex patterns with numerous links (Wood, 1969). This typology, then, is based upon the elements of function, strength and complexity. The first two clearly have significance for any study of contacts between spatially separated manufacturing plants. The major functional distinction between types of linkage distinguishes material from information flows; although Lever (1972) uses the functional link as

measured in terms of the value of goods flowing directly between pairs of industries. In terms of linkage strength, it means that the main problem is one of direct measurement, especially of non material contact; whilst the complexity of linkage is even more difficult to encompass but "... is of particular importance in assessing the organisational context of location" (Taylor and Wood, 1973 p.130). Thus, it seems that the conventional association of linkage and industrial agglomeration has arisen because of the difficulty of analysing complex sets of linkage (Taylor and Wood, 1973). Further, any analysis of linkage is likely to be made more difficult if, as seems probable, the nature and complexity of industrial linkage varies significantly between large and small establishments, between plants specialising in different products, between plants with varying degrees of decision making freedom and between those possessing different ownership characteristics and degrees of technical sophistication. On the other hand, patterns of spatial organisation may vary in some ways between plants independently of these more conventionally acknowledged aspects of their operation (Taylor and Wood, 1973).

Much of the literature seems to have concentrated on discussing backward and forward linkage flows. The former may be seen as the input provision or derived demand effect, in that "... every non primary economic activity will induce attempts to supply through domestic production the inputs needed in that activity" (Hirschman, 1958 p.100). Forward linkages, on the other hand, refer to the "... output utilisation effect in that every economic activity that does not by its nature cater exclusively to final demands will induce attempts to utilise its outputs as inputs in some new activities" (Hirschman, 1958 p.100). These kinds of linkage effects tend to limit linkage flows to raw materials and components and it has been argued that

there should be a greater awareness of the heterogeneous composition of industrial linkage (Hoare, 1978). Thus, one could examine the ratio of local to non-local backward elements, although Hoare (1978) recognises that these may differ widely among further subdivisions. It is also likely that some input links represent more specific and demanding material and service requirements than do others. Moreover, the regional pool of potential input suppliers may also vary among linkage types, and even if a newly immigrant firm "... is willing to hand over all its diverse input needs to local firms it may be unable to do so over its entire spectrum of requirements" (Hoare, 1978 p.167). In order to incorporate into the discussion the multi-faceted nature of linkage patterns, it is likely that we require a perceptual response of manufacturers to the need for proximity to linkage partners in general and to the linkage potential of different locations in particular. Moreover, this implies abstract ideas about the attitudes of firms to the value of linkage proximity and to the advantages offered by their particular locations and an awareness of local linkage opportunities (Hoare, 1975). We return to such considerations later in the thesis.

In the above, we have attempted to show that there are a number of ways in which industrial linkage has been defined. Further, there are a number of factors, relating to size of establishment, ownership type, management perception and so on, which if considered may aid our understanding of the linkage concept. This is considered in some detail in the next chapter. However, arriving at a definition which incorporates the more complex aspects of the linkage concept may result in problems of a practical nature, in that it could make the identification and measurement of linkage more, rather than less, difficult.

1.3 THE IDENTIFICATION OF INDUSTRIAL LINKAGE

In this section we consider the main conceptual techniques that may be used to identify industrial linkage. Perhaps the major reason for attempting to identify and measure linkage is to assess the likely impact of inter-industry linkages upon a given study area. This may be seen in terms of the potential effects upon employment and income, for example, of a given change in expenditure. Of crucial importance to an understanding of this area of impact analysis is the multiplier concept, with the simplest member of the impact family being the regional multiplier. This technique essentially provides an aggregate estimate of the effects of expenditure changes; whilst, as a means of achieving detailed disaggregation, one needs to apply econometric techniques. Such an approach would allow us to incorporate changes in tax revenue and transfer payments, for example, as well as income and employment. However, probably the most conceptually appealing technique for identifying linkage is input-output analysis, which sets out in detail the economic linkages between various sectors of a region. We consider briefly each of these techniques below.

No attempt is made here to explain the detailed workings of the Keynesian regional multiplier mechanism; but instead a brief review is given of the application of this technique in the UK. The regional multiplier can provide implied linkage effects, it is argued, since a relatively high multiplier value suggests a relatively high marginal propensity to consume locally produced goods. That is, a relatively low marginal propensity to withdraw and, hence, strong local linkages. There have been numerous attempts to formulate a neat multiplier model at the regional level (Archer, 1976; Sinclair and Sutcliffe, 1978), and for many authors the crucial variable in the formula appears to be the value of the marginal propensity to consume locally produced

goods. Thus, from the point of view of industrial linkage, it may be the case that a small town has comparatively few strong local links and, therefore, a significantly large marginal propensity to import than a larger metropolitan area; hence, a smaller multiplier value.

The role of regional multipliers in the formulation and evaluation of regional policy has been stressed by Wilson (1968). Some writers have suggested that high levels of leakage, and consequent low multiplier values, are causes of economic decline and slow growth in the peripheral regions just as much as economic structure or locational disadvantage (Thirlwall, 1972). The early approaches to the calculation of income or employment multipliers generally used aggregate data on employment, and where data on output were not available, national input-output tables to identify input mixes and generalised economic base concepts to distinguish local and non local purchases and sales (Archibald, 1967; Steele, 1969). Later work identified another approach, forsaking the use of aggregate national data sets and, instead, employing intensive survey methods of individual plants (Greig, 1971) and educational establishments (Brownrigg, 1973; 1976).

As noted above, the propensity to import has proved to be of special concern and studies have attempted to calculate the most reliable measure. Lever (1974a) argues that by focusing upon the purchasing patterns of individual establishments a more accurate measure of the regional propensity to import may be achieved; whilst, more recently, the focus of attention has shifted to the nature of the multiplicand, with Archer (1976), disaggregating the propensity to import into separate propensities relating to producers and consumers. He attempts to show the income generation effects of tourism upon each individual sector of a regional economy. Sinclair and Sutcliffe (1978), on the other hand, do not disaggregate to the same extent but

instead focus on the first round multiplier effects, since these, they argue, are of the greatest magnitude and require, therefore, correct estimation. The majority of these approaches have used cross sectional data and this seems to be the major reason for the stability of regional multiplier values over time (Lever, 1974b). In short, the regional multiplier plays a potentially useful role in estimating the extent of implied linkage effects, since significant local linkage suggests a relatively high marginal propensity to consume locally produced goods which, in turn, suggests a relatively high multiplier value.

A further and more satisfactory way of identifying industrial linkages is via an econometric model for a region. This would give a detailed picture of the structure of the regional economy and the linkages between various sectors. Such models depend, however, upon there being adequate data at the regional level and thus far this has not proved to be the case in the UK. Hence, an absence of such models at the regional and local level. Despite the practical problems associated with this approach, the advantages of this technique, at the conceptual level, for estimating the impact of a regional policy seems clear. For example, the model may show that capital subsidies to private industry may cause an increase in manufacturing investment and that regional labour subsidies reduce relative labour costs, thereby improving the competitiveness of the region.

A third technique one can use to identify industrial linkage is input-output analysis. The pioneering work in this area was by Leontief, (1951), and it has been argued by some growth theorists that input-output analysis is the most appropriate technique for observing inter-industry linkages (Hirschman, 1958). A special attraction of this approach is that it concentrates on the links that tie

together all the various economic activities operating within the economy. At the regional level, the aim is to identify and measure linkages between various economic agents within the region. Thus, a change in the demand for the output of one industry may have diverse effects on a wide range of other industries in the region because of the production linkages that tie the industries together (Armstrong and Taylor, 1978).

The production function is the basis of input-output analysis and, in essence, industries purchase inputs to produce outputs. They buy inputs from other industries, from households and from government and sell output to other industries and final demanders. If an industry's output is sold to another industry the output becomes an input; hence, an input-output linkage system, with the acquired information being translated into a transactions table. Assuming a two industry economy, the transactions table describes the links between various sectors of a two industry economy, including the links between the processing and payments sector. This table, then, explains where the inputs of an industry come from and where the output goes to. It thus highlights the interdependencies in the economic system. At the centre of input-output analysis are industry production flows and by constructing a technical coefficients matrix, we are able to express the inputs of each industry as a ratio of the gross output of that industry. Thus, given a proportional relationship between inputs and outputs:

$$x_{ij} = a_{ij}X_j \text{ where}$$

x_{ij} = the gross output from industry i to industry j

X_j = the gross output of industry j

a_{ij} = the technical coefficient relating x_{ij} to X_j

Once a matrix has been calculated it can be used to estimate the effects of any change in final demand for the industry's output. We can obtain the required change in inputs by multiplying the change in final demand by the relevant technical coefficient. This is the direct effect. However, we must consider also the fact that the industry supplying the extra input may require more inputs itself to increase its own output. Thus, an indirect effect occurs because of the inter-industry linkages that exist within the system.

Owing to the fact that there are a number of problems associated with it, applications of the input-output technique at the regional level have been limited. The Northern Region model (1976) was wholly regional in the sense that all other regions were ignored and it used a non survey approach. In other words, national coefficients were substituted into the model for the region. The Welsh model of Nevin, Roe and Round (1966) also used a non survey approach, but unlike the Northern Region considered inter-regional links. Again national coefficients were used but the model predicted more accurately on the whole than simple extrapolation based on time series data.

One problem with this approach is that, essentially, the Leontief input-output formalisation of industrial interdependence is static. That is, " ... input-output data is incapable of explaining the process of economic development, though it may aid in giving insights into its manifestations" (Hermansen, 1972 p.171). Thus, to use input-output type inter-industry linkages within a dynamic framework requires considerable knowledge about the stability over time of technical coefficients, as well as the stability of the composition of sectors in urban areas. The problems are well illustrated by Rodwin (1963 pp. 150 - 151) when he says " ... the neglect of price effects, the difficulty of getting data for these models, the vastly increased computa-

tional problems which regional breakdowns entail, coupled with the egregious simplifications of industry categories and the unrealistic assumptions, makes one sceptical of the immediate not to mention long term usefulness of the instrument". However, despite the difficulties associated with the basic assumptions of static models, such as linear production functions and the difficulty in acquiring suitable data in terms of the necessary levels of disaggregation and for appropriate area units, at the conceptual level at least, it has the potential for inducing growth or structural change under certain conditions (Thomas, 1972).

There are, then, a number of conceptual techniques which may be used to identify industrial linkage. All suffer from the problem of an inadequate data base. Further, whilst input-output analysis and econometric modelling are the most conceptually appealing methods, they do have inherent weaknesses which makes their use limited. Thus, it appears that regional multiplier analysis, whilst not providing the first best method, is perhaps the technique that is most often used to identify (implied) linkage relationships. Given such problems, this study forsakes the use of such approaches and resorts to an establishment survey which produces a non parametric data base. The nature of this is discussed later.

1.4 INDUSTRIAL LINKAGES AND REGIONAL ECONOMIC GROWTH

The notion that regional economic growth may be best explained by the neat theorems of neoclassical economics has been challenged by a number of authors, especially since the 1950's (Hirschman, 1958; Kaldor, 1970; Myrdal, 1957; Perroux, 1955). They have taken the view that economic growth is not necessarily balanced and supply constrained but rather is demand determined and occurs in certain centres or

'poles' of development. The growth process is a dynamic one characterised by the continuous differentiation of rates of growth of new and old products and their respective industries via the direct and indirect effects of innovations (Perroux, 1955). We are in a world, then, of fundamental disequilibria and not one of comparative static equilibrium, since every move in the development process is induced by a previous disequilibrium which, in turn, creates a new disequilibrium and so on. Thus, growth becomes cumulative and self reinforcing (Myrdal, 1957). It is when one views growth as demand constrained that it is appropriate to discuss the role of industrial linkages and the theory of industrial interdependence. Before examining this, let us begin with a brief discussion of the essential elements of the neoclassical version of growth at the regional level.

For neoclassical scholars, supply side factors are dominant. Growth is resource based and regional growth performance is essentially determined or constrained by the rate of growth of indigenous factor supplies and productivity, exogenously given independent of demand. However, it may well be the case that regional growth is demand determined, since it is probable that no region's rate of growth can be constrained by supply when factors of production are freely mobile. Thus, for a region in which capital and labour are highly mobile, in and out, growth must be demand determined (Thirlwall, 1980). Given that the demand for a region's output is strong, labour and capital will migrate to the region to the benefit of that region. Thus, supply adjusts to demand. In essence, then, "... the major explanation for the rate of growth of labour, capital and total factor productivity to differ between regions is that there are differences in the strength of demand for regions' products" (Thirlwall, 1980 p.420).

A further aspect of neoclassical theory in a regional context, and

one which the unbalanced growth theorists reject, is that migration and the free flow of factors of production between regions are assumed to act as an equilibriating mechanism to equalise growth, income and unemployment rate differences between regions. In other words, a comparative static stable equilibrium approach. In practice, as Perroux (1955) observed, it seems that once an initial disequilibrium develops between regions, most economic and social processes in the dynamic context of development work, on balance, to perpetuate or worsen the disequilibrium, rather than narrow it. That is, supply and demand curves for factors of production are not independent but interdependent. Thus, factor prices do not necessarily equilibriate between regions (Thirlwall, 1980). This is essentially the idea of circular and cumulative causation as first articulated by Myrdal (1957). In an attempt to more rigorously test this idea and clarify the process, a more formal treatment has been carried out in more recent years (Dixon and Thirlwall, 1975; Kaldor, 1970; 1975; Swales, 1981; Thirlwall, 1980). The principle of circular and cumulative causation is based on the existence of increasing returns in the widest sense; a phenomenon which the neat theorems of neoclassical economics do not admit. Further, it is the Verdoorn relationship, between the rate of growth of output and the rate of growth of labour productivity, which plays a key role (Dixon and Thirlwall, 1975).

In short, those writing in the Keynesian tradition have departed from the supply oriented approach to explaining regional growth and, instead, take demand to be the major constraint upon development. Regional growth rates will tend not to equalise and stable equilibrium may not be restored; hence, a process of potentially continuous disequilibrium characterised by areas of a regional economy with different rates of growth as the development process continues

(Thirlwall, 1980).

We now turn to a consideration of how development proceeds in a non neoclassical world and, more especially, the way linkages play a part in this process. A major contribution to the economic development literature has been Perroux's notion of growth poles (Perroux, 1955). Originally, growth pole theory developed as a tool to explain the anatomy of economic development in abstract economic space; although, more recently, it has been seen as a general theory of development in a simultaneous sectoral-temporal-spatial setting. Perroux observed that " ... growth does not appear everywhere at the same time; it manifests itself in points or 'poles' of growth with variable intensities; it spreads by different channels and with variable terminal effects for the economy as a whole" (Perroux, 1971 p.279). His concept is highly abstract and is introduced essentially as a tool to explore the process by which economic activities, that is, firms and industries appear, grow, stagnate and sometimes disappear. Thus, the process of economic growth is seen as " ... essentially unbalanced involving a succession of dynamic poles through time (Hermansen, 1972 p.168).

Inter-industry linkages and the theory of industrial interdependence play a key role in development pole theory. These aspects, plus a process of innovation, may be said to provide the basis for Perroux's theory. Essentially, the theory of industrial interdependence is a means of conceptualising and giving clearer meanings to the somewhat vague notions of industrial dominance, forward and backward linkages, leading and key industries, industrial complexes and development poles. The notion of dominance may be derived from input-output tables; whilst the concepts of backward and forward linkage effects act to make the meaning of dominance more precise. An industry may be said

to exert a strong backward linkage effect if it has a high ratio of intermediary inputs delivered from other industries to its total production. Such an industry tends to dominate, in the sense that it induces expansionary or stagnatory forces into the delivery industries, depending on its own trend of development. This, then, would constitute a key industry in Perroux's terminology, since it determines the amount of expansion induced in dependent industries relative to its own expansion. Forward linkages, on the other hand, tend to be dominated and to have a higher ratio of intermediary deliveries to final demand. Further, a forward linkage industry depends upon other industries for the determination of its rate of growth. However, by producing important intermediaries to other industries it will be able to induce expansion in these by transmitting innovations, or the effects of innovations, forward (Hermansen, 1972).

This structure of industrial interdependence will create real poles of development only if the key industry is dynamic or propulsive. That is, if it has a strong capacity to innovate, faces a highly income elastic demand curve and can transmit growth impulses via backward and forward linkages. Other groups will tend to cluster around a core of industries of a highly propulsive strength and these clusters constitute industrial complexes. The expansion of industries leads to a process of development sustained by a high supermultiplier, where this is seen to be " ... the combined effect of an ordinary final demand multiplier and induced inter-industry deliveries further supported by the investment accelerator" (Hermansen, 1972 p.170). Such a process may be termed polarised, insofar as it contributes to the formation and strength of development poles.

An industrial complex, however, will only constitute a development pole in industrial space if the propulsive industries which make up

its core are relatively new, are working at an advanced technical level, face a rapidly growing demand and possess a strong capacity to innovate and diffuse. Given that the input-output technique is essentially static, sustained economic development is not likely to evolve from the installation of an industrial complex planned on the basis of traditional input-output models, so as to achieve as high a super-multiplier and as low a net outflow of generated income as possible. Although the complex may work, it will only function as a true development pole if it contains a dynamic core which can generate and transmit innovations that lead to the emergence of new firms and industries and new interdependencies (Hermansen, 1972).

Development, then, may well occur via the direct and indirect effect of innovations. When highly income elastic new products replace the relatively low income elastic old ones, this leads to smaller scale innovations in the products related to them. The adjustments in the products linked to new ones, both through forward and backward linkages, are caused by expectations generated by the new products and by their realised impacts via price and income channels; hence, cumulative deviations from stationary equilibrium (Lasuen, 1972). Further, the newer industries will tend to expand at a faster pace, since around these new industries and locations, sectorally and geographically, the activities linked to the leading ones increase faster than their counterparts elsewhere. Development, therefore, implies a cumulative sectoral and spatial differentiation in impact. Moreover, " ... it implies a sectoral and spatial clustering of activities around leading activities and a faster growth than the rest" (Lasuen, 1972 p.23). Given this, the linkages between the large and small firms within the industry and between firms of all sizes in different industries, play an even more crucial role. These links may

take the form of subcontracting, or licensing or custom manufacturing, or marketing ... and the channels of diffusion of specific information are enlarged and strengthened. Such linkages, therefore, multiply the previous sensitivity levels of firms to all innovations, making them receptive to more because the intensity of the market links between firms has been multiplied. Further, new linkages will tend to increase the potential spread of adoptions (Lasuen, 1972).

We noted above that when a propulsive industry raises its output this induces expansions in the output of other industries; and in cases where the induced growth in output is significantly greater than the initial growth of the propulsive industry's output, then such a propulsive industry is called a key industry. Given this, we need to know what determines the increase in output in the propulsive industry. Perroux (1955) emphasised that declining costs would lead to growth which, in turn, would result in internal and external economies of scale. This is important because the external economies act to spread the possibilities of growth into many sectors, following the propulsive industry's move to a lower average cost curve. A consequence of this is that the industry lowers the price of its output, which provides lower priced inputs to user industries and, given the appropriate price elasticities, the external economies act as a growth multiplier. Here, however, we are not referring to the Marshallian concept of external economies, which uses the assumptions of competitive equilibrium and pertains to costs and benefits of production not adequately reflected in the price mechanism; but, instead, to the effect of one investment on the profitability of another, which becomes significant given the assumptions of dynamic disequilibrium. At the conceptual level, then, and within the framework of dynamic disequilibrium, the cost reduction and induced growth effects of dynamic external

economies are important events (Thomas, 1972).

Linkages are important, then, since it is via these that the lower priced outputs of a key industry are passed on as lower priced inputs to user industries. We need to remember, however, that to apply the inter-industry linkage concept in a dynamic way requires knowledge about the stability over time of industries' technical coefficients, as well as the stability of the composition of sectors in the pole. It seems, therefore, that we require information on technical change, factor substitution and on changes in the product mix of plants and firms over time. Thus, we would need to attain input-output linkage at the plant level (Thomas, 1972).

So far in the discussion we have focused upon development pole theory and the important role played by industrial interdependence theory and inter-industry linkages in inducing growth. We have not, as yet, placed the unbalanced growth idea into a regional context. When doing this, we are inextricably tied into the notion of geographical space. On applying Perroux's theory to geographical space it rests on the traditional theories of location; theories of inter-temporal locational interrelations; theories of spatial organisation and theories of the external economies of agglomeration. According to Paelinck (1965), when applying growth pole theory to geographical space, it should be regarded as a conditional theory of regional growth that establishes conditions under which accelerated regional growth may occur. It does not provide necessary and sufficient conditions.

It is Boudeville (1965) who has perhaps been most responsible for regionalising growth pole theory. He emphasised the regional characteristics of economic space and elaborated on the different types of space that exist. In essence, then, " ... growth poles will appear

as towns possessing a complex of propulsive industries" (Boudeville, 1965 p.112). Thus, at an abstract level, he saw economic space tied to geographical space through a functional transformation that describes the relevant proportions of economic processes. There is, then a distinction between types of space and a region. The latter is characterised by being a continuous area localised in geographical space, whereas economic space is not. Homogenous space is seen in terms of the uniformity of the relevant properties of the elements localised in geographical space. Polarised space is studies in terms of the interdependencies between the elements; whilst, a polarised region is seen as a heterogeneous area localised in geographical space whose different parts are interdependent through mutual complementary and interplay relations centred around a regional centre. The notion of regional centres as poles of growth localised in geographical space, in the Boudevillian sense, is based on the assumption that economic growth is polarised in organisational and industrial, as well as geographical space (Hermansen, 1972).

One of the first authors to discuss the notion of unbalanced growth along similar lines to Perroux was Hirschman, who argued that " ... there can be little doubt that an economy, to lift itself to higher income levels, must and will first develop within itself one or several centres of economic strength" (Hirschman, 1958 p.183). For him, then, economic growth is unbalanced and occurs in certain sectors which induce growth via inter-industry linkages by way of investment incentives. A crucial component of his theory of development is thus the recognition of interdependence linkages between industries and the articulation of their significance as they relate to the process of induced economic growth. Tables showing forward and backward linkages became an integral part of his theory of unbalanced growth and of his

strategy for economic development. Further, Hirschman recognised the importance of the technical complementarity that work through vertical linkages; and, moreover, that the degree of complementarity is stronger between some particular groups than others. These are known as master industries and they tend to have relatively high forward and backward linkage effects and may be seen as corresponding to Perroux's notion of a key industry (Hirschman, 1958).

Important to the Hirschman analysis are the concepts of linkage strength and linkage importance emanating from a given productive unit. By importance, is meant the potential net output of industries that may be induced; whilst, linkage strength refers to the probability that plants producing the said output shall be established as a response to the inducement. The total effect may be seen as the sum of the products of these two elements (Hirschman, 1958). Further, the combination of these links may be said to call forth 'satellite' industries, where a 'satellite' industry usually has the following characteristics; it enjoys a strong locational advantage from proximity to the master industry; it uses as its principal input an output of the master industry without subjecting it to elaborate transformation; or, its principal output is an input of the master industry; and third, its minimum economic size, the size at which the domestic firm can secure normal profits and compete with existing foreign suppliers, is smaller than that of the master industry (Hirschman, 1958).

There will be also certain stimuli to the setting up of non satellite industries. In this situation, linkage strength tends to be weaker and this may be explained by the absence of the three factors that define 'satellites'. Here, linkage is seen in terms of an input of the newly established industry, is an output of the to be created industry or vice versa; but, the established industry would not be

the principal customer or supplier of the to be created industry. In fact, especially in the cases of backward linkage " ... the minimum economic size of the to be created industry would frequently be larger than that of the industry where the linkage originates" (Hirschman, 1958 p.103). The fact, then, that the linkage effects of two industries viewed in combination are greater than the sum of the linkage effects of each industry in isolation helps to account, argues Hirschman, for the cumulative character of development. Thus, when industry A is first established its 'satellites' soon follow; but when industry B is subsequently set up, this may help to bring into existence not only its own 'satellites' but some firms which neither A nor B in isolation could have called forth. When industry C comes into play, some firms will appear that require not only the combined stimuli of B and C but of A, B and C. This, then, may go towards explaining the acceleration of industrial growth (Hirschman, 1958).

When Hirschman refers to the idea of abstract space, it is mainly to illustrate further aspects of the inducement mechanisms of unbalanced growth. As his point of departure, he takes the gains of agglomeration and the subsequent external economies. Thus, development tends to be geographically unbalanced and for a country to develop there is a need for the emergence of some growing points. The existence of these growth centres ensures their further growth, since they would be subject to agglomeration economies. Further, it is argued that development is induced in the backward hinterlands via trickling down forces which work partly through the transfer of capital and interregional trade. The effect, however, depends primarily on the existence of complementarities between industries in the growth centre and the hinterland. Migration from the hinterland to the growth centre is likely to absorb some hidden unemployment and raise the

marginal product of labour and income per capita of the hinterland. However, there may also be at work polarisation effects, characterised by greater competition from the urban centre, which may adversely affect the hinterland and a situation may then develop where the polarisation effects outweigh the trickling down effects (Hirschman, 1958).

This tendency for polarisation forces to outweigh the trickling down effects was a major conclusion of Myrdal's (1957) work on the problem of geographical coincidence and the spread of economic development. His spread and backwash effects coincide with Hirschman's trickling down and polarisation effects. It was Myrdal who first articulated the idea that development proceeds in a circular and cumulative fashion. Thus, the movements of labour, capital and goods, contrary to equilibrium theory, are precisely " .... the media through which the cumulative process evolves - upwards in the lucky regions and downwards in the unlucky ones (Myrdal, 1957 p.27). The spread effects of momentum from a centre of industrial expansion to other regions and areas, operating via an increased demand for their products, tie themselves into the cumulating social process by circular causation in the same way as the opposing backwash effects to which they set up countervailing changes. Myrdal emphasises that the spread effects do not establish the assumptions for an equilibrium analysis, since although in the marginal case the two effects will balance, " ... this balance is not a stable equilibrium, for any change in the forces will start a cumulative movement upwards or downwards" (Myrdal, 1957 p.32). Further, the higher the level of development and the higher the rate of growth of the economy, then the stronger the spread effect. Moreover, " ... a gradual neutralisation of the backwash effect as a country develops can be seen as an important factor to speed up

development" (Myrdal, 1957 p.34).

In effect, both Myrdal and Hirschman argue that development makes for more efficient spread effects via increased regional exports; whilst, improved transport links between and within regions may lead to firms seeking new investment opportunities. However, whereas Hirschman argues in favour of the need for an initial geographical unbalance through the creation of development centres, Myrdal wants the mechanisms for the spread effects to be strengthened from the outset. They differ, then, on the nature of a development strategy, although both point out why development occurs in a limited set of urbanised regions. Further, they remain fundamentally non-geographical in their approach, in that they say little about the geographical location of growth centres and the geographical manifestations of growth impulses propagated from the centre (Hermansen, 1972).

Many of those who have written in the area of cumulative causation since Myrdal have essentially attempted to formalise the theory, with the major attempts at a mathematical treatment being undertaken by Dixon and Thirlwall (1975); Kaldor, (1970); Swales (1981); and Thirlwall (1980). As mentioned above, such an approach helps to clarify the process of growth and, although we do not discuss this formal approach here, we note the words of Kaldor (1970), perhaps the main contributor in this area. He has been a long-standing critic of the application of neoclassical modes of thought to the analysis of economic growth, and development. Kaldor has followed the line of Myrdal in attacking neoclassical predictions that regional growth rate differences will tend to narrow with trade and the free mobility of factors of production. Thus, " ... I am sure that this principle of cumulative causation - which explains the unequal regional incidence of industrial development by endogenous factors resulting from the process of

historical development itself rather than by exogenous differences in 'resource endowment' - is an essential one for the understanding of the diverse trends of development as between different regions" (Kaldor, 1970 p.343).

At a general level, the early unbalanced growth theorists identified a transmission mechanism of development throughout geographical space which spills growth into transitional areas in between the geographical poles as trickling down and spread effects. Further, " ... these effects may be viewed as the materialisation of the diffusion of innovations in geographical space" (Hermansen, 1972 p.188). Hence, the existence of theories dealing with the geographical diffusion of innovations closely related to a theory of localised poles of development at a general level and as a tool to explain the dynamic process of the transmission of development among poles and from growth centres to surrounding areas. Hagerstrand (1966) did the pioneering work in this area and he formulated a general positive theory " ... purporting to explain and predict the process of geographical diffusion of any type of innovation, technical as well as cultural and social, in any society having its population spread out in geographical space" (Hagerstrand, 1966 p.27). The salient features of his theory are; firstly, the diffusion of innovations into the dissemination of information concerning an innovation and the adoption of the innovation; second, the spread of information takes place through a number of channels; and third, patterns of social (interpersonal) communication will be conceived as a network consisting of nodes (sources and receivers) and links (channels).

In the approaches to growth that we have considered, behavioural aspects are taken to be implicit. However, **Leibenstein** (1966) has argued that behavioural assumptions are an essential part of theory

formulation. Thus, within a growth pole theory framework, in considering the response of 'affected' firms to an expansion of the propulsive industry's output, one may examine the kinds of factors that condition the nature of their responses. The knowledge concerning the decision making framework used and the pattern of behaviour by decision makers may well contribute to the development of better behavioural assumptions for theories on unbalanced growth.

In this discussion on industrial linkages and regional development, a number of points have been made that help to explain the nature of the unbalanced growth process and the role that linkages play in this. By arguing that " ... most contemporary problems of resource allocation in space necessarily involve complex urban industrial growth patterns ... not amenable to treatment in terms of an analysis which ... abstract(s) from external effects" (Hansen 1967 p.709), we are implying that there is a problem with the deductive models of classical location theory which see activities allocated by means of purely market forces. In unbalanced growth theory, firms do not operate under general competitive equilibrium conditions, but rather, it is oligopolistic conditions which are dominant; hence, the stationary stable equilibrium idea does not operate. Growth, then, is of the induced type and industrial linkages play a central role given two main underlying assumptions. First, the propulsive industry anticipates the induced growth effect by the 'affected' industries which would follow its decision to operate at higher levels of output; and second, increasing levels of output coincide with lower points on cost curves, so that there is a lower price of output in the propulsive industry. When there is an expansion of the propulsive industry's markets, this leads to growth in backward linked industries which supply it with the necessary inputs. The amount of growth induced in backward linked

industries is conditioned by the net increase in demand for the inputs by the propulsive industry, as determined by the output level desired and the form of the production function. In turn, the form of the backward linked industries' production functions will influence the net increase in demand for inputs (Thomas, 1972).

The induced growth theorists feel that economic growth will be sustained by the tensions of shortages and excess supplies and disequilibria in strategic sectors which are capable of responding to pace setting pressures (Hirschman, 1958). Given that the literature on induced growth provides some theoretical justification for viewing linkages as an important factor in the potential for regional development, the next logical step would be to subject such ideas to empirical verification. This was begun in the UK in the late 1960's and a discussion of the main linkage studies is presented below. Clearly, this will help set in context the empirical work contained in this thesis.

1.5 MICRO LEVEL STUDIES OF INDUSTRIAL LINKAGE

Prior to the 1970's, there had been little discussion on the spatial nature of inter-industry linkage despite the fact that backwash and spread effects have a spatial relevance. Growth transmission of a centripetal and centrifugal nature flow along inter-industry linkages centred on plants located in the growth pole. Streit (1969) and Richter (1969) attempted to provide empirical measurement of the strengths of spatial agglomerature ties between various kinds of industries and the sources of inputs. Thus, the durability of the components of the spatial structure of inter-industry linkages is felt to be of theoretic and applied interest. For example, we may wish to know how long linkages between plants and their sources of

inputs and those linking plants to their markets remain unchanged; or, how we anticipate the direction, rate and magnitude of change. Vernon (1966) noted that firms tend to allocate the most standardised products to larger branch plants more distant from managerial centres, with the characteristics of these products determining the spatial ability of their inter-industry linkages. Below, we discuss the main micro level studies that have been carried out in the UK since the late 1960's.

From a study of the literature it seems that there are two main micro approaches to an examination of industrial linkage. There is, on the one hand, that approach which focuses on linkages across a particular sector or in a particular industry; and, on the other hand, there is the approach which concentrates upon the individual establishment so as to argue that it is the decisions made at plant level which ultimately determine the potential for linkage. As regards methodology, studies have generally either gathered original data on linkage relationships from samples of firms, via interviews and questionnaires, (Keeble, 1969; Marshall, 1979), or looked at aggregate industrial data analysed from published sources leading to circumstantial evidence presented on the significance of linkage in explaining various trends (Lever, 1972).

The first major UK study examining linkages at the industry wide level and using survey techniques was carried out by Keeble (1969). His study of industry in suburban North-West London, a major centre of such modern industries as electrical and mechanical engineering and vehicles, examined the local linkage patterns of 153 manufacturing firms operating in this area in 1963. He asked firms whether they had any links with other firms in North-West London, in terms of providing them with services or raw materials, or obtaining their own materials from

them. Keeble then classified firms into five categories on the basis of the importance of local linkage (generally forward) in their growth and activity. Thus, an emphasis was placed on local and forward linkage.

Three main conclusions were drawn from the results. First, taking the area's industry as a whole, local linkage relationships were not as developed or significant as in inner London. However, and second, they did seem to be of importance in the growth of the three key industries mentioned above, especially via the role of smaller sub-contract and engineering processes, notably metal finishing via heat treatment, electroplating etc. and in tool and pattern making. Detailed examination of the activities of these firms led to the conclusion that because of specialisation and low unit production costs " ... the existence of a locally dense undergrowth of small 'service' (and subcontracting) firms thus represents a most valuable external economy for many larger North-West London (engineering) concerns" (Keeble, 1969 p.175). Third, the study draws attention to the even greater importance of linkages in these industries within a wider spatial matrix than North-West London , notably that defined broadly by South-East England and the Midlands. In other words, " ... the specific external economies associated with linkage in these modern industries can be enjoyed by firms throughout the central regions, and not just those located in particularly concentrated industrial zones such as outer London" (Keeble, 1976 p.62).

Taylor (1973), in part, confirms the above results for the iron foundry industry of the West Midlands, though with important qualifications. He develops a statistical market interaction model to predict flows of West Midland iron foundry products on the basis of transport costs and nationwide variations in demand. Comparison of these predictions with actual flows recorded by 103 iron foundry plants in

1968 and 1969 suggested that the latter are far more localised than might be expected. Forty-two percent of the sales links of West Midlands iron **founders** excluding those for the sale of 'building' castings, are locally oriented. Thus, the " ... benefits offered by the immediately local industrial environment cause West Midlands iron **founders** to deal twice as much as would be expected with the local area" (Taylor, 1973 p.393). Further, localised iron **founders** have been shown to display a distinct tendency to locally orientate their operational linkages, a characteristic that might reasonably be ascribed to the impact of local external economies of one type or another. He also concludes, as in Keeble's (1969) study, that " ... the system of local linkage and local integration ... appears to extend beyond the narrow confines of the conurbations to embrace adjacent areas" (Taylor, 1973 p.399). His qualification centres on his finding that local flows are least in that type of iron foundry production, for the vehicles industry, which has grown fastest in the West Midlands at the time of the study. Taylor, therefore, argues that local external economies do not seem to explain the above average growth, unless such economies are seen as " ... behavioural, yielding 'psychic' rather than monetary benefits" (Taylor, 1973 p.399).

A further linkage study using survey techniques was undertaken by Taylor and Wood (1973). In their study, sample establishments in the metal industries of the West Midlands conurbation were classified according to the number and function of their material linkages with other establishments. Three industries were examined and compared; iron foundry, drop forgings and local latch production, and these accounted for seventy-eight percent of the conurbation's manufacturing employment in 1966. Information was collected from each factory on: linkage data describing the spatial arrangement of the establishment's

functional contacts; and organisational data relating to employment size, production and ownership characteristics. Further, multivariate ordination techniques were employed to assess the combined influence of various linkages and to identify the different arrays of local and non local connection. The extent of local agglomeration was, therefore, also identified in terms of the complexity of local plant linkage. This participation of industrial establishments in the local linkage system was then correlated with independently identified organisational attributes, including employment size, type of ownership, the technical processes employed and the principal product markets which are served.

Taylor and Wood conclude that local linkage appears to be related to the organisational forms and size of industrial plants, acting to some extent independently of their product categories. Thus, certain firms seem to " ... depend upon local connections almost overwhelmingly and it is difficult to imagine how they could ... continue to operate elsewhere. Other plants use local transactions only for some aspects of their productive organisation" (Taylor and Wood, 1973 p.151). Further, it seems that linkage analysis adds a spatial dimension to the study of firm growth, suggesting that further progress in the understanding of manufacturing spatial organisation is possible by associating it with broader issues of industrial and regional growth and development. They further conclude that the spatial organisation of manufacturing is one aspect of its more general organisational characteristics, suggesting that an understanding of one is important for the appreciation of the other.

Empirical work on industrial linkages has also focused on the effects of industrial acquisition on linkage patterns. Leigh and North's (1975) study concentrated upon the spatial aspects of acquisition activity in four manufacturing industries. The two main

data bases were an unpublished inventory of acquisitions by British public and private companies maintained by the Department of Industry, with 1973-1974 chosen for the study period; and, an interview programme with senior executives in a sample of the acquiring firms making acquisitions in 1973 and 1974. With respect to linkage, the data were confined to 'significant changes' in material, service and market linkages attributable to takeover, using executives' own definitions of these terms.

Their main conclusion, in a later paper, was that " .... acquisition very often results in a re-arrangement of service linkages but that material linkages are not often directly affected by acquisition, normally maintaining their pre-takeover pattern" (Leigh and North, 1978 p.242). For service linkages, in nearly eighty-five percent of the acquisitions studied, the established links of the acquired firms were severed and transferred to the suppliers of the acquiring group. As for material linkages, only about eighteen percent of the sample acquisitions resulted in a marked change of linkage patterns. Thus, " ... there is no evidence ... for the idea that takeovers lead to the centralisation of material purchases at the expense of small regional suppliers" (Leigh and North, 1978 p.243). In terms of regional development, they argue that the implications for the acquired factories undergoing market expansion are clearly positive: enhanced sales volumes and more diversified market outlets via larger and more efficient marketing organisations. Where the incidence of linkage change is relatively large, for example, the North-West, they say this may be due to the fact that acquisition related linkage changes may be more marked in those areas characterised by industries which traditionally have been localised, small firm and external economy seeking, compared to regions more dependent upon modern growth industries.

The influence of business organisation was studied by McDermott (1976) with regard to the Scottish electronics industry. His analysis was based on data gathered in the course of a survey of Scottish electronic component manufacturing companies conducted between July and October, 1974. The survey produced a structured sample including only autonomous or semi autonomous firms with their UK headquarters in Scotland. Branch plants and non-autonomous divisions were excluded. Thus, McDermott studied both structure and linkage in a single industry in Scotland. He argues that the industry " ... is characterised by a low level of local ownership, the distinctive subcontract role played by indigenous firms and an employment structure which reflects the industry's policy induced origins" (McDermott, 1976 p.333). On the linkage front, levels of local purchasing in the components sector are low for both local and externally controlled firms, while high levels of regional exports are achieved only by a small group of more specialised Scottish owned companies, betraying their dependence upon externally controlled customers. Further, the form of organisation at the level of the individual firm associated with lower levels of dependence upon local markets is that which reflects membership of a wide corporate group. For McDermott, then, the internal organisation affects the pattern of spatial linkages and at the local level linkages are not extensively developed.

A further study on linkages, and one which departs somewhat from the industry wide approach, in the sense that it treats linkages as part of a wider study on growth poles and the idea of induced growth, has been carried out by Moseley (1973). Via the geographical dimension, he aimed to discover the various channels by which the expansion of a growth centre will affect the region within which it is located. He takes as his growth centres the Thetford and Haverhill areas of

East Anglia, and between April and November 1971 three surveys were undertaken; an industrial survey, a commuter survey and a survey of Thetford residents. With reference to linkages, he asked such questions as; to what extent do firms moving to a growth centre make increasing use of the sources of materials and industrial services within the region? What sort of areas in the region benefit most from increased expenditure? Have 'satellite' firms been attracted and have growth centre firms established branch plants? Do the markets of these firms become more regionally oriented? Moseley aimed to consider the relative strengths of the links between the growth centre and other places and speculate on the impact; and moreover, he wanted to quantify, in financial terms, the spatial flows of goods and materials between firms.

As regards the regional effects of linkage, it is " ... clear that extra industrial activity has been generated, by increasing purchasing within the region, the use of local subcontractors and to some extent by the establishment of small branch factories. But the scale of such impact is small, because most of the larger firms in the centres have been unaffected. Much of the greater proportion of 'spin off' has been outside the region" (Moseley, 1973 p.92). Within the region, the industrial activity generated in other towns appears to relate directly to the importance as industrial centres and inversely to the distance away. Thus, the big towns benefit. Moseley questions, then, the view that growth impulses trickle down and so in policy terms " ... given an objective to foster the economic development of a number of small towns in a region then direct investment in those towns would appear to be required" (Moseley, 1973 p.93). He thus doubts whether a spatial concentration policy will benefit wider geographical areas, although whether such a conclusion

would hold for larger growth centres does not seem clear.

As far as linkage studies relating to Devon and Cornwall are concerned, little previous research has been carried out. Braithwaite's (1968) study on Plymouth largely concerned itself with attitudes to firm location. It was found that, for the twenty-one Plymouth firms studied, the main factors in attracting firms to the area relate to labour, a pleasant environment and government policy. Further, little backward or forward linkage is observed in these plants at the local level. Spooner's (1972) work tends to confirm these findings and he noted a lack of external economies in his plants; hence, a problem in forming linkages. In a later study in Devon and Cornwall, Spooner (1974) examined linkages in different types of local plant. These are seen as indigenous firms, since they were set up pre 1939, and new plants set up since 1939 or established through industrial movement. He found that the older firms and the ones having moved to the local area tend to have strong forward links with the London area; whilst, local orientation is more marked in the new firms. Further, the extent of local backward linkage is relatively weak, but is most marked in the older firms. Given that relatively little work has been undertaken in this location, the time is perhaps right for further work on the role of linkages in the Devon and Cornwall economy, and it is hoped that the results of this thesis may go some way towards furthering our understanding of local linkage relationships.

Stewart (1976) carried out a study in the west of Ireland of forty-three firms whose employment exceeded thirty persons. He tests two main hypotheses relating to linkages. First, that nationally owned firms have more local linkages than foreign owned; and, second, that foreign owned firms have not established links in the study period. He finds evidence to support the first hypothesis, although

as far as the second is concerned, it is found that foreign owned firms have sought local contacts in the period of study. It is concluded that backward links will be difficult to establish because of a poor quality of supply. Further, the externally owned plants seem to maximise the value added in the organisation via an internalisation of linkages within the corporate group.

A study of linkages in the scientific and industrial instruments industry (Minimum List Heading 354) was undertaken by Oakey (1981). In this sector firms are characterised by high technology, high value added and a strong labour orientation. From his study of individual establishments, it is found that " ... local supply linkages are of a low general importance to MLH 354 plants" (Oakey, 1981 p.56). That is, the agglomerative force of supply links is seen as weak. Further, on the question of an internalisation of linkages " .... there is a general absence of any strong input linkage effect caused by internal material linkage flows between plants in multiplant organisations" (Oakley, 1981 p.61). For Oakey, then, the agglomerative effect of inputs and outputs in this industry has been low. Weak linkage stems from the high technology nature of the industry; hence, inputs and outputs are diverse in both their specification and origin. In short, constant product change leads to fragmented linkage patterns.

Thus far, we have considered those studies which have adopted industrial survey methods as a means of acquiring relevant information on linkages. Lever (1972), however, used a macro level manipulation of aggregate published statistics on linkage and location. He compared the degree of spatial association of pairs of manufacturing industries, defined in terms of sixty-one industrial groups, with the level of each pair's functional input-output relationship as revealed by national data on inter-industry purchases and sales. The former was

measured by correlation coefficients derived from 1966 employment in each industry in each of the sixty-two UK subregions; and the latter by 1963 UK Census of Production input-output data. In particular, Lever specifically distinguished between the newer expanding and older declining industries.

His chief finding was that there was indeed a relationship between functional linkage and spatial association. For example, purely by chance, one would expect to find that forty-three of the top ten percent (183) of pairs of industries, in terms of level of spatial association, were also significantly related by industrial linkage. In fact, no less than 179 pairs were thus significantly related. However, he discovered that there were important differences in this respect between newer and older industries. Not only was there " ... a general tendency for the expanding industries to be more closely associated spatially than the older declining industries" (Lever, 1971 p.380), but functional linkages seemed to be more important as an explanation for the spatial association of the former than the latter. Thus, only " ... forty five per cent of the spatially associated pairs of older industries are functionally linked whereas sixty two per cent of the spatially associated pairs of newer industries are" (Lever, 1972 p.381). Of key importance in this difference was a web of functional linkages between different but spatially associated metalworking industries, including mechanical and electrical engineering and motor vehicles. These findings again seem to support the contention that linkages between firms and industries located in the central regions of the UK are highly developed and yield specific external economies of agglomeration.

So far, we have reviewed some of the major micro level studies on industrial linkage, with the focus of attention being at both the

firm/establishment and industry wide level. There is evidence of developed local linkage in some areas of the UK; whilst, the spatial significance of some linkage patterns may have growth inducing effects in other areas. Little attention has, however, been given to the more peripheral areas of the UK, such as Devon and Cornwall. In recent years, there has been a trend towards the adoption of the organisational concepts of management science in linkage studies. Here, it is argued that the overall evolution of an organisation's material and service linkages may depend upon the organisation's perception of the external environment, and also the adoptive responses to perceived environmental change (Marshall, 1979). Aspects of this approach are considered in more detail in Chapter 2. Here, we illustrate examples of studies which have considered elements of perception in linkage analysis.

Hoare (1975) was one of the first writers to examine the role of perception in a linkage study. As well as explaining volumes of linkage flows, he tried to explain " ... the importance that the firms themselves presently place upon being close to their linkage partners" (Hoare, 1975 p.43). He set up and tested a series of hypotheses for Greater London concerning the inter-relationships between linkage flows, spatial patterns and locational evaluation. The results led Hoare to conclude that " ... the volume of goods moved in industrial linkage proves to be a poor indicator of the degree of spatial correspondence between pairs of industries, the rates at which industries leave London, their concentrations upon local markets and their perception of the locational importance of access to suppliers or markets"(Hoare, 1975 p.54). Thus, the volume of freight moving to and from firms in linkage flows is a poor predictor of spatial patterns and locational evaluation, despite the fact that London firms perceive

linkages as important, not only in themselves, but also in their strong relationship both to the degree to which firms concentrate on local markets and to their rates of decentralisation. In relation to policies aimed at establishing growth poles, one may, he says, decide on the nature of the ancillary industries on two grounds. One, is that they should be likely to generate a large volume of work through linkages with the 'propulsive' industries; and second, that firms should be encouraged whose close proximity to these same industries for linkage purposes is valued highly by client and supplier alike. Given these findings, one may require " ... a balance to be struck between the goals of maximum employment generation on the one hand, and industrial efficiency and security on the other" (Hoare, 1975 p.56).

In an attempt to highlight the importance of linkage heterogeneity and perceptual dimensions, Hoare (1978), took a sample of engineering and metal working firms in Northern Ireland and acquired data to examine these further and to consider their relationships to industrial growth and organisation. He focused on the attitude of firms to the value of linkage proximity and to the advantages offered by their particular locations and their awareness of local linkage opportunities. For Hoare, the study showed that we need to know more about the spatial dimension of various components of linkage flows and the ways in which they impinge on managerial consciousness. The nationality of firms was an important factor, and from a regional point of view it seems that a firm " ... buying all its inputs locally and selling all its outputs externally, vanishes with the dawn and probably always will" (Hoare, 1978 p.180).

Further work in the area of micro study has been carried out by Marshall (1979). He focuses upon the relationship between establishment linkages and economic growth in the Northern region of the UK; and,

essentially, studied the extent to which differing types of establishment possess local suppliers and markets. More especially, he was concerned with the importance of establishment ownership as an explanation for differences in the linkage patterns of his 92 plants. However, he also considered factors such as firm size, the level of autonomy in decision making, the operations technology of the plant and a perception of the external environment as predictors of firm linkage patterns. The results of his survey show that ownership status is not a significant predictor of establishment linkage and, moreover, that local linkage is more typical in small plants and in firms perceived to be operating in a stable environment. In other words, " ... organisational variables associated with environmental demands, managerial strategies towards their linkages and organisational structural factors also predict linkage patterns" (Marshall, 1979 p.555). Further, since many plants have markets outside the region growth nationally is important for local growth prospects.

As mentioned above, relatively little attention has been given to the linkage structure of peripheral underdeveloped areas. Instead, that work which has focused on peripheral regions tends to concentrate upon their growth potential and how best to achieve this (Goddard, 1980; O'Farrell, 1980). In this literature it is argued that such areas need to mobilise their own indigenous potential for growth rather than rely on a transfer of resources from elsewhere. Clearly, this could take the form of promoting those strong local linkages which are spatially significant. Thus, the extent of local linkage in a peripheral area could be important for future growth. For O'Farrell (1980), a key factor in the growth process is the role of innovation and the diffusion of information; although, this idea is not new in itself, since Perroux (1955), for example, advocated the key role that

innovation would play in the induced growth process. It is useful to know, then, what may influence innovation. It is argued that extra regional factors such as accessibility to external economies, the availability of key skills in local markets, the relative proximity of firms in manufacturing similar products, the density of information flows and other environmental influences external to the plant, may affect innovation and adjustment potential. Further, the wider the information channels covered by a firm and the more effective this process is, then the greater is the probability that a suitable new technique will be discovered and utilised (O'Farrell, 1980).

Goddard (1980) argues that there is a need for a regional dimension to a national offensive strategy towards industrial innovation, since the ability of a firm to participate in technological progress is partially determined by its particular locational environment. His study of indigenous innovating performance covered 807 establishments in the scientific instruments, electrical components and metal working machine tool industries. He suggests that there are differences in the innovatory performance of single region locally owned companies and argues that " ... the least innovative establishments in terms of products tend to be either independent companies or the small branches of not very large multi site companies, both located in development areas" (Goddard, 1980 p.20). The most innovative are those companies in the scientific instruments industry in the inner urban ring of South-East England. Further, the ability of a firm to develop innovatory products and processes, which is central to firm competitiveness, is spatially determined (Goddard, 1980). Moreover, he suggests that there are a number of spatial bottlenecks to the innovatory process, such as differences in the availability of skilled labour and subcontractors and problems of access to specialist

information.

This section has reviewed the main micro level studies of industrial linkage which have been carried out in the UK since the late 1960's. It has been argued that two distinct approaches have emerged in empirical study. One focuses upon identifying the extent of linkage in particular sectors or industries; whilst the other, more recent approach, focuses upon the individual establishment/firm and concentrates upon no particular type of manufacturing activity. This latter approach says it is the decisions made at plant level and management perception of the external environment which determines linkage and the potential for regional growth. The studies considered here seem, on the whole, to support aspects of the induced growth idea, since strong local links in certain industries and in certain urban areas can be identified. Further, in some cases they are spatially significant in terms of potential spread effects. Given that it may be decisions taken at establishment/firm level which influence the nature of linkage patterns, a fuller appreciation of the role of linkages in the growth process may be gained by directing more attention at the level of the plant. The theoretically relevant aspects to such an analysis are therefore discussed in the next chapter.

1.6 SUMMARY

This chapter has examined, at the conceptual level, the relationship between industrial linkages and regional economic growth. It has been argued that growth is essentially unbalanced and demand constrained and occurs in certain centres or poles of development; whilst it is the linkages between industries which transmit growth into other sectors. We began by stating that there is no one generally adopted definition of industrial linkage and discussed possible ways in

which linkage may be defined. Further, a number of factors may be worthy of consideration in the formulation of any definition. Next, we examined the conceptual techniques that are available for identifying linkage and concluded that input-output analysis is the most appealing technique, although it has a number of problems associated with it which makes its application difficult.

Our review of the induced growth theory literature suggests a theoretical argument for studying linkages, since it is these that play a key role in the development process. Finally, in an attempt to identify the extent of industrial linkage in different areas, we have examined empirical work undertaken on linkages in the UK since the late 1960's. In most studies we find spatially significant local linkage; although we note that little attention has been given to peripheral areas, especially Devon and Cornwall. The micro approach has also suggested that it is decisions taken in the establishment itself which may shape linkage patterns and, therefore, the potential for growth. Given this, we next consider the way that linkages may be assembled at firm level. Further, this will allow the formulation of hypotheses for empirical analysis.

2. EVOLVING ESTABLISHMENT LINKAGE PATTERNS AND THE IMPLICATIONS FOR PERIPHERAL AREA DEVELOPMENT

2.1 INTRODUCTION

As was alluded to at the end of the last chapter, an understanding of the relationship between manufacturing linkages and regional economic growth may be made more complete if we focus attention at the level of the firm/establishment. This is so because it seems that it is decisions taken at firm level which ultimately influence the nature of linkage patterns and, therefore, the potential for local area development (McDermott, 1976). Given, then, an intention to foster self sustaining regional growth and accepting the role that linkages can play in this process, it is important to identify those factors which may shape linkage patterns at establishment level. Initially, a discussion on the nature of evolving linkage patterns is necessary because once we have offered an explanation for the prevailing linkage structure across manufacturing industry, we can then formulate certain hypotheses on linkage determination. Having done this, we next introduce explicitly the regional dimension by examining the likely implications of such linkage patterns for self sustaining growth in a peripheral area. Finally, we consider those possible determinants of linkage patterns at the establishment level; and, in doing so, produce a number of hypotheses which we test, in chapters 5 and 6, in our study area, Devon and Cornwall.

2.2 THE PREVAILING ESTABLISHMENT LINKAGE STRUCTURE

This section serves as a brief note to lend support to the suggestion that there exists a clearly defined linkage structure within large organisations across the space economy of the UK. We recognise, of course, that this must be couched in general terms, since the linkage structure for one particular manufacturing industry may differ considerably from that in another. This apart, it does seem that such a

structure can be identified.

A central feature of UK manufacturing industry today is the major role played by the multi-national enterprise (MNE) in the production process. The past few years have witnessed a steady increase in the share of manufacturing output taken by the top 100 companies, in the UK. For example, in 1950 the top 100 companies controlled about one fifth of net output; yet by 1970 this had reached one half, and by 1985 it is estimated that the figure may be as high as two thirds (Prais, 1976). Such a situation represents oligopoly concentrated on a massive scale in the heartland of the economy (Holland, 1976). As a result of this trend towards increased concentration, there now exists, it is argued, a clearly defined linkage structure within large enterprises, evidenced by the fact that they maintain the head office in the South-East or abroad; there is a tendency for high order functions, such as Research and Development (R and D) and decision making, to be centralised in selected core regions; and to have routine production activities taking place in peripheral plant locations (Malecki, 1981). Moreover, it has been estimated that between 1945 and 1965 82.6 percent of all moves to peripheral areas were branch plants (Keeble, 1972). Clearly, such a structure must have certain implications for the nature of establishment linkage patterns, in the sense that this may mean that linkage changes are seen as the inevitable outcome of industrial activity undertaken at a given location, as a necessary adjustment made to avoid relocation, or an adjustment prior to a locational move (Le Heron and Schmidt, 1976).

From the point of view of the large corporation, it seems to imply that its spatial network is altered by corporate decisions concerning acquisition, new locations and plant closures; hence, the overall trend is towards a concentration of administrative activities in a small

number of locations, notably the selected core regions, and this may be because of " ... the low priority given to the maximisation of profit in the general growth strategy of the firm of which location is but one factor taken into account among many others" (Holland, 1976 p.140).

Not only is the existence of the MNE important but, as Malecki (1980) points out, the organisation of the MNE can be an important factor in the shaping of linkage patterns between establishments. For instance, within the multi enterprise situation, a small single product firm tends to exhibit a simple structure centred around its founders with limited scope for specialisation of tasks. Malecki adds that as a firm's operations become more complex and management specialisation becomes a necessity, then the functional form of company organisation is a natural outgrowth of the division of labour. Further, the functional components typically include marketing, finance, research and production. Thus, as a firm's strategies lead to new and different lines of business, the functional structure is less capable of managing the diversity within the organisation. The multi divisional firm, then, responds to this problem by comprising a number of product line divisions within which many management functions are to some extent decentralised (Malecki, 1980).

Following on from this, it seems likely that a linkage structure where a head office is located in the South-East or abroad and where the production of standardised products takes place in plant in peripheral areas, suggests that the relationships and interdependencies between individual plants reflect operational ties both within and between individual firms or other organisations. In this context, linkages in geographical space, both of materials and information, become manifestations of ownership and commercial exchange patterns.

Specific exchanges of materials and information may exert a strong effect on plant location or growth, but it may well be that increasingly the interest in linkages will be derived more from what they tell us about the corporate role and status of plants at different locations and, more especially, the local or non local multiplier effects of particular manufacturing activities.

In the above, we have suggested that there exists across the UK space economy a linkage structure which owes much to the domination of the MNE in the manufacturing production process. Given this, we need to examine the shaping of linkage patterns at establishment level, since these patterns may well be influenced by the nature of the corporate status of plants and the complexity of firms' operations. Thus, we now need to consider those aspects of organisation theory which help provide us with an explanation for evolving establishment linkage patterns.

2.3 AN EXPLANATION FOR EVOLVING ESTABLISHMENT LINKAGE PATTERNS

For many years industrial linkage contacts between individual plants, their material sources and markets, have provided a rationale for the spatial structure of manufacturing. More recently, it has been argued that such linkages are influenced not only by distance and its associated costs but also by patterns of company organisation (Dicken and Lloyd, 1976). A major factor in approaching the problem of industrial linkage behaviour at the level of the plant is that the importance of economic and organisational variables may be realised. Given this, these linkage patterns may be seen as reflecting the productive and administrative scale economies within the corporate space of firms. In other words, industrial location analysis in the last few years has become increasingly concerned with organisations and

their spatial ramifications in modern society (Wood, 1978). Thus, if we are to arrive at an explanation for evolving linkage patterns, we are more likely to find the answer by focusing attention at the level of the organisation. Inevitably, therefore, writers have begun to examine the organisation theory literature with a view to incorporating aspects of this analysis into their work, so as to direct attention upon the behavioural, as well as operational, aspects of firms' activities. Given that this approach is of increasing importance, we need to examine, then, the theoretically relevant aspects to linkage analysis.

As was alluded to earlier, when one incorporates organisational variables into the discussion it should be emphasised that industrial linkage now becomes a multi-faceted concept. That is, we are interested in business service and communication linkages as well as flows of materials. Such a perspective allows us to examine the way in which the location of the firm interacts through linkages with aspects of the internal structure of the company to influence the rate and nature of its development (Marshall, 1979). Further, the nature of linkage patterns has important repercussions for organisation theory, since it may be argued that it is aspects of this approach which ultimately determine linkages. Thus, in looking at the spatial organisation of industrial linkages and, therefore, individual establishments, it may be useful to look not only at material and service flows, but also at the links of internal and external communication which occur between functional units and organisations (Wood, 1969). Assuming the organisation operates as an open system, survival depends upon its activities of input acquisition and output disposal evidenced by material and information linkages. Moreover, in abstract terms, it is possible to

view industrial linkages as interrelated channels of contact between an organisation and enterprises with which it must interact to grow and survive. Given this, linkages must imply something more than simply the flow of goods from one manufacturing firm to another. It is, then, the multi-faceted nature of the concept which makes the determination of linkage patterns more and not less problematic. Consequently, this study limits its empirical analysis to material and business service linkages only.

When looking at the role of the organisation in a spatial context, of major importance for the MNE is likely to be any decision to either centralise or decentralise activites. A decision to centralise may imply greater scope or economies of scale and a detachment from present technology. However, it may also mean difficulty in combining operations at both the R and D stage and when making a transition to production. Moreover, large scale research tends to have a momentum of its own and may be unresponsive to short term needs; whilst, specialised labour and equipment at centralised laboratories may lead to higher unit costs despite higher efficiency. On the other hand, if the organisation is decentralised there may be a better integration with operations within the division because interaction occurs more frequently. Further, the objectives of the decentralised laboratory are more easily established, since the laboratory needs to be responsive only to the division. Thus, the transition from R and D to production is made easier. However, the limited resources at a small scale laboratory and the varying interests of the operating division, make the stability of certain projects impossible and, therefore, relatively unattractive to technical people (Steele, 1975). In short, a decentralised R and D organisation located, for example, in a selected core region of the space economy, will tend to have better

coupling with marketing and other corporate operations and, therefore, is best suited to product related research. The large centralised laboratory, however, is more likely to attract those people most suited to long run projects and basic research (Malecki, 1980). For various reasons, then, the large organisation may feel it necessary to decentralise R and D functions within the company away from the head office location and such action may provide an insight into the nature of R and D linked activities in core regions.

A major factor in the attraction of organised R and D seems to be the role played by the technical labour force of a firm. Increasingly, firms have recognised the locational preferences of research personnel as important considerations in R and D location decisions (Browning, 1980). Surveys of firms and researchers show a complex interaction of types of preferred locations. Further, firms tend to recognise that technical personnel are found near, and wish to remain in proximity to, good universities and other R and D activities. Moreover, researchers tend to place emphasis on the quality of local living conditions, local schools, housing and cultural opportunities. Thus, there emerges a locational pattern near to large urban areas where there are numerous cultural and recreational attractions. More especially, however, at suburban sites within these urban regions where the school system and home environment are seen to be attractive to educated and well-paid personnel (Malecki, 1981). Such attitudes, then, on the part of the technical labour force of large companies may play some part in explaining why organisations choose to locate R and D activities in or near to major metropolitan areas, as opposed to those areas peripheral to such cultural and environmental centres.

Thus far, we have argued that adopting an approach which focuses upon the individual organisation requires that we view the concept of

industrial linkage as a multi-faceted one. Given this, linkage patterns may be influenced by corporate decisions to either centralise or decentralise key activities and this, in turn, may be partly determined by the desire of the technical labour force to be located in those metropolitan areas close to major cultural and research opportunities. It seems, however, that it is the more abstract elements of organisation theory which offer the major insights into the shaping of establishment linkage patterns and it is to aspects of this that we now turn.

One of the key elements of organisation analysis, with respect to linkages, is the notion of the product cycle. This concept becomes a relevant one for us because it is based explicitly on the interaction between technology, the nature of demand and the strategy of multiplant enterprises. Much of the early work in this area was carried out by Vernon (1966), who essentially argues that different products pass through life cycles of differing lengths and that these are determined by the economic vicissitudes of demand. In other words, products pass through a series of developmental stages from initial innovation and early production on to a growth stage where mass production methods are gradually introduced, and ultimately into a stage of maturity characterised by the stability of long production runs. Two aspects of the theory seems especially important. First, each stage of the cycle is typified by particular organisational, technical and input-output characteristics. Thus, the early stage depends heavily upon a rapidly changing technical expertise and skilled workforce, while the mature phase witnesses a stable technology, relatively low levels of innovation and an unskilled or semi-skilled labour force. Second, as the cycle evolves, the spatial characteristics alter. Initially, the enterprise introduces new products largely in response to favourable

demand and supply conditions in the home market. However, the early monopoly achieved by the innovator is threatened as competition emerges and the resulting loss of sales in the home market leads to an increasing emphasis on exports. These export markets become threatened by indigenous producers and continued growth demands, therefore, direct investment overseas. In the mature stage, however, late entrants to the industry with more up to date technology threaten the original domestic market. The original innovators, then, are forced to seek out locations of lower production costs so as to compete at home and abroad (Dicken, 1976).

Clearly, a spatial dimension to the evolution of products may be said to exist. This may be due to the fact that " ... the course of a product cycle in any one corporation, for example, can be described by its changing impact on one region, or a system of regions, i.e. in terms of input-output linkages, skill requirements or income and quantitative employment multipliers" (Krumme and Hayter, 1975 pp. 332-333). More important, however, in a spatial context is the extent to which the multidivisional firm is able to divert resources, employment and other corporate activities among product lines and regions. As the strategy evolves, emphasis is placed upon different lines of business, each in a different stage of its product cycle, and the regions where the firms are located become affected. Important at the regional level, is the tendency for firms' operations to have distinct regional specialisation and life cycle characteristics. Further, R and D activities in high technology manufacturing leads to highly skilled labour being concentrated in some regions. The manufacturing of standardised products in later stages of the product cycle results, then, in lower costs in areas with lower wages and a lower level of technical capability (Malecki, 1980).

Continuing this theme, once production costs become a major concern the parent plant, which serves a geographically dispersed market, will benefit from economies of scale but, at the same time, it incurs distribution costs. Given standardisation, the transfer to branch production can occur if there are advantages in serving markets from that location. This may, however, imply that regional branch plants are only set up when the product has matured and there are only marginal technical gains to be exploited. If so, the majority of mobile plants mass produce relatively standardised goods (Vernon, 1966). Moreover, parent plants may wish to control each regional unit and see it be economically viable. Given this, the firm is unlikely to decentralise anything to branches that require day-to-day supervision; hence, a case of routine production at sites distant from the research centre. Evidence from this study with regard to decision making freedom in externally owned plants is given in chapter 4.

In an attempt to verify this argument, work has been carried out on the mature end of the product cycle and its location in low wage branch plants. This has emphasised the increasing concentration of R and D in a few regions and the increasing evolution of branch plant economies in other areas. Further, given that the increasing spatial division of labour is a major force in the economic development prospects of regions, a specialisation in branch plant manufacturing will, it is argued, inhibit innovation and the formation of new firms (Thwaites, 1978). From a linkage point and within a general spatial context, any sort of horizontal or vertical integration in regionally based industries can be expected to have significant industrial linkage change effects (Leigh and North, 1978). Moreover, the view may be held that there is likely to be a greater incidence of linkage change

during the early and late stages in a product cycle; whilst, the growth phase sees a period of relative stability (Le Heron and Schmidt, 1976).

In sum, aspects of the product life cycle hypothesis may be applied to linkage analysis, since it can help us to understand the changing nature of linkage patterns. It is suggested that in the early stages of the product's evolution production takes place in the main R and D centres close to the parent company headquarters. As the product matures, however, and reaches the end of the cycle, production transfers to branches in peripheral locations, such as the far South-West of England.

A further element of organisation theory which may be deemed as relevant for a discussion on evolving linkage patterns, is the notion of the establishment's task environment. This refers to the set of other organisations in question; or, it is that part of the total environment to which the firm cannot be indifferent, in the sense that there exists firms it interacts with in order to grow and survive. Writings by a number of organisational theorists, such as Thompson (1967), have suggested that the processes going on within the organisation are significantly affected by the complexity of the organisation's environment. In the case of manufacturing, this environment may include customers, suppliers of raw materials and services, labour and capital. In general, it has been suggested that organisations with heterogeneous and complex task environments exhibit patterns of decision making which are decentralised. Those operating within stable environments, on the other hand, are likely to be centrally controlled. A consensus has emerged in organisation theory that relates the internal structure of large firms to the environmental uncertainties with which they deal (Wood, 1978). Within the task environment, then, some customers and suppliers may be external to the organisation itself but

internal to the company framework, or external to itself and the corporate framework or a mixture of both. Thus, in an abstract sense, we may view material and information links as being the channels for contact which the organisation has established with its task environment.

In a similar sense, we may perceive the firm as being an open system. By this, we mean that a firm is not self sufficient but relies on external organisations for support and inputs, such as, manpower, raw materials, information or technology. The survival of a firm is, therefore, dependent upon the manner in which it controls transactions across the organisation - environment boundaries. This is essential if the organisation is to be active within its task environment. Thus, according to the open systems view, the internal characteristics of a firm are, on the one hand, dependent upon its task environment and, on the other hand, are decisive for its success in the innovation process. Clearly, in order to survive, firms need to respond and adapt internally to the disturbances with which they are confronted by their environment. That is, firms not only alter their strategies in response to changed circumstances in their environment, but also adapt their internal structure and characteristics in order to improve their ability to absorb shocks from the environment. Thus, under conditions of increased environmental complexity firms have to develop ways of coping with the growing complexity. This, however, may not necessarily lead to the installation of a formal 'boundary spanning' unit, especially in the case of small firms, but it is likely that boundary spanning information activities will be strengthened under such circumstances (Rabey, 1978). If such monitoring occurs, the firm's ability to adapt to changing contingencies will, in turn, be strengthened.

This view of establishment/firm operations necessarily leads us on to considerations of inter-organisation relationships. Terreberry (1968), has suggested that contemporary trends in organisational environments are increasing the importance of externally induced change, and that the behaviour of other organisations increasingly impinges upon decision making. Further, modern society is characterised by what she calls turbulence; that is, complexity and rapidity of change in the environment, making long range planning both difficult and hazardous, especially if there is no co-operation between organisations (Terreberry, 1968). Organisations, then, increasingly behave in response to the relative certainty of a short run view of the future. In these circumstances, linkages take on the form of information gathering activities and these may take on extra urgency. In fact, they may be the main functions determining the success or even survival of the organisation.

The above, then, perceives organisational behaviour in terms of an open systems model where one concentrates upon those constraints and contingencies that lie outside the boundary of the organisation. This model demands that the organisation adapts to a changing environment, hence, the formulation of new strategies. Moreover, the extent to which an organisation is dependent upon those other organisations which control the resources and markets which are necessary to ensure its survival may be crucial. Thus, the resource dependence perspective of organisation behaviour requires organisations to be studied in the context of the population of organisations with which they are competing and sharing scarce resources; hence, the development of the dependency of one organisation upon others (Mindlin and Aldrich, 1975). Clearly, constant adaptation should affect externally directed linkages and, therefore, be a factor contributing to evolving material

and information linkages, which in this situation are subject to exogenous and endogenous factors.

The spatial linkage structure may be further explained if we conbine the open systems view with the notion of inherent space - time limitations of a firm's respective location. This implies that the internal characteristics of firms must be, ceteris paribus, different because of a spatial influence. If one sees environmental complexity as dependent upon the degree of urbanisation, then firms in urbanised locations will have, ceteris paribus, systematically better developed information activities. In other words, they will use more external information to decide upon their strategies and tend to have a higher capacity for processing the information than do firms in peripheral locations. Hence, there is a weakness in terms of information linkages for those firms in peripheral areas. As a result, they may require personal contacts with those who decide on such key matters as R and D, the use of capital, marketing strategies and so on, and such people tend to reside in the larger cities and will, in all probability, not be familiar with the situation of a firm far away (Ewers and Wettman, 1980).

Thus far, we have used certain abstract elements of organisation theory to help explain the evolving nature of establishment/firm linkage patterns. Our main observations have been that: first, organisation structure is heavily influenced, if not determined, by environmental uncertainty; second, this uncertainty is based primarily on the roles and actions of other organisations; and finally, the strategies of firms are, therefore, a result of the varying relative dependence upon other organisations. Although such statements are central to the modern study of organisations, they do tend to be couched in such a general way that it makes it difficult to subject them to empirical

verification. Thus, the application of the notions of organisational structure, environmental uncertainty and inter-organisational dependence, to the constituent parts of organisations in particular environments, such as manufacturing plants in a region, cannot be expected to present an easy task. Given this, the sympathies of the writer lie with Wood (1978), who says, that we need to more than ever concentrate upon gaining some useful insights.

How may we incorporate such abstract notions into an analysis which is focused at the level of the individual firm/establishment? Since Wood (1978) has made a number of relevant points here, we make reference to his work. As noted above, organisation theorists largely discuss organisational structures without reference to the nature of the physical entities, factories, offices ... within which they operate. For organisation theory, the physical units simply mirror the divisional structures of organisations. Further, their significant 'environment' consists of general market and technological conditions, mediated solely through the structure of the firm to which they belong. A critical problem, therefore, for the locational impact of organisations is the need for a framework of analysis within which some balance can be achieved between the purely local notions of plant/environment relations and the too generalised aggregate notions of organisation theorists (Wood, 1978).

If we were to incorporate so-called traditional ideas, such as regional externalities, factor mobility or market area analysis into the organisation theory approach, then we may go some way to including locational influences. However, the work of the organisation theorists embodies certain generalisations that may be applied to the plant and region and which may be more novel in their implications. For example, if we were to look at individual plants at particular locations, this

balance may be affected by: first, the environmental uncertainty faced by the firm at large influencing whether it displays a centralised or decentralised control structure; second, whether the individual plant within the organisation be a headquarters or branch; next, the technical status of the plant, in terms of its share of standardised or innovatory processes (Dicken, 1976); and, the uncertainty of the regional environment within which the plant operates for locally provided functions. There may be a locally managed purchasing of materials if there exists a particular regional concentration of suppliers and local plants are aware of this fact (Wood, 1978).

One feature of the organisational approach which we should be aware of, is that it suggests that assumptions about the nature of corporate control, for example, between headquarters and branches, may be misleading; and clearly this has implications for what has been said as regards the prevailing linkage structure. For organisation theorists, the 'status' of particular plants depends upon complex corporate/environment relationships operating at both the local and national scale. An important tenet of organisation theory is that either decentralised or centralised control may be successful in different industries since they may each reflect a company's effective adaptation to the conditions that it faces. Thus, since organisation structure is seen as a response to environmental uncertainty, Wood (1978), it is felt, correctly observes that regional economists should not become over-involved with organisation theory, but in attempting to make the notions of structure and environment more physically explicit, in terms of linkage patterns, we may be able to make a significant contribution to a line of enquiry in organisation theory. In short, " ... a good deal more thought and investigation are required before anything resembling an 'organisational theory of spatial behaviour' is

likely to emerge" (Wood, 1978 p.149).

In this section we have cited various factors which go towards providing an explanation for evolving establishment linkage patterns. Despite the fact that the spatial implications of organisation analysis are only beginning to be understood, we have drawn upon organisation theory, since we feel it can help our understanding of the way linkages may be assembled across the space economy. We have especially focused upon such abstract ideas as: the firm operating as an open system, the nature of its task environment and the role of the product life cycle hypothesis, since these help explain the nature of organisation structure and corporate control. Thus, although it is difficult to reconcile some of these abstract notions with the more conventional views on industrial location, this should not detract from the fact that we can gain some useful insights into the evolving nature of linkage patterns at the firm/establishment level.

2.4 THE REGIONAL DIMENSION : IMPLICATIONS FOR PERIPHERAL AREA DEVELOPMENT

We now consider the implications of this suggested linkage structure of head offices of large firms in the South-East or abroad and branch production in peripheral areas, for self-sustaining growth in a peripheral location, such as Devon and Cornwall. At a largely *a priori* level, then, we discuss the likely development implications for an area characterised not only by a substantial small firm population, but also by medium and large sized externally owned plants carrying out routine standardised production.

At this juncture, it may be useful to offer some idea as to how we may distinguish between centre and periphery areas in this context. The centre-periphery debate has been a long-standing one in disciplines

such as political science and for such schools of thought the terms centre and periphery have certain important connotations which are beyond the scope of this thesis. For our purposes, a peripheral area is seen to be one where there are many small micro firms as well as a significant branch plant population. Many firms, then, may not be able to compete effectively with big league firms in either national or international markets (Holland, 1976). Thus, different types of firm are seen to be concentrated in different types of regional markets, and this, says Holland (1976), may be seen as another dimension of inter-regional dualism. It is when one sees this as a structural problem that there exists, it is argued, a distinction between centre and periphery systems (Averitt, 1968). This type of approach may well have connotations, for the UK regions. The centre may be composed of firms large in size and influence benefitting from management scale economies; whilst, the periphery, on the other hand, is more likely to consist of relatively small firms usually dominated by a single individual or family who sell to relatively restricted markets and whose profits are lower than centre firms. Further, production techniques are relatively outdated and firms here are regarded as 'technical followers'. Centre firms, however, tend to be innovative and participate in extensive advertising. Although this analysis lacks a spatial dimension, the use of the terms centre and periphery are highly suggestive for regional theory, complementing the spatial concentration of most economies in centre or periphery areas (Holland, 1976). With reference to the UK in particular, such a classification seems to have strong implications for the structure of industry at least on a priori grounds.

What are the likely development implications, then, for a peripheral area given the suggested linkage structure across the space economy?

The link between mobile plants and regional development is provided by the concepts of growth poles and growth centres leading to external effects and self sustained growth. As we noted in chapter 1, essentially the pole firms need to act as propulsive units by innovating via links with other indigenous plants. Most mobile plants are seen to be branch plants, where a branch may be seen as a new additional establishment for the company (Townroe, 1972). These branch or externally owned plants may be part of an expanding firm where rapid change is taking place; they may have access to the resources of the large organisation, namely, manpower, finance and technical knowledge; and they may use modern technology, introduce new products and employ dynamic personnel. In doing so, they would seem to satisfy many of the conditions deemed as necessary to promote technical advance via intra and extra firms' activities. That is, acting as an innovator and initiator, operating as incubator units and diffusing knowledge to the local environment. However, many branches seem not to bring with them the full range of services necessary to the operation of a business; whilst, some are seen as mere production units located in peripheral areas and this reflects the corporate strategy and uncertainties, associated with the goods provided (Townroe, 1975).

In developing this line of argument, any suggestion that branches will not bring managerial decision making tasks to the area, implies a lack of people with the relevant experience for future self generating and self sustaining economic growth. In other words, the branch, in operating as solely a production unit controlled from a distance, will tend to lack commitment to an area and, therefore, may offer little opportunity for managerial advancement. Further, because of the ease of withdrawal there is a fear that branch plants are the most likely to cease production in a recession. As regards linkage potential, it

could be argued that an externally owned plant is less likely to buy and sell locally in the new area, preferring instead to maintain original links from the parent plant location. Consequently, the spin-off effects, agglomeration economies and so on are weakened. This is likely to be especially true of purchasing responsibilities reatined at the parent plant in another region. Thus, regional development is slowed down (Townroe, 1975). The real fear, then, is that branch plants may become mere operating units without purchasing and marketing functions; hence, a lack of white collar employment and a reduction in the number of potential managers. In short, management may be unable to take significant investment decisions and so will deprive the area of growth generated by the new plant.

It is suggested, then, that mobile plants may not seek to establish local links and, therefore, this will have a detrimental effect on the area's growth potential. Available evidence is limited but McCrone (1969) argues that mobile plant linkages are not great; whilst Townroe (1975) found that, in general, the emergence of numerous short backward linkages in such plants has not occurred. Lever (1972) believes that an important factor which differentiates mobile plants from others is that the external economies which are available at one site are relatively unimportant or can be found elsewhere. Thus, industries with a few important links have very limited choice of location and are, therefore, unlikely to form part of the mobile branch population. Moreover, regional development may exist with only a portion of industry being footloose; whilst, it seems that those firms who do move may be constrained from breaking existing ties with suppliers and consumers (Thwaites, 1978). In a study of Scottish industry, Lever (1974c), found that branch plants hauled supplies over longer distances and purchased more in the South-East and West Midlands than indigenous

plants. Further, they also bought more from the region in which the head office was located. Thus, many of the original linkages are transferred and, in this sense, are extended not altered. The results of this work in relation to the pattern of linkages in externally owned plants is discussed later.

Focusing upon an information theory of regional development, suggests that firms based solely in peripheral areas would be peripheral to the dominant flows of information in the space economy. This is important because, as regards communication flows, it suggests that externally owned industry is not oriented towards regional communication and longer distance contacts are primarily with superiors and peers within their organisations. It is not likely, then, that externally owned companies will transfer vital information to indigenous plants if their local contact is limited; and, in any event, the information they obtain from the organisation may be merely instruction and advice (Marshall, 1979).

Having cited above the relevance of growth pole theory with reference to mobile plants and regional growth, of central importance, becomes the idea of technical advance and its implications for subsequent development. Thus, any notion of self sustained growth and the mobilisation of indigenous potential involves a technological dimension. Moreover, technical change has been seen as an important, if not the most important factor, responsible for economic growth (Mansfield, 1968; Solow, 1957). In effect, continued growth requires a perpetual redirection of resources to meet changing conditions. Given this, a region can only maintain a high level of growth, or achieve self sustained growth, if the firms established there are able to adjust continually to satisfy current market demand and technical change (Feller, 1975). In other words, regional development depends upon the

creation of a circular and cumulative pattern of growth, which, in turn, is based upon the ability of the local economy to generate new firms and activities as economic and technical conditions change. This ability to generate new firms, tends to be especially likely where R and D and technical activities are common and active within local firms, universities, government facilities and non-profit organisations. However, the so-called branch plant economies have become increasingly recognised as being inhibited in both technical innovation and in the formation of new firms. Thus, it is argued that administrative control, strategic decisions and related R and D are found in relatively few locations, especially when compared with the number of production sites (Malecki, 1981). We suggest, then, that technical change is important for long run self sustained growth and the creation of new markets; whilst, the quick adoption of technical innovations is crucial for the survival and growth of many industries. Moreover, given that levels of technical change can vary between countries, it seems reasonable to suppose that it may also vary between regions and, therefore, any region lagging behind others in technical knowledge or the rate of adoption of new techniques can expect, in the long run, to grow more slowly.

The relationship between technical change and linkages has been given attention by a number of writers, including Le Heron and Schmidt (1976). They say that what is important in examining the nature of linkage change is the role played by technical change in stimulating and developing linkage shifts. Thus, linkage adjustments may be seen as part of a set of necessary adaptive reactions to survive in the face of changing conditions. Such changes may arise whenever a firm purchases a good or service, employs a new productions method, or alters the input mix, and this constitutes a technical

change (Schmookler, 1966). Thus, technical change will induce changes in linkage patterns and it is these new linkages which then serve to promote subsequent spin off effects. It seems possible, however, that the nature of the existing linkage structure may inhibit the rate of adoption of new techniques in a peripheral area, since the periphery is likely to be composed, not only of a relatively large number of small firms operating at comparatively low levels of technical capability and with little capacity for change; but also consist of many branch plants. These plants, as we have suggested, may not be well linked into the local economy and, therefore, any technical advance in these mobile plants may not significantly affect local linkage patterns.

Thus far, the term technical change has been coined fairly loosely and within the area of technical advance there may be a number of different aspects. We briefly discuss these below. Most authors in this area have concentrated upon three distinct phases to technical advance; namely, invention, innovation and diffusion. Here, we do not pretend to offer any original insight into the nature of technical change, but instead cite the work of Ewers and Wettman (1980) as an indicator of what technical advance may be said to describe. For them, innovation describes the initial introduction of a new product or the first utilisation of a new production process or an organisational technique. It rests on an invention, which describes new knowledge which is translated by the innovator into concrete economic activity. Given that inventor and innovator are not necessarily identical, there lies, then, between invention and innovation a process of diffusion. Within the diffusion process, there are two subphases: the information transfer between inventor and innovator; and the micro economic (firm level) innovation process. The latter is a process of varying length and complexity, according to the degree of maturity of the

received innovation and the specific goals and the particular economic situation of the receiver. There are up to three phases included in the firm level innovation process which are not always clearly delineated in practice. That is, the determination of demand; R and D; and the translation into production and marketing. New ideas and knowledge often emerge in the course of this process which, on their part, release further diffusion processes. For Ewers and Wettman (1980) then, the macro innovation process is a series of individual economic innovation, as well as diffusion, processes which emanate from individual firms/establishments, which occur partly in parallel and partly at staggered points in time. Thus, when we refer to technical change in subsequent chapters, we are usually speaking of a number of different aspects in the overall process.

We can now consider, in somewhat more detail the way each aspect may present itself at the regional level. If a region had a firm structure biased towards large enterprise, then as regards R and D and invention, one could expect to find a considerable proportion of resources committed to R and D; and hence, new inventions. A region composed of mainly small firms would, it seems, experience a relatively lower level of R and D but still there may be a few significant inventions (Thwaites, 1978). It has been shown by Buswell and Lewis (1970), that technology producing units are disproportionately found in the South-East, and West Midlands, while the peripheral areas possess relatively few such establishments. Thus, in a spatial context in the UK, where industrial structure, firm size and corporate organisation vary between regions, the aggregate level of inventive activity is likely to vary between geographical areas. Moreover, if market and technical information flows vary in their spatial strength, then the opportunity for, and the ability of, a firm to participate in inventive

activity will be dependent upon its location. As regards innovation, it appears that the availability of specialist personnel in a region may condition its ability to support innovative activity. The regional structure of industry may cause variations in aggregate regional innovative activity and, over time, certain products may become standardised. Clearly, then, regional levels and the substantiveness of innovation can depend upon the type and stage of industry found there. In terms of the diffusion process, Chinitz (1961), has argued that a competitive market structure typified by many small firms is more conducive to the diffusion of innovations than a concentrated market dominated by a few large firms. Further studies which offer a regional dimension (Pred, 1977; Robson, 1973), seem to suggest that the rate and level of diffusion of any given technique may vary over space with considerable implications for regional technical and economic performance.

Continuing this theme of technical change and regional development, it may well be the case that at the local level, information is transmitted through the sale of products to local industry and, in this sphere, many branches appear to be formed, at least in part, to serve the local market. Since the externally owned plant may employ relatively few research staff, there may only be a limited number of innovative ideas emerging; hence, the plant becomes totally dependent upon the parent to produce and devolve innovation and imitations. Further, unless there is a continual assessment of market changes, local plants will have difficulty in linking their technology with new or different market demands which lead to innovating situations (Thwaites, 1978). Moreover, assuming the branch is engaged in standardised production, then the knowledge gained by personnel may be of a mature technology, where economies of scale are being exploited

and technical gains are only marginal. It appears, then, that mobile plants may have relatively few short backward linkages that might generate a need to improve technology in indigenous suppliers. A higher purchasing level in regions by units with different technical attributes could have demanded that local plants seek out this knowledge. Thus, the suggestion is that little is known of the technical impact of this type of establishment on the regional economies of peripheral areas (Thwaites, 1978), but, if regional growth is to be achieved, it appears that it should, in part, be based on the rejuvenation of technology in this type of unit, especially where there is potential for local linkage.

We can pursue this line of argument further by saying that given that a firm's success depends upon within the firm and environmental factors, the peripheral area establishment is seen to be at a disadvantage because " ... peripheral regions frequently lack those factors ... upon which a successful innovation and adaptation process within the individual plant is dependent" (O'Farrell, 1980 p.4). Further, intra regional factors, such as, the accessibility to external economies, the availability of key skills in local labour markets, the relative proximity of firms in manufacturing similar products, the density of information flows and other environmental influences, may affect innovation and adjustment potential. This, then, plus the acceleration of product change with new technologies and reduced life cycle, makes the potential problems of a peripheral area relatively worse because it contains firms with low innovative and adjustment potential. In other words, for many firms in peripheral areas, research, invention and innovation may be a comparatively rare event. Clearly, therefore, the key problem becomes one of speeding up the adoption and imitation of innovations introduced elsewhere (O'Farrell, 1980).

At the time of writing, the evidence as regards the innovative performance of firms in peripheral areas is not extensive. Work by Oakey, Thwaites and Nash (1980) found the South-East to be the most innovative region and, furthermore, " ... based upon the limited evidence offered in this study it is tentatively suggested that the branch plant population has not produced its expected share of innovations" (Oakey, Thwaites and Nash, 1980 p.242). Their findings may be due to the fact that the innovative activity of regions appears to be dependent to a large extent upon their indigenous activities, which essentially are determined by their respective industrial structures. This may be seen by the high number of firms which have developed on site innovations and the relatively low distance involved in the transfer of innovations in multi plants. Second, the innovativeness of small firms is clearly dependent upon their respective regional environments (Ewers and Wettman, 1980).

More recently, Thwaites (1982) work on the diffusion of industrial products and processes does lend support to the findings of his co-writers in 1980; whilst, a study by Thwaites (1983) shows evidence of the South-East having significant innovations, well above its share of total manufacturing employment. The dominance of the South-East region is further identified by Howells (1984), where, in 1971, it is found that the South-East had five times more employment in research services than any other region; and the area has since improved its position. However, comparatively high levels of employment in R and D services have been found in American owned electronics affiliates located in Scotland (Haug, Hood and Young, 1983). Work has also focused upon high technology sectors (Oakey, 1984) with there being an encouraging growth of innovations in Scottish small high technology firms compared with ones in the South-East. This, says Oakey (1984)

may be due to the fact that those high technology firms in the South-East are generally older than in Scotland and, therefore, are perhaps less likely to engage in R and D. However, it has been found by Goddard and Thwaites (1983) that, during a five year period in the 1970's, fifty-six percent of small and medium sized firms in three high technology sections of the Northern region failed to introduce new or improved products, compared with fifteen percent in the South-East. This, they say, seems to be due to a lack of R and D activity in manufacturing establishments in the North.

A study by Le Heron and Schmidt (1976), which although not a UK one, does shed some light on the relationship between technical change and linkage patterns and is, therefore, worthy of a mention here. Their main conclusions are outlined below. Thirty-two plywood-veneer and twenty iron steel mills in the Pacific North-West region of the United States were analysed and they found that patterns of linkage change at the plant level are influenced by the nature of technical change. Second, process related technical change influenced output purchasing patterns, with best practice plants possessing more stable linkages over time. Next, in one industry, product related changes affected output linkage changes; and, finally, the spatial incidence of linkage change was primarily intraregional. Clearly, the inference we can make for a UK peripheral area from such a study may be limited. However, it may be useful to discover, for the UK, whether it is not only technical change per se that helps shape plant linkage patterns, but also, the nature of the technical change; that is, whether it be invention, innovation or diffusion.

In this section we have attempted to provide some insight into the likely implications for self sustained growth in a peripheral area, given our suggested prevailing linkage structure across the space

economy. At a largely a priori level, it has been suggested that the periphery is composed of a significant number of branch plants as well as many small firms, and the mobile plant tends to be engaged in standardised production. The presence of these externally owned plants may not aid in the fostering of indigenous potential, since such plants will probably not seek to integrate themselves into the local economy, preferring instead to maintain those linkages established at a previous location. Thus, the plant's communications with local suppliers of inputs may be either severed or at a lower level than might be the case if the plant was autonomous; hence, a leakage of some locally generated income via profits remitted to the head office region and reduced local spending. There may be a reduction of local inputs, while, in the long run, a general decline in the level of regional income and a lessening of attractiveness for further investment may result. Clearly, then, an increase in external control of a region's economic activities is likely to lead to a negative multiplier process, whereby the repercussions of external decisions, on such matters as R and D, investment and marketing becomes mutually reinforcing and, therefore, reduces the economic prosperity of the region (Dicken, 1976). As regards technical change, which is seen to be a major factor in the process of self sustained growth, many new techniques are unlikely to be adopted by local firms, since the level of information transfer in the periphery is thought to be relatively low; hence, they may be unaware of the existence of new techniques. Thus, the argument that branches will provide beneficial effects, such as the introduction of new techniques, adopted from the parent which induces other firms to readjust and restructure, only seems sound if the branch plant establishes strong backward and forward linkages in the area. It seems, however, that many branches do not, hence, the failure to incorporate

new technology in indigenous suppliers. From this discussion on evolving linkage patterns and the implications of this for peripheral area development, we are now in a position to present some possible determinants of establishment linkage patterns. This enables us to test these hypotheses in the Devon and Cornwall economy.

2.5 THE DETERMINANTS OF ESTABLISHMENT LINKAGE PATTERNS

From the discussion so far, it would appear that we can make a clear distinction between the types of environment in which plants operate; namely, the operational and behavioural milieu. With regard to the former, one may be able to establish and quantify various operational factors which may influence linkage patterns such as, ownership status, firm size, the level of autonomy in decision making, the operations technology of the plant and productivity levels. However, attempting to quantify these relevant behavioural variables, emerging from an examination of key organisational concepts, poses greater problems because here we are largely concerned with the perception of the external environment by the chief decision maker. Important factors here in influencing strategy may be, individual perceptions of the strength of price competition, and awareness of local suppliers as well as the nature of the environment itself.[1] Before we discuss further the nature of these variables, a brief resume of certain key elements of the discussion will, it is hoped, serve to make clear the classification that follows.

It has been said that variations in industrial linkage patterns are not simply the result of differences in the ownership status of establishments, since McDermott (1976) suggests that the internal organisation of an enterprise, and its implications at the establishment level, are more important determinants of linkage. Essentially, since

the organisation is an open system, its survival depends upon contacts with other firms in its task environment. Environmental change, then, affects the organisation's structural and strategic responses; that is, the organisation's strategy and structure emerges from its dependence upon others. On this basis, it may be postulated that the overall evolution of an organisation's linkages may be determined by exogenous and endogenous factors. The former are the conditions and demands established by the organisation's perception of its environment; whilst, the endogenous are the adaptive strategic and structural responses to environmental change.

Although many organisational science studies examine the business enterprise without reference to individual sites, it has been claimed by Marshall (1979), that the organisational factors of environment, structure and strategy may be operationalised both at establishment and company level; and, moreover, an establishment based approach adds a spatial dimension. In other words, there may be differences in environmental impact depending upon the location of each establishment. Thus, from the above, we may consider the variables influencing linkage patterns under two broad headings: environmental factors; and structural and strategic variables.

In the literature on industrial linkages, writers have tended to concentrate on the product market of the plant, as reflected in its Standard Industrial Classification (S.I.C.) as a proxy for the type of environment in which plants are operating (Britton, 1976). We consider this a viable method to adopt, since it enables us to gain some idea as to the role of the product in influencing linkage patterns. Thus, the nature of the product, for example, cars or lemonade, may affect the pattern of forward or backward linkages to local or national markets. Purpose built specialist factories producing an

input or final product are likely to deal with similar factories at other stages in the production cycle. Since in such cases transport costs are likely to be small relative to product price, there may be little incentive to seek local suppliers. Further, plants producing high technology products may require specialist inputs which are not available locally (Oakey, 1981). Moreover, the number of products produced may be important in some cases, since as the number produced increases, this raises the likelihood that inputs for some may not be available locally. Thus, the type of product may help shape plant linkages; whilst, focusing upon product groups can act as a proxy for the nature of the environment.

Alternatively, it has been suggested by some authors (Marshall, 1979; Rabey, 1978), that such classifications are arbitrary and may not provide us with a real insight into the working of the environment. Thus, we could adopt a measure based upon environmental uncertainty. For some, the viability of an organisation will, in part, be a function of its ability to adapt successfully to change in its environment (Emery and Trist, 1967). It is suggested, then, that as uncertainty increases there is a growing need to monitor the environment (Milleti and Gillespie, 1976). Hence, organisations in more uncertain environments may possess many customer and supplier contacts. However, relatively high levels of environmental uncertainty may encourage the internalisation of linkage within the company to keep the activity under control. In short, an establishment with frequent adjustments to its linkage patterns, may be operating in an uncertain environment. Clearly, this approach requires an ability to assess the degree of certainty/uncertainty in the environment and, as was alluded to above, this may be done by assessing a number of factors. These may include a perception of the strength of price competition; the

number of competitive products; the level of advertising and sales promotion and so on. Questions regarding these variables would be put to the chief decision maker of the establishment, since the organisational leader sets the stage for environmental interaction by subordinates (Osborn and Hunt, 1974).

Following the work of Marshall (1979) and Rabey (1978), the degree of change in an establishment's environment may be measured by means of a scaling technique. This means that each of the relevant factors would be scored by the chief decision maker on a scale according to its strength or degree of change. Managers may also be asked to assess on a similar scale the importance of each factor to the ultimate profitability of the plant. By then combining both sets of scores, a measure of the degree of change in the environment of the establishment is obtained. This may then be divided into either stable, intermediate or dynamic environments.

Those using this technique in the past have recognised that it has potential disadvantages. First, it assumes that any changes in the environment which affect the firm as a whole will be perceived as relevant by managers in establishments. Thus, the methodology clearly relies on the manager being aware of changes in the corporate environment. Second, the environmental change variable includes both technological and market variations, which may have different implications for firm linkage. However, the environmental variable does measure not only change per se, but also the strength of any change. The methodology, then, equates perceived levels of competition with environmental uncertainty. Finally, with such an approach there exists both a measure of change and an importance score. The reason for this is that change in the environment alone will not produce a managerial response unless it is also seen to be important by the

chief decision maker. In effect, this score is a measure of the need for response by management.

Thus, as far as the environmental factors are concerned, there appears to be two main approaches. One focuses upon the role of the product market as a proxy for the type of environment; and the other is concerned with establishing a measure of environmental change so as to predict linkage patterns. This work forsakes the use of the latter approach in its detailed form, but does, nevertheless, include aspects of it; for example, it focuses upon how decision makers' perception of price and product competition and an awareness of local contacts affects the purchasing strategy. The thesis also examines the role of the product in influencing linkages. In other words, we attempt to include aspects of both approaches to the role of the environment, so as to determine how such factors may influence linkage patterns. At an a priori level, then, we expect both the nature of the product and the perception of the corporate environment to be factors influencing linkage.

Some authors argue that the measurement of organisational structure and strategy constitutes a complex task since, on the basis of research undertaken at the University of Aston, organisational structures, and implicitly managerial strategies, are composed of a number of dimensions (Pugh and Hickson, 1976). However, by focusing upon certain establishment measures associated with differences in organisational structure and strategy we are able to overcome this problem and, furthermore, it seems that we can subject most of these measures to empirical verification. One variable we may consider is ownership status.

The importance of ownership in identifying variations in plant linkage is well established. For example, Lever (1974c), has argued

that externally owned establishments possess more dispersed material linkages, but that the extent of such flows depends upon the location of the head office of the plant studied. Further, Taylor and Wood (1973), in a study of the West Midlands, identified a number of small independent establishments which were characterised by strong local ties. However, Marshall (1979) in a study of the Norther region, did not find ownership status to produce marked variations in local linkage patterns. The implications of ownership status for establishment linkage patterns from this discussion seems clear. In this study, we expect the externally owned plants to have relatively few local material linkages compared to the independent plants, since they choose to buy from and sell to the headquarters location. As far as the locally owned independent is concerned, we expect to find that it is more integrated into the local economy, and, hence, has a greater linkage potential. The status of the plant is also likely to influence the pattern of business services. We expect the local use of business services to be more pronounced in the independent plants, with the externally owned firms likely to acquire such services from other establishments in the same corporate group. In short, we expect local linkage, for both materials and services, to be most marked in the independent plants.

A further factor which may influence linkage patterns is the employment size of the firm. The size of an organisation has been related to differences in organisational structure by the Aston group (Pugh and Hickson, 1976). In larger organisations the feeling is that activities are more highly structured and managerial tasks more rigorously controlled. However, in the establishment based linkage literature size of plant has been identified as a strong determinant of establishment material purchases (McDermott, 1976). Clearly, what

constitutes a large or small firm, in employment terms, varies from study to study and so there is no standard definition. Here, we categorise firms employing less than twenty-five people as small; those employing between twenty-five and forty-nine people as medium sized; and firms with fifty or more employees we define as large. Such a categorisation reflects the nature of the Devon and Cornwall economy, with its relatively high concentration of small firms. From a linkage point of view, we expect the larger sized firms to have relatively few local material and service linkages compared with the smaller plants. That is, we expect the tendency for firms to buy and sell locally and acquire local services to be more pronounced in the smaller establishments.

A third factor under the general heading structural and strategic measures, concerns the extent to which there exists managerial autonomy in decision making. The degree of freedom in decision making may be associated with varying managerial strategies and structures. Thus, the emphasis placed in management strategies on differing aspects of a firm's environment may be related to varying patterns of managerial control (Jacobs, 1974; Thompson, 1967). For example, given that the major problem experienced by an organisation is in acquiring capital, then the board of directors or the finance department may control the organisation; whilst, if the organisation's major difficulty is output disposal, then the sales department could dominate the company (Perrow , 1961). The extent of managerial control of decision making could have important implications for the pattern of industrial linkage. If an externally owned establishment is heavily dependent and largely controlled from other sites within its overall enterprise, then the freedom to take decisions across key activities, such as R and D, investment and marketing may be reduced. However, the parent

plant may allow the on site manager to take more routine decisions relating to production and purchasing. Given this, it may be difficult for the plant to become well integrated locally. In other words, the degree of local linkage may be related to the level of decision making freedom. Thus, we expect that in plants where there is a low degree of autonomy (the decisions taken outside Devon and Cornwall) local linkages will be weakly developed. That is, local linkage, for materials and services, is most likely in plants where freedom to take decisions exists.

The above discussion also suggests that the operations technology of the plant may have implications for linkage patterns. Hickson et al (1969) have related the operations technology used in an organisation to differences in managerial structure and strategy. Further, operations technology has been related to patterns of establishment material linkage. For example, Taylor and Wood (1973) suggest that unsophisticated types of jobbing technology are more associated with local linkage. They utilise Woodward's method of classifying the dominant method of production (Woodward, 1958; 1965). Thus, production processes within establishments are divided into three major types: unit production or jobbing; production in small batches; and mass production. It is argued that this type of classification measures the increasing complexity of production. Clearly, it could be that a small firm producing for the local market will undertake jobbing techniques; whilst, mass production is more likely to emanate from larger concerns. Given this, we can infer that for a peripheral area, such as Devon and Cornwall, devoid of the large R and D centres which predominate in core regions, those firms adopting a relatively simple technology and less complex production methods may be relatively small, locally owned and be more strongly linked with the local economy. The

larger branch, on the other hand, in producing for a wider market, is likely to be engaged in mass production methods. It is noted here, that we are not able to test the relevance of this variable owing to problems relating to the questionnaire at the design stage. However, a proxy for operations technology could be the size of the plant; and moreover, operating technology is a factor worth discussing, since it has been shown to be relevant in other studies.

Growth or decline in industry may also have an effect upon linkage patterns. It may be possible to gauge some measure of this by attaining levels of productivity for individual establishments. In periods of growth or decline, it is felt that there is more chance of structural changes in input-output networks. Thus, in a local area characterised by rapid growth or decline, we may see changes in linkage patterns, since firms will either be seeking new suppliers and customers or shutting down certain links. In other words, if we use levels of productivity as a proxy for growth or decline, we may be able to relate this measure to expected changes in linkage patterns. Again, we note that data is not available to test this, although we recognise its potentially relevant role.

To sum up, we suggest that there are certain factors which may well be important influences upon the nature of establishment linkage patterns. Such factors have been categorised as either environmental or strategic and structural variables. This classification follows that of Marshall (1979) among others, and is adopted here because it provides a synthesis of our discussion on behavioural and operational factors in such a way that we are able to subject some to empirical verification. Thus, an examination of the literature has produced a number of hypotheses which we test for the Devon and Cornwall economy. These relate to variations in ownership status, firm size, the level

of autonomy in decision making, the nature of the product and the perception of the environment by the chief decision maker, in determining establishment linkage patterns.

2.6 SUMMARY

This chapter has examined the nature of evolving establishment linkage patterns and the implications of this for peripheral area development. We began by suggesting that a fuller appreciation of the relationship between linkages and economic growth is to be gained by focusing attention at the level of the firm/establishment. Next, we suggested that given the domination of the MNE in the production process, there exists across the UK space economy a clearly identifiable linkage structure, typified by the head offices of multisite companies being located in the South-East or abroad; their R and D activities taking place in selected core regions; and the production of standardised products taking place in branch plants in the more peripheral areas. An explanation for this may be found in those more abstract elements of organisation theory, since this analysis illustrates how organisation structure and corporate control is important for future strategy, which in turn influences patterns of decision taking and, therefore, the linkage structure.

We then considered the regional dimension to this by discussing, on largely a priori grounds, the implications for self sustaining growth in a peripheral area. It is argued that such an area comprises a relatively large number of externally owned plants, as well as many small firms, and this will inhibit the potential for growth, since the externally owned plants may fail to establish local links, hence, the consequent spin off effects are limited; whilst, the smaller firms may lack the capacity for change. Finally, the literature suggests a

number of factors which may influence the nature of establishment linkage patterns. Thus, we have formulated a number of hypotheses concerning linkage determination and these we test on a sample of manufacturing plant in Devon and Cornwall. This has necessitated extensive survey work and the nature of this is discussed in chapter 4. Before considering this and the results of the empirical analysis, we need to examine the nature of the local economy, so as to establish the context in which linkages are studied. It is to a consideration of this that we now turn.

FOOTNOTES

1. This factor is potentially important because if in the local environment suppliers do exist then this has different implications for any future growth strategy than is the case in the absence of local sources of supply. However, we do not know the nature of the actual environment in terms of the existence or not of local contacts, hence we rely upon individual management perception as a proxy.

3. THE LOCAL CONTEXT : A PROFILE OF THE DEVON AND CORNWALL ECONOMY

3.1 INTRODUCTION

A recognition of the problems of inadequate economic growth in the far South-West has culminated in the area being awarded different categories of aid over time. By 1983 all of Devon and Cornwall, with the exception of East Devon, had some category of aided status; although the December 1983 Government White Paper on regional policy proposes changes which will almost certainly have implications for the local economy. A decision by Government is expected in November 1984, and the possible move to withdraw assisted area status from Plymouth is being openly resisted by local economic agents.

Essentially, the problems of Devon and Cornwall have arisen from a combination of local and structural disadvantages, with the chief economic activities of the region having not provided a basis for rapid economic expansion in the late twentieth century (Spooner, 1972). Further, the relatively small and dispersed population and remoteness from major markets have combined to limit the development of manufacturing. This is evidenced by the fact that, by mid 1977, manufacturing employment accounted for seventeen percent of total employment in Cornwall and for twenty-two percent of employment in Devon. These figures contrast with ones of over forty percent in the more industrially developed areas of the UK. Moreover, although services account for the largest share of employment, as is illustrated in detail below, most of such industries tend to serve local rather than national demand. The local economy is regarded, then, as an industrially underdeveloped 'problem' area, since it exhibits relatively high unemployment rates, below average incomes, relatively low activity rates and a low rate of economic growth. One consequence of this situation, argues Plymouth City Council (1984), may be weakly developed linkages between indigenous industry. Clearly, the purpose of this research is to contribute to

this discussion. In order to do this, it is necessary to establish a profile of the Devon and Cornwall economy, so as to illustrate the context in which local linkages are studied and economic growth is proposed.

We begin with an examination of the employment structure in Devon and Cornwall, before focusing upon a number of economic variables which may be seen as factors measuring the economic health of the area. Thus, we consider the pattern of unemployment, the level of per capita incomes, the activity rate and the extent to which employment land made available for development is taken up by manufacturing. Finally, the role of Plymouth in the local economy is discussed, since it has potential as a regional service centre and it has the largest concentration of manufacturing, which is the sector with the greatest potential for initiating economic growth (Kaldor, 1970). We also note that available data tends to be compiled separately from various sources by Devon and Cornwall economic agents. Hence, statistics are not always comparable or forthcoming and information on one aspect of employment, for example, may be available for Devon but not for Cornwall. Moreover, the most recent data, at the time of writing, on industrial and employment structure from the Census of Employment relates to 1978. Clearly, this may lead to problems of interpretation in the light of the current recession. We begin with a consideration of the employment structure in Devon and Cornwall.

3.2 THE STRUCTURE OF EMPLOYMENT

3.2.1 The Economically Active Population

An examination of the working population normally involves a discussion of the economically active. This is the total number of

persons in full or part-time employment, including both employees and the self employed and those unemployed. In Cornwall, in 1977, the male activity rate was 90.8 percent, slightly below the UK figure. By 1981 in Devon, the proportion of economically active women aged between sixteen and fifty-nine stood at 55 percent; whilst, the figure for economically active males aged sixteen to sixty-four was 88 percent. In effect, 37000 more people were classified as economically active in Devon; the rise being largely due to an increase in the number of economically active women. In the light of this, we consider the largest section of the economically active, employees in employment.

3.2.2 Employees in Employment

These comprise 76 percent of the total economically active in Devon in 1981. Between 1977 and 1981 there was a 3 per cent increase in jobs and this growth was largely made up of an expansion in the number of women employees. In Cornwall between 1971 and 1978, the number of employees in employment rose by 12 per cent, with the rise mainly due to a growth in female employment. One of the particular characteristics of the Devon and Cornwall economy is the relatively small size of the manufacturing sector, compared with other regions and Great Britain (GB) as a whole. Further, there are over twice as many employees in employment in Devon than there are in Cornwall. Table 3.1 illustrates the pattern of employment between 1971 and 1978 in Devon and Cornwall by major industry groups, and compares this with the situation in the South-West as a whole and GB.

As the table shows, the pattern of employment has been marked by the dominance of the service sector in both Devon and Cornwall. By 1978 it accounted for 72 percent of employment in Cornwall and

68 per cent in Devon; with both figures being above the regional average. Clearly, manufacturing takes a relatively small share. However, the numbers employed in this sector actually rose during the 1970's; hence, rather than there being any major labour shake out from the manufacturing sector, its share of total employment fell as a result of the larger increase in employment in the service sector. The 1970's also witnessed a decline in employment in the primary and construction sectors in both Devon and Cornwall. In short, the increase

Table 3.1 Employees in Employment by Industry Groups

Industry Group	1971 GB No/%	1971 South West No/%	1971 Devon No/%	1971 Cornwall No/%	1978 GB No/%	1978 South West No/%	1978 Devon No/%	1978 Cornwall No/%
Primary	745800 3.4	51100 3.9	16106 5.5	14708 13.4	723000 3.0	57900 4.0	14321 4.1	13373 10.7
Manufac-turing	8431600 38.3	426200 32.6	67806 23.0	21102 19.2	7117000 32.0	427100 27.0	68565 21.5	21268 17.0
Construc-tion	1248600 5.6	83900 6.4	21779 7.4	8611 7.8	1225000 6.0	86300 6.0	19941 6.1	7525 6.0
Services	11660400 52.7	746000 57.1	189042 64.1	74020 67.4	13187000 59.0	993100 63.0	219572 68.3	89929 72.2
Total	22026400	1307200	295093	109830	22253800	1564400	322399	124578

Source: Employment in Devon, Devon County Council, June 1983 p.21; and Department of Employment Census of Employment, 1978.

in total employment in the local economy is largely due to an expansion in the services. Clearly, this study of local linkage is in the context of an economy in which proportionately few people are employed in the manufacturing sector. It is this feature of the employment structure which sets apart the Devon and Cornwall economy from most other UK regions. Given this, it becomes even more important

that we recognise the need to generate self sustained growth via development in those firms, in the manufacturing sector, where linkage potential is greatest.

Table 3.2 Employment Structure of Employees in Employment GB and Devon (000's)

	Structure Plan Areas 1978						
Industry Group	Exeter/ East Devon	South-East Devon	Plymouth	North Devon	West Devon	Devon	GB
	No/%	No/%	No/%	No/%	No/%	No/%	%
Primary	4.7	2.1	2.5	2.7	1.0	13.0	
	4.8	3.6	2.2	7.6	16.4	4.1	3.0
Manufac-	14.0	9.9	33.3	9.1	1.0	67.3	
turing	14.4	16.1	29.5	29.5	16.4	21.5	32.0
Construc-	6.1	3.3	7.6	1.6	0.5	19.1	
	6.2	5.4	6.7	4.6	8.2	6.1	6.0
Services	72.7	46.0	69.7	21.8	3.6	213.8	
	74.6	74.9	61.6	61.9	59.0	68.3	59.0
Total	97.5	61.3	113.1	35.2	6.1	313.2	
	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Devon County Structure Plan First Alteration, Devon County Council, 1983 p.59.

Information is also available on the extent to which the pattern of employmeat varies by area within the two counties. This is shown in tables 3.2 and 3.3. For Devon, the division is via Structure Plan areas; whilst, for Cornwall the breakdown is based upon an aggregate of employment office areas. As we know, the majority of employees in Devon are employed in the service sector. In all areas the proportions in services are above or equal to the national figure, with this most marked in the Exeter/East Devon and South Devon areas. Plymouth has the highest number and proportion of employees in manufacturing;

although this is below the national average. As for the construction industry, the proportion of employees in each plan area is similar to that nationally; whilst, not surprisingly Plymouth is the only area to have a proportion of employees in the primary sector which is lower than the national average of three per cent. In West Devon the proportion is relatively high at 16.4 per cent.

For Cornwall, as table 3.3 shows, we do not have separate figures for the construction sector. Instead, they are included as part of the service figure. As in Devon, proportionately many people are employed in the service sector. Further, this is above the national level in all areas, with this tendency most marked in South-East Cornwall. The proportion of employment in manufacturing is not markedly different by sub area; but in each area is well below the GB average.

Table 3.3 Employment Structure of Employees in Employment GB and Cornwall (000's)

Employment Office Areas 1978

Industry Group	West Cornwall	North Cornwall	South & East Cornwall	Cornwall	GB
	No/%	No/%	No/%	No/%	%
Primary	4.8	7.4	1.1	13.3	
	7.4	15.0	9.9	10.7	3.0
Manufac-	11.6	8.6	1.6	21.8	
turing	18.0	17.6	15.1	17.3	32.0
Services	48.0	34.3	8.1	90.4	
	74.6	68.0	75.0	72.0	59.0
Total	64.4	50.3	10.8	125.5	
	100.0	100.0	100.0	100.0	100.0

Source: Department of Employment Census of Employment, 1978.

For those employed in primary industries, the highest proportion are located in the north of the county. As above, then, a geographical

breakdown at county level reveals differences in the pattern of employment. However, in Devon and Cornwall as a whole, the overall pattern is one of proportionately many people working in services. Despite the small increase in the numbers in manufacturing, the proportion of total employment in this sector is below the national average. Clearly, on this basis the local economy may be regarded as industrially underdeveloped relative to other UK regions.

3.2.3 The Self Employed

A further group of the economically active is the self employed. In both Devon and Cornwall the self employed represent a higher proportion of the economically active population than is the case for GB as a whole. Thus, in 1981 there were 59000 self employed in Devon, representing 14.6 per cent of the economically active, compared with 7 per cent nationally. In Cornwall, this figure stood at 17 per cent. The increase in the number of self employed persons may reflect an expansion in the small business sector, which itself may be a consequence of a wave of redundancies in recent years (Cornwall County Council, 1979). Tables 3.4 and 3.5 indicate the numbers self employed by county. For Devon, this is represented in terms of the numbers by Structure Plan area; whilst, for Cornwall by major industry groups.

Table 3.4 shows a wide range of self employed as a proportion of the total economically active between the Structure Plan areas. Each area has a higher proportion of self employed than nationally; ranging from Plymouth, which is 2 per cent above the GB average, to West Devon where almost one-third of the workforce is self employed. As table 3.5 shows, the highest proportion of the Cornish self employed are in the service sector; whilst, four times as many males as females are self employed.

Table 3.4 Self Employed Persons in Devon 1981 (000's)

Structure Plan Area	Men	Women	Total	% of Total Economically Active
Exeter/East Devon	15.1	3.8	18.9	15.3
South-East Devon	10.7	3.5	14.2	17.9
Plymouth	9.9	2.6	12.5	9.1
North Devon	8.0	2.2	10.2	20.0
West Devon	2.7	0.6	3.3	32.5
Devon 1981	46.4	12.7	59.1	14.6
Devon 1971	40.0	10.6	50.6	13.0

Source: Devon County Structure Plan First Alteration, Devon County Council, 1983 p.60.

In sum, the largest proportion of the economically active population in Devon and Cornwall are employees in employment. Within this group manufacturing employment is relatively under-represented as a proportion of total employment. It is in services where the majority of persons are employed. Such a situation has persisted over a number of years and is still the case today. Further, a sub area breakdown reveals differences in emphasis as far as the pattern of employment is concerned. Finally, the self employed in Devon and Cornwall represent a relatively high proportion of the economically active compared with the national average. Having considered the pattern of employment, we now turn to a group which have assumed an increasing share of the economically active over recent years, the unemployed.

3.3 UNEMPLOYMENT

Levels of unemployment in Devon and Cornwall have been consis-

Table 3.5 Residents in Employment by Industry in Cornwall 1981

Industry	Self Employed	Employees	Total	%
Agriculture	7120	3860	10980	7.1
Forestry & Fishing	650	410	1060	0.7
Mining, Quarrying, & Manufacturing	1840	25060	26900	17.4
Construction	4630	8120	12750	8.2
Distribution, Hotels & Catering	10200	27360	37560	24.2
Banking, Finance & Insurance	1530	7820	9350	6.0
Civilian public administration & other services	2640	34780	37420	24.2
Armed Forces	Nil	7000	7000	4.5
Energy & Water)			2500	1.6
Transport)	810	11060	7850	5.1
Inadequately described)			1520	1.0
Total	29420	125470	154890	100.0
Males	23320	76270	99590	64.3
Females	6100	49200	55300	35.7
Economically Active not in employment			19400	
Self Employed as a proportion of the Economically Active				17.0

Source: Census of Population, 1981.

Note: All figures are based on a 10 per cent sample of the population. They exclude people in absent households, perhaps 1 per cent of all economically active residents.

tently above the national average for a number of years. Indeed, as at December 1983, the unemployment rate stood at 13.7 per cent in Devon

and 17 per cent in Cornwall, compared with a national average of 13 per cent. Not surprisingly, therefore, unemployment is perceived as a major problem and the pattern has tended to mirror the change in national unemployment rates. By mid 1982 46000 persons were registered as unemployed in Devon, a total which had almost doubled during the previous three years. In Cornwall, by the end of 1983, the unemployment rate had doubled from its rate in 1975. Further, although the rate of unemployment has fluctuated the underlying trend has been upwards for a number of years. The situation between 1979 and 1981 in Devon and Cornwall, compared with other areas of the South-West region, is shown in table 3.6. Clearly, the unemployment rate in the far South-West in these years has been above both the regional and national averages. For Cornwall, the growing numbers of unemployed is shown by the fact that the lowest unemployment rate between 1976 and 1978 (9.6 per cent) is more than the highest rate in any year between 1960 and 1974 (8.5 per cent). This is shown in table 3.7.

Table 3.6 Percentage Unemployed in the South-West Region and GB

	1979	1980	1981
Cornwall	8.9	9.5	13.5
Devon	7.1	8.3	12.0
Somerset	4.6	5.9	8.2
Wiltshire	5.2	6.6	9.1
South-West	5.7	6.9	10.0
GB	5.3	6.8	10.5

Source: Department of Employment Gazette, June 1983.

With regard to the geographical breakdown of unemployment within the local economy, then in Devon the rate of unemployment in the

Structure Plan areas has generally followed national levels. However, the Plymouth area exerts a relatively strong influence over the unemployment figure in Devon, since 45 per cent of the total number of unemployed persons in the county are registered in the Plymouth area. Further, Plymouth is the only Structure Plan area where the unemployment rate has consistently remained above the national level since 1976. Moreover, the recession does not appear to have had as significant an impact in the Exeter/East Devon and West Devon areas, since unemployment rates here have increased at a slower rate than nationally. Indeed, since the onset of the economic recession the unemployment rates of East and West Devon have fallen below the relative national levels and are the lowest of the five Structure Plan areas. For Cornwall, the largest numbers of unemployed are, not surprisingly, found in and around the main centres of population; whilst, the areas with the highest rates consistently include Camelford, Helston and St. Ives.

Table 3.7 Monthly Unemployment Rates in Cornwall 1960-1977

Period	Highest Monthly Rate	Lowest Monthly Rate	Average Monthly Rate
1960 - 1964	6.8	2.0	4.1
1965 - 1969	6.9	2.3	4.9
1970 - 1974	8.5	3.1	5.5
1975	10.9	6.5	8.3
1976	11.9	9.6	10.6
1977	12.8	10.0	11.3

Source: County Structure Plan, Cornwall County Council, 1979 p.29.

The number of persons in Devon unemployed for six months or more has almost doubled between 1976 and 1981. In each of the plan areas

over 40 per cent of unemployed persons have been seeking work for over six months. For Cornwall, by the mid 1970's, this figure was 25 per cent. It is in Plymouth where the fastest rate of increase in the number of long term unemployed has occurred; whilst, in Devon as a whole, the under twenty age group has experienced the fastest rate of increase in the number of long term unemployed. That is, between 1976 and 1981 the number of young people unemployed for six months or more rose 150 per cent. In Cornwall, the proportion of unemployed people aged under forty increased from 30 to 35 per cent in the early 1960's, to over 60 per cent in January 1977, 15 per cent being under the age of twenty. Further, more than 80 per cent of the increase in unemployment during 1977 was among school leavers. In Devon, the number of unemployed school leavers during 1982 peaked at 6,000. The relatively large increase in the proportion of unemployed persons, in the twenty to fifty-four age group, in Devon between 1976 and 1981, may be attributed to the relatively high concentration of unemployment in this age group in the Plymouth area. In contrast, in other Structure Plan areas it was youth unemployment which experienced higher rates of increase. Moreover, the proportion of unemployment in the fifty-five plus age group fell in each plan area between 1976 and 1981. Unemployment in the young in Cornwall seems to have been especially marked in females, with 11 per cent of all those females unemployed at the end of 1977 being under twenty years of age, compared with 4 per cent of males.

In contrast to the early 1970's, the last few years have witnessed a labour shake out across most major industries; and, in both Devon and Cornwall, the service sector has fared worse. That is, in Cornwall, of the increase in unemployment throughout the 1970's, 51 per cent stems from a reduction in employment in the service sector; whilst,

almost one-half of those seeking work in Devon in 1981 had last been employed in services. Both figures are a bove the national average. Further, by 1981, the proportions having lost jobs in the primary and construction industries are similar to those nationally, with 25 per cent of the increased unemployment in Cornwall being in construction. Moreover, the proportionate increase in unemployment within the manufacturing sector is below the national average, reflecting its relatively low share of employment in both Devon and Cornwall.

Seasonal unemployment is a recurrent problem in the local economy. In Devon, variations are most marked in the holiday areas, with numbers seasonally unemployed being markedly higher in the relatively prosperous South-East Devon compared with North Devon. Further, although during the summer months a 'fuller' employment situation is achieved in South-East Devon, the rate of unemployment has generally remained above the national level. In Cornwall, at times of relative economic stability, when seasonal factors could be isolated, male unemployment was one-and-a-half times, and female unemployment two-and-a-half times, greater in winter than summer. As overall unemployment has increased, so the variations between the winter and summer rates have become less marked, particularly for females. Thus, over the period 1975-1976 to 1977-1978, the average ratios of winter to summer unemployment were 1.3:1 for males and 1.9:1 for females.

The rate of unemployment, then, has been above the national average for a number of years in both Devon and Cornwall. Further, it is more pronounced in certain parts of the local economy, especially Plymouth; whilst, the problem of long term unemployment in the young has been an increasing feature in recent years. Moreover, the increase in unemployment has been relatively large in services, compared with other sectors. Finally, the area suffers from marked seasonal variations in

the pattern of unemployment. A further potential indicator of the economic health of the local economy relates to the extent to which land, set aside for industrial development, is taken up by manufacturing industry, since the higher the take-up rate, the greater is the likelihood of growth in the manufacturing sector. The situation with regard to this is considered below.

3.4 EMPLOYMENT LAND AND DEVELOPMENT

One of the main ways a local authority can help boost employment, is via allocating sites for industrial development. By 1977 Cornwall County Council owned three estates and there were further estates in all six districts being developed by the District Councils concerned. As for Devon, data is available on the actual Structure Plan provision of employment land, the amount developed between 1976 and 1981 and the land which is readily available for development in relation to the phasing requirements of the plan. This is shown in table 3.8.

Table 3.8 Employment Land Developed and Readily Available in Devon (hectares)

Structure Plan Area	Structure Plan Provision 1976-1981	Land Developed 1976-1981	% of Plan Provision Developed in First Phase	Land Readily Available
Exeter/East Devon	162	53	33	82
South-East Devon	121	38	32	72
Plymouth	186	57	31	66
North Devon	101	19	18	27
West Devon	28	9	33	9
Total	598	176	29	256

Source: Devon County Structure Plan First Alteration, Devon County Council, 1983 p.63.

Table 3.8 clearly shows the scope for industrial development. Between 1976 and 1981 176 hectares of employment land were developed. This amounts to almost 30 per cent of the total Structure Plan provision for the period 1976 to 1991, and is perhaps a reasonable take up rate given economic recession. Clearly, industry is prepared to develop and this may be indicative of greater economic activity in the area. Moreover, at mid 1981 a further 255 hectares of land was available for development. With regard to each of the plan areas, almost one-third of the provision had been taken up, with the exception of North Devon. Thus, a prime concern for the local authorities is ensuring available land for development in the two counties; whilst, the rate at which it is taken up may indicate prospects for industrial growth. The question then remains as to the type of industry which needs to be encouraged to develop with regard to future employment effects. A more detailed discussion on this issue appears in chapter 7.

3.5 INCOME

One of the major features of the far South-West economy is relatively low incomes. Further, the differential between local average earnings and the GB figure has not narrowed over time. The situation with regard to Cornwall is shown in table 3.9. In 1977 the average

Table 3.9 Average Weekly Earnings of Male Workers 1974 to 1977. Cornwall relative to England and Wales

Year	1974	1975	1976	1977
Amount (£)	40.3	51.4	61.3	65.8
Percentage behind England and Wales	16.0	15.5	15.0	16.0

Source: County Structure Plan, Cornwall County Council, 1979 p.36.

weekly earnings of male workers in Cornwall were 16 per cent lower than the average in England and Wales. However, averages do not tell the whole story. That is, there exists a relatively high proportion of low incomes and earnings and a low proportion of high incomes and earnings in Cornwall. For example, the county is particularly deficient in the higher range of earnings, with the upper decile earnings (the level which marks off the top 10 per cent of workers) 18 per cent below the GB figure. Lower decile earnings (the bottom 10 per cent), on the other hand, are 11 per cent below the national average. These relatively low earnings may be indicative of the comparatively high proportion of employment in nationally low paying industries; although seasonal factors may play a part. The nature of the industrial structure in Cornwall, then, may account for as much as one-half of the pay deficiency of male manual workers and two-thirds for females, but a lower proportion for non-manual workers. In 1973 some 43 per cent of employees in Cornwall, compared with 29 per cent in GB, worked in specific low paying industries. Further, 39 per cent of male workers and 47 per cent of female employees worked in such industries.

The relatively low pay in Devon throughout the 1970's is shown in table 3.10. Clearly, the disparity in earnings is greatest for males, where it would appear that the earnings difference has increased since 1979, both in the region itself as well as between Devon and GB as a whole. Female pay, however, whilst remaining below the national level, is closer to that of the regional figure than is the case for males. Further, over the period 1976 to 1981, the disparity between the South-West region and GB has increased in all industries and services. In both counties, then, a problem of relatively low pay throughout the 1970's. This trend has continued into the 1980's as can be seen in table 3.11. By 1981 the relative position of weekly earnings in Devon,

Table 3.10 Average Gross Weekly Earnings 1976 - 1981 (£'s - unadjusted)

ALL FULL TIME MALES

	1976	1977	1978	1979	1980	1981
Devon	63.5	69.4	77.9	87.3	108.3	124.7
South-West	67.2	73.4	82.5	92.4	115.9	132.6
GB	71.8	78.6	89.1	101.4	124.5	140.5

ALL FULL TIME FEMALES

	1976	1977	1978	1979	1980	1981
Devon	44.5	48.8	52.9	60.8	74.4	84.9
South-West	44.4	49.6	53.6	60.0	75.2	87.2
GB	46.2	51.0	56.4	63.0	78.8	91.4

Source: Employment in Devon, Devon County Council, June 1983 p.25.

compared with the other 38 English counties, was thirty-fourth for full time males and for females, twenty-eighth. Thus, relatively low incomes characterise this peripheral industrially underdeveloped area. For some, the situation may be rectified via a reduction in the rate of unemployment, the maintenance of a high and stable level of employment, the introduction of additional manufacturing which would increase the pressure of demand for labour, and an increase in the female activity rate (Cornwall County Council, 1979).

Thus far, we have illustrated the pattern of employment, unemployment and income in the far South-West. In doing this, certain characteristics of the economy and the particular problems it faces have been highlighted. Given an acceptance of such criteria for assessing economic performance, then clearly Devon and Cornwall may be deemed a 'problem' area. Thus, it is in the context of an economy with a relatively poorly developed manufacturing sector and a comparatively low rate of economic growth in which this study on manufacturing

Table 3.11 Average Gross Weekly Earnings (£'s)

Full Time Men aged 21 and Over

	April 1981	April 1982	April 1983
Cornwall	118.1	126.5	138.8
Devon	124.7	136.0	147.3
South-West	132.6	143.2	156.2
GB	140.5	154.5	167.5

Full Time Women Aged 18 and Over

	April 1981	April 1982	April 1983
Cornwall	82.3	89.2	96.8
Devon	84.9	92.3	100.2
South-West	87.2	93.5	102.6
GB	91.4	99.0	108.8

Source: Department of Employment New Earnings Survey, 1983.

linkages and economic development takes place. Given this, a solution to the problems of the far South-West is likely to depend upon indigenous firm growth, since the supply of mobile plant is drying up. Progress towards this end may be made easier with substantial development in the Plymouth area because this location, perhaps more than any other in Devon and Cornwall, possesses potential both for manufacturing development and as a regional service centre. Thus, we briefly consider below the nature of the Plymouth area in the local economy context.

3.6 THE ROLE OF PLYMOUTH

Plymouth is the largest single centre of population and employment in Devon and Cornwall, with an estimated home population of 253,600 in 1982. The main thrust of post-war economic policy in Plymouth has been to reduce the dependence of the city on the Devonport Dockyard,

which was originally the only significant source of employment in the manufacturing sector (Plymouth City Council, 1984). It has been said that problems of remoteness have meant that relatively few firms are interested in Plymouth unless Government assistance is available. As a consequence, only certain forms of manufacturing activity have been attracted and sources of employment growth in the service sector have not developed (Plymouth City Council, 1984). Local economic agents stress, therefore, the need for inward investment which they feel will lead to growth via linkages with indigenous plants. Clearly, the results of this work will throw light on the extent to which this seems a viable option.

A further concern for local economic agents is the role of the dockyard. Employment in shipbuilding and marine engineering still accounts for nearly one-half of all manufacturing employment in Plymouth. This is a cause for concern because, not only is there uncertainty about the future of the yard, but also, the dockyard is entirely outside the scope for regional aid. Thus, almost 50 per cent of the manufacturing employment in part of a Development Area is unaffected by the benefits of regional policy. Further, the dockyard has few linkages with the rest of the local economy (Plymouth City Council, 1984).

Recent economic development initiatives tend to have eluded Plymouth. That is, the Government has announced several development proposals such as Enterprise zones, Freeports, Urban Development Corporations and measures to aid inner cities. None of these benefits have been conferred upon Plymouth. The area also suffers from a lack of private sector financial backing to industrial and commercial activity. This may be due to the problems of remoteness and the reluctance of institutions to invest risk capital in the peripheral

areas (Plymouth City Council, 1984). Hence, Plymouth largely relies upon its own efforts, plus aid from local authorities and the European Regional Development Fund. Given this, the City Council argues that the maintenance of aided status is essential for the economic prosperity of the wider area. The argument essentially is, then, that denying Plymouth aided status would reduce the attractiveness of the area for manufacturing plant and hence, restrict the development of the manufacturing sector. Given this possibility, the argument for a mobilisation of indigenous potential and achieving self sustained growth, based upon the promotion of local linkages, gathers even more credence.

3.7 SUMMARY

The dominating influence upon the Devon and Cornwall economy over the last ten years has been one of economic recession. This has affected all sectors of industry and has tended to reflect the national economic situation. A number of indicators of economic prosperity have been discussed, so as to build up a profile of the local area and illustrate, therefore, the context in which linkages are studied and economic development is suggested. Activity rates are slightly below the national level; whilst, the employment structure consists of a relatively small proportion in manufacturing and an above average percentage in services. Further, there are sub area variations in this pattern. Unemployment in Devon and Cornwall has been above both regional and national levels for a number of years. Moreover, long term and youth unemployment is especially acute. Incomes are relatively low compared with the national average, with the differential most marked for males. Thus, as well as suffering from relatively high unemployment, low incomes, a relatively low rate

of economic growth and so on, the area also has problems associated with its peripheral location. This affects the ability of Plymouth, potentially the main growth centre in the local economy, to attract mobile plant without aided status; hence, future growth, not only in Plymouth but in the rest of the economy also, requires indigenous firm development. This study of manufacturing linkage is, therefore, undertaken in an industrially underdeveloped area; hence, it may in the future possess the potential for economic growth. Having discussed the nature of the local economy we now need to consider the methodology adopted for empirical data gathering. This is the subject of the next chapter and leads us into an analysis of the empirical results.

4. THE DEVON AND CORNWALL ESTABLISHMENT SURVEY

4.1 INTRODUCTION

Having identified the topic of study and established the possible determinants of linkage, the problems of empirical data gathering now present themselves. The method adopted to overcome this problem is the industrial survey. In this approach, actual decision makers within establishments are questioned, so as to gain empirical information. This has the advantage of allowing the researcher to construct questions which isolate precisely the topics deemed relevant to the study. In essence, then, the survey aims to identify variations in material and business service linkage using characteristics of the business establishment and its environment, as described in chapter 2.

The following approach is adopted. First, the background to the study is discussed, so as to highlight the original aims and objectives. We then consider some of the salient features of a direct survey, making reference at the same time to the problems associated with sample data and questionnaire design. A discussion on the nature of the questionnaire and final choice of sample follows. Next, we outline the method of analysis and examine the role of non-parametric statistics in this. Finally, we illustrate some of the characteristics of the sampled firms, since although this does not directly relate to data on linkages, it does provide an insight into aspects of the firm's activities and is data to which we refer later. In short, it is the establishment survey which provides the basis for our empirical analysis, the results of which are reported in the following two chapters.

4.2 ORIGINAL OBJECTIVES

This work on establishment linkages in Devon and Cornwall forms part of a wider study on local manufacturing firms. This fact is

reflected in the questionnaire design, as shown in Appendix A, where questions not only relevant to a linkage analysis are included. The wider project has essentially four objectives. First, to produce a directory of aids and incentives to businessmen in Devon and Cornwall. This is seen as necessary, since other studies (Green, 1977; Townroe, 1972) have shown firms to be largely unaware of such aids. Next, to produce a directory of firms' inputs and outputs, so as to improve the possibility of matching in the local economy. The third consists of producing a capacity register of firms, so that unused capacity can be hired out to existing entrepreneurs. Finally, the work aims to obtain detailed information on material and service linkages in the local area. This, it is envisaged, will serve to provide information on the growth potential in the far South-West.

Clearly, as far as this research is concerned, it is the final objective which is the focus of attention. However, the questionnaire itself, reflecting as it does relatively broad aims, covers objectives two to four. Thus, whilst the writer took an active role in designing questions pertaining to linkages, other relevant aspects were under the auspices of other project members. Furthermore, the linkage questions were carefully considered after reviewing the literature on regional growth and other industrial survey work (Marshall, 1979; Stewart, 1976). Given the above, the task then becomes one of surveying local firms. It is to a consideration of this that we now turn.

4.3 THE DIRECT SURVEY

Before discussing the nature of the Devon and Cornwall survey, a brief consideration is given to some of the factors which we need to bear in mind when undertaking industrial survey research. For

some authors, access to data at establishment level is essential if the patterns and processes of industrial location are to be analysed (Mason, 1981). Firm and establishment data is required, then, not only to overcome some of the limitations of the available aggregate data, but also to analyse the processes of change. Further, it is required to test those hypotheses in urban and regional industrial research which relate to individual units. Moreover, micro data may be used to provide a sampling frame, and this generally comprises the total population under study; for example, all the manufacturing establishments in a particular area.

Given this, an understanding of the nature of direct surveys is important because the results of any limitations may find their way through to those published sources used by urban and regional researchers. A key element in the survey relates to the type of sample used. Sample surveys have been extensively applied in industrial research because " ... samples can be more economical, less time consuming and more accurate than large numbers such as total populations" (Gardner, 1978 p.79). If conclusions are to be drawn about a larger population the sample should be random. A number of industrial surveys (for example, McDermott, 1978) are based upon random samples drawn from some specified population. Thus, if generalisations are to be made, then simple random samples are most suitable (Healey, 1983). That is, each member of the population has an equal chance of being in the sample. However, in some cases the characteristics of the population may be stratified, in which case a stratified random sample is needed. In order to sample in a random manner a sampling frame is required. This should ideally contain a complete list of the members of the population with no duplicate entries. For our purposes, this effectively means the population of manufacturing

firms in Devon and Cornwall. In short, unless the sample is random the conclusions reached apply only to the sample itself (Healey, 1983).

A further key aspect of an industrial survey relates to questionnaire design and the nature of response. It would seem that the nature of replies obtained in direct surveys depends critically upon the quality of the questionnaire design, the administration of the questionnaire and the way the questions are phrased. In other words, " ... the construction of a schedule, the precise framing of questions ... and the exclusion of bias are skilled procedures which require every attention to detail" (Jackson, 1963 p.83). Further, the use of a pilot survey to test out the questions and help maximise the response rate is advocated by many authors.

Assuming that problems at the design stage are overcome, of fundamental importance then becomes difficulties associated with the interpretation of the answers given. A number of potential problems exist. For example, respondents in attempting to be helpful may give answers which they think will aid the researcher. Alternatively, they may try to justify their actions. For instance, Gudgin (1976) found, in a postal survey in the East Midlands, that although many firms gave rational reasons for their choice of location, subsequent investigation revealed that 90 per cent had investigated no alternative site. Problems may also arise when questions are being asked about events which occurred several years previously; or, the person answering had not taken part in a key decision. Moreover, there is the problem of inferring the motives of the organisation from the responses given by a single representative (Healey, 1983). Clearly, then, we need to be aware that responses are a form of subjective evaluation and not necessarily objective facts. The answer to a question may be precise. It does not follow, however, that even where

questions are fully understood that the response is an objective fact (Oakey, 1981). Thus, it seems thatpotentially the major source of inaccuracy in questionnaire surveys stems from a variable accuracy of replies and not necessarily from inadequacies in questionnaire design. However, this does not mean that care should be abandoned at the design stage. In sum, despite the potential problems which exist with direct surveys, they still have a major role to play in urban and regional industrial research.

4.4 THE QUESTIONNAIRE AND CHOSEN SAMPLE

Given the above, we now discuss the nature of the questionnaire used in this survey and the means by which we arrive at our working sample. The clear advantage of the postal questionnaire is its lower unit cost allowing for a larger survey which, in turn, reduces the chances of sampling error at the analysis stage. Further, as mentioned above, the questions themselves reflect the fact that information other than that on linkages is also being sought. In the first instance, preliminary discussions were held with local businessmen with a view to obtaining the 'maximum' amount of information on the nature of firms' operations. It was further decided to hold discussions with the Plymouth Manufacturers Group and the Chamber of Commerce, since it was felt that this would increase the likelihood of surveying all Devon and Cornwall firms. From these discussions, it emerged that a variety of sources could be used in an attempt to compile such a list. Thus, use was made of yellow pages, trade directories, trade lists and firms provided by the Chamber of Commerce and Department of Employment. Having compiled a list of local firms, we decided not to make use of a pilot survey, since it was seen as sufficient for the questions to be tested by members of the management committee of the Plymouth Chamber

of Commerce.

A postal questionnaire, plus follow ups, was sent to the 'known' population of 2100 manufacturing firms in Devon and Cornwall as at July 1982. Clearly, we cannot be certain that this is the total population, since firm 'birth' and 'death' is a continuous event. By December of 1982, 366 firms had replied to the questionnaire. As a result of the time constraint placed upon the research it was decided to proceed with an analysis of this number of firms. Processing of the questionnaires has now ceased and it has come to the writer's attention that of the total number sent out, 597 have now been returned; thus, a response rate of 28.4 per cent. However, since the questionnaires were sent out during the depth of the economic recession many of the firms circulated had gone out of business. Hence, it is extremely difficult, if not impossible, to estimate the response rate as a percentage of those still trading. Further, the response obtained is not uncommon since, as Gudgin (1978) points out, where questionnaires are relatively long (as is this one) response rates can fall to one-third or even less. Moreover, we should not lose sight of the fact that detailed information is available on a relatively large sample of 366 firms. In the light of this, those firms that do agree to take part may be treated as a sample (Healey, 1983). In other words, the nature of the research may result in the sample being determined by the response rate. The final choice of sample is, therefore, not only influenced by a time constraint, but also by the response rate. In this sense, the sample is illustrative rather than representative. Thus, the data analysis is to be undertaken on a sample of 366 plants. As far as the sample itself is concerned, then in the absence of tests to show the contrary, we assume that the likelihood of response is not affected by firm size,

ownership status, age of plant, address ... and to the extent that this is correct, the sample is unbiased. Therefore, in the absence of knowledge to the contrary, the sample is assumed to be random.

At this stage, it is appropriate to clarify one or two points relating to questionnaire design. Each respondent, when completing the questionnaire, is asked to indicate whether the firm is an independent concern or whether it is part of a group. Clearly for those managers who tick the answer 'part of a group' the firm is likely to be either a branch plant, a subsidiary or even perhaps a parent concern. However, as a consequence of questionnaire design we are not in a position to say which are branches and which are subsidiaries. For this reason, then, we group the non independent firms together under the heading 'externally owned establishments'. There is still a slight possibility, however, of sampling a parent plant. Despite this, for the purposes of this study there are two types of firm; the independent and the externally owned. As far as size of firm is concerned, then as we mentioned in chapter 2, small firms are those employing less than 25 people; medium sized employ between 25 and 50 persons; and firms with over 50 employees are seen as large.

With regard to the location of material inputs and outputs, the questionnaire asks each respondent to estimate the approximate proportion, by value, falling into the following locations: Devon and Cornwall; the rest of the South-West; London and the South-East; the rest of the Uk and overseas. Such a geographical classification clearly allows us to see the extent of both intra and inter-regional trade. Further, the South-East location is treated separately from others in the UK, since it is argued that the concentration of economic activity is spatially determined and centred on the South-East (Goddard, 1980). We wish to test for this in our sample. With regard

to service linkage, such activities are divided into separate groups; reflecting their inherently different nature. Moreover, the focus of attention is on the source of service used and the proportions received from other group plants. One problem here, relates to our not knowing whether the local use of a service represents 'in house' utilisation, or whether the service is acquired locally from some other plant. Further, with respect to the R and D service, we do not know whether it is first applied locally or adopted from elsewhere. Despite this, the questionnaire serves the purpose of providing useful information on the nature of firms linkage patterns.

In sum, whilst with hindsight we recognise some potential drawbacks with the questionnaire itself and the method of sampling, we have to weigh this against the desire to acquire the maximum amount of information, on a relatively large sample of firms and in as short a time as possible. In effect, then, the final choice of 366 firms for empirical analysis is dictated by the response rate and the constraints of research time. The sample is illustrative and it is assumed to be random; hence, generalisations beyond sample level are justified. Thus, the outcome of this survey work is 366 completed questionnaires containing information on establishment linkages and other aspects of firms operations. This, however, only serves to present a further problem: how best to analyse the data. The adopted method is considered below.

4.5 THE METHOD OF ANALYSIS

Having acquired a data set, the task then becomes one of analysing the replies. Given a questionnaire comprising over twenty questions, some of which have more than one section, and 366 cases, it was necessary to utilise an appropriate computer programme for

this purpose. The Statistical Package for the Social Sciences (SPSS) was adopted. Once coded, the data was placed on the Prime computer file and the SPSS package used to analyse it. As is normal in studies of this type, the main statistical technique used is Cross Tabulation and significance testing is based on the use of the Chi-Square Statistic. This method is adopted, since the data, by way of yes/no response, is of a non parametric nature. In short, it was decided to subject the information to computer analysis so that statistical work may be carried out on the data base. The use of the Chi-Square test of significance enables us to establish whether or not generalisations can be made to the wider population of firms. However, the use of this and other non parametric techniques needs to be given careful attention, since a number of criteria need to be met when applying such statistics. Frequently, such conditions seem to be ignored. Below, therefore, we discuss the role of such techniques in survey work.

4.6 THE USE OF NON PARAMETRIC STATISTICS

It is well known that if observations at sample level are to be used to make inferences to the wider population, then a test of statistical significance is required. As the data is non parametric a number of test statistics present themselves. A discussion on the Chi-Square test follows. We conclude that it may be the nature of the research itself, rather than the use of a statistical technique per se that holds the key to further understanding the research problem.

An important consideration when applying a test statistic is to know the level at which the variables are measured. This is so, because the level of measurement affects the kind of interpretation that is warranted. In this study, the variables are measured at two

levels; the nominal (for example, ownership status) and the ordinal (firm size). The former refers to variables that are properly defined with logically exhaustive and mutually exclusive categories, so that differences are clearly established (Loether and McTavish, 1980). The categories, then, are simply logically different from each other. Thus, in this study ownership status is measured at the nominal level, since there is a logical difference in definition between plants which are independent and those which are part of a group. Ordinal variables on the other hand, are those which are defined to include features of nominal variables, plus the characteristic that the categories are ordered in some way. Here, size of firm satisfies this criteria, since we categorise plants into different size bands ranging from smallest to largest.

In essence, it is most appropriate to use the statistical procedure which features the kind of information contained in the scores. Thus, if statistics appropriate for lower levels of measurement, for example, Chi-Square, are used on scores defined at a higher level of measurement, for example, firm size, then no technical error is made, since the properties of level of measurement are cumulative. However, this procedure does not use all the information readily available in a higher level score. A technical error is made, however, if we use statistical procedures appropriate to higher levels of measurement, say Tau or Gamma, when the data is defined at a lower level (Loether and McTavish, 1980). For our purposes, then, the use of the Chi-Square test (a lower level of measurement) on both nominal and ordinal variables does not commit any technical error. That is, it is an accepted procedure. Even so, we do recognise the existence of other test statistics and that these may be more relevant depending upon the level at which the variables are measured. However, since this

research does not purport to engage in any rigorous statistical analysis, but is more concerned with simple relationships, then the use of the Chi-Square test is deemed as most appropriate.

In this study, we test the statistical hypotheses by means of the Chi-Square statistic computed from sample data. A fuller discussion on Chi-Square is contained in Appendix B. In general, the statistical hypotheses are framed contrary to that we are hoping to prove. That is, we set up a null hypothesis. If the sample data warrant a rejection of the null hypothesis, then this is regarded as evidence for its alternatives, those our theory suggests. We seek, therefore, to reject the null hypothesis of zero correlation. In order to do this, we need first to specify a level of significance. This is usually couched at the 5 per cent level, so that we aim to be 95 per cent confident that the observed findings do not happen by chance. Further, it is necessary to make known the number of degrees of freedom in any calculation. By this, we mean the number of cells in a contingency table that are not determined by the marginal totals of the table. The formula for this is simply:

degrees of freedom = $(r-1)(c-1)$

where r = number of rows and c = number of columns.

This empirical work reports the degrees of freedom, the value of Chi-Square and the level of significance of any test. Essentially, then, although rejection of the null hypothesis does not mean that it is false, we are confident that 95 per cent of the time the observed findings do not happen by chance.

Given the above, it would seem that the use of the Chi-Square test is relatively straightforward. However, the nature of the statistical analysis on this data base presents a key problem in relation to its meaningful use. The difficulty arises because, when

using Chi-Square, one of the main assumptions made is that it is a continuous distribution and no expected cell frequency is less than five. Here, however, this condition is not always met; and if this assumption does not hold, the researcher may be making erroneous conclusions. In an attempt to overcome this, we may combine categories, reduce the size of the table and, therefore, increase the expected frequencies. Clearly, this serves to reduce the amount of information that can be obtained, and, moreover, should not be attempted unless the combination has some logical justification (Loether and McTavish, 1980). Thus, many of the reported tables in chapters 5 and 6 contain expected cell frequencies of less than five; and when this is the case the reported Chi-Square value may be meaningless. Given this, we resort to the following in an attempt to make the Chi-Square value meaningful.

It has been suggested by Cochran (1954) that if no more than 20 per cent of the expected numbers are less than five, then a minimum expected frequency of one is allowable provided there is more than one degree of freedom. This we take, then, as a yardstick for the use of Chi-Square. Clearly, the expected number condition is important because if it does not hold, our computed Chi-Square value may be an overestimate and lead to erroneous conclusions, especially when the significance is marginal at the 5 per cent level. In effect, therefore, in chapters 5 and 6, we only mention the significance of the Chi-Square figure if no more than 20 per cent of the cells have an expected frequency of less than five and the expected frequency is at least one, with more than one degree of freedom. Where this condition is not met, and the Chi-Square value is meaningless, we report the value in brackets below the table and no reference is made in the text. Thus, much of the statistical analysis is relevant

at sample level only.

Given this, it could be argued that failure to apply a meaningful test of significance detracts from the importance of the results. However, this is not necessarily the case since " ... the inductive process in statistics is merely an aid to the researcher in making substantive decisions. Ultimately, the researcher must decide whether the data support or fail to support the theoretical notions he is investigating" (Loether and McTavish, 1980 p.523). In other words, we may view statistics as a crutch for the researcher to lean on in the process of making decisions. The statistics alone are not capable of making substantive decisions. Further, we should also remember that tests of significance are a means of determining whether there is anything that can be generalised from samples to populations. The relevant analysis from the theoretical standpoint is the descriptive analysis, since this addresses itself to the meaning of the data. Tests of null hypotheses merely help to establish whether such meanings can be generalised.

The essence of the argument is, then, that statistics are only meaningful when they relate to theory and research. A way of testing for this is to describe analytically the sample data, interpret the findings and evaluate the implications for the hypotheses and theory. It is here where the decision to make the inferential leap from sample to population is made. Further, we should not expect the reader to decide whether the inferential leap is justified. That is, we should report the results of our tests to inform the reader of the information used to make any decision; but we must take the responsibility ourselves (Loether and McTavish, 1980). Thus, statistical significance is only one criterion that should be considered in the decision process; and significant does not necessarily mean

'important'. The problem of a meaningless Chi-Square canbe overcome, therefore, by remembering that the crucial analysis of data is that which takes place at sample level to explain the nature of observed relationships. Further, " ... a little knowledge can be a dangerous thing. The person knowing a little about Chi-Square may go around blithely computing it on whatever he or she can lay their hands on" (Loether and McTavish, 1980 p.621).

4.7 CHARACTERISTICS OF THE SAMPLED FIRMS

As mentioned above, the questionnaire intended to acquire information on aspects of firms activities other than simply the nature of linkage relationships. Here, we illustrate a few of the characteristics of the sampled firms, since this provides information relevant to our empirical tests on linkages and gives an insight into the nature of these firms' operations. In chapter 2, we suggested that a number of factors may influence linkage patterns, but made no reference to the fact that these variables may be related to each other. For example, size of firm may be related to ownership status, in the sense that the small firms in the sample may be independent plants on the whole; whilst, most of the larger firms may be externally owned. If this is the case, it could mean that the tendency for small firms to have more extensive local links, for example, is due to such firms being independently owned rather than size being a relevant influence. It is useful, then, to be able to isolate the relative importance of each variable; hence, in table 4.1, we illustrate the relationship between firm size and ownership status in this sample of firms.

As the table shows, 62 per cent of the sampled firms are classified as small, since they employ less than 25 people; whilst, 25 per

Table 4.1 Establishment Ownership by Employment Size of Firm

Status of Firm	Size of Firm 1 - 9	10 - 24	25 - 49	50 - 99	100-499	500+	Row Total
Independent	132 (50.9)	71 (27.4)	31 (11.9)	12 (4.6)	12 (4.6)	1 (0.4)	259 (70.8)
Externally Owned	7 (6.6)	18 (17.0)	16 (15.1)	20 (18.9)	38 (35.8)	7 (6.6)	106 (29.2)
Column Total	139 (38.1)	89 (24.4)	47 (12.9)	32 (8.7)	50 (13.7)	8 (2.2)	365 (100.0)

Number of Missing Observations = 1

In parenthesis : row percentage unless otherwise stated.

cent are large firms. More important, however, is the fact that of the small firms 89 per cent are independently owned and, conversely, 72 per cent of all large firms are externally owned plants. Further, 78 per cent of the independent plants are small and 16 per cent large; whilst, only 24 per cent of the externally owned firms are small. Moreover, 87 per cent of the largest employers (500 plus) are externally owned plants. As we suggested, then, there is a relationship between ownership status and firm size, with the smaller firms tending to be independent and the larger firms being externally owned plants. In other words, the largest employers are not locally owned establishments. Thus, the fact that we observe a relationship between these two variables means that when we come to study the influence of each in shaping linkage patterns, we have to control for one against the other to see if they are independent influences. That is, when testing the relevance of firm size, we carry out tests of size of firm and linkage patterns for externally owned plants only.

A further characteristic of these firms relates to the degree of decentralisation of decision taking in the externally owned plants.

In chapter 2, we suggested that such plants, located in peripheral areas, will tend not to take decisions relating to high order functions such as R and D and investment, although the more routine decisions relating to production and purchasing may be taken locally. As far as this sample is concerned, there is a marked difference in the degree to which decisions are taken locally by type of activity. This is shown in table 4.2. Thus, in the key areas of R and D, investment

Table 4.2 The Decision Making Location of Key Activities in Externally Owned Plants

	Location of Decision							
Type of Activity	On site	Rest of Devon & Cornwall	Rest of South-West	London & South East	Rest of UK	Abroad	More than one site	Row Total
R and D	47 (44.8)	4 (3.8)	3 (2.8)	12 (11.7)	5 (4.8)	11 (10.5)	23 (21.6)	105 (100.0)
Investment	25 (23.8)	5 (4.8)	3 (2.8)	21 (20.0)	8 (7.6)	11 (10.5)	32 (30.5)	
Purchasing	76 (72.4)	3 (2.8)	3 (2.8)	5 (4.8)	1 (0.9)	1 (0.9)	16 (15.2)	
Production	84 (80.0)	1 (0.9)	0 (0.0)	3 (2.8)	1 (0.9)	1 (0.9)	15 (14.3)	
Marketing	51 (48.6)	2 (1.9)	7 (6.7)	23 (21.9)	3 (2.8)	2 (1.9)	17 (16.2)	

Number of Missing observations = 1

and marketing less than one-half of these plants take the decision in the local economy. Further, only one-fifth of such plants admit to taking the investment decision on site. However, the fact that such decisions are taken at more than one site may mean some local autonomy. When we consider the production and purchasing decisions, we find a different story. Here, most externally owned plants have the freedom to take these decisions locally. As expected, branch management is allowed

to take decisions relating to production and purchasing, but the more high order functions tend to be controlled at sites distant from the local economy. Thus, the external control of key activities in these local plants seems strong. This aspect of firms' operations becomes more relevant later when we consider whether variations in decision making freedom influences linkage patterns.

Data is also available on the number of products these plants produce and the annual sales value. As we said in chapter 2, the number, as well as the type, of products may affect backward linkages, since the more that are produced raises the likelihood that inputs for some will not be available locally; hence, supplies are drawn from elsewhere. Thus, the number of different products made by type of firm may lead us to expect a certain pattern of linkage in such plants. That is, if the externally owned plants are multi product firms, then this may be reflected in relatively weak local linkages compared to the one product independent plants. However, as table 4.3 shows, the tendency to produce one or five products is as marked in independent and externally owned plants. Further, most plants produce

Table 4.3 Establishment Ownership by Number of Products

	Number of Products			
Status of Firm	1	2 - 4	5 plus	Row Total
Independent	52 (20.4)	157 (61.8)	45 (17.8)	254 (70.5)
Externally Owned	26 (24.5)	60 (56.6)	20 (18.9)	106 (29.5)
Column Total	78 (21.6)	217 (60.3)	65 (18.1)	360 (100.0)

Number of Missing Observations = 6

between one and five products. Thus, in these firms the tendency to be a multi product plant is no more marked in one type of plant than another. Given this, any difference in linkage patterns we may find between independent and externally owned firms would seem to be not influenced by the number of products made.

As for the sales value, then we may expect the total value of sales to be greater in the externally owned plants, since they are likely to be producing a larger volume and for a wider market; hence, relatively high value added in such plants. As table 4.4 shows, most externally owned firms have annual sales of over one million pounds;

Table 4.4 Establishment Ownership and Annual Sales (£)

	Value of Sales				
Status of Firm	£0-50000	£50-250000	£250-1m	£1m plus	Row total
Independent	54 (21.1)	111 (43.3)	70 (27.3)	21 (8.3)	256 (71.1)
Externally Owned	3 (2.8)	7 (6.7)	23 (22.0)	71 (68.5)	104 (28.9)
Column Total	57 (15.8)	118 (32.9)	93 (25.8)	92 (25.5)	360 (100.0)

Number of Missing Observations = 6.

whilst, for the independent concerns, most of their sales are less than 250,000 pounds. This may be relevant when we consider linkage patterns, because a strategy of buying inputs over a long distance may reflect low supply costs relative to the value of outputs.

In this section we have considered some of the characteristics of these sampled plants which do not relate directly to linkages. We observe that most of the smaller plants are independently owned, with the larger firms tending to be externally owned; whilst, the freedom

to take decisions locally is most marked in the production and purchasing area. Key decisions tend to be taken elsewhere. Further, similar proportions of both independent and externally owned firms are multi product and the highest sales value is found in the externally owned plants.

4.8 SUMMARY

In order to obtain empirical information on local linkages an industrial survey has been undertaken. The nature of the Devon and Cornwall establishment survey has been discussed, with attention focusing upon the original objectives, the nature of the questionnaire and sample, the method of analysis and the role of the test statistic. It is recognised that problems associated with questionnaire design and the nature of the sample may exist, but such problems are often more readily apparent with hindsight. Further, the nature of the research itself necessitates a set of questions on a number of topics aimed at securing the 'maximum' amount of information. The sample is assumed to be random and is determined by the response rate at the time analysis was begun. Moreover, the detailed information acquired on a relatively large number of firms should provide useful insights into the nature of firms' operations. Thus, we examined some of the characteristics of the sampled firms which do not specifically relate to linkages. Further, we note that it is the meaning of the observed findings which is perhaps more relevant than the application of a statistical technique, per se. The results of the empirical tests on the data base follow in chapters 5 and 6. First, we consider material linkage.

5. MANUFACTURING ESTABLISHMENT LINKAGE PATTERNS IN DEVON AND CORNWALL : AN EMPIRICAL STUDY OF MATERIAL LINKAGE

5.1 INTRODUCTION

This chapter examines the possible significance of manufacturing establishment linkage patterns for economic development in Devon and Cornwall. Using data from a survey of manufacturing plants in the area the linkage of differing types of establishment in the local economy are studied. Several factors are used to identify differences in establishment linkage. The aim, then, is to help further establish variations in material linkage using characteristics of the business enterprise and its environment as described in chapter 2. In effect, the study provides an opportunity to assess the way in which the interaction of firms via linkages may influence the nature of development. Below we report our findings.

Initially, we focus upon the pattern of backward and forward linkages in all firms by geographical location. That is, we report the general linkage structure. From this, we go on to examine characteristics of the business organisation and corporate environment as discussed above, so as to establish their relevance in influencing linkage patterns. It is also noted here, that in carrying out the empirical analysis the nature of the data and small cell numbers in the tables does not allow for a meaningful interpretation of the Chi-Square value in most cases. As was mentioned in the last chapter, if more than 20 per cent of the expected frequencies are less than five then a key condition for the use of Chi-Square is not met. Thus, in this and the following chapter, the Chi-Square statistic poses a problem. Where this is the case the statistic is reported in brackets and no reference is made in the text. On those occasions where we can make a meaningful interpretation reference is made.

5.2 THE GENERAL LINKAGE STRUCTURE

The general linkage pattern is considered in terms of inputs and outputs falling into the following locations: Devon and Cornwall, London and the South-East, the rest of the UK and overseas. As mentioned earlier, this geographical classification allows us to see the extent of both intra and inter-regional trade; whilst, the London and South-East location warrants separate attention, since it is suggested that economic activity is spatially determined and centred upon the South-East (Goddard, 1980). Hence, we may expect extensive non local linkage in this area. Table 5.1 illustrates the general linkage pattern for all 366 sampled firms. Here, we find forward linkages to be more extensively developed in the local area. That is, 45 per cent of all firms sell at least half their outputs in Devon and Cornwall; whilst, proportionately fewer firms purchase substantially from this location. The extent, then, of backward linkage in the local economy is less marked, suggesting that for many firms access to a local specialist supplier is not necessary for their everyday operation. This seems especially so for firms' purchasing of capital inputs. We also note the limited backward and forward linkages with the South-East, suggesting that for these firms it is not a dominant market. The tendency is clearly to buy and sell in other UK markets; and, therefore, leakages from the local economy are with other possibly problem areas. Further, the extent to which firms do not respond varies by question and is shown as number of missing observations. In effect, the extent of local linkage, both forward and backward, is relatively limited and this suggests a low local multiplier. Moreover, it implies that the role local linkages may play in fostering self sustained growth may be reduced. As far as understanding the likely reasons for such an observed pattern of

Table 5.1 The Pattern of Linkages in All Firms
Locational Distribution of Outputs and Source of Inputs

Proportion of Outputs

Material Outputs to:	Over 50%	30-49%	Less than 30%	Total
Devon & Cornwall	162 (45.1)	17 (4.7)	180 (50.2)	359 (100.0)
London & South-East	17 (4.7)	37 (10.3)	305 (85.0)	
Rest of UK	84 (23.3)	50 (14.0)	225 (62.7)	
Overseas	42 (11.7)	34 (9.5)	283 (78.8)	

Number of Missing Observations = 7

Proportion of Inputs

Material Inputs from:				
Devon & Cornwall	114 (32.0)	32 (9.0)	210 (59.0)	356 (100.0)
London & South-East	26 (7.3)	31 (8.7)	299 (84.0)	
Rest of UK	125 (35.1)	47 (13.2)	184 (51.7)	
Overseas	34 (9.6)	19 (5.3)	303 (85.1)	

Number of Missing Observations = 10

Capital Inputs from:				
Devon & Cornwall	60 (21.5)	11 (3.9)	208 (74.6)	279 (100.0)
London & South-East	38 (13.6)	23 (8.2)	218 (78.2)	
Rest of UK	151 (54.1)	23 (8.2)	105 (37.7)	
Overseas	31 (11.1)	11 (3.9)	237 (85.0)	

Number of Missing Observations = 87

linkage is concerned, we now consider in some detail the extent to which variations in those characteristics of the business enterprise and environment may help shape material linkage patterns. First of all, the ownership status of the firm.

5.3 OWNERSHIP STATUS AND MATERIAL LINKAGES IN DEVON AND CORNWALL

The following tests relate to the role of the ownership status of the firm in identifying variations in buying and selling patterns for the sampled plants. Such an empirical analysis is based upon the hypothesis that there exists a difference in the nature of material linkages in local establishments depending upon the status of the plant. In other words, as we said in chapter 2, studies have shown that the degree of local area linkage is more marked in independent than externally owned establishments (Lever, 1974c; Taylor and Wood, 1973). On this basis, our a priori expectation is that the tendency to buy from and sell to the Devon and Cornwall economy is more marked in the independent plants, with linkages over a greater distance being more pronounced in the externally owned firms. The first results focus upon ownership status and patterns of material output.

5.3.1 The Pattern of Output Linkages

As far as the geographical location of material outputs is concerned, attention is focused, for reasons given above, upon the proportions falling into the following areas: namely, Devon and Cornwall, London and the South-East, the rest of the UK and overseas. Our expectation is that proportionately more independent than externally owned plants sell a substantial amount (over 50 per cent) of their output locally. As table 5.2 shows, ownership status, ceteris paribus, seems to be a relevant discriminatory factor in influencing the varying

amounts of output sold in Devon and Cornwall, since there exists a marked difference by establishment type in terms of the proportion of sales distributed locally. That is, ownership status produces a

Table 5.2 Location of Material Outputs by Establishment Ownership

Material Outputs to Devon and Cornwall

Status of Firm	Over 50%	30-49%	Less than 30%	Row Total
Independent	131 (51.2)	16 (6.3)	109 (42.5)	256 (71.3)
Externally Owned	31 (30.1)	1 (1.0)	71 (68.9)	103 (28.7)
Column Total	162 (45.1)	17 (4.7)	180 (50.2)	359 (100.0)

Chi-Square = 21.72 Degrees of freedom = 2 Significance = 0.0000

Number of Missing Observations = 7

In parenthesis : row percentage unless otherwise stated

differential result, in the sense that 51 per cent of independent firms sell over half their outputs locally, compared with only 30 per cent of externally owned plants. Thus, proportionately many externally owned firms sell relatively little in the local area. However, when firms admit to selling less than one-third of total outputs in Devon and Cornwall, this may mean that some sell zero per cent and others 29 per cent; thus, highlighting a key problem when analysing this type of data. Here, then, as we expected the tendency to sell a relatively large amount of output in the local economy is more marked in independent plants. Further, this differential result is based upon a significant Chi-Square statistic.

The above result for externally owned plants is not surprising, since our hypothesis suggests proportionately many of such plants to

be selling to a wider market, especially the South-East, not only because it is seen as the dominant UK market, but also because 44 per cent of the sampled externally owned plants have a headquarters here. However, the evidence in table 5.3 suggests relatively limited forward linkage to this location. Thus, although relatively few externally

Table 5.3 Material Outputs to London & the South-East

Status of Firm	Over 50%	30-49%	Less than 30%	Row Total
Independent	15 (5.9)	26 (10.1)	215 (84.0)	256 (71.3)
Externally Owned	2 (1.9)	11 (10.7)	90 (87.4)	103 (28.7)
Column Total	17 (4.7)	37 (10.3)	305 (85.0)	359 (100.0)

Chi-Square = 2.50 Degrees of freedom = 2 Significance = 0.2866

Number of Missing Observations = 7

owned plants sell a substantial amount locally, only 2 per cent admit to selling over half their outputs to London and the South-East; whilst, 87 per cent sell less than one-third to this location. Further, ownership status does not produce a differential result here, since whether the firm be locally owned or not seems unimportant because the sales patterns are similar by type of firm. In other words, the tendency to sell relatively little in the South-East is equally likely in independent and externally owned plants. The fact that there is weak forward linkage to this location appears a somewhat surprising result, in the light of earlier work by Spooner (1974), on the Devon and Cornwall economy, who found that firms which had located in the local area since 1939 showed a marked preference for the South-East in the distribution of their outputs. Moreover, the result in

this study proves non significant. Thus, our a priori expectation is not supported here.

Given the above, it is not surprising to find greater forward linkages in both types of plant with the rest of the UK, as table 5.4 shows. Here, over 20 per cent of both types of firm admit to distributing over a half of their outputs to the rest of the UK. In short, proportionately more independent and externally owned establishments sell to other parts of the UK than distribute outputs to the South-East. This may be a result of firms, who having moved moved to the area from other parts of the UK, continue to do business with known contacts from their previous location. Moreover, the nature of firms operations may prevent an extensive local market search, especially if this is not considered to be an efficient exercise; whilst, the

Table 5.4 Material Outputs to the Rest of the UK

Status of Firm	Over 50%	30-49%	Less than 30%	Row Total
Independent	55 (21.5)	32 (12.5)	169 (66.0)	256 (71.3)
Externally Owned	29 (28.1)	18 (17.5)	56 (54.4)	103 (28.7)
Column Total	84 (23.3)	50 (14.0)	225 (62.7)	359 (100.0)

Chi-Square = 4.29 Degrees of freedom = 2 Significance = 0.1169

Number of Missing Observations = 7

relatively small size of the local market perhaps induces firms to seek new outlets for their products. In this case, status does not produce a differential result, since similar proportions of independent and externally owned establishments sell varying amounts to the rest of the UK. Further, the result proves non significant.

Finally in this section on material outputs, we consider the pattern of sales overseas. Given the above, we would not expect many of the sampled firms to be selling substantially abroad, although this feature may be more marked in the externally owned plants. This is clearly shown in table 5.5. Almost one-fifth of the externally owned firms sell over half their outputs overseas, and this tendency is more marked than in the independent plants. Thus, as our a priori reasoning suggests, proportionately more externally owned establishments sell substantial amounts to the overseas market. Further, the result proves significant. The fact that the tendency to sell substantially abroad is more

Table 5.5 Material Outputs Overseas

Status of Firm	Over 50%	30-49%	Less than 30%	Row Total
Independent	22 (8.6)	16 (6.3)	218 (85.1)	256 (71.3)
Externally Owned	20 (19.4)	18 (17.5)	65 (63.1)	103 (28.7)
Column Total	42 (11.7)	34 (9.5)	283 (78.8)	359 (100.0)

Chi-Square = 21.16 Degrees of freedom = 2 Significance = 0.0000

Number of Missing Observations = 7

marked in externally owned plants, perhaps reflects their being part of international or London headquartered companies. Those independent plants with extensive links abroad may well be relatively large concerns possessing specialist export services which the smaller plants do not have. Clearly, then, the nature of plants' operations can be important, since those plants operating as specialised units are probably part of large companies which have facilities for a successful and efficient export of sales. Further, the peripheral nature of produc-

tion probably means that some firms are persuaded against seeking foreign outlets by the relatively poorly developed transportation network.

In sum, with reference to material outputs, our a priori expectations concerning local linkage are supported. That is, proportionately more independent than externally owned plants sell at least half their outputs in Devon and Cornwall. Thus, at the local level, ownership status, ceteris paribus, helps further identify variations in output patterns, something which Marshall (1979) in his study of the industrially developed Northern region, did not find. For him, there was no significant difference between the proportions of each type of firm selling to the local market. In this study, status does produce a differential result in that a clear distinction between the proportion of independent and externally owned firms selling varying amounts to the local area is found. Further, there is a preference in local plants for sales to parts of the UK other than the South-East when linkages are over a greater distance. This behaviour conflicts with previous findings on Devon and Cornwall firms and the suggested dominant attraction of the South-East location. In short, this analysis of forward linkages clearly shows that externally owned plants do possess proportionately fewer contacts than do independent establishments.

5.3.2 The Pattern of Input Linkages

Having considered the forward linkage patterns of the sampled firms, we now turn to an examination of firm inputs and, in particular, the relationship between ownership status and the geographical location of establishment purchases. In this discussion on backward linkages we distinguish between two types of input; namely, raw materials and

capital equipment. Further, the same geographical locations are considered. One potential problem which arises from this question relates to interpreting the data on capital supplies, since, for whatever reason, we have a noticeably higher no reply rate than we have for other questions. Thus, we are to an extent guarded in the inferences we can make.

First of all, we examine the geographical source of raw material inputs by establishment type. Table 5.6 below, represents purchases from Devon and Cornwall. A priori, we expect local backward linkage to

Table 5.6 Location of Material Inputs by Establishment Ownership

Material Inputs to Devon and Cornwall

Status of Firm	Over 50%	30-49%	Less than 30%	Row Total
Independent	94 (37.3)	27 (10.7)	131 (52.0)	252 (70.8)
Externally Owned	20 (19.2)	5 (4.8)	79 (76.0)	104 (29.2)
Column Total	114 (32.0)	32 (9.0)	210 (59.0)	356 (100.0)

Chi-Square = 17.54 Degrees of freedom = 2 Significance = 0.0002

Number of Missing Observations = 10

be more marked in the independent plants, with externally owned firms tending to be supplied over greater distances. As the table shows, over 50 per cent of independent plants admit to buying less than one third of their raw material inputs from the local area; whilst, three quarters of the externally owned establishments fall into this category. Further, twice as many independent compared with externally owned plants buy a substantial amount locally. Clearly, ownership status produces a differential result with the tendency to purchase over one half of input requirements in Devon and Cornwall more pronounced in the

independent concerns. Thus, our a priori expectations are supported here. Further, the test statistic proves significant. Here, in both types of plant, proportionately fewer firms buy at least half their raw materials locally than sell to Devon and Cornwall. In other words, the extent of backward linkage is less marked. This is not to say that there are necessarily fewer local suppliers than there are buyers. It may be the case that managers in both types of firm are unaware of local suppliers, and this is a question to which we return later in the chapter.

We now turn to an examination of the purchasing patterns from London and the South-East. The theory suggests that backward linkages will be relatively strong in this location, and, moreover, this has proved to be the case in other studies (Spooner, 1974). However, as table 5.7 shows, relatively few firms, of either status, purchase a substantial amount of their inputs from other plants in London and the

Table 5.7 Material Inputs from London & the South-East

Status of Firm	Over 50%	30-49%	Less than 30%	Row Total
Independent	20 (7.9)	23 (9.2)	209 (82.9)	252 (70.8)
Externally Owned	6 (5.8)	8 (7.7)	90 (86.5)	104 (29.2)
Column Total	26 (7.3)	31 (8.7)	299 (84.0)	356 (100.0)

Chi-Square = 0.76 Degrees of freedom = 2 Significance = 0.6835

Number of Missing Observations = 10

South-East. That is, only 16 per cent of independent and 12 per cent of externally owned establishments purchase more than one third of their inputs from this location; whilst, in each case over 80 per cent

buy less than one third. Thus, our expectations are not supported. In essence, therefore, ownership status fails to produce a differential result, in the sense that the tendency to buy relatively little from the South-East is as marked in independent and externally owned plants. Moreover, the result is non significant. Clearly, for this sample the South-East location, contrary to our hypothesis, generates neither an extensive number of forward nor backward material linkages.

Next, we consider material purchases from the rest of the UK. Given the above, we expect it to prove a more attractive source for material purchases. This is the case as table 5.8 shows. As we would espect, proportionately more externally owned than independent plants

Table 5.8 Material Inputs From the Rest of the UK

Status of Firm	Over 50%	30-49%	Less than 30%	Row Total
Independent	81 (32.1)	32 (12.7)	139 (55.2)	252 (70.8)
Externally Owned	44 (42.3)	15 (14.4)	45 (43.3)	104 (29.2)
Column Total	125 (35.1)	47 (13.2)	184 (51.7)	356 (100.0)

Chi-Square = 4.34 Degrees of freedom = 2 Significance = 0.1139

Number of Missing Observations = 10

buy a substantial amount from this location. Further, backward linkages are more extensively developed in the rest of the UK than are output links. In effect, as our hypothesis would suggest, the tendency to buy over 50 per cent of supplies from the rest of the UK is most pronounced in the externally owned plants. Further, the result again proves to be non significant.

Finally here, we discuss the pattern of material inputs from

abroad. Our expectation is that proportionately more externally owned than locally owned firms will purchase substantially from overseas. This proves to be the case as can be seen in table 5.9. Those externally owned firms with extensive overseas contact are perhaps part of international headquartered companies. For independent plants, proportionately fewer admit to buying at least half their inputs from abroad than sell to this location. Moreover, those that are purchasing

Table 5.9 Material Inputs from Overseas

Status of Firm	Over 50%	30-49%	Less than 30%	Row Total
Independent	13 (5.2)	8 (3.2)	231 (91.6)	252 (70.8)
Externally Owned	21 (20.2)	11 (10.6)	72 (69.2)	104 (29.2)
Column Total	34 (9.6)	19 (5.3)	303 (85.1)	356 (100.0)

Chi-Square = 29.33 Degrees of freedom = 2 Significance = 0.0000

Number of Missing Observations = 10

abroad are perhaps engaged in production which requires a specialist input not available locally or elsewhere in the UK. Thus, a differential result is produced which proves to be significant.

Clearly, our hypothesis relating to material purchases, that is, that proportiontely more independent than externally owned establishments would buy substantially from Devon and Cornwall, seems to hold. For externally owned plants, establishing linkages over a greater distance is more typical, although such contacts tend not to be with firms in the South-East as we would have expected. These results clearly have implications for achieving self sustained growth, especially if one bases this upon mobilising the local economy's

indigenous potential which, in turn, may depend upon promoting as many strong local linkages as possible. Overall, our a priori expectations hold with the tendency to possess local backward links more marked in the independent firms.

Having examined raw material purchasing patterns, let us now consider the pattern of capital inputs. This should serve as an interesting comparison with material inputs, and furthermore, the writer is unaware of any other similar study which has adopted this approach. Here, the theory suggests that proportionately more independent than externally owned plants will acquire substantial amounts

Table 5.10 Location of Capital Inputs by Establishment Ownership

Capital Inputs from Devon and Cornwall

Status of Firm	Over 50%	30-49%	Less than 30%	Row Total
Independent	52 (27.4)	11 (5.8)	127 (66.8)	190 (68.1)
Externally Owned	8 (9.0)	0 (0.0)	81 (91.0)	89 (31.9)
Column Total	60 (21.5)	11 (3.9)	208 (74.6)	279 (100.0)

Chi-Square = 19.42 Degrees of freedom = 2 Significance = 0.0001

Number of Missing Observations = 87

of capital from Devon and Cornwall. As far as the local purchasing of capital supplies is concerned, then, status of the firm, ceteris paribus, is clearly a relevant discriminatory factor, since there are marked differences between establishment type, in terms of the proportions buying varying amounts of capital from Devon and Cornwall, as table 5.10 shows. Further, our a priori expectations are supported, since proportionately more locally owned than externally owned firms

buy at least 50 per cent of their capital requirements from other local plants. Moreover, the test statistic proves significant.

In table 5.11 we see that the pattern of capital inputs from the London and South-East location is similar to that for material purchases. Thus, the tendency to buy varying amounts from here is not markedly different by type of firm. In other words, variations in ownership type do not produce a differential result; hence, status is not a relevant discriminatory factor. Further, the result is non significant. There is no evidence, then, that externally owned plants are more likely to buy substantial amounts of capital from the South East, as we might have expected. Again, the South-East would appear not to be the dominant market.

Table 5.11 Capital Inputs from London & the South-East

Status of Firm	Over 50%	30-49%	Less than 30%	Row Total
Independent	24 (12.6)	15 (7.9)	151 (79.5)	190 (68.1)
Externally Owned	14 (15.7)	8 (9.0)	67 (75.3)	89 (31.9)
Column Total	38 (13.6)	23 (8.2)	218 (78.2)	279 (100.0)

Chi-Square = 0.65 Degrees of freedom = 2 Significance = 0.7219

Number of Missing Observations = 87

Given the above, we expect both types of firm to have more extensive backward links with establishments in the rest of the UK. This expectation is supported by the evidence, as can be seen in table 5.12. Here, not only do proportionately more firms buy their capital inputs from this location, than any other geographical area; but also, proportionately more purchase their capital as opposed to material

inputs from the rest of the UK. Thus, we have found that plants located in Devon and Cornwall, whodo not buy substantial capital supplies locally, will instead tend to purchase from UK locations other than the South-East. Further, since similar proportions of each type of plant buy substantial amounts of capital from the rest of the UK, our hypothesis that non local purchasing would be more marked in the externally owned firms is not supported. Moreover, the result proves non significant.

Finally, we turn to the pattern of capital inputs from overseas. In table 5.13 we find that, as is the case with material inputs, relatively few firms, of whatever status, buy substantial amounts from

Table 5.12 Capital Inputs from the Rest of the UK

Status of Firm	Over 50%	30-49%	Less than 30%	Row Total
Independent	101 (53.2)	13 (6.8)	76 (40.0)	190 (68.1)
Externally Owned	50 (56.2)	10 (11.2)	29 (32.6)	89 (31.9)
Column Total	151 (54.1)	23 (8.2)	105 (37.7)	279 (100.0)

Chi-Square = 2.41 Degrees of freedom = 2 Significance = 0.3001

Number of Missing Observations = 87

Table 5.13 Capital Inputs from Overseas

Status of Firm	Over 50%	30-49%	Less than 30%	Row Total
Independent	13 (6.8)	3 (1.6)	174 (91.6)	190 (68.1)
Externally Owned	18 (20.2)	8 (9.0)	63 (70.8)	89 (31.9)
Column Total	31 (11.1)	11 (3.9)	237 (85.0)	279 (100.0)

Chi-Square = 21.29 Degrees of freedom = 2 Significance = 0.0000
Number of Missing Observations = 87

abroad; although, this tendency to do so, as we expected, is more pronounced in the externally owned plants. A differential and significant result is thus produced. In short, as our hypothesis suggests, proportionately more externally owned than independent firms acquire substantial amounts of capital from overseas. To sum up, as far as capital inputs are concerned most plants do not buy substantially in the local economy; but of those that do this tendency is more pronounced in the locally owned firms.

The evidence presented above does, then, ceteris paribus, support our a priori expectations that externally owned plants possess relatively fewer backward and forward linkages in Devon and Cornwall, than do independent concerns. This is the case for material outputs, as well as for both material and capital inputs. Thus, the results clearly show that proportionately more independent than non independent plants buy and sell substantially in the local area. In other words, the largest proportion of externally owned plants prefer to buy from and sell to locations outside of Devon and Cornwall. Of interest, however, is the fact that there is no marked preference for linkages with the South-East location, as we may have expected, given the suggested dominance of this market in terms of economic activity. Further, the results here do not allow us to say that all, or even most, of the independent plants are strongly linked into the local economy. It is clear that a good many possess little contact with other local firms, in terms of the buying and selling of materials. Thus, for many firms the buying in of their inputs and the selling of their outputs outside the local area is common practice. Given this, it then becomes even more important to identify the types of firm where potentially strong linkages do exist if the economy is to achieve self sustained growth.

How relevant a factor is ownership status in helping to understand

these linkage patterns? In most cases, we find that there exists a systematic relationship between status of the firm and linkage structure. That is, ownership status, ceteris paribus, produces differential patterns of linkage and thus helps in describing the variations in the buying and selling patterns for this sample of firms. This is especially so in relation to the local and rest of the UK locations. It is in these areas, where the linkage patterns are most different by establishment type. This conclusion differs somewhat from that of Marshall (1979), who could not be confident about the relevance of the status variable, since for him, independent plants are no more likely to buy and sell substantial amounts locally than are his other categories of firm.

In sum, this characteristic of the business establishment seems a relevant discriminatory factor in helping to identify variations in buying and selling patterns. However, we note that not all of the independent firms have established local contacts; whilst, most of the externally owned plants have extensive links with firms outside of Devon and Cornwall. Even so, some such firms do possess strong local linkages. It may be worthwhile, then, to attempt to isolate factors which may go towards identifying this differential pattern among the same ownership type. Elsewhere (Marshall, 1979), it has been suggested that the linkages of externally owned firms may be influenced by the length of time the plant has been located in an area; by the location of the headquarters plant; or by the degree of decision making freedom at the local level[(1)]. As far as the independent plants are concerned, the observed pattern may be influenced by the address of the establishment[(2)]. These factors may be relevant for this sample of firms and it is to a consideration of these issues that we now turn.

5.4 THE PATTERN OF LINKAGES IN EXTERNALLY OWNED PLANTS

5.4.1 Age of Plant

An insight into the differential nature of linkage in externally owned plants may be gained by focusing upon the age of the plant in Devon and Cornwall. Thus, increased local integration may be a consequence of a greater awareness of local market conditions, which results from the length of time the plant has been located in the local economy.(3) In other words, variability in the length of time a firm has been established in the local area may account for the differential linkage patterns among these firms. A priori, we expect that where externally owned plants have been established in the local area a relatively long period of time (say over ten years) then proportionately many firms buy and sell substantial amounts locally; compared with those firms who are regarded as recently established (less than ten years). We note, that in this sample 70 per cent of externally owned plants have been established locally over ten years; whilst, only six per cent have been resident for less than five years. Relatively few, then, are recent locaters which may reflect a scaling down of the regional policy effect in these years.

The relationship between material outputs to Devon and Cornwall and age of plant is shown in table 5.14. Here, we observe that when examining each age group we find similar proportions of older and more recently established plants selling substantially in Devon and Cornwall. Clearly, age of plant does not produce a differential result, and on this basis our a priori suggestion is not supported. In short, the sales of these externally owned plants to the local area seems independent of the length of time they have been located in Devon and Cornwall.

Table 5.14 Location of Material Outputs by Years Established in Devon and Cornwall in Externally Owned Plants

Material Outputs to Devon & Cornwall	Years Established				
	1 - 4	5 - 9	10 - 24	25 plus	Row Total
Over 50%	3 (50.0)	6 (28.6)	7 (19.4)	15 (41.7)	31 (31.3)
30 - 49%	0 (0.0)	0 (0.0)	1 (2.8)	0 (0.0)	1 (1.0)
Less than 30%	3 (50.0)	15 (71.4)	28 (77.8)	21 (58.3)	67 (67.7)
Column Total	6 (6.1)	21 (21.1)	36 (36.4)	36 (36.4)	99 (100.0)

(Chi-Square = 6.65 Degrees of freedom = 6 Significance = 0.3545)

Number of Missing Observations = 7 In parenthesis = column percentage

What of the pattern of material inputs and age of the plant in Devon and Cornwall? Here, we expect extensive backward linkage to be more pronounced in those plants established locally for a relatively long period of time. As table 5.15 shows, no marked difference exists between age of plant and the tendency to purchase locally. That is, substantial local buying, in these externally owned plants, is as likely in both the older and more recently established firms. Age of plant, then, fails to produce a differential result; and our a priori expectations are not supported.

An examination of capital input patterns produces similar results to those above. That is, contrary to what our hypothesis suggests, a differential result is not produced, since proportionately as many recent locaters as older firms are likely to purchase capital supplies from the local area. This is shown in table 5.16.

In sum, the pattern of local forward and backward linkages among these externally owned plants seems independent of the number of years

Table 5.15 Location of Material Inputs by Years Established in Devon and Cornwall in Externally Owned Plants

Material Inputs from Devon & Cornwall	Years Established				
	1 - 4	5 - 9	10 - 24	25 plus	Row Total
Over 50%	2 (28.6)	3 (14.3)	6 (17.1)	7 (18.9)	18 (18.0)
30 - 49%	0 (0.0)	0 (0.0)	4 (11.5)	1 (2.7)	5 (5.0)
Less than 30%	5 (71.4)	18 (85.7)	25 (71.4)	29 (78.4)	77 (77.0)
Column Total	7 (7.0)	21 (21.0)	35 (35.0)	37 (37.0)	100 (100.0)

(Chi-Square = 5.70 Degrees of freedom = 6 Significance = 0.4581)

Number of Missing Observations = 6 In parenthesis : column percentage.

Table 5.16 Location of Capital Inputs by Years Established in Devon and Cornwall in Externally Owned Plants

Capital Inputs from Devon & Cornwall	Years Established				
	1 - 4	5 - 9	10 - 24	25 plus	Row Total
Over 50%	1 (16.7)	1 (5.6)	2 (5.9)	4 (13.3)	8 (9.1)
Less than 30%	5 (83.3)	17 (94.4)	32 (94.1)	26 (86.7)	80 (90.9)
Column Total	6 (6.8)	18 (20.5)	34 (38.6)	30 (34.1)	88 (100.0)

(Chi-Square = 1.76 Degrees of freedom = 3 Significance = 0.6224)

Number of Missing Observations = 18 In parenthesis : column percentage

the firm has been established in Devon and Cornwall. Such a conclusion, with regard to the age of plant, has been arrived at elsewhere (Marshall, 1979). Thus, our a priori suggestion that local linkage may be more marked in older plants seems not supported. In short, variability in age of plant does not produce differential patterns of linkage, since

similar proportions of both older and newer plants buy and sell similar amounts in Devon and Cornwall as well as outside. Given that the differential nature of linkage patterns among these firms is independent of the age of plant, we now consider whether or not the location of the headquarters plant acts as a relevant discriminator.

5.4.2 Location of the Headquarters Plant

In chapter 2 we suggested that for externally owned plants in a peripheral area, such as Devon and Cornwall, that the headquarters may play a key role in the operations of the plant. More especially, it may control the buying and selling in the sense that it may supply the branch plant itself with the inputs it requires; hence, the externally owned plant's links are with the region in which the headquarters is situated. Thus, if the location of the headquarters plant is a relevant factor, our a priori expectations are that the largest proportion of those externally owned plants buying and selling substantial amounts locally, will have a local headquarters. Clearly, such a situation would suggest the internalisation of linkages with the corporate organisation. This is something to which we shall return in more detail later.

We begin with an examination of material outputs to Devon and Cornwall. These results are discussed without any tabular representation, since this does not necessarily add anything to the overall analysis. It is found that of the 31 externally owned plants who sell over one half of their outputs locally, that 19 per cent have a headquarters in Devon and Cornwall. More important, however, is the fact that 54 per cent of those plants with a local headquarters do not sell substantially in the local area. Thus, for most firms the selling of a significant amount of output in the local area seems independent of their being part of Devon and Cornwall headquartered companies. This

suggests that internalisation is not a strong feature; although they may be distributing outputs to other branches up country. Here, then, our a priori expectations are not supported. For forward linkage outside the local area, then of those plants selling over one half of their outputs to the rest of the UK some 50 per cent possess a headquarters location outside of the region. However, the difference by proportion in each headquarters location is not marked, suggesting that differential forward linkages are largely independent of the location of the headquarters firm. Again, a differential result is not produced.

As far as the local buying of material inputs is concerned, a differential result is not produced, in the sense that the tendency to acquire over 50 per cent of inputs from Devon and Cornwall is as marked across each headquarters location. In other words, proportionately as many firms with a non-local as local headquarters buy substantially from the local area. Further, for the majority of Devon and Cornwall headquartered firms the buying of a relatively high proportion of their material inputs from the local is not typical. For those firms purchasing most of their materials from outside Devon and Cornwall, the only differential result is for inputs from overseas, where most of the firms buying from here are part of London and international headquartered companies. Overall, the location of the headquarters firm does not produce a differential result.

Next, we consider capital inputs. In this case the tendency to buy substantial amounts locally is not markedly different by headquarters location. That is, proportionately as many firms with a local and non-local headquarters purchase substantial amounts in the local area. A differential result is thus not produced. Thus, the pattern of capital inputs seems independent of where the headquarters may be

located.

Overall, then, our a priori reasoning does not seem to be supported. We have no empirical evidence to support the hypothesis that the location of the headquarters plant is a relevant discriminatory factor in helping to further understand the differential nature of the linkage patterns among the externally owned plants. That is, the tendency to buy and sell locally is equally as likely whether the firm has a local headquarters or not. Thus, a further appreciation of why some of these firms are locally linked is not to be gained by focusing upon where the headquarters is situated. This again is supportive of earlier work (Marshall, 1979). We find, therefore, that focusing attention upon the age of the plant and the location of the headquarters does not produce differential results. That is, the tendency for some externally owned plants to be locally linked is no more marked in the older established or locally headquartered firms. In short, the linkage patterns seem independent of the length of time the firm has been in Devon and Cornwall, and the location of the headquarters. We may gain more of an insight into the pattern of linkages in these plants when aspects of decision making at firm level are considered.

5.4.3 Managerial Autonomy in Decision Making

In the previous chapter we illustrated the degree of decentralisation of decision taking across a range of key activities existing in these externally owned plants. It is observed that the degree of freedom varies by type of activity, with more autonomy in the purchasing and production areas, compared with R and D and investment. However, such information says nothing about whether varying degrees of autonomy are related to externally directed linkage patterns. Thus, here we are interested in whether or not the degree of management

freedom in decision making is a relevant factor in influencing the nature of firms' linkages. A priori we expect those plants where decision making freedom exists to have more of a tendency to purchase from the local area, since those plants controlled from other sites may be more likely to receive supplies from that source. Further, since it is the backward linkage effect which has received most attention recently, we focus upon it here. Moreover, " ... as most chains of production involve additions in value to the product and reductions in weight, access to markets would be less important to firms than access to suppliers" (Lever, 1974c p.314). In the light of this, we concentrate upon levels of autonomy in the purchasing decision and its influence upon buying patterns.

Within the general hypothesis that local backward linkage is associated with relatively high degrees of autonomy in decision making, we also test for the following. Is it the case that relatively low levels of autonomy (the decision taken outside Devon and Cornwall) are associated with a substantial buying in of supplies? If a substantial degree of importing is common, then do most of the supplies come from the plant's own organisation? Furthermore, is localised buying more typical in plants with relatively few inputs from their own organisation, and where there is a relatively high degree of autonomy? It may be the case, then, that where the purchasing decision is taken outside of Devon and Cornwall, firms tend not to buy locally; and, moreover, will purchase substantially from their own company. In essence, we are attempting to show whether or not local and non local purchasing is related to variations in the level of decision making freedom.

First of all, to what extent is the buying in of supplies (both materials and capital) associated with low levels of autonomy in the

Table 5.17 Low Autonomy in the Purchasing Decision by the Proportion of Supplies Purchased from Outside Devon & Cornwall

Location of the Purchasing Decision	Proportion of Supplies		
	50% Plus	Less than 50%	Row Total
Rest of the South-West	3 (100.0)	0 (0.0)	3 (11.5)
London/South-East	4 (80.0)	1 (20.0)	5 (19.3)
Rest of the UK	1 (100.0)	0 (0.0)	1 (3.8)
Abroad	1 (100.0)	0 (0.0)	1 (3.8)
More than one site	14 (87.5)	2 (12.5)	16 (61.6)
Column Total	23 (88.5)	3 (11.5)	26 (100.0)

(Chi-Square = 1.02 Degrees of freedom = 4 Significance = 0.9071)

Number of Missing Observations = 1

purchasing decision? Table 5.17 above, includes those 26 firms for whom the purchasing decision is not taken locally, and relates this to whether or not they buy more or less than 50 per cent of their supplies from outside Devon and Cornwall. Clearly, we find that relatively low levels of autonomy are associated with the buying in of a substantial amount of supplies. Here, of those firms who are not free to take the purchasing decision alone, 88 per cent receive over half of their inputs from outside Devon and Cornwall. This suggests, of course, that the corporate organisation is supplying the local plant; or instructing it to buy from some other plants which are not part of the corporate group, but which are known to the headquarters firm and located elsewhere. For those plants not buying in a substantial amount, then this may be a case of a corporate decision to instruct the local plant to

purchase from known suppliers in the local area. Thus, as the theory suggests, a low degree of managerial freedom in the purchasing decision is associated with the buying in of a substantial amount of supplies from outside Devon and Cornwall. Given this, we now consider whether the inputs are drawn largely from the corporate organisation or from independent suppliers located elsewhere.

In effect, we are assessing the extent to which backward linkages are internalised within these multi plant companies. A priori, we expect that externally owned plants in Devon and Cornwall who do not take the purchasing decision, receive most of their inputs from other corporate plants. Is this the case? The evidence, as presented in table 5.18 would suggest not. We find that only 12 per cent of low

Table 5.18 Low Autonomy in the Purchasing Decision by the Proportion of Supplies Purchased from the Same Organisation

Location of the Purchasing Decision	Proportion of Supplies			
	Over 50%	25-49%	Less than 25%	Row Total
Rest of the South-West	0 (0.0)	1 (33.3)	2 (66.7)	3 (12.0)
London/South-East	1 (20.0)	0 (0.0)	4 (80.0)	5 (20.0)
Rest of the UK	0 (0.0)	0 (0.0)	1 (100.0)	1 (4.0)
Abroad	0 (0.0)	0 (0.0)	1 (100.0)	1 (4.0)
More than one site	2 (13.4)	4 (26.6)	9 (60.0)	15 (60.0)
Column Total	3 (12.0)	5 (20.0)	17 (68.0)	25 (100.0)

(Chi-Square = 3.44 Degrees of freedom = 8 Significance = 0.9040)

Number of Missing Observations = 2

autonomy firms admit to buying over 50 per cent of supplies from their own company. Thus, with the purchasing decision taken outside Devon and Cornwall, as many as 68 per cent of such firms buy relatively little from their own organisation. Clearly, internalisation is not a strong feature in these firms. Here, then, the fact that most low autonomy plants buy substantially from outside Devon and Cornwall, does not mean that they purchase mostly from their own organisation. In this case, our hypothesis relating to the internalisation of supplies does not hold. Further, this result suggests that these firms are being supplied from other establishments located elsewhere in the UK, which are not part of the same organisation. In short, a relatively high number of firms possessing a relatively low degree of decision making freedom do not buy from their own company. This contrasts with Marshall's (1979) findings, where he observed that only those plants with significant purchases from their own organisation buy substantially from outside the local area. Clearly, here, this is not the case.

Given that relatively many externally owned plants buy in a substantial amount of their inputs from outside Devon and Cornwall, and that this is the case for most plants where there is no freedom to take the purchasing decision locally, then of interest from a linkage point of view, is whether those plants that do buy substantially from the local area are in fact firms with decision making freedom (the decision taken in Devon and Cornwall). Thus, a priori, we expect that if the purchasing decision is taken locally and the firm is not buying a substantial amount from its own organisation, then the tendency to establish local contact is more marked in the high autonomy firms.

Our earlier discussion showed that relatively few firms have developed extensive backward linkages. More especially, we found in

table 5.6 that 20 externally owned plants purchase substantially from the local area. Of interest, then, is the fact that, as table 5.19 shows, 15 or 75 per cent of these firms exhibit a high degree of autonomy in the purchasing decision. However, we need also to compare

Table 5.19 High Autonomy in the Purchasing Decision. Firms Purchasing Less than 25 per cent from the Same Organisation by the Location of Material Inputs

Material Inputs from Devon and Cornwall

Location of Purchasing Decision	Over 50%	30-49%	Less than 30%	Row Total
On site	14 (22.2)	4 (6.3)	41 (69.5)	59 (95.2)
Rest of Devon and Cornwall	1 (33.3)	0 (0.0)	2 (66.7)	3 (4.8)
Column Total	15 (24.1)	4 (6.5)	43 (69.4)	62 (100.0)

(Chi-Square = 0.31 Degrees of freedom = 2 Significance = 0.8541)

Number of Missing Observations = 2

the pattern of local purchasing in firms with both a high and low degree of autonomy. In table 5.19 we find that 24.1 per cent of those firms with a high level of autonomy purchase substantial amounts locally. In table 5.20 we compare this with the situation for low autonomy plants. Here we find that 22 per cent of those firms without decision making freedom buy substantially in the local area. Thus, although proportionately more of those plants buying locally have high autonomy, the tendency within the high autonomy firms to purchase locally is not markedly different from that in low autonomy plants. Clearly, variations in the level of autonomy are not associated with a differential pattern of local linkage. Contrary to our expectation,

Table 5.20 Low Autonomy in the Purchasing Decision. Firms Purchasing Less than 25 per cent from the Same Organisation by the Location of Material Inputs

Material Inputs from Devon and Cornwall

Location of Purchasing Decision	Over 50%	Less than 30%	Row Total
Rest of the South-West	1 (50.0)	1 (50.0)	2 (11.0)
London/South-East	1 (25.0)	3 (75.0)	4 (22.0)
Rest of the UK	0 (0.0)	1 (100.0)	1 (5.5)
Abroad	0 (0.0)	1 (100.0)	1 (5.5)
More than one site	2 (20.0)	8 (80.0)	10 (56.0)
Column Total	4 (22.0)	14 (78.0)	18 (100.0)

(Chi-Square = 1.85 Degrees of freedom = 4 Significance = 0.8692)

Number of Missing Observations = 1

then, firms without decision making freedom seem as likely as the high autonomy plants to possess local contacts.

To sum up, variations in the level of autonomy does not produce a differential result in relation to local purchasing. That is, the tendency to purchase substantially from Devon and Cornwall is as pronounced in high and low autonomy firms. Thus, it remains that a majority of those plants with decision making freedom do not establish local contacts. Any suggestion, then, that greater autonomy will lead to more local integration must be guarded. In short, it is not the case that proportionately more high than low autonomy plants purchase locally. An insight into why a high proportion of firms with decision making freedom do not buy in the local economy may be gained when we

consider management's explanation for the adopted purchasing strategy. Further, we do observe, as expected, that most low autonomy plants do buy in supplies; but, contrary to our expectation, relatively few such firms purchase substantially from their own organisation. Thus, overall there is a case of firms operating in national markets, with the tendency for local purchasing independent of the level of managerial autonomy in decision making. For an externally owned plant, then, the pattern of linkage seems independent of the age of the plant, the location of the headquarters firm and variability in decision making freedom, since differential linkage patterns are not produced. Below, we consider the pattern of linkage in the independent firms.

5.5 THE PATTERN OF LINKAGES IN INDEPENDENT PLANTS

When considering the differential nature of linkages in the independent firms, a relevant discriminatory factor may be the address of the plant (Marshall, 1979). That is, there may be a locational influence, in the sense that the tendency to buy and sell substantial amounts locally may be especially marked for firms in certain parts of Devon and Cornwall. For example, it may be the case that in the more spatially concentrated manufacturing areas, such as Plymouth and the Plymouth Travel to Work Area (PTWA), the tendency to be locally linked is more pronounced, suggesting perhaps a greater awareness of potential contacts. A priori, then, we expect local linkage to be more marked in PTWA firms.

The results show that 60 per cent of all firms in the Plymouth and PTWA sell substantially locally, which is not markedly higher than in other areas. Thus, with the exception of firms in North Cornwall, proportionately as many firms sell over half their outputs in Devon

and Cornwall when plants are located in different areas. In effect, the differential nature of output linkages to the local area among these firms, seems independent of where the firm is located. Address, therefore, does not act as a relevant discriminator. Similarly, the tendency to distribute most of firms' outputs outside Devon and Cornwall is equally marked in plants in different locations. That is, in no one particular location are firms more likely to sell substantial amounts outside the local area. For firm outputs, then, address of the plant fails to produce a differential result.

The local purchasing of material inputs also appears to be independent of the address of the firm. In other words, local buying is as likely wherever the firm is located. Address of the firm also fails to prove a relevant discriminator when we consider inputs purchased from outside Devon and Cornwall. Thus, contrary to our expectations, the pattern of backward material linkages in these plants seems largely independent of the address of the firm.

Similar tests have been performed for the pattern of capital inputs. In this case, we note the relatively high no reply rate which does not occur evenly. Thus, some 10 per cent of Plymouth firms do not respond to the question on capital supplies; whilst, over 50 per cent of those in North Cornwall fail to reply. As for the purchasing of capital from Devon and Cornwall, we do observe a differential result, since proportionately more Plymouth and PTWA firms buy substantial amounts locally compared with other areas. Here, our a priori expectation is supported. Such a difference is not found when we consider purchases from outside the local area. In sum, the differential nature of these backward and forward linkage patterns among our independent firms is not, on the whole, further understood by focusing upon the address of the firm. Thus, with the exception of local capital

purchases, the tendency for firms to buy and sell substantially in the local area or not seems independent of where the firm is situated.

As mentioned above, the ownership status of the firm, ceteris paribus, is a relevant discriminatory variable, since differential patterns of linkage are associated with variations in the status of the firm. Further, the age of the plant, location of the headquarters firm, variation in the level of autonomy and address of the plant do not seem to establish differences within the two status categories, since differential linkage patterns are not produced. Thus, such factors do not aid our understanding of the nature of linkages in these firms. It would seem, then, that the nature of ownership itself is a relevant factor, since it does produce differential results. Further, perhaps other characteristics of the business establishment are relevant influences; for example, the employment size of firm.

5.6 SIZE OF FIRM AND MATERIAL LINKAGES IN DEVON AND CORNWALL

As we stated in chapter 2, the employment size of firm has been shown, in some studies, to produce differing patterns of material linkage, with larger establishments being associated with purchases from outside the local area (McDermott, 1976); and more local linkage being typical in smaller plants (Marshall, 1979). There is a possibility also that it is size of firm relative to the size of the local market which is important, since firms may need to sell outside Devon and Cornwall to be economically viable. Thus, this factor may play a part in influencing linkage patterns. Whilst recognising this point, our hypothesis, as stated in chapter 2, is that local linkage is more typical in relatively small plants; whilst, larger firms tend to buy and sell substantial amounts outside the local area. Does the employment size of firm produce a differential result? First

of all, we examine the pattern of forward linkage.

5.6.1 The Pattern of Output Linkages

As for the local distribution of outputs, table 5.21 clearly shows that the largest proportion selling over one half of their outputs to

Table 5.21 Location of Material Outputs by Employment Size of Firm

Size of Firm	Material Outputs to Devon and Cornwall			
	Over 50%	30-49%	Less than 30%	Row Total
1 - 9	84 (61.3)	7 (5.1)	46 (33.6)	137 (38.2)
10 - 24	45 (51.1)	4 (4.5)	39 (44.4)	88 (24.5)
25 - 49	15 (32.6)	4 (8.7)	27 (58.7)	46 (12.8)
50 - 99	8 (25.8)	1 (3.2)	22 (71.0)	31 (8.6)
100 - 499	7 (14.6)	1 (2.1)	40 (83.3)	48 (13.4)
500 plus	3 (33.0)	0 (0.0)	6 (67.0)	9 (2.5)
Column Total	162 (45.1)	17 (4.7)	180 (50.2)	359 (100.0)

(Chi-Square = 49.26 Degrees of freedom = 10 Significance = 0.0000)

Number of Missing Observations = 7

Devon and Cornwall are the small firms (employing less than 25 people); whilst, as size of firm increases the proportions locally linked decreases. In other words, the tendency to sell a substantial amount of outputs in the local area is less marked in larger firms (over 50 employees). Further, over 50 per cent of all small firms sell significantly in Devon and Cornwall, compared with 20 per cent of all large.

Clearly, then, local forward linkage, as we expected, is more marked in the smaller plants. Size of firm thus produces a differential result, since variations in plant size are associated with differences in the tendency to sell locally.

We know that plant linkages with firms in the London and South-East location are limited and that this tendency is not markedly different by type of firm. As far as size of firm is concerned, a differential result is not produced, as table 5.22 shows. Here, a

Table 5.22 Material Outputs to London and the South-East

Size of Firm	Over 50%	30 - 49%	Less than 30%	Row Total
1 - 9	4 (2.9)	8 (5.9)	125 (91.2)	137 (38.2)
10 - 24	7 (8.0)	7 (8.0)	74 (84.0)	88 (24.5)
25 - 49	3 (6.5)	10 (21.7)	33 (71.8)	46 (12.8)
50 - 99	1 (3.2)	5 (16.1)	25 (80.7)	31 (8.6)
100 - 499	2 (4.2)	6 (12.5)	40 (83.3)	48 (13.4)
500 plus	0 (0.0)	1 (11.2)	8 (88.8)	9 (2.5)
Column Total	17 (4.7)	37 (10.3)	305 (85.0)	359 (100.0)

(Chi-Square = 15.63 Degrees of freedom = 10 Significance = 0.1107)

Number of Missing Observations = 7

similar proportion of small, medium and large sized firms sell varying amounts to this location. Thus, a marked variation in forward linkages to the South-East by firm size is not found. Clearly, then, the tendency to sell an insignificant amount in this area is equally marked

whatever size category of firm we examine. Again this result suggests that the South-East is not the dominant market.

In table 5.23 we find that some 40 per cent of those firms selling at least one half of their outputs to the rest of the UK are large; whilst, for smaller plants the figure is 20 per cent. Thus, proportionately more large than small firms sell substantially in the rest of the UK. In other words, as firm size increases the tendency is for outputs to be distributed over a greater distance. Here, then, size of firm produces a differential and significant result. Thus, as the theory suggests, larger firms tend to sell substantial amounts outside the local area; whilst, forward links in smaller plants are more locally oriented.

Table 5.23 Material Outputs to the Rest of the UK

Size of Firm	Over 50%	30 - 49%	Less than 30%	Row Total
1 - 9	29 (21.2)	11 (8.0)	97 (70.8)	137 (38.2)
10 - 24	20 (22.7)	10 (11.4)	58 (65.9)	88 (24.5)
25 - 49	10 (21.7)	9 (19.6)	27 (58.7)	46 (12.8)
50 - 99	7 (22.6)	7 (22.6)	17 (54.8)	31 (8.6)
100 - 499	17 (35.4)	10 (20.8)	21 (43.8)	48 (13.4)
500 plus	1 (11.1)	3 (33.3)	5 (55.6)	9 (2.5)
Column Total	84 (23.3)	50 (14.0)	225 (62.7)	359 (100.0)

Chi-Square = 20.05 Degrees of freedom = 10 Significance = 0.0288

Number of Missing Observations = 7

Our a priori expectation with regard to the distribution of outputs overseas, is that proportionately more large than small firms sell substantially abroad. The evidence, as presented in table 5.24, would seem to support this hypothesis. The tendency to sell substantially

Table 5.24 Material Outputs Overseas

Size of Firm	Over 50%	30 - 49%	Less than 30%	Row Total
1 - 9	11 (8.0)	3 (2.2)	123 (89.8)	137 (38.2)
10 - 24	7 (8.0)	9 (10.2)	72 (81.8)	88 (24.5)
25 - 49	6 (13.0)	5 (10.9)	35 (76.1)	46 (12.8)
50 - 99	5 (16.1)	6 (19.4)	20 (64.5)	31 (8.6)
100 - 499	11 (22.4)	9 (18.4)	28 (59.2)	48 (13.4)
500 plus	2 (22.2)	2 (22.2)	5 (55.6)	9 (2.5)
Column Total	42 (11.7)	34 (9.5)	283 (78.8)	359 (100.0)

(Chi-Squre = 32.69 Degrees of freedom = 10 Significance = 0.0003)

Number of Missing Observations = 7

abroad is, then, more marked in the larger firms; with 20 per cent of them actively engaged in substantial selling overseas. Again, the differential nature of firms' linkage patterns can be further identified by focusing upon variations in the size of firm.

In sum, firm size, ceteris paribus, seems a relevant factor in identifying the differential sales patterns of these firms. It produces differential results for sales locally, to the rest of the UK and overseas. Further, our a priori expectations are supported,

since, as we suggested, the pattern of forward linkage varies by size of firm, with more local sales associated with the smaller plants; whilst, the tendency to distribute outputs over a greater distance is more marked in the larger concerns. This national orientation suggests, that outputs may be relatively easily dispersed due to the high value-to-weight ratio in the final product (Lever, 1974c). Moreover, this may be more marked in the large firms.

5.6.2 The Pattern of Input Linkages

We now consider the relationship between firm size and the pattern of material inputs. The theory suggests that substantial local buying will be most pronounced in small plants; with the larger firms acquiring their supplies from a wider national market. Table 5.25 confirms this expectation in relation to local purchasing. Thus, proportionately more small firms (40 per cent) are buying substantial amounts from Devon and Cornwall, compared with the larger plants (10 per cent). Further, of those with significant local links, 70 per cent are small firms. Clearly, then, as size of firm increases the tendency to purchase locally diminishes. This may suggest that as establishment size increases some firms outgrow local suppliers. In short, the size of firm helps further identify the differential nature of these local input patterns. This finding thus confirms our a priori expectations that substantial local purchasing is most typical in the smaller plants.

As for the pattern of inputs from London and the South-East, table 5.26 clearly shows that the tendency not to buy substantially from this area is equally marked in the different size categories of firm. In other words, smaller firms are no more or less likely to buy varying amounts from this location, than are the larger plants. Thus,

Table 5.25 Location of Material Inputs by Employment Size of Firm

Size of Firm	Material Inputs from Devon and Cornwall			
	Over 50%	30 - 49%	Less than 30%	Row Total
1 - 9	65 (48.5)	11 (8.2)	58 (43.3)	134 (37.6)
10 - 24	29 (32.6)	10 (11.2)	50 (56.2)	89 (25.0)
25 - 49	8 (17.0)	6 (12.8)	33 (70.2)	47 (13.2)
50 - 99	4 (12.5)	3 (9.4)	25 (78.1)	32 (9.0)
100 - 499	6 (13.3)	1 (2.2)	38 (84.5)	45 (12.7)
500 plus	2 (25.0)	1 (12.5)	6 (62.5)	9 (2.5)
Column Total	114 (32.0)	32 (9.0)	210 (59.0)	356 (100.0)

(Chi-Square = 40.89 Degrees of freedom = 10 Significance = 0.0000)

Number of Missing Observations = 10

employment size of establishment does not produce differing patterns of backward linkage. Further, contrary to what we may have expected the tendency to use the South-East market as a source of inputs is not markedly different by size of firm.

Size of firm does produce a differential result when we consider material inputs from the rest of the UK. This can be seen in table 5.27. Here, as firm size increases there is a greater tendency for firms to purchase substantially from this location; thus, confirming the suggestions of the theory. We find that some 40 per cent of large firms have extensive links to the rest of the UK; whilst, 30 per cent of smaller firms do so. Clearly, then, a large number of plants possess national suppliers; and this is most pronounced in

Table 5.26 Material Inputs from London & the South-East

Size of Firm	Over 50%	30 - 49%	Less than 30%	Row Total
1 - 9	12 (9.0)	7 (5.2)	115 (85.8)	134 (37.6)
10 - 24	7 (7.9)	9 (10.1)	73 (82.0)	89 (25.0)
25 - 49	3 (6.4)	4 (8.5)	40 (85.1)	47 (13.2)
50 - 99	1 (3.1)	7 (21.9)	24 (75.0)	32 (9.0)
100 - 499	3 (6.7)	3 (6.7)	39 (86.6)	45 (12.7)
500 plus	0 (0.0)	1 (11.2)	8 (88.8)	9 (2.5)
Column Total	26 (7.3)	31 (8.7)	299 (84.0)	356 (100.0)

(Chi-Square = 12.26 Degrees of freedom = 10 Significance = 0.2679)

Number of Missing Observations = 10

the large firms, confirming the findings of earlier work (Marshall, 1979; McDermott, 1976).

Next, the pattern of material inputs from overseas. We know that proportionately few firms buy substantially from abroad. In this case, as table 5.28 shows, of those that do proportionately many are the larger firms; although the difference between the size categories of firm is not as marked as in certain other cases. Thus, the tendency for substantial overseas purchasing is more pronounced as firm size increases. Again, then, we can identify differing patterns of linkage by variations in the size of establishment; and here, too, our a priori expectations are supported.

As far as material inputs are concerned, the results largely confirm our hypothesis. That is, there is proportionately more local

Table 5.27 Material Inputs from the Rest of the UK

Size of Firm	Over 50%	30 - 49%	Less than 30%	Row Total
1 - 9	37 (27.6)	12 (9.0)	85 (63.4)	134 (37.6)
10 - 24	31 (34.8)	12 (13.5)	46 (51.7)	89 (25.0)
25 - 49	19 (40.4)	10 (21.3)	18 (38.3)	47 (13.2)
50 - 99	16 (50.0)	1 (3.1)	15 (46.9)	32 (9.0)
100 - 499	18 (36.0)	10 (20.0)	17 (34.0)	45 (12.7)
500 plus	4 (50.0)	2 (12.5)	3 (37.5)	9 (2.5)
Column Total	125 (35.1)	47 (13.2)	184 (51.7)	356 (100.0)

(Chi-Square = 22.22 Degrees of freedom = 10 Significance = 0.0140)

Number of Missing Observations = 10

contact in smaller firms, with the larger concerns being more inclined to buy and sell in national or overseas markets. However, we find little contact with the South-East in either large or small firms; and this again questions the role of this location as the dominant market. The local orientation of purchases in smaller establishments may reflect the cost of transporting bulky material and component supplies which possess a relatively low value-to-weight ratio. In short, size of firm, ceteris paribus, acts as a relevant discriminatory factor.

We now examine the relationship between firm size and the pattern of capital inputs. Again we expect local purchasing to be more marked in the independent plants. The evidence, as presented in table 5.29, shows that proportionately more small than large firms buy substantial

Table 5.28 Material Inputs from Overseas

Size of Firm	Over 50%	30 - 49%	Less than 30%	Row Total
1 - 9	6 (4.5)	2 (1.5)	126 (94.0)	134 (37.6)
10 - 24	7 (7.9)	3 (3.4)	79 (88.7)	89 (25.0)
25 - 49	7 (14.9)	3 (6.4)	37 (78.7)	47 (13.2)
50 - 99	4 (12.5)	3 (9.4)	25 (78.1)	32 (9.0)
100 - 499	10 (22.2)	8 (17.8)	27 (60.0)	45 (12.7)
500 plus	0 (0.0)	0 (0.0)	9 (100.0)	9 (2.5)
Column Total	34 (9.6)	19 (5.3)	303 (85.1)	356 (100.0)

(Chi-Square = 38.06 Degrees of freedom = 10 Significance = 0.0000)

Number of Missing Observations = 10

amounts of capital locally. Moreover, the vast majority of those plants purchasing a significant amount from Devon and Cornwall are small concerns. Conversely, most large firms have relatively weakly developed local links for this resource. Thus, the local purchasing of capital is more pronounced in the small and medium sized firms. As our hypothesis suggests, as size of firm increases, the tendency to buy substantially from the local economy is reduced. Clearly, size of firm produces differing patterns of capital linkage.

The pattern of capital inputs drawn from the London and South-East location does not produce a differential result. Thus, contrary to what the theory suggests, similar proportions of small, medium and large sized plants admit to buying less than 30 per cent of their capital from this location. Further, there is no marked difference

in the tendency to purchase substantially from the South-East by establishment size. Clearly, size of firm does not act as a discriminatory influence in the purchasing of capital supplies. This can be seen in table 5.30.

Table 5.29 Location of Capital Inputs by Employment Size of Firm

	Capital Inputs from Devon and Cornwall			
Size of Firm	Over 50%	30 - 49%	Less than 30%	Row Total
1 - 9	38 (38.0)	7 (7.0)	55 (55.0)	100 (35.8)
10 - 24	16 (23.5)	2 (2.9)	50 (73.6)	68 (24.4)
25 - 49	4 (10.6)	1 (2.6)	33 (86.8)	38 (13.6)
50 - 99	1 (3.7)	0 (0.0)	26 (96.3)	27 (9.7)
100 - 499	1 (2.5)	1 (2.5)	38 (95.0)	40 (14.3)
500 plus	0 (0.0)	0 (0.0)	6 (100.0)	6 (2.2)
Column Total	60 (21.5)	11 (3.9)	208 (74.6)	279 (100.0)

(Chi-Square = 41.50 Degrees of freedom = 10 Significance = 0.0000)

Number of Missing Observations = 87

Table 5.31 illustrates the pattern of capital purchases from the rest of the UK. A priori, we expect proportionately more large than small plants to be buying substantially from here. We do find that size of firm produces a differential result, since as firm size increases, the tendency for capital supplies to be drawn substantially from the rest of the UK is more marked. Thus, as we expect, contacts over greater distances are more pronounced in the larger establishments.

Table 5.30 Capital Inputs from London and the South-East

Size of Firm	Over 50%	30 - 49%	Less than 30%	Row Total
1 - 9	15 (15.0)	7 (7.0)	78 (78.0)	100 (35.8)
10 - 24	7 (10.3)	4 (5.9)	57 (83.8)	68 (24.4)
25 - 49	7 (18.4)	4 (10.5)	27 (71.1)	38 (13.6)
50 - 99	7 (25.9)	1 (3.7)	19 (70.4)	27 (9.7)
100 - 499	2 (5.0)	7 (17.5)	31 (77.5)	40 (14.3)
500 plus	0 (0.0)	0 (0.0)	6 (100.0)	6 (2.2)
Column Total	38 (13.6)	23 (8.2)	218 (78.2)	279 (100.0)

(Chi-Square = 14.65 Degrees of freedom = 10 Significance = 0.1452)

Number of Missing Observations = 87

Finally, in table 5.32, we consider the pattern of capital inputs from overseas. Of the relatively few firms who buy substantially from abroad proportionately many, as we expected, are large firms. Here too, as firm size increases the tendency to purchase from this location is more marked. Clearly, then, size of firm produces a differential result, with proportionately fewer smaller plants buying substantially from overseas. Further, our a priori expectations hold in this case. The result is thus similar to that for backward material linkage.

The above analysis clearly shows firm size to be a relevant factor in helping to further understand the differential nature of forward and backward linkage patterns in this sample of firms. Variations in establishment size seem, ceteris paribus, to be associated with varying amounts of outputs and inputs distributed to or purchased from the local

Table 5.31 Capital Inputs from the Rest of the UK

Size of Firm	Over 50%	30 - 49%	Less than 30%	Row Total
1 - 9	44 (44.0)	5 (5.0)	51 (51.0)	100 (35.8)
10 - 24	42 (61.8)	4 (5.9)	22 (32.3)	68 (24.4)
25 - 49	19 (50.0)	7 (18.4)	12 (31.6)	38 (13.6)
50 - 99	17 (63.0)	2 (7.4)	8 (29.6)	27 (9.7)
100 - 499	25 (62.5)	5 (12.5)	10 (25.0)	40 (14.3)
500 plus	4 (66.7)	0 (0.0)	2 (33.3)	6 (2.2)
Column Total	151 (54.1)	23 (8.2)	105 (37.7)	279 (100.0)

(Chi-Square = 19.54 Degrees of freedom = 10 Significance = 0.0339)

Number of Missing Observations = 87

Table 5.32 Capital Inputs from Overseas

Size of Firm	Over 50%	30 - 49%	Less than 30%	Row Total
1 - 9	3 (3.0)	1 (1.0)	96 (96.0)	100 (35.8)
10 - 24	5 (7.4)	1 (1.5)	62 (91.1)	68 (24.4)
25 - 49	5 (13.2)	2 (5.3)	31 (81.5)	38 (13.6)
50 - 99	4 (14.8)	2 (7.4)	21 (77.8)	27 (9.7)
100 - 499	12 (30.0)	5 (12.5)	23 (57.5)	40 (14.3)
500 plus	2 (33.3)	0 (0.0)	4 (66.7)	6 (2.2)
Column Total	31 (11.1)	11 (3.9)	237 (85.0)	279 (100.0)

(Chi-Square = 40.42 Degrees of freedom = 10 Significance = 0.0000)

Number of Missing Observations = 87

area or elsewhere. In other words, as we expected to find, the tendency to buy and sell substantially in national and overseas markets is more pronounced in the larger firms; whilst, for small plants the tendency is for proportionately many to be locally linked. Size of firm, ceteris paribus, thus produces differential results. Clearly, in this discussion on size of firm and linkage patterns we are assuming away the possible influence of other factors, for example ownership status, upon the firm size variable. Thus, we can make the analysis more sophisticated by controlling for ownership status. The relationship between size of firm and linkages when doing this is considered below.

5.6.3 Size of Firm and Material Linkages in Externally Owned Plants

In controlling for ownership status, we are saying that we recognise the possibility of wrong association. That is, as was alluded to in chapter 4, the existence of an apparent relationship between firm size and linkage patterns may in fact reflect the association between ownership status and linkages. This possibility arises, since as table 4.1 shows, larger plants tend to be externally owned. Thus, the tendency for larger plants to buy and sell in national markets, may simply reflect the fact that externally owned plants tend to possess contacts over greater distances. To establish whether size of firm is an independent influence we need to consider whether firm size produces a differential result in our externally owned plants. If a differential result does exist, then the prevailing linkage patterns owe as much to variations in firm size as they may do to a difference in ownership type. A non differential result, on the other hand, suggests that size of firm is not an independent factor and that the linkage patterns reflect status variations. The relevant data is

reported in table 5.33. This illustrates the pattern of material outputs to Devon and Cornwall; and we also discuss the results in relation to the pattern of inputs.

The table shows that firm size does produce a differential result, since proportionately more small externally owned plants (54 per cent) than large (17 per cent) sell substantially to the local economy. That is, the tendency to sell a substantial amount of firm outputs is more marked in the smaller externally owned plants. Thus, variations in the size of externally owned firms are associated with differences in the proportions sold locally. It would seem, then, that size of plant acts as an independent influence. If it did not, then the small externally owned plants would be no more likely to sell

Table 5.33 Location of Material Outputs by Employment Size of Firm in Externally Owned Plants

	Material Outputs to Devon and Cornwall			
Size of Firm	Over 50%	30 - 49%	Less than 30%	Row Total
1 - 9	4 (57.1)	0 (0.0)	3 (42.9)	7 (6.8)
10 - 24	9 (52.9)	0 (0.0)	8 (47.1)	17 (16.5)
25 - 49	7 (43.7)	0 (0.0)	9 (56.3)	16 (15.5)
50 - 99	5 (25.0)	0 (0.0)	15 (75.0)	20 (19.4)
100 - 499	4 (11.1)	1 (2.8)	31 (86.1)	36 (35.0)
500 plus	2 (28.6)	0 (0.0)	5 (71.4)	7 (6.8)
Column Total	31 (30.1)	1 (1.0)	71 (68.9)	103 (100.0)

(Chi-Square - 15.89 Degrees of freedom = 10 Significance = 0.1029)

Number of Missing Observations = 3

substantially in Devon and Cornwall than do large plants, because, as we know, externally owned plants tend not to sell locally. The fact that there is a difference and that the smaller plants in both types of firm tend to be locally linked, suggests that size of plant is a relevant and independent influence.

Similar results hold when we consider the pattern of inputs. As for the pattern of material inputs, then proportionately more small externally owned plants (28 per cent) buy substantially from Devon and Cornwall, compared with the larger plants (15 per cent); whilst, as far as capital inputs are concerned, 25 per cent of the smaller externally owned firms acquire substantial amounts of capital locally, compared with 3 per cent of the larger plants. Clearly, for both forward and backward linkages in the local economy size of firm produces differential results in these externally owned plants. The tendency to buy and sell locally is not equally pronounced by size of plant as it would be if size of firm were not an independent factor. In short, the smaller externally owned plants are more likely to buy and sell substantial amounts in Devon and Cornwall; hence, we conclude that size of firm is an independent influence.

Overall, the size of firm acts as a relevant discriminatory factor. Further, our a priori suggestions seem to hold, with local linkage, as in other studies, more typical in small plants. We also recognise the possibility of wrong association, owing to the relationship between ownership status and firm size. However, when controlling for the type of firm and testing the relevance of the firm size variable, we find that it produces a differential result. Thus, we conclude that size of firm is an independent influence upon the nature of backward and forward linkage patterns.

5.7 THE ROLE OF THE PRODUCT

The above has discussed the relationship between linkage patterns and those key operating variables which, in chapter 2, we labelled as structural and strategic factors. That is, variations in the strategy and structure of the firm may influence linkage patterns. In chapter 2, we also said that we could identify relevant environmental influences. Further, as a proxy for the type of environment, we may consider the nature of the product as reflected in its Standard Industrial Classification (SIC). Thus, a possible influence upon linkages is the nature of the product. This may affect both the pattern of forward and backward linkages, in the sense that variations in product type may be associated with differing linkage patterns in these firms. In other words, the tendency to buy and sell a substantial amount locally may be especially marked in certain product groups. We can also use the product to establish the potential degree of interdependency in the local economy, as seen by the distribution of plants in Minimum List Heading (MLH) groups. Thus, before examining the relationship between the product and linkage patterns we discuss the breakdown of plants by MLH order, so as to illustrate the potential interdependency in the economy. Other work has focused upon the product group (Marshall, 1979) but this is not strictly comparable, since they have been stratified samples designed to select only certain groups. This study makes no such deliberate attempt.

For this sample of plants, as table 5.34 shows, the nature of the local economy would appear relatively diverse, with no one particular SIC order especially dominant. Clearly, therefore, a factor in helping shape linkage patterns may be the potential degree of interdependency in the Devon and Cornwall economy, since the greater the diversity the less would seem the scope for local linkage. The highest

Table 5.34 Industries Represented in the Devon & Cornwall Establishment Survey by Establishment Ownership and Employment Size of Firm

Industry Order	MLH	Establishments in Survey		% of Establishments Independent	% of Establishments Externally Owned	% of Establishments Large	% of Establishments Medium	% of Establishments Small
		No	%					
Mining & Quarrying	102, 103, 109	10	2.7	50.0	50.0	50.0	20.0	30.0
Food, drink and tobacco	212-215, 217, 219, 231, 232, 239	34	9.3	55.9	44.1	47.0	5.9	47.1
Chemicals and Allied	271-273, 276-279	14	3.8	78.6	21.4	7.1	28.6	64.3
Metal Manufacture	311-313, 321	5	1.4	60.0	40.0	20.0	20.0	60.0
Mechanical Engineering	331-334, 337, 339, 341, 342, 349	64	17.5	62.5	37.5	31.3	9.4	59.3
Instrument Engineering	352-354	14	3.8	64.3	35.7	21.4	21.4	57.2
Electrical Engineering	361, 363-369	29	7.9	58.6	41.4	32.1	25.0	42.9
Shipbuilding, Marine and Engineering	370	21	5.7	81.0	19.0	14.4	0.0	85.6
Vehicles	380, 381, 384	5	1.4	40.0	60.0	100.0	0.0	0.0
Other Metal Goods	390, 394, 396, 399	28	7.6	71.4	28.6	0.0	14.3	85.7
Textiles	413, 417, 419, 422, 429	12	3.3	91.7	8.3	16.7	0.0	83.3
Leather & Fur	431, 432	3	0.8	66.7	33.3	0.0	33.3	66.7
Clothing and Footwear	441-444, 449, 450	14	3.8	71.4	28.6	42.8	21.4	35.8
Bricks, Pottery and Glass	461-463, 469	17	4.7	58.8	41.2	23.6	17.6	58.8
Timber & Furniture	471-474	51	13.9	92.2	7.8	9.8	7.8	82.4
Paper and Printing	481-483, 489	16	4.4	75.0	25.0	37.6	18.8	43.6
Other Manufacturing	491, 494 - 496 499	19	5.3	89.5	10.5	5.2	15.8	79.0
Construction	500	10	2.7	80.0	20.0	30.0	10.0	60.0
TOTAL		366	100.0					

proportion of establishments are represented in the mechanical engineering and timber and furniture industries; whilst, similar proportions of establishments are represented across a wide range of manufacturing. The table serves to illustrate, then, the fact that a relatively large spread of industries are represented in this sample, reflecting the relatively diverse nature of local manufacturing compared to the size of the local market, and suggesting, therefore, that potential interdependency may be limited.

Given this, we need to consider whether linkage patterns may be influenced by the nature of the product. Examining the SIC orders in table 5.35 leads one to conclude that there does seem to be an effect on the buying and selling patterns locally. The table reports the pattern of local buying and selling by SIC and we find that in only six orders (Mining and Quarrying, Food, Drink and Tobacco, Other Metal Goods, Bricks, Pottery and Glass, Timber and Furniture and Construction) are the majority of firms selling most of their outputs locally; whilst, in the case of material inputs we find four orders where most firms are buying substantial amounts locally (Mining and Quarrying, Other Metal Goods, Bricks, Pottery and Glass and Construction). Thus, clear differences in the pattern of linkage exist within orders and this may be the result of high value added goods having a relatively high import content. This could apply, since in such cases transport costs would be a small percentage of plant sale price. However, high value added goods are also likely to be produced in large firms and be amenable to externally owned plant production. Clearly, therefore, the problem is to find independent effects for these variables. These may be indicated by the fact that nearly all SIC orders have a good representation of both independent and externally owned plants and small and large firms, as table 5.34

Table 5.35 Proportion of Firms Buying and Selling Substantially in Devon and Cornwall by Industry Type

Industry Order	% of firms selling over 50 per cent locally	% of firms buying over 50 per cent locally
Mining and Quarrying	70.0	66.7
Food, drink and tobacco	76.5	39.4
Chemical and Allied	14.3	14.3
Metal Manufacture	20.0	20.0
Mechanical Engineering	37.1	33.3
Instrument Engineering	14.3	38.5
Electrical Engineering	10.7	0.0
Shipbuilding, Marine and Engineering	26.3	35.0
Vehicles	0.0	0.0
Other Metal Goods	60.7	64.3
Textiles	16.7	8.3
Leather and Fur	0.0	0.0
Clothing and Footwear	14.3	0.0
Bricks, Pottery, Glass	76.5	52.9
Timber and Furniture	78.0	44.0
Paper and Printing	37.5	14.3
Other Manufacturing	22.2	10.5
Construction	100.0	55.6

shows. Independent effects may also be indicated by examining the pattern of linkage within individual SIC groups. In sum, much of this chapter has argued that the nature of establishment ownership and the size of firm are relevant discriminatory influences upon linkage patterns; yet this variation could simply reflect a product influence, as table 5.35 would suggest. It is necessary, then, to try

and isolate whether ownership status and firm size may be seen as independent influences.

First, we consider the pattern of material outputs to the local economy. Here, when comparing different orders, we find that in nearly all SIC groups except Electrical Engineering, Vehicles, Leather and Fur and Construction, the tendency tosell over 50 per cent of outputs locally differs by ownership type, with proportionately more independent than externally owned plants selling locally in almost all cases except in the Textiles, Other Manufacturing and Chemicals and Allied groups. Thus, for most industries represented there is a marked difference by ownership type in the proportions selling substantial amounts locally. Here, then, the pattern of linkage seems independent of any product influence. The pattern of local output also varies by size of firm. That is, the tendency to sell over 50 per cent of outputs locally varies by firm size in all orders except Electrical Engineering and Construction, with proportionately more small than large plants selling substantial amounts locally, apart from the other Manufacturing SIC group.

As for the pattern of material inputs, then in all orders except Instrument Engineering, Electrical Engineering, Vehicles, Other Metal Goods and Construction, the tendency to buy over 50 per cent of material inputs locally differs by ownership type. Here, proportionately more independent than externally owned plants buy substantial amounts locally in all cases except Mining and Quarrying. In most orders, then, variations in ownership type produces a differential pattern of backward linkage. As far as the size of firm is concerned, the tendency to purchase locally varies by firm size in all groups except Instrument Engineering, Electrical Engineering, Clothing and Footwear, and Construction, with proportionately more small than large

firms purchasing locally. Thus, in most groups backward linkage patterns are markedly different by variations in plant size. We should also note that there is the problem of the three-way link between size, status and product. Ideally, then, we should test patterns of linkage in all orders for size of firm in externally owned plants only. However, this is not viable because of the low numbers involved.

The above has been an exercise in attempting to understand the possible role of the product in influencing linkage patterns. As we see in table 5.35 there are clear differences in the pattern of local selling and buying within different orders; hence, we conclude that the product may be an influence. Further investigation reveals, however, that in most SIC groups the pattern of forward and backward linkage does vary by ownership type and size of firm. That is, in most orders proportionately more independent and small firms buy and sell over 50 per cent locally. Thus, we conclude that ownership status and size of firm act as independent influences.

5.8 MANAGERIAL PERCEPTION OF THE CORPORATE ENVIRONMENT

Thus far, we have focused upon measures of structural and strategic variation to help identify variations in establishment linkage patterns; whilst, the role of the environment has been couched in terms of the representation of the sampled plants across different product groups. That is, although we do not know the nature of the actual environment, we do have some idea as to the type of environment plants are operating in from our discussion on the role of the product. Thus, we recognise the potentially important part the nature of the environment itself may play, since the existence or not of buyers and sellers is likely to influence linkage potential. Moreover, in a relatively small economy

such as Devon and Cornwall, the type of environment may be crucial in influencing linkage patterns. In the following, however, the emphasis is altered somewhat, since we concentrate upon managerial perception of the corporate environment and its role in the formulation of a particular strategy. In this case the buying in of a substantial amount (over 50 per cent) of supplies from outside Devon and Cornwall. That is, as mentioned in chapter 2, we attempt to illustrate the extent to which a strategy of importing a significant amount of supplies is influenced by managements' perception of the corporate environment, as measured by a number of factors.

In chapter 2, we suggested that a given organisational structure may emerge from the implementation of a particular strategy, which itself, may evolve as a response to the perception of the corporate environment by individual decision makers. Depending upon the nature of the perception, the strategy may take numerous forms. For example, an increase in activities, a change in economic functions, diversification or the buying in of supplies from outside the local area. Thus, plant linkages may be influenced by the way the plant decision maker perceives the nature of the corporate environment. For our purposes, this influence may be gauged by focusing upon spatial variations in access to suppliers; the degree of corporate internalisation of supplies and the extent to which firms recognise elements of competition. In other words, based upon perception at plant level, we seek to establish the degree to which establishment linkages, and more especially the buying in of supplies, are influenced by factors such as: are suppliers known? are supplies internalised? and is competition seen as a potential threat?

Given, then, that some firms purchase substantially from outside Devon and Cornwall, we ask, is this strategy adopted because: manage-

ment is unaware of local suppliers; because most supplies come from plants in the same organisation located elsewhere; or as a result of other local firms being uncompetitive in terms of price, quality or in some other sense. Attention is focused upon backward linkages, since more fundamental to local growth prospects is the extent to which the area can achieve a clustering of activities, around leading sectors, from which agglomeration effects are strengthened. We consider the above questions in relation to type of firm and then by size of firm. Clearly, an examination of the internalisation of supplies is only relevant for externally owned plants and is considered when we focus upon firm size. The tabulated results are presented below.

5.8.1 Ownership Status and Managerial Perception of the Corporate Environment

First of all, we focus upon management perception of potential local suppliers. Table 5.36 shows that, of the 258 firms who admit to receiving more than one half of their supplies (materials and capital) from outside Devon and Cornwall, some 73 per cent say it is because they are unaware of any local supplier. Thus, a large majority of those establishments buying a relatively small amount locally do so because of a lack of knowledge concerning other local contacts. In short, it would seem that either firms do not know of local suppliers or they do not exist. As for variations in ownership, clearly the tendency to not know of local contacts is as marked in independent and externally owned plants. That is, variations in ownership type does not produce a differential result. Thus, being unaware of local suppliers is as likely whichever category of firm we consider. In both types of plant information channels would seem to be poorly developed and in externally owned plants, in particular, this may

Table 5.36 Over 50 per cent of Supplies Purchased from Outside Devon and Cornwall by Reason For in All Plants

Status of Firm	No Known Local Supplier		
	Yes	No	Row Total
Independent	119 (70.4)	50 (29.6)	169 (65.5)
Externally Owned	69 (77.5)	20 (22.5)	89 (34.5)
Column Total	188 (72.8)	70 (27.2)	258 (100.0)

(Chi-Square = 1.07 Degrees of freedom = 1 Significance = 0.3000)

Number of Missing Observations = 8

simply reflect the more dispersed nature of backward linkage. Further, it appears that these plants are established in the first instance to make a profit, rather than develop local contacts. Moreover, this result helps clarify our findings in relation to the level of autonomy in decision making, in the sense that relatively few externally owned plants with purchasing freedom, as we know, actually buy substantial amounts locally, owing, it would seem, to the fact that the majority of externally owned firms are not aware of local suppliers. This suggests, of course, that decentralisation of decision taking needs to go hand in hand with increased monitoring of the local economy.

Next, we consider the extent to which firms buy in their inputs because other local plants are seen to be uncompetitive. As table 5.37 shows proportionately many firms say that there is no problem; although of those that do proportionately more quote problems regarding the price of inputs. Thus, it appears that it is the price of supplies rather than their poor quality which induces plants to seek out contacts elsewhere. As for variations by ownership type, the major difference relates to the pricing of inputs. Here, twice as many independent as

Table 5.37 Over 50 per cent of Supplies Purchased from Outside Devon and Cornwall by Reason For in All Plants: Local Suppliers Are:

Status of Firm	Uncompetitive in Terms of: Competitive	Quality	Price	Other	Row Total
Independent	89 (52.7)	9 (5.3)	56 (33.1)	15 (8.9)	169 (65.5)
Externally Owned	55 (61.8)	7 (7.9)	15 (16.8)	12 (13.5)	89 (34.5)
Column Total	144 (55.8)	16 (6.2)	71 (27.5)	27 (10.5)	258 (100.0)

(Chi-Square = 5.59 Degrees of freedom = 3 Significance = 0.2000)

Number of Missing Observations = 8

externally owned plants stress this point. This may reflect the fact that for the externally owned firms the type of inputs required locally are competitively priced; or the fact that such plants are part of high value added industries where input costs are not of paramount concern. Externally owned plants, then, are more likely to emphasise some other aspect of competition than are the independent firms. This may relate to problems associated with the speed of delivery or reliability in local plants.

Thus, when considering management perception of the corporate environment, ownership status does not produce a differential result. That is, for a similar porportion of independent and externally owned plants, adopting a strategy of buying in a substantial amount of supplies is largely due to management being unaware of local contacts, rather than firms seeing other establishments as uncompetitive. Management awareness is, therefore, not significantly different by ownership type. However, of those firms that are aware of other local contacts, problems on the price side are most often quoted, with this

tendency more marked in the independent plants. In sum, for most firms, it would seem not to be a case of plants developing a strategy of more dispersed linkage so as to counter possible changes in local supply, since most admit to not knowing of local suppliers in the first instance. Whether or not such suppliers exist is, of course, of some importance.

5.8.2 Size of Firm and Managerial Perception of the Corporate Environment

We now consider whether or not there is any marked difference in managerial perception by size of firm. This we examine by ownership status, beginning with the independent plants. If size of the firm is a relevant factor we expect a differential result. As table 5.38

Table 5.38 Over 50 per cent of Supplies Purchased by Independent Plants from Outside Devon and Cornwall : Firm Size by Reason For:

	No Known Local Supplier		
Size of Firm	Yes	No	Row Total
1 - 9	50 (69.4)	22 (30.6)	72 (42.6)
10 - 24	35 (68.6)	16 (31.4)	51 (30.2)
25 - 49	16 (64.0)	9 (36.0)	25 (14.8)
50 - 99	10 (83.3)	2 (16.7)	12 (7.1)
100 - 499	7 (87.5)	1 (12.5)	8 (4.7)
500 plus	1 (100.0)	0 (0.0)	1 (0.6)
Column Total	119 (70.4)	50 (29.6)	169 (100.0)

(Chi-Square = 3.10 Degrees of freedom = 5 Significance = 0.6835)

shows this is the case for our independent firms. Here as size of firm increases the tendency to stress that firms are unaware of local contacts is more marked. That is, proportionately more large independent plants (85 per cent) than small (69 per cent) admit to not knowing of local suppliers. This may reflect the fact that the larger plants have outgrown existing local suppliers; hence, none now exist. Thus, the tendency to not know of local contacts does vary by size of firm with proportionately more large independent plants than small citing this as the reason for buying in supplies.

A consideration of competitive problems illustrates the fact that, of those independent plants emphasising problems regarding the price of inputs, proportionately more are small plants, as we may expect. This is shown in table 5.39. Here, larger scale production is perhaps associated with high value added, and this reduces the emphasis placed by large independent plants upon the cost side. Further, problems relating to the quality of inputs or some other reason seem only important to the smaller independent plants. In sum, proportionately more small than large independent plants find problems on the competitive front.

As far as the externally owned plants are concerned, size of firm produces a differential result in relation to the no known supplier argument. That is, as table 5.40 shows, proportionately fewer small externally owned plants (70 per cent) cite this factor compared with the larger firms (90 per cent). Thus, in these externally owned plants, the larger the establishment the greater is the tendency to buy in substantially from outside the local area because management is not aware of local contacts.

In table 5.41 we find that the tendency for externally owned plants to be supplied by their own organisation is not markedly different by

Table 5.39 Over 50 per cent of Supplies Purchased by Independent Plants from Outside Devon and Cornwall : Firm Size by Reason For : Local Suppliers Are:

Size of Firm	Uncompetitive in Terms of: Competitive	Quality	Price	Other	Row Total
1 - 9	36 (50.0)	7 (9.7)	23 (31.9)	6 (8.3)	72 (42.9)
10 - 24	26 (51.0)	1 (2.0)	18 (35.3)	6 (11.8)	51 (30.4)
25 - 49	12 (48.0)	1 (4.0)	10 (40.0)	2 (8.0)	25 (14.9)
50 - 99	10 (83.3)	0 (0.0)	2 (16.7)	0 (0.0)	12 (7.1)
100 - 499	5 (62.5)	0 (0.0)	3 (37.5)	0 (0.0)	8 (4.8)
Column Total	89 (53.2)	9 (5.4)	56 (33.1)	14 (8.3)	168 (100.0)

(Chi-Square = 11.18 Degrees of freedom = 12 Significance = 0.5133)

Numbeer of Missing Observations = 1

Table 5.40 Over 50 per cent of Supplies Purchased by Externally Owned Plants from Outside Devon and Cornwall : Firm Size by Reason For:

Size of Firm	No Known Local Supplier Yes	No	Row Total
1 - 9	3 (60.0)	2 (40.0)	5 (5.6)
10 - 24	10 (71.4)	4 (28.6)	14 (15.7)
25 - 49	7 (50.0)	7 (50.0)	14 (15.7)
50 - 99	15 (88.2)	2 (11.8)	17 (19.1)
100 - 499	30 (90.9)	3 (9.1)	33 (37.1)
500 plus	4 (66.7)	2 (33.3)	6 (6.7)
Column Total	69 (77.5)	20 (22.5)	89 (100.0)

(Chi-Square = 12.19 Degrees of Freedom = 5 Significance = 0.0323)

size of firm. Clearly, relatively few firms buy in their inputs as a result of their being supplied by the corporate group. However, of those that are so supplied proportionately more are the smaller plants. In other words, as size of firm increases the tendency for an internalisation of supplies is less pronounced. This suggests that corporate control is more marked in the initial stages of the plant's development. In sum, of the relatively few firms who buy in a substantial amount of their inputs from outside Devon and Cornwall because they are supplied by the corporate group, proportionately more are the small plants.

Finally, table 5.42 considers the extent to which variations in

Table 5.41 Over 50 per cent of Supplies Purchased by Externally Owned Plants from Outside Devon and Cornwall : Firm Size by Reason For :

	Supplied by Plants in the Same Organisation		
Size of Firm	Yes	No	Row Total
1 - 9	0 (0.0)	5 (100.0)	5 (5.6)
10 - 24	7 (50.0)	7 (50.0)	14 (15.7)
25 - 49	3 (21.4)	11 (78.6)	14 (15.7)
50 - 99	5 (29.4)	12 (70.6)	17 (19.1)
100 - 499	7 (21.2)	26 (78.8)	33 (37.1)
500 plus	3 (50.0)	3 (50.0)	6 (6.7)
Column Total	25 (28.1)	64 (71.9)	89 (100.0)

(Chi-Square = 7.80 Degrees of freedom = 5 Significance = 0.1675)

Table 5.42 Over 50 per cent of Supplies Purchased by Externally Owned Plants from Outside Devon and Cornwall : Firm Size by Reason For : Local Suppliers Are:

Size of Firm	Uncompetitive in Terms of: Competitive	Quality	Price	Other	Row Total
1 - 9	3 (60.0)	0 (0.0)	2 (40.0)	0 (0.0)	5 (5.6)
10 - 24	10 (71.4)	0 (0.0)	3 (21.4)	1 (7.1)	14 (15.7)
25 - 49	5 (35.7)	0 (0.0)	5 (35.7)	4 (28.6)	14 (15.7)
50 - 99	12 (70.6)	2 (11.8)	1 (5.9)	2 (11.8)	17 (19.1)
100 - 499	19 (57.6)	5 (15.2)	4 (12.1)	5 (15.2)	33 (37.1)
500 plus	6 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	6 (6.7)
Column Total	55 (61.8)	7 (7.9)	15 (16.8)	12 (13.5)	89 (100.0)

(Chi-Square = 20.84 Degrees of freedom = 15 Significance = 0.1416)

firm size are associated with problems of uncompetitiveness. Comparatively few of these plants, compared with independents, quote this factor as a motive for importing a substantial amount of supplies. Further, problems relating to the price of inputs are not as marked here. Of those that do emphasise this, proportionately many are the smaller plants. Here, then, as is the case for independent plants, problems associated with the price of inputs are more typical in the smaller firms. The larger plants tend to encounter other problems rather than the price side; and these may include problems of reliability and the speed of delivery of inputs. Thus, size of firm does produce a differential result. Overall, then, we conclude that size of firm does act as a relevant discriminatory factor, in the sense

that proportionately more large than small firms, of both ownership types, admit to not knowing of local suppliers; whilst, problems of price uncompetitiveness are most emphasised in the smaller plants.

In the above, we have attempted to illustrate the degree to which firms' adopted strategy of purchasing a substantial amount of inputs from outside the local area, is influenced by managerial perception of the corporate environment, as measured by a number of factors. The findings clearly show that for proportionately many firms, whether they be independently owned or not, this strategy evolves from a belief that local suppliers do not exist. Given this, the next most emphasised reason relates to inputs being price uncompetitive. In effect, most firms who buy in substantially do so not because local supplies are over priced or are of a poor quality; but, because suppliers are not known. As for any difference in emphasis by ownership type, then only in relation to elements of competition is there any variation, since proportionately more independent than externally owned plants quote problems of uncompetitiveness. For firm size, a differential result is produced, since relatively more large firms than small admit to being unaware of local suppliers. Further, the other possible reasons for importing supplies are stressed more in the small firms. Thus, given that this management perception is correct, then the corporate environment itself needs changing. If, on the other hand, it is incorrect, then increased information linkage is required. However, as mentioned above, we do not know the exact nature of the corporate environment. In sum, a strategy of importing a substantial amount of supplies can be attributed, in part, to a particular perception of the corporate environment by local decision makers. It is this perception of the corporate environment, as much as the type of environment itself, which influences the nature of backward linkage patterns.

5.9 SUMMARY

This chapter has attempted to identify variations in establishment material linkage by focusing upon a number of characteristics of the business enterprise and its environment. Clearly, we find that a number of factors associated with business structure and strategy and the nature of the environment influence material linkage patterns. That is, the degree of local linkage is largely a reflection of the status of the plant, employment size, the nature of the product and the nature of environmental perception. In effect, then, we find local linkage to be more typical in independent plants and in relatively small firms. Thus, we conclude that most of our key operating variables are relevant factors in helping to identify the nature of establishment linkage patterns in Devon and Cornwall.

FOOTNOTES

1. The length of time an independent firm has been located in Devon and Cornwall is less likely to be an influence. The majority of independents are likely to be indigenous firms which already know of local contacts; hence, we do not test for this factor for the independent plants. Moreover, the location of the headquarters and autonomy in decision making factors, by definition, do not apply to independent firms.

2. This factor may possibly affect externally owned plants, but it is not seen as important relative to the other factors considered. Thus, it is not examined in this thesis.

3. This point clearly has implications for our examination of managerial perception and its influence upon linkages. That is, over time, the age of the plant in Devon and Cornwall is likely to influence individual perception. Thus, it is not easy to separate these respective influences. However, the cross sectional nature of this study only allows us to examine perception at a point in time; hence, this analysis cannot detect whether length of time in Devon and Cornwall affects perception of the environment.

6. MANUFACTURING ESTABLISHMENT LINKAGE PATTERNS IN DEVON AND CORNWALL : AN EMPIRICAL STUDY OF BUSINESS SERVICE LINKAGE

6.1 INTRODUCTION

This chapter focuses upon those key variables associated with variations in firm structure and strategy, so as to establish differences in business service linkage. That is, it attempts to discover whether those characteristics of the business establishment previously discussed above, are relevant discriminatory factors for service as well as material linkage patterns. In doing this, we aim to identify two types of process. First, a distance effect. This seeks to establish the location of the supplier of services to the local plant. Second, and with respect to externally owned plants, an organisational effect. Here, we examine the extent to which the local plant receives its services from other plants in the same organisational group. Clearly, we are attempting to discover the distance over which firms acquire their business services, and the degree to which such services are internalised within the corporate organisation.

Senior managers in each local plant were asked to indicate the major source of each service used from the following: Devon and Cornwall; the rest of the South-West; London and the South-East; the rest of the UK and overseas. Such a classification allows us to gauge the extent to which firms use the local economy for services; the extent to which services are drawn from service centres in the rest of the South-West region; and the relative influence of the South-East market, where proportionately many externally owned plants are headquartered. On the question of the extent to which externally owned plants carry out their own service needs, management was asked to indicate whether the firm receives more or less than 50 per cent of its services from other plants in the group.

In this study, we group the range of business services into three main categories, since this helps more clearly define their inherently

different nature. Thus, Group one services comprise: computing; legal services; financial advice; accounting; export services; and public relations. In Group two we include: R and D; whilst Group three comprises: haulage; office cleaning; plant hire; and waste disposal. Our expectation is that variations in service linkage patterns will be most marked in the more specialist Group one and Group two services, since these may be more easily influenced by variations in organisational structure and strategy.

In discussing the nature of these business service linkage patterns there are a number of related questions which we need to bear in mind. For example, whether external ownership appears to effect the development of local business services; whether the development of the service sector is restricted; and, if it is, whether this can be related to a demand shortfall in manufacturing industry. Further, do externally owned plants place their service demands outside the local area because they are not available locally? or is it a consequence of company policy? Even though hard empirical evidence on all of these issues may not be forthcoming, the results may nevertheless offer suggestive probing in these areas.

The following focuses upon whether factors such as the ownership status of the firm; size of firm; and the degree of managerial autonomy in decision making, help further our understanding of the differential nature of business service linkage patterns. Reference to each Group of services is made in turn. First of all, we illustrate the general linkage structure for business services, before then going on to discuss the relevance of our key operating variables.

6.2 THE GENERAL LINKAGE STRUCTURE

Below we report our findings in relation to the overall pattern

of business service linkage. Table 6.1 illustrates the pattern of service linkages in these local plants in terms of the geographical

Table 6.1 The Pattern of Business Service Linkage in All Firms

Major Source of Service by Type of Service

Type of Service	Source of Service (%)						
	Devon & Cornwall	Rest of South-West	London/ South-East	Rest of UK	Overseas	Total	No Replies (No.)
Computing	60.1	8.1	20.7	10.4	0.7	100	231
Legal	75.7	2.8	16.2	5.0	0.3	100	49
Financial Advice	71.7	4.9	17.5	5.5	0.4	100	143
Accounting	78.3	3.4	12.4	5.6	0.3	100	44
Export Service	50.3	11.5	25.5	12.1	0.6	100	209
Public Relations	60.9	7.1	24.4	7.0	0.6	100	210
R and D	61.2	2.9	16.5	12.4	7.0	100	196
Haulage	90.1	2.9	1.5	5.5	0.0	100	91
Office Cleaning	99.4	0.0	0.6	0.0	0.0	100	192
Plant Hire	94.5	1.5	0.5	3.5	0.0	100	165
Waste Disposal	97.9	0.4	0.4	1.3	0.0	100	131

Computing to Publication Relations = Group one

R and D = Group two

Haulage to Waste Disposal = Group three.

source of different types of service. Clearly, we find variations in the proportions of firms using local suppliers by type of business service. Thus, as we would expect, in the main proportionately more

firms acquire Group three services locally, reflecting perhaps the less technical nature of these services. Furthermore, the extent to which other locations, apart from Devon and Cornwall, are used seems limited; although Group one services are delivered from London and the South-East to a relatively large extent. Again we separate this location from the rest of the UK since, as we said above, the concentration of economic activity is, it is argued, spatially determined and centred upon the South-East (Goddard, 1980). Thus, we test for these firms whether or not this market seems dominant in terms of the extent to which services are delivered from this source. Further, we note the extent to which firms do not reply to the questions on service linkage. As is shown, this tendency varies by type of service; and, moreover, as far as Group one and two services are concerned, relatively few of the no replies are in externally owned plants, with, for example, 91 per cent of the no replies to the R and D question in independent plants. Clearly, the no reply rate may also reflect the fact that managers feel that such questions are 'too sensitive' to answer; or, it may simply be that such business services are not used by many plants. If it is the latter, this would suggest a demand shortfall for business services in numerous manufacturing firms. As a consequence of this, we may expect there to be somewhat restricted development in the service sector. Overall, then, once we discount those firms who do not reply, a relatively large proportion of firms place their business service orders locally, with this tendency being most pronounced in the Group three services. However, the Devon and Cornwall category itself raises problems in the sense that a defect with the questionnaire is that, in the interests of simplicity and, therefore, ease of response, no category exists for 'in plant' services. Thus, the column Devon and Cornwall will include services internal to the firm and this

is potentially important for policy purposes.(1)

Given the above, we now turn to a consideration of whether or not the differential linkage pattern is further understood by focusing upon those aspects of the business establishment as discussed above. First of all, the ownership status of the firm and its relevance to the business service linkage structure.

6.3 OWNERSHIP STATUS AND BUSINESS SERVICE LINKAGES IN DEVON AND CORNWALL

The following tests relate to the ownership status of the firm, ceteris paribus, in helping to identify variations in business service linkage patterns. As we said in chapter 2, it is believed that the pattern of service linkage will differ by ownership type. That is, the strategy towards business service provision varies by type of firm, and this is reflected in the fact that proportionately more independent plants utilise a local service. Since we are concerned here with the distance effect, our a priori expectation is, then, that proportionately more externally owned than independent plants will acquire services over a greater distance. We note, of course, that the organisational effect is not considered here, since by definition it only applies to externally owned firms. Thus, its relevance is discussed later in relation to the other key variables under study.

Not only do we expect proportionately more independent than externally owned plants to acquire business services locally, but, within this general hypothesis, we expect the pattern to differ by type of service. Thus, in relation to the less specialist Group three services, it is expected that the linkage patterns will not markedly differ by type of firm, since they are less likely to be influenced by variations in firm structure and strategy. The pattern of our

Group one and Group two services, on the other hand, are more likely to be linked to variations in ownership patterns. For example, in the case of the externally owned plants, the corporate organisation may take an active role in the servicing of these facilities, if it sees them as essential aspects of business operations. Thus, a number of externally owned plants may acquire their services from other plants in the same group. Clearly, this possibility does not exist for our independent plants. Variations by type of service are, therefore, most likely to be marked in the more technical Group one and Group two services. Does ownership status produce a differential result? Below, we report our findings with reference to each type of service.

Table 6.2 Location of Computing Service by Establishment Ownership

	Computing Service From:					
Status of Firm	Devon & Cornwall	Rest of South-West	London & South-East	Rest of UK	Overseas	Row Total
Independent	47 (83.9)	2 (3.6)	6 (10.7)	1 (1.8)	0 (0.0)	56 (41.5)
Externally Owned	34 (43.0)	9 (11.4)	22 (27.8)	13 (16.5)	1 (1.3)	79 (58.5)
Column Total	81 (60.1)	11 (8.1)	28 (20.7)	14 (10.4)	1 (0.7)	135 (100.0)

(Chi-Square = 23.74 Degrees of freedom = 4 Significance = 0.0001)

Number of Missing Observations = 231

In Parenthesis : Row Percentage unless otherwise stated.

The first of our Group one services is computing, and the relationship between this and the status of the firm is discussed below. Table 6.2 clearly shows ownership status, ceteris paribus, to be a relevant discriminatory factor in influencing the geographical source of the computing service. There exists, then, a marked difference in the

proportions acquiring this business service from various locations by ownership type. Further, almost twice as many independent plants use a computing facility locally, compared with the externally owned firms. A differential result is thus produced. In effect, of those firms admitting to using a local computing service, proportionately many are independent plants. Thus, our hypothesis that the tendency to acquire this service over a greater distance is most marked in the externally owned plants is supported. Moreover, the vast majority of independent firms who answer the question on computing use a local supplier. Here, then, ownership status, ceteris paribus, acts as a relevant discriminatory factor.

Table 6.3 Location of Legal Service by Establishment Ownership

	Legal Services From:					
Status of Firm	Devon & Cornwall	Rest of South-West	London & South-East	Rest of UK	Overseas	Row Total
Independent	196 (91.2)	5 (2.3)	8 (3.7)	6 (2.8)	0 (0.0)	215 (67.8)
Externally Owned	44 (43.1)	4 (3.9)	43 (42.2)	10 (9.8)	1 (1.0)	102 (32.2)
Column Total	240 (75.7)	9 (2.8)	51 (16.2)	16 (5.0)	1 (0.3)	317 (100.0)

(Chi-Square = 94.07 Degrees of freedom = 4 Significance = 0.0000)

Number of Missing Observations = 49.

In table 6.3 we consider the legal service. A priori, we expect ownership status to produce a differential result. This is confirmed by the evidence, with proportionately more independent than externally owned plants acquiring their legal services locally. Further, almost all of the independent firms who answer this question use a local

service. For our externally owned plants, the tendency to utilise a local service is less marked with similar proportions of firms being serviced from the London and South-East location. Given that a relatively large number are London headquartered firms, then this may suggest the internalisation of this service within the corporate organisation. Thus, as expected, ownership type acts as a relevant influence, since the tendency to buy the legal service locally is more pronounced in the independent plants.

Table 6.4 Location of Financial Advice Service by Establishment Ownership

	Financial Advice From:					
Status of Firm	Devon & Cornwall	Rest of South-West	London & South-East	Rest of UK	Overseas	Row Total
Independent	121 (92.4)	2 (1.5)	6 (4.6)	2 (1.5)	0 (0.0)	131 (58.7)
Externally Owned	39 (42.4)	9 (9.8)	33 (35.9)	10 (10.9)	1 (1.0)	92 (41.3)
Column Total	160 (71.7)	11 (4.9)	39 (17.5)	12 (5.5)	1 (0.4)	223 (100.0)

(Chi-Square = 66.72 Degrees of freedom = 4 Significance = 0.0000)

Number of Missing Observations = 143.

The next of our Group one services is financial advice. Here, we are focusing upon the extent to which local plants seek advice on matters such as budgeting, investment and so on from local firms, or from establishments in other locations. Table 6.4 clearly shows ownership status to be a relevant discriminatory factor, ceteris paribus. That is, over twice as many independent as externally owned plants seek such advice locally. Thus, a differential result is produced.

In short, our a priori expectations that local linkage would be more marked in the independent plants seems supported here.

A consideration of the accounting service results in a situation similar to the above, as table 6.5 shows. Here, proportionately more independent plants than externally owned use local accounting firms.

Table 6.5 Location of Accounting Service by Establishment Ownership

	Accounting Service From:					
Status of Firm	Devon & Cornwall	Rest of South-West	London & South-East	Rest of UK	Overseas	Row Total
Independent	209 (91.7)	3 (1.3)	11 (4.8)	5 (2.2)	0 (0.0)	228 (70.8)
Externally Owned	43 (45.7)	8 (8.5)	29 (30.9)	13 (13.8)	1 (1.1)	94 (29.2)
Column Total	252 (78.3)	11 (3.4)	40 (12.4)	18 (5.6)	1 (0.3)	322 (100.0)

(Chi-Square = 82.86 Degrees of freedom = 4 Significance = 0.0000)

Number of Missing Observations = 44.

The tendency, then, to seek such a service over a greater distance is most marked in the externally owned firms, where again the South-East location proves relatively attracttive. Ownership status thus produces a differential result. Moreover, this result provides further credence to our a priori suggestion that proportionately fewer externally owned plants will acquire Group one services locally.

The situation for the export service is shown in table 6.6. Here, the fact that relatively many independent plants do not reply to the question on export services is perhaps not surprising, since relatively few firms distribute their outputs overseas. In this case we do not observe such a marked difference between types of firm in their local

use of the service. That is, whilst proportionately more independent than externally owned plants use a local export service, the difference is not as pronounced as in other cases. This, in part, appears to be due to more independent firms than previously seeking a service from the London and South-East location, reflecting perhaps the non-availability of a specialist service which some firms require. Thus,

Table 6.6 Location of Export Service by Establishment Ownership

	Export Service From					
Status of Firm	Devon & Cornwall	Rest of South-West	London & South-East	Rest of UK	Overseas	Row Total
Independent	46 (58.2)	8 (10.1)	17 (21.5)	8 (10.2)	0 (0.0)	79 (50.3)
Externally Owned	33 (42.3)	10 (12.8)	23 (29.5)	11 (14.1)	1 (1.3)	78 (49.7)
Column Total	79 (50.3)	18 (11.5)	40 (25.5)	19 (12.1)	1 (0.6)	157 (100.0)

(Chi-Square = 4.72 Degrees of freedom = 4 Significance = 0.3163)

Number of Missing Observations = 209.

in this case the differential result is not as marked.

Finally, under the heading Group one services we consider public relations. As table 6.7 shows a differential linkage pattern results, with over twice as many independent firms using this service locally, compared with the externally owned. Further, the South-East location proves relatively attractive for our externally owned plants; hence, these findings in relation to some services clearly contrast with those for material linkage. In short, the tendency to utilise a local public relations service is most marked in the independent plants. Again, our a priori expectations are supported.

Table 6.7 Location of Public Relations Service by Establishment Ownership

Status of Firm	Public Relations Service From: Devon & Cornwall	Rest of South-West	London & South-East	Rest of UK	Overseas	Row Total
Independent	64 (85.3)	0 (0.0)	8 (10.7)	3 (4.0)	0 (0.0)	75 (48.1)
Externally Owned	31 (38.3)	11 (13.6)	30 (37.0)	8 (9.9)	1 (1.2)	81 (51.9)
Column Total	95 (60.9)	11 (7.1)	38 (24.4)	11 (7.0)	1 (0.6)	156 (100.0)

(Chi-Square = 38.29 Degrees of freedom = 4 Significance = 0.0000)

Number of Missing Observations = 210.

As far as the Group one services are concerned, the results largely support our hypothesis. That is, proportionately more independent than externally owned plants acquire their business services in Devon and Cornwall. We find also that of those independent plants who answer the questions on business services a relatively high proportion are locally linked. In the case of the externally owned firms, a relatively high number use the London and South-East location when they do not buy locally, rather than seek supplies in other parts of the South-West or UK. In short, ownership status, ceteris paribus, produces a differential result, and in doing so, helps further our understanding of the differential nature of these Group one service linkages.

We now consider the relationship between ownership status of the firm and our Group two service, R and D. It was noted in chapter 2 that, for many authors, any notion of self sustained growth and the mobilisation of regional potential must involve a technological dimension (Howells, 1984; Thwaites, 1982). Further, technical change has

been seen as an important, if not the most important factor responsible for economic growth (Solow, 1957). Given this, regional development depends upon a cumulative pattern of growth which, in turn, is based upon the ability of the local economy to generate new firms as technical conditions change. This ability to generate new firms tends to be especially likely where R and D and technical activities are common within local firms (Malecki, 1981). Clearly, the degree to which R and D is carried out in these firms or bought in from elsewhere may have important implications for local growth prospects. It should be noted, however, that as eonsequence of questionnaire design we do not know whether the R and D undertaken is basic or applied, or whether it is first carried out on site or adopted from elsewhere. Despite this shortcoming, the results may nevertheless provide an insight into the likelihood of technologically induced local economic growth.

Our a priori expectation is that proportionately more independent than externally owned plants will acquire this activity locally, since we expect a relatively high proportion of externally owned firms to be supplied from corporate plants located outside the local area. We find, as table 6.8 illustrates, that although the highest proportion of firms who answer the question on R and D are externally owned, proportionately more independent plants acquire this activity locally. A differential result is thus produced which proves to be significant. For the majority of our externally owned plants, it seems that acquiring R and D in the local economy is not typical; hence, the local development of this activity via these plants may be restricted. However, the fact that 40 per cent of our sampled plants do admit to buying in R and D, and that the vast majority of the independent firms acquire

this locally may help stimulate new firm formation as technical conditions change.

The results in relation to our Group three services are somewhat different, in the sense that differences in ownership type do not produce marked variations in the source of the services used. Thus,

Table 6.8 Location of R and D Service by Establishment Ownership

	R and D Service From:					
Status of Firm	Devon & Cornwall	Rest of South-West	London & South-East	Rest of UK	Overseas	Row Total
Independent	66 (80.5)	0 (0.0)	7 (8.5)	8 (9.8)	1 (1.2)	82 (48.2)
Externally Owned	38 (43.2)	5 (5.7)	21 (23.9)	13 (14.8)	11 (12.4)	88 (51.8)
Column Total	104 (61.2)	5 (2.9)	28 (16.5)	21 (12.4)	12 (7.0)	170 (100.0)

Chi-Square = 28.88 Degrees of freedom = 4 Significance = 0.0000

Number of Missing Observations = 196.

some 90 per cent of both types of plant admit to using local suppliers. Here, ownership status, ceteris paribus, is not a relevant discriminatory factor, since firms are as likely to use a local service independent of the status of the plant. As we expected, then, a differential result with respect to Group three services, is not produced.

In the above, we have considered the relationship between ownership status and the pattern of business service linkage, in terms of the location of the service used - the distance effect. As expected, as far as Group one and two services are concerned, ownership status, ceteris paribus, produces a differential result, with proportionately

more independent than externally owned firms using a local service. The tendency to look beyond Devon and Cornwall for service requirements is clearly most marked in the non-independent plants. Here, the South-East location proves relatively popular, something which we did not observe in our discussion on material linkage. Thus, our a priori expectation, that the tendency to acquire services over a greater distance would be most pronounced in the externally owned plants is clearly supported. Ownership status, ceteris paribus, is, therefore, a relevant discriminatory factor in relation to our Group one and two business service linkages.

The results discussed thus far not only highlight the differential patterns of linkage by type of firm, but also, in the case of the externally owned plants, show a difference among the same category of ownership.(2) Thus, in an attempt to gain a greater insight into the nature of the relationship between ownership status and service linkages, we focus upon those factors cited in relation to material linkage as a means of clarifying the differential result in the externally owned plants. That is, may the service linkage patterns in these firms be related to the length of time the plant has been in Devon and Cornwall; to the location of the headquarters plant; or to the degree of autonomy in decision making at the local level.

6.4 THE PATTERN OF SERVICE LINKAGE IN EXTERNALLY OWNED PLANTS

6.4.1 Age of Plant

Here, we are seeking to establish whether or not variability in the length of time the firm has been established in the local area influences the nature of business service linkage patterns in externally owned plants. We may expect those plants which have been located in

Devon and Cornwall a relatively long period of time (ten years plus), to be the ones where the use of a local service supplier is most marked. This is based upon the notion that relatively new locaters (less than ten years) may require servicing from the corporate organisation; whilst, the longer the firm has been established the more likely it is to have sought local contacts. Clearly, such an approach assumes away the relevance of corporate decision making policy. If the theory is to be supported we expect to find proportionately more older established firms acquiring the business services locally, compared with other ages of plant. Further, we only discuss this in relation to Group one and two services, since, as we have seen, the linkage patterns among these firms for Group three services is not markedly different. Do we find age of plant to be a relevant discriminatory factor?

In table 6.9 we find that when comparing the situation for those plants established over ten years with those located locally for less than ten years, a differential result is produced, in the sense that proportionately more longer established firms (45 per cent) than recently located (30 per cent) acquire this service locally. Thus, as expected, age of plant produces a differential result.

The situation for the legal service is shown in table 6.10. Here, the result is similar to that above. That is, age of plant produces a differential result, in the sense that the tendency to use a local service is noticeably different by the length of time the firm has been established locally. Thus, the pattern of legal service linkage in these externally owned plants may be influenced by the age of the plant. Here, too, our a priori expectations are supported.

An examination of the financial advice service shows similar proportions of both the older and newer established firms acquiring

Table 6.9 Location of Computing Service by Years Established in Devon and Cornwall in Externally Owned Plants

Location of Service	Years Established				
	1 - 4	5 - 9	10 - 24	25 plus	Row Total
Devon & Cornwall	4 (57.1)	2 (15.4)	13 (50.0)	12 (40.0)	31 (40.8)
Rest of South-West	1 (14.3)	1 (7.7)	3 (11.5)	4 (13.3)	9 (11.8)
London & South-East	1 (14.3)	8 (61.5)	7 (26.9)	6 (20.0)	22 (28.9)
Rest of UK	1 (14.3)	2 (15.4)	3 (11.6)	7 (23.4)	13 (17.2)
Overseas	0 (0.0)	0 (0.0)	0 (0.0)	1 (3.3)	1 (1.3)
Column Total	7 (9.2)	13 (17.1)	26 (34.2)	30 (39.5)	76 (100.0)

(Chi-Square = 12.24 Degrees of freedom = 12 Significance = 0.4266)

Number of Missing Observations = 30

In Parenthesis : Column percentage.

this service locally, as can be seen in table 6.11. Here, then, whether the plant has been in Devon and Cornwall a relatively long or short period, seems not to influence the local use of this service. In other words, the tendency to use a financial advice service locally is independent of the length of time the firm has been located in Devon and Cornwall. Our hypothesis that proportionately more longer established firms than recent locaters would buy locally, is thus not supported.

The situation for the accountancy service is shown in table 6.12. Here, as expected, proportionately fewer recent locaters (34 per cent) than older established firms (48 per cent) use a local accountancy service. A differential result is thus produced; hence, our expectation

Table 6.10 Location of Legal Service by Years Established in Devon and Cornwall in Externally Owned Plants

	Years Established				
Location of Service	1 - 4	5 - 9	10 - 24	25 plus	Row Total
Devon & Cornwall	3 (42.9)	4 (20.0)	18 (51.4)	17 (47.2)	42 (42.9)
Rest of South-West	0 (0.0)	0 (0.0)	2 (5.7)	2 (5.6)	4 (4.1)
London & South-East	3 (42.9)	12 (60.0)	13 (37.1)	13 (36.1)	41 (41.8)
Rest of UK	1 (14.2)	3 (15.0)	2 (5.8)	4 (11.1)	10 (10.2)
Overseas	0 (0.0)	1 (5.0)	0 (0.0)	0 (0.0)	1 (1.0)
Column Total	7 (7.2)	20 (20.4)	35 (35.7)	36 (36.7)	98 (100.0)

(Chi-Square = 11.95 Degrees of freedom = 12 Significance = 0.4496)

Number of Missing Observations = 8

In parenthesis : Column percentage.

that the local use of this business service would be more marked in the well established firms, is supported by the evidence. Thus, variations in the length of time the firm has been located in Devon and Cornwall, seem to influence the local use of an accounting service.

The next of our Group one services is the export facility. Here, the results show that age of plant is not a relevant discriminatory factor, since similar proportions of the older and more recently established firms utilise a local export service. In other words, variability in the length of time the firm has been located in Devon and Cornwall seems not to help further identify the differential nature of the linkage pattern with respect to this service. In effect, then, as table 6.13 illustrates, the location of the export service in

Table 6.11 Location of Financial Advice Service by Years Established in Devon and Cornwall in Externally Owned Plants

Location of Service	Years Established 1 - 4	5 - 9	10 - 24	25 plus	Row Total
Devon & Cornwall	6 (85.7)	4 (20.0)	13 (44.8)	14 (41.2)	37 (41.1)
Rest of South-West	0 (0.0)	3 (15.0)	1 (3.4)	5 (14.7)	9 (10.0)
London & South-East	1 (14.3)	11 (55.0)	12 (41.4)	9 (26.5)	33 (36.7)
Rest of UK	0 (0.0)	2 (10.0)	3 (10.4)	5 (14.7)	10 (11.1)
Overseas	0 (0.0)	0 (0.0)	0 (0.0)	1 (2.9)	1 (1.1)
Column Total	7 (7.8)	20 (22.2)	29 (32.2)	34 (37.8)	90 (100.0)

(Chi-Square = 15.63 Degrees of freedom = 12 Significance = 0.2084)
Number of Missing Observations = 16
In parenthesis : column percentage.

Table 6.12 Location of Accounting Service by Years Established in Devon and Cornwall in Externally Owned Plants

Location of Service	Years Established 1 - 4	5 - 9	10 - 24	25 plus	Row Total
Devon & Cornwall	5 (71.4)	4 (21.1)	14 (43.8)	18 (52.9)	41 (44.6)
Rest of South-West	0 (0.0)	2 (10.5)	1 (3.1)	5 (14.7)	8 (8.7)
London & South-East	1 (14.3)	9 (47.4)	12 (37.5)	7 (20.6)	29 (31.5)
Rest of UK	1 (14.3)	3 (15.8)	5 (15.6)	4 (11.8)	13 (14.1)
Overseas	0 (0.0)	1 (5.2)	0 (0.0)	0 (0.0)	1 (1.1)
Column Total	7 (7.5)	19 (20.7)	32 (34.8)	34 (37.0)	92 (100.0)

(Chi-Square = 15.15 Degrees of freedom = 12 Significance = 0.2330)
Number of Missing Observations = 14
In parenthesis : column percentage.

Table 6.13 Location of Export Service by Years Established in Devon and Cornwall in Externally Owned Plants

	Years Established				
Location of Service	1 - 4	5 - 9	10 - 24	25 plus	Row Total
Devon & Cornwall	3 (75.0)	5 (29.4)	14 (51.9)	7 (26.9)	29 (39.2)
Rest of South-West	0 (0.0)	2 (11.8)	3 (11.1)	5 (19.2)	10 (13.5)
London & South-East	1 (25.0)	6 (35.3)	8 (29.6)	8 (30.8)	23 (31.1)
Rest of UK	0 (0.0)	3 (17.6)	2 (7.4)	6 (23.1)	11 (14.9)
Overseas	0 (0.0)	1 (5.9)	0 (0.0)	0 (0.0)	1 (1.3)
Column Total	4 (5.4)	17 (23.0)	27 (36.5)	26 (35.1)	74 (100.0)

(Chi-Square = 11.53 Degrees of freedom = 12 Significance = 0.4833)

Number of Missing Observations = 32

In parenthesis : column percentage.

these plants seems independent of the age of plant. In sum, the tendency to use this Group one service locally is as likely in both the age categories of firm we consider.

Finally, under the heading Group one service we focus upon public relations. The result here confirms our previous findings. That is, that age of plant does not produce a differential result, since the local use of this service is no more marked in the older established firms, compared with the more recent locaters. Thus, as table 6.14 shows, age of plant, ceteris paribus, is not a relevant discriminatory factor; hence, our a priori expectations do not hold.

As far as the Group one services are concerned, age of plant, in some cases, produces a differential result, since of those firms

Table 6.14 Location of Public Relations Service by Years Established in Devon and Cornwall in Externally Owned Plants

	Years Established				
Location of Service	1 - 4	5 - 9	10 - 24	25 plus	Row Total
Devon & Cornwall	4 (57.1)	5 (31.3)	12 (42.9)	9 (32.1)	30 (38.0)
Rest of South-West	2 (28.6)	2 (12.5)	2 (7.1)	5 (17.9)	11 (13.9)
London & South-East	1 (14.3)	6 (37.5)	11 (39.3)	11 (39.3)	29 (36.7)
Rest of UK	0 (0.0)	2 (12.5)	3 (10.7)	3 (10.7)	8 (10.1)
Overseas	0 (0.0)	1 (6.2)	0 (0.0)	0 (0.0)	1 (1.3)
Column Total	7 (8.9)	16 (20.3)	28 (35.4)	28 (35.4)	79 (100.0)

(Chi-Square = 9.44 Degrees of freedom = 12 Significance = 0.6642)

Number of Missing Observations = 27

In parenthesis : column percentage.

using a local service or a service acquired from elsewhere, there is a noticeable difference by age of plant. That is, proportionately more older than newer established firms acquire their business services in the local area. Thus, the differential nature of some of the Group one service linkages among the externally owned plants is perhaps influenced by variations in the length of time the firm has been located in Devon and Cornwall. However, for some services age of plant does not produce a differential result; hence, the local use of the service, contrary to what we expected, is independent of the length of time the plant has been in Devon and Cornwall.

Next, we consider the situation for our Group two service, R and D. As table 6.15 shows, those firms acquiring R and D locally

exhibit no marked difference by age of plant. That is, similar proportions of older and more recent locaters buy R and D in the local economy. Clearly, variability in the length of time the plant has been established in Devon and Cornwall fails to produce a differential result. Thus, our expectation that locally undertaken R and D may be most pronounced in those plants located in Devon and Cornwall the longest, is not supported. In effect, the differential nature of the R and D linkage pattern in these externally owned plants is not further understood by focusing upon the age of plant in the local economy.

Table 6.15 Location of R and D Service by Years Established in Devon and Cornwall in Externally Owned Plants

Location of Service	Years Established 1 - 4	5 - 9	10 - 24	25 plus	Row Total
Devon & Cornwall	2 (33.3)	6 (40.0)	13 (40.6)	15 (48.4)	36 (42.8)
Rest of South-West	0 (0.0)	0 (0.0)	2 (6.3)	3 (9.7)	5 (6.0)
London & South-East	2 (33.3)	5 (33.3)	7 (21.9)	7 (22.6)	21 (25.0)
Rest of UK	2 (33.3)	2 (13.3)	4 (12.5)	5 (16.1)	13 (15.5)
Overseas	0 (0.0)	2 (13.3)	6 (18.7)	1 (3.2)	9 (10.7)
Column Total	6 (7.1)	15 (17.9)	32 (38.1)	31 (36.9)	84 (100.0)

(Chi-Square = 8.93 Degrees of freedom = 12 Significance = 0.7085)

Number of Missing Observations = 22

In parenthesis : column percentage.

In sum, the above has shown that, with respect to certain Group one services, age of plant does help us further understand the differential nature of service linkages in these externally owned plants. In

other words, the variation in the pattern of business service linkage seems to be related to the length of time the plant has been in Devon and Cornwall. The tendency, then, to use a local supplier for some services is more likely in the older established plants. Our a priori expectations, therefore, concerning the influence of the age of the plant are supported in some cases. However, on certain occasions age of plant fails to produce a differential result. Given this, may the differential pattern of service linkage in our externally owned plant be further understood by focusing upon the location of the headquarters plant? It is to a consideration of this that we now turn.

6.4.2 Location of the Headquarters Plant

If this is a relevant factor, we would expect to find that the largest proportion of firms acquiring their services from each location to have a headquarters in that location. That is, expect a relatively high proportion of locally headquartered firms to buy their services from the local area; expect a relatively high proportion of London headquartered firms to acquire their services from London and the South-East and so on. Clearly, such a pattern would suggest the internalisation of business services. Further, since it has been suggested that externally owned plants will tend to use their own organisation for business services (Britton,1974), we may expect the location of the headquarters plant to be a relevant discriminatory factor. Thus, with respect to the Devon and Cornwall economy, we expect proportionately many locally headquartered firms to acquire their services from Devon and Cornwall. In other words, we expect to find that the tendency to use local services is most marked in the locally headquartered firms. Again, we discuss these results in relation to Group one and two services only.

We consider first of all the computing service. In table 6.16 we find that all of the Plymouth headquartered firms receive their computing

Table 6.16 Location of Computing Service by Headquarters Location of Externally Owned Plants

Location of Service	Headquarters Location PTWA	RD&C	RSW	L&SE	RUK	EEC	USA	ROW	Total
Devon & Cornwall	5 (14.7)	4 (11.8)	2 (5.9)	11 (32.4)	3 (8.8)	1 (2.9)	8 (23.5)		34 (43.6)
Rest of South-West	0 (0.0)	0 (0.0)	4 (44.4)	1 (11.2)	0 (0.0)	0 (0.0)	4 (44.4)		9 (11.5)
London & South-East	0 (0.0)	0 (0.0)	2 (9.1)	19 (86.4)	0 (0.0)	0 (0.0)	1 (4.5)		22 (28.2)
Rest of UK	0 (0.0)	2 (16.7)	2 (16.7)	4 (33.3)	4 (33.3)	0 (0.0)	0 (0.0)		12 (15.4)
Overseas	0 (0.0)	0 (0.0)	1 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)		1 (1.3)
Column Total	5 (6.4)	6 (7.7)	11 (14.0)	35 (44.9)	7 (9.0)	1 (1.3)	13 (16.7)		78 (100.0)

(Chi-Square = 58.15 Degrees of freedom = 24 Significance = 0.0001)

Number of Missing Observations = 28

Where PTWA = Plymouth Travel to Work Area

RD&C = Rest of Devon and Cornwall

RSW = Rest of South-West

L&SE = London and South-East

RUK = Rest of UK

EEC = European Economic Community

USA = United States of America.

service locally; whilst 66 per cent of those with a headquarters in the rest of Devon and Cornwall do so. That is, proportionately more locally headquartered firms acquire their computing service locally,

compared with other plants. A similar relationship holds for those firms with a London headquarters, in the sense that proportionately more of these firms acquire this service from the South-East. Here, then, a differential result is produced. Our a priori expectation, that of those plants using the local area for business services proportionately many would be locally headquartered, holds here. Thus, the location of the headquarters plant, ceteris paribus, is clearly a relevant discriminatory factor.

A similar result is observed when we consider the legal service. Here, a differential result is produced, with proportionately more locally headquartered firms receiving their legal service from the local area. This is shown in table 6.17. Thus, the tendency to use a local legal service is most marked in the locally headquartered

Table 6.17 Location of Legal Service by Headquarters Location of Externally Owned Plants

Location of Service	Headquarters Location							
	PTWA	RD&C	RSW	L&SE	RUK	EEC	USA	ROW Total
Devon & Cornwall	5 (11.6)	7 (16.3)	5 (11.6)	13 (30.3)	4 (9.3)	0 (0.0)	9 (20.9)	43 (42.6)
Rest of South-West	0 (0.0)	0 (0.0)	4 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	4 (4.0)
London & South-East	0 (0.0)	1 (2.3)	2 (4.7)	30 (69.8)	1 (2.3)	1 (2.3)	8 (18.6)	43 (42.6)
Rest of UK	0 (0.0)	1 (10.0)	0 (0.0)	3 (30.0)	6 (60.0)	0 (0.0)	0 (0.0)	10 (9.8)
Overseas	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (100.0)	1 (1.0)
Column Total	5 (5.0)	9 (8.9)	11 (10.9)	46 (45.5)	11 (10.9)	1 (1.0)	18 (17.8)	101 (100.0)

(Chi-Square = 87.96 Degrees of freedom = 24 Significance = 0.0000)

Number of Missing Observations = 5

firms, as we would expect. Again, the location of the headquarters plant, ceteris paribus, is found to be a relevant factor.

The relationship between the location of the headquarters plant and the source of the financial advice service is shown in table 6.18.

Table 6.18 Location of Financial Advice Service by Headquarters Location of Externally Owned Plants

Location of Service	Headquarters Location							
	PTWA	RD&C	RSW	L&SE	RUK	EEC	USA	Row Total
Devon & Cornwall	5 (12.8)	4 (10.3)	4 (10.3)	12 (30.8)	3 (7.7)	0 (0.0)	11 (28.1)	39 (42.9)
Rest of South-West	0 (0.0)	0 (0.0)	7 (77.8)	2 (22.2)	0 (0.0)	0 (0.0)	0 (0.0)	9 (9.9)
London & South-East	0 (0.0)	1 (3.0)	0 (0.0)	28 (84.8)	1 (3.0)	1 (3.0)	2 (6.2)	33 (36.3)
Rest of UK	0 (0.0)	2 (22.2)	0 (0.0)	1 (11.1)	6 (66.7)	0 (0.0)	0 (0.0)	9 (9.9)
Overseas	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (100.0)	1 (1.0)
Column Total	5 (5.5)	7 (7.7)	11 (12.1)	43 (47.3)	10 (11.0)	1 (1.1)	14 (15.3)	91 (100.0)

(Chi-Square = 108.86 Degrees of freedom = 24 Significance = 0.0000)

Number of Missing Observations = 15

Here, our a priori expectations are supported, since proportionately more locally headquartered plants receive this service locally, compared with firms in other headquarter locations. Thus, the result shows that the tendency to acquire the financial advice service locally is most pronounced in those plants with a headquarters in Devon and Cornwall. A differential result is thus produced. Again, then, the location of the headquarters plant seems a relevant factor, suggesting possibly that these business services are to some extent internalised.

The situation for the accounting service is shown in table 6.19. In this case, of those firms receiving this service locally, proportionately many are plants with a local headquarters. Thus, a differential

Table 6.19 Location of Accounting Service by Headquarters Location of Externally Owned Plants

Location of Service	Headquarters Location							
	PTWA	RD&C	RSW	L&SE	RUK	EEC	USA	Row Total
Devon & Cornwall	5 (11.8)	6 (14.3)	5 (11.8)	11 (26.2)	2 (4.8)	0 (0.0)	13 (31.1)	42 (45.2)
Rest of South-West	0 (0.0)	0 (0.0)	6 (75.0)	1 (12.5)	1 (12.5)	0 (0.0)	0 (0.0)	8 (8.6)
London & South-East	0 (0.0)	0 (0.0)	0 (0.0)	26 (89.7)	0 (0.0)	1 (3.4)	2 (6.9)	29 (31.2)
Rest of UK	0 (0.0)	2 (15.4)	0 (0.0)	3 (23.1)	8 (61.5)	0 (0.0)	0 (0.0)	13 (14.0)
Overseas	0 (0.0)	1 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (1.0)
Column Total	5 (5.4)	9 (9.7)	11 (11.8)	41 (44.1)	11 (11.8)	1 (1.1)	15 (16.1)	93 (100.0)

(Chi-Square = 117.27 Degrees of freedom = 24 Significance = 0.0000)

Number of Missing Observations = 13.

result is produced, with the local use of the accounting service more marked in the locally headquartered plants. Clearly, as the theory suggests, the location of the headquarters plant acts as a relevant discriminatory variable. In other words, differences in the service linkage of these externally owned plants seem to be further clarified by concentrating upon the location of the headquarters plant.

The next of the Group one services is the export service. As table 6.20 shows, although proportionately more of those plants acquiring this service locally are those with a local headquarters, we also find that a relatively large proportion of foreign headquartered

firms use a local service. This may reflect a relatively high degree of autonomy in decision making, with the on site manager preferring to make use of a local export service. Given this, it still remains that the tendency to use a local service is most marked in the locally headquartered firms, compared with other UK locations. As expected, then, a differential result is produced.

Table 6.20 Location of Export Service by Headquarters Location of Externally Owned Plants

Location of Service	Headquarters Location							
	PTWA	RD&C	RSW	L&SE	RUK	EEC	USA	Row Total
Devon & Cornwall	2 (6.1)	2 (6.1)	1 (3.0)	11 (33.3)	3 (9.1)	1 (3.0)	13 (39.4)	33 (42.3)
Rest of South-West	1 (10.0)	0 (0.0)	5 (50.0)	3 (30.0)	0 (0.0)	0 (0.0)	1 (10.0)	10 (12.8)
London & South-East	1 (4.3)	0 (0.0)	0 (0.0)	20 (87.0)	0 (0.0)	0 (0.0)	2 (8.7)	23 (29.5)
Rest of UK	0 (0.0)	1 (9.1)	1 (9.1)	3 (27.3)	6 (54.5)	0 (0.0)	0 (0.0)	11 (14.1)
Overseas	0 (0.0)	1 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (1.3)
Column Total	4 (5.1)	4 (5.1)	7 (9.0)	37 (47.4)	9 (11.5)	1 (1.3)	16 (20.6)	78 (100.0)

(Chi-Square = 87.41 Degrees of freedom = 24 Significance = 0.0000)

Number of Missing Observations = 28.

Finally, under the heading Group one services we consider public relations. In table 6.21 we find that the local use of a public relations service is most pronounced in the locally headquartered firms. Again, the location of the headquarters plant produces a differential result, and we conclude that it does help us further understand the differential pattern of linkage among these plants. Thus, our a priori

expectation that proportionately more locally headquartered firms would acquire this service in Devon and Cornwall, is supported.

Table 6.21 Location of Public Relations Service by Headquarters Location of Externally Owned Plants

Location of Service	Headquarters Location PTWA	RD&C	RSW	L&SE	RUK	EEC	USA	Row Total
Devon & Cornwall	3 (10.0)	5 (16.7)	1 (3.3)	10 (33.3)	3 (10.0)	1 (3.3)	7 (23.4)	30 (37.5)
Rest of South-West	2 (18.2)	0 (0.0)	6 (54.5)	2 (18.2)	0 (0.0)	0 (0.0)	1 (9.1)	11 (13.8)
London & South-East	0 (0.0)	1 (3.3)	2 (6.7)	22 (73.3)	0 (0.0)	0 (0.0)	5 (16.7)	30 (37.5)
Rest of UK	0 (0.0)	1 (12.5)	1 (12.5)	1 (12.5)	4 (50.0)	0 (0.0)	1 (12.5)	8 (10.0)
Overseas	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (100.0)	1 (1.2)
Column Total	5 (6.2)	7 (8.8)	10 (12.5)	35 (43.8)	7 (8.8)	1 (1.2)	15 (18.7)	80 (100.0)

(Chi-Square = 64.67 Degrees of freedom = 24 Significance = 0.0000)

Number of Missing Observations = 26.

As far as the Group one services are concerned, the location of the headquarters plant is clearly a relevant factor in influencing the differential pattern of business service linkage in these externally owned plants. In each case a differential result is produced. Thus, we find that, as expected, the tendency to use these services locally is more pronounced in the plants with a local headquarters. In short, we conclude that the location of the headquarters firm does help further our understanding of these service linkage patterns. Clearly, such a situation possibly suggests the internalisation of services within the corporate organisation, and this we consider in

the next section.

An examination of the Group two service produces a similar result to the above. That is, proportionately more locally headquartered firms acquire R and D in Devon and Cornwall. This is clearly shown in table 6.22. Thus, our a priori expectation that the tendency to buy

Table 6.22 Location of R and D Service by Headquarters Location of Externally Owned Plants

Location of Service	Headquarters Location							
	PTWA	RD&C	RSW	L&SE	RUK	EEC	USA	Row Total
Devon & Cornwall	5 (13.5)	3 (8.1)	3 (8.1)	19 (51.4)	1 (2.7)	1 (2.7)	5 (13.5)	37 (42.5)
Rest of South-West	0 (0.0)	0 (0.0)	4 (80.0)	1 (20.0)	0 (0.0)	0 (0.0)	0 (0.0)	5 (5.7)
London & South-East	0 (0.0)	1 (4.8)	0 (0.0)	18 (85.6)	1 (4.8)	0 (0.0)	1 (4.8)	21 (24.2)
Rest of UK	0 (0.0)	1 (7.6)	4 (30.8)	2 (15.4)	4 (30.8)	0 (0.0)	2 (15.4)	13 (14.9)
Overseas	0 (0.0)	1 (9.1)	0 (0.0)	1 (9.1)	0 (0.0)	0 (0.0)	9 (81.8)	11 (12.7)
Column Total	5 (5.7)	6 (6.9)	11 (12.6)	41 (47.2)	6 (6.9)	1 (1.1)	17 (19.6)	87 (100.0)

(Chi-Square = 87.32 Degrees of freedom = 24 Significance = 0.0000)

Number of Missing Observations = 19.

in R and D in the local area would be most marked in the locally headquartered plants holds here. In effect, the location of the headquarters firm proves to be a relevant discriminatory factor, and helps further identify the differential nature of the R and D service linkage in these plants.

For both the Group one and Group two services, then, the location of the headquarters plant, ceteris paribus, seems a relevant discrimin-

atory factor. It would appear to be this, rather than the age of plant, which goes further in helping our understanding of the differential nature of business service linkage in these externally owned plants. Thus, location of the headquarters plant produces differential results. In sum, the variability in the pattern of service linkage in these firms is understood more by focusing upon the location of the headquarters plant, than it is by concentrating on age of plant.

Thus, it may be argued that establishment ownership, ceteris paribus, is a relevant factor in identifying variations in the pattern of business service linkage. That is, it produces a clear cut variation in the pattern of locational emphasis in business service supply. In essence, we find that proportionately more independent than externally owned plants use a local service supplier. The tendency is, therefore, for the non independent plants to acquire their services over a greater distance. A differential result is thus produced, and this confirms our a priori expectations regarding ownership status. Further, it has been shown that the differential pattern of linkage in the externally owned plants is related to a variability in the location of the headquarters plant, and to an extent to variations in the length of time the plant has been in Devon and Cornwall. This clearly contrasts with the findings for material linkage, where neither of the above factors proved relevant. Given the above, we now consider whether other characteristics of the business establishment are relevant. For example, and with respect to externally owned plants, the degree of managerial autonomy in decision making.

6.4.3 Managerial Autonomy in Decision Making

Here, we consider the extent to which variation in managerial decision making freedom is associated with differences in the location

from which business services are drawn, and in the degree to which they are supplied by the corporate group. In the above, we only tested for an organisational effect implicitly via the location of the headquarters plant. Below, attention is focused explicitly upon the internalisation of services in these externally owned plants. Of interest, is whether the level of autonomy helps us further understand the differential nature of these business service linkage patterns. That is, does the tendency to use a local service differ by degree of managerial freedom? and does the tendency to be serviced from the corporate organisation vary by the level of autonomy? A priori, we expect those plants with a relatively low degree of autonomy to be the ones where the buying in of services from outside the local area and from the plant's own organisation, is most marked. In other words, proportionately more high autonomy firms will acquire their services locally, since it is believed that the lower the dependency and control from other sites in the overall enterprise, the more likely the on site manager is to seek local suppliers. Thus, we examine the way in which differences in the level of decision making freedom are related to the pattern of service linkages, in terms of the distance and organisational effects.

In the following, we focus upon two key aspects of the decision making sphere: namely, the R and D and purchasing decisions. As far as the former is concerned, we are interested in the extent to which differences in autonomy are related to the local or non local use of the R and D facility; and, the degree to which the R and D is internally supplied. As regards the purchasing decision, attention is focused upon the relationship between levels of autonomy in this area and the location of the Group one services used; plus, the degree to which internalisation exists. Thus, our Group two service, R and D, is

considered in relation to the R and D decision; whilst, the Group one services are discussed with regard to levels of autonomy in the purchasing decision. Does the level of autonomy, then, act as a relevant discriminatory factor?

6.4.3.1 The level of Autonomy in the R and D Decision

Here, we expect to find that proportionately more low (decision taken outside Devon and Cornwall) autonomy than high (decision taken in the local area) autonomy firms acquire their R and D from outside the local economy. In table 6.23 we find that, of those plants who are

Table 6.23 Low Autonomy in the R and D Decision by Location of R and D Service in Externally Owned Plants

Location of R and D Decision	Location of Service: Devon & Cornwall	Rest of South-West	London & South-East	Rest of UK	Overseas	Row Total
Rest of South-West	0 (0.0)	2 (66.7)	0 (0.0)	1 (33.3)	0 (0.0)	3 (6.4)
London & South-East	2 (18.2)	0 (0.0)	9 (81.8)	0 (0.0)	0 (0.0)	11 (23.4)
Rest of UK	0 (0.0)	0 (0.0)	0 (0.0)	4 (100.0)	0 (0.0)	4 (8.5)
Overseas	1 (10.0)	0 (0.0)	0 (0.0)	0 (0.0)	9 (90.0)	10 (21.3)
More than one site	6 (31.7)	2 (10.5)	7 (36.8)	2 (10.5)	2 (10.5)	19 (40.4)
Column Total	9 (19.1)	4 (8.5)	16 (34.0)	7 (14.9)	11 (23.5)	47 (100.0)

(Chi-Square = 78.67 Degrees of freedom = 16 Significance = 0.0000)

Number of Missing Observations = 8.

not free to take the R and D decision locally, over 70 per cent receive their service from outside the South-West region. That is, only

20 per cent of low autonomy plants acquire R and D locally. This suggests in house usage or that those that do are instructed to buy from other plants located in Devon and Cornwall. Further, we know from the above that 38 externally owned plants buy R and D locally. Of these, 24 per cent are low autonomy firms. Thus, relatively few low autonomy plants undertake R and D locally; whilst, proportionately few of those that do acquire R and D locally are low autonomy plants. Clearly, for the large majority of firms, where managerial freedom does not exist, the R and D facility is acquired from outside the local area.

As table 6.24 shows, of those firms with decision making freedom, some 70 per cent receive their R and D service locally. Thus, our a priori suggestion that the local use of this service is more marked in those plants with relatively high autonomy clearly holds. A differential result is thus produced. Those high autonomy plants who do not seek

Table 6.24 High Autonomy in the R and D Decision by Location of R and D Service in Externally Owned Plants

Location of R and D Decision	Location of Service: Devon & Cornwall	Rest of South-West	London & South-East	Rest of UK	Row Total
On site	26 (70.3)	1 (2.7)	5 (13.5)	5 (13.5)	37 (92.5)
Rest of Devon and Cornwall	2 (66.7)	0 (0.0)	0 (0.0)	1 (33.3)	3 (7.5)
Column Total	28 (70.0)	1 (2.5)	5 (12.5)	6 (15.0)	40 (100.0)

(Chi-Square = 1.21 Degrees of freedom = 3 Significance = 0.7486)

Number of Missing Observations = 11.

a local service, may be ones requiring specialist information or

advice which is not available locally. Here, then, we find that proportionately many high autonomy firms acquire R and D locally. Further, of those plants buying R and D in the local economy, 76 per cent are plants where decision making freedom exists. In sum, the tendency to acquire R and D locally is most marked in the high autonomy firms. In other words, the greater the managerial freedom in the R and D decision, the shorter is the distance over which the majority of firms receive the R and D service. This confirms our a priori expectations, and Marshall's (1979) conclusions in the Northern region. Thus, with regard to the distance effect, level of autonomy produces a differential result and, in this sense, is a relevant factor.

Given this, we now seek to establish whether or not variations in the level of autonomy influences the extent to which the R and D service is internalised in these plants. That is, we examine the organisational effect. As mentioned above, it has been found that externally owned plants tend to utilise their own group for the provision of business services (Crum and Gudgin, 1977). Here, we are interested in whether the tendency to receive services from the plant's own organisation, is related to differences in the level of decision making freedom. A priori, we would expect the low autonomy plants to be the ones most likely to acquire their R and D from the corporate group. In effect, the non local use of R and D may reflect the fact that firms tend to use their own organisation.

In this study, there are 49 externally owned plants who receive over 50 per cent of their R and D service from their own group. Of these, 76 per cent are firms where the freedom to take the R and D decision does not exist. Clearly, proportionately many of those plants who are supplied from the same organisation, are low autonomy firms. Further, a consideration of the low autonomy firms, in table 6.25,

shows that 78 per cent receive a substantial amount of R and D from their own corporate group. Thus, the tendency to receive over one half of the R and D service from the plant's own organisation is most marked in the low autonomy firms. Moreover, the result confirms our a priori

Table 6.25 Low Autonomy in the R and D Decision by the Proportion of R and D Service from Own Organisation

Location of R and D Decision	Proportion From Own Organisation 50% Plus	Less than 50%	Row Total
Rest of South-West	3 (100.0)	0 (0.0)	3 (6.4)
London & South-East	8 (72.7)	3 (27.3)	11 (23.4)
Rest of UK	3 (75.0)	1 (25.0)	4 (8.5)
Overseas	8 (80.0)	2 (20.0)	10 (21.3)
More than one site	15 (78.9)	4 (21.1)	19 (40.4)
Column Total	37 (78.7)	10 (21.3)	47 (100.0)

(Chi-Square = 1.09 Degrees of freedom = 4 Significance = 0.8958)

Number of Missing Observations = 8.

expectations that corporate supply is more pronounced in plants without decision making control.

For those firms where decision making freedom does exist, 27 per cent receive a substantial amount of R and D from their own group. Clearly, proportionately fewer higher than low autonomy firms are serviced internally. Thus, the greater the autonomy, the less marked is the tendency to acquire R and D from the corporate organisation. In short, with respect to the R and D service level of autonomy produces a differential result.

To sum up, we find that slightly more than 50 per cent of the externally owned plants admit to receiving over one half of their R and D service from their own organisation. Internalisation, then, is a relatively strong feature in relation to this service. Further, proportionately many of those plants utilising group suppliers are low autonomy ones. Those firms with decision making freedom, on the other hand, tend to acquire R and D locally, and be serviced from the corporate organisation to a markedly lower extent. Thus, the tendency to be supplied internally does vary by degree of autonomy. A differential result is thus produced. As expected, then, the differential R and D linkage pattern is further understood by focusing upon the level of decision making freedom. Variations in the level of autonomy do seem to be relevant for both the distance and organisational effects. That is, the higher the autonomy the more marked is the tendency to acquire R and D locally; whilst, the tendency to receive R and D over a greater distance, and from the corporate group, is most likely in the low autonomy plants. Thus, level of autonomy in the R and D decision, ceteris paribus, seems a relevant discriminator factor.

6.4.3.2 The Level of Autonomy in the Purchasing Decision

We now consider whether the level of autonomy in the purchasing decision is related to patterns of business service linkage. A priori, we expect the tendency for the Group one services to be acquired locally, to be most marked in those firms where freedom to take the purchasing decision exists. In other words, we expect proportionately more low autonomy firms to buy in their services from outside the local area, and from other plants in the same organisation. Is it the case, then, that the local use of these services and relatively little internalisation is most typical in the high autonomy plants? We discuss

Table 6.26 Low Autonomy in the Purchasing Decision by Location of Computing Service in Externally Owned Plants

Location of Purchasing Decision	Location of Service: Devon & Cornwall	Rest of South-West	London & South-East	Rest of UK	Overseas	Row Total
Rest of South-West	0 (0.0)	1 (33.3)	0 (0.0)	1 (33.3)	1 (33.3)	3 (14.3)
London & South-East	0 (0.0)	1 (33.3)	2 (66.7)	0 (0.0)	0 (0.0)	3 (14.3)
Overseas	1 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (4.8)
More than one site	2 (14.3)	1 (7.1)	7 (50.0)	4 (28.6)	0 (0.0)	14 (66.6)
Column Total	3 (14.2)	3 (14.2)	9 (42.9)	5 (23.9)	1 (4.8)	21 (100.0)

(Chi-Square = 17.64 Degrees of freedom = 12 Significance = 0.1269)

Number of Missing Observations = 6

this relationship between level of autonomy and **Group one service linkage**, first in relation to the distance effect.

As table 6.26 shows, relatively many low autonomy firms (85 per cent) receive their computing service from outside the local area. Clearly, we associate low autonomy in the purchasing decision with the use of a non local computing service. Further, of the 34 firms who acquire a computing service locally, 9 per cent are low autonomy plants. Thus, where a site freedom does not exist, the greater is the distance over which the computing service is drawn.

The situation for the high autonomy firms is shown in table 6.27. Here, proportionately many of those firms with a high degree of autonomy acquire the computing service locally. Clearly, level of autonomy produces a differential result, in the sense that proportionately more low autonomy plants receive this service from outside the local area;

Table 6.27 High Autonomy in the Purchasing Decision by Location of Computing Service in Externally Owned Plants

Location of Purchasing Decision	Location of Service: Devon & Cornwall	Rest of South-West	London & South-East	Rest of UK	Row Total
On site	29 (52.7)	6 (10.9)	13 (23.7)	7 (12.7)	55 (96.5)
Rest of Devon & Cornwall	2 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	2 (3.5)
Column Total	31 (54.4)	6 (10.5)	13 (22.8)	7 (12.3)	57 (100.0)

(Chi-Square = 1.73 Degrees of freedom = 3 Significance = 0.6284)

Number of Missing Observations = 22

whilst, a large majority of those plants using a local computing service are high autonomy firms. The local use of this service, therefore, is most pronounced in those plants where freedom to take the purchasing decision exists. Thus, the level of autonomy is a relevant discriminatory factor.

Next, we consider the legal service. As table 6.28 shows, relatively few (24 per cent) low autonomy plants acquire a legal service in Devon and Cornwall. Those that do, may be firms who are instructed to use a local supplier or are serviced from other plants in the same group located in Devon and Cornwall. Again, proportionately many low autonomy plants do not establish local links. Further, of those plants who do acquire the legal service locally, 14 per cent are ones without decision making freedom. Thus, as we expected, the local use of this Group one service is not typical in the low autonomy plants.

When we consider the pattern of linkage in the high autonomy plants, it is observed that twice as many of these acquire their legal services

Table 6.28 Low Autonomy in the Purchasing Decision by Location of Legal Service in Externally Owned Plants

Location of Purchasing Decision	Location of Service: Devon & Cornwall	Rest of South-West	London & South-East	Rest of UK	Row Total
Rest of South-West	0 (0.0)	2 (66.7)	1 (33.3)	0 (0.0)	3 (12.0)
London & South-East	0 (0.0)	0 (0.0)	4 (80.0)	1 (20.0)	5 (20.0)
Rest of UK	0 (0.0)	0 (0.0)	1 (100.0)	0 (0.0)	1 (4.0)
Overseas	1 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (4.0)
More than one site	5 (33.3)	1 (6.7)	6 (40.0)	3 (20.0)	15 (60.0)
Column Total	6 (24.0)	3 (12.0)	12 (48.0)	4 (16.0)	25 (100.0)

(Chi-Square = 17.22 Degrees of freedom = 12 Significance = 0.1414)

Number of Missing Observations = 2.

from the local area, compared with those firms with a low degree of freedom. Clearly, a differential result is produced. Thus, in table 6.29 we find a marked difference in the tendency to buy locally by level of decision making freedom. In this case, however, the majority of high autonomy plants do not use a local service, with a relatively high proportion utilising the London and South-East location. This reflects, perhaps, the fact that even where decision making freedom exists, some managers decide to acquire this service from their own group. Thus, differences in the level of managerial freedom result in differential linkage patterns; and, therefore, confirm our a priori expectations.

Next, we examine the financial advice service. Table 6.30 shows

Table 6.29 High Autonomy in the Purchasing Decision by Location of Legal Service in Externally Owned Plants

Location of Purchasing Decision	Location of Service: Devon & Cornwall	Rest of South-West	London & South-East	Rest of UK	Overseas	Row Total
On site	34 (46.6)	1 (1.4)	31 (42.5)	6 (8.1)	1 (1.4)	73 (96.1)
Rest of Devon & Cornwall	3 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	3 (3.9)
Column Total	37 (48.7)	1 (1.3)	31 (40.8)	6 (7.9)	1 (1.3)	76 (100.0)

(Chi-Square = 3.29 Degrees of freedom = 4 Significance = 0.5102)

Number of Missing Observations = 3.

Table 6.30 Low Autonomy in the Purchasing Decision by Location of Purchasing Decision by Location of Financial Advice Service in Externally Owned Plants

Location of Purchasing Decision	Location of Service: Devon & Cornwall	Rest of South-West	London & South-East	Rest of UK	Row Total
Rest of South-West	0 (0.0)	2 (100.0)	0 (0.0)	0 (0.0)	2 (8.7)
London & South-East	0 (0.0)	0 (0.0)	5 (100.0)	0 (0.0)	5 (21.8)
Rest of UK	0 (0.0)	0 (0.0)	0 (0.0)	1 (100.0)	1 (4.3)
Overseas	1 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (4.3)
More than one site	3 (21.4)	3 (21.4)	6 (42.9)	2 (14.3)	14 (60.9)
Column Total	4 (17.4)	5 (21.7)	11 (47.8)	3 (13.1)	23 (100.0)

(Chi-Square = 24.29 Degrees of freedom = 12 Significance = 0.0186)

Number of Missing Observations = 4.

that proportionately few low autonomy plants (17 per cent) receive this service locally. Most, would seem to be acquiring such advice from the location in which the purchasing decision is taken. Further, of those firms who admit to receiving financial advice in Devon and Cornwall, 10 per cent are low autonomy firms. Thus, where freedom to take the purchasing decision does not exist, the tendency to receive the financial advice service locally is not marked.

In table 6.31 we find that relatively many high autonomy establishments acquire local financial advice. Thus, proportionately more

Table 6.31 High Autonomy in the Purchasing Decision by Location of Financial Advice Service in Externally Owned Plants

Location of Purchasing Decision	Location of Service: Devon & Cornwall	Rest of South-West	London & South-East	Rest of UK	Overseas	Row Total
On site	33 (50.0)	4 (6.1)	22 (33.3)	6 (9.1)	1 (1.5)	66 (97.1)
Rest of Devon & Cornwall	2 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	2 (2.9)
Column Total	35 (51.5)	4 (5.9)	22 (32.4)	6 (8.8)	1 (1.4)	68 (100.0)

(Chi-Square = 1.94 Degrees of freedom = 4 Significance = 0.7463)

Number of Missing Observations = 11.

high than low autonomy firms acquire this Group one service from Devon and Cornwall. Again, level of autonomy in the purchasing decision produces a differential result, in the sense that proportionately more high than low autonomy establishments acquire local financial advice. Moreover, it supports our a priori expectations and helps further our understanding of the differential nature of the service linkage pattern.

As far as the accounting service is concerned, as expected, we find proportionately few low autonomy firms acquiring this service locally. This is shown in table 6.32. Clearly, where decision making

Table 6.32 Low Autonomy in the Purchasing Decision by Location of Accounting Service in Externally Owned Plants

Location of Purchasing Decision	Location of Service: Devon & Cornwall	Rest of South-West	London & South-East	Rest of UK	Row Total
Rest of South-West	0 (0.0)	2 (100.0)	0 (0.0)	0 (0.0)	2 (8.7)
London & South-East	1 (20.0)	0 (0.0)	4 (80.0)	0 (0.0)	5 (21.8)
Rest of UK	0 (0.0)	0 (0.0)	0 (0.0)	1 (100.0)	1 (4.3)
Overseas	1 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (4.3)
More than one site	3 (21.4	2 (14.3)	6 (42.9)	3 (21.4)	14 (60.9)
Column Total	5 (21.7)	4 (17.4)	10 (43.5)	4 (17.4)	23 (100.0)

(Chi-Square = 21.34 Degrees of freedom = 12 Significance = 0.0456)

Number of Missing Observations = 4.

freedom does not exist many plants draw this Group one business service from outside Devon and Cornwall. Further, of those establishments who use local accounting firms, only 12 per cent are low autonomy plants. A comparison with the high autonomy plants in table 6.33 shows that proportionately many of those (54 per cent) acquire the accounting service in the local area. Further, 84 per cent of those firms using local accountants are high autonomy ones. Clearly, then, a differential result is produced, with proportionately more firms with decision making

freedom using a local service, compared with those where such freedom does not exist. In sum, the greater the local autonomy in decision making the more likely are firms to receive their accounting service from Devon and Cornwall. Variability in the level of decision making freedom would again appear to be a relevant discriminatory factor.

Next, under the heading Group one service, we consider the export service. As above, proportionately few low autonomy plants make use of a local supplier, as table 6.34 shows. Instead, relatively many firms are serviced from the London and South-East location, reflecting the fact that this is the dominant headquarters location. Thus, where

Table 6.33 High Autonomy in the Purchasing Decision by Location of Accounting Service in Externally Owned Plants

Location of Purchasing Decision	Location of Service: Devon & Cornwall	Rest of South-West	London & South-East	Rest of UK	Overseas	Row Total
On site	35 (52.2)	4 (6.0)	19 (28.4)	8 (11.9)	1 (1.5)	67 (95.7)
Rest of Devon & Cornwall	3 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	3 (4.3)
Column Total	38 (54.4)	4 (5.7)	19 (27.1)	8 (11.4)	1 (1.4)	70 (100.0)

(Chi-Square = 2.63 Degrees of freedom = 4 Significance = 0.6199)
Number of Missing Observations = 9.

decision making freedom does not exist in local plants, the tendency is for the export service to be drawn from outside the local area. Moreover, of the firms using a local service, 12 per cent are low autonomy plants. In short, proportionately few (22 per cent) low autonomy firms establish local contacts for this service.

For the high autonomy firms, although twice as many receive an export service locally compared with the low autonomy plants, the

Table 6.34 Low Autonomy in the Purchasing Decision by Location of Export Service in Externally Owned Plants

Location of Purchasing Decision	Location of Service: Devon & Cornwall	Rest of South-West	London & South-East	Rest of UK	Row Total
Rest of South-West	0 (0.0)	2 (66.7)	0 (0.0)	1 (33.3)	3 (16.7)
London & South-East	1 (25.0)	0 (0.0)	3 (75.0)	0 (0.0)	4 (22.1)
Rest of UK	0 (0.0)	0 (0.0)	0 (0.0)	1 (100.0)	1 (5.6)
Overseas	1 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (5.6)
More than one site	2 (22.2)	2 (22.2)	4 (44.4)	1 (11.2)	9 (50.0)
Column Total	4 (22.2)	4 (22.2)	7 (38.9)	3 (16.7)	18 (100.0)

(Chi-Square = 16.64 Degrees of freedom = 12 Significance = 0.1633)

Number of Missing Observations = 9.

Table 6.35 High Autonomy in the Purchasing Decision by Location of Export Service in Externally Owned Plants

Location of Purchasing Decision	Location of Service: Devon & Cornwall	Rest of South-West	London & South-East	Rest of UK	Overseas	Row Total
On site	28 (47.5)	6 (10.2)	16 (27.0)	8 (13.6)	1 (1.7)	59 (98.3)
Rest of Devon & Cornwall	1 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (1.7)
Column Total	29 (48.3)	6 (10.0)	16 (26.7)	8 (13.3)	1 (1.7)	60 (100.0)

(Chi-Square = 1.08 Degrees of freedom = 4 Significance = 0.8963)

Number of Missing Observations = 19.

majority are not supplied from within Devon and Cornwall. Even so, the tendency to acquire this service locally is more marked in those plants with decision making freedom, as is seen in table 6.35. Further, proportionately many (88 per cent) of all those firms using a local service are high autonomy plants. A differential result is thus produced. As expected, the level of autonomy is, then, a relevant factor in identifying differences in the export service linkage pattern. In sum, the greater the distance over which the purchasing decision is taken, the less likely are local plants to receive this Group one service from Devon and Cornwall.

Finally, as part of the Group one services, we consider public relations. As can be seen in table 6.36, proportionately few low autonomy firms acquire a local public relations service; whilst, this

Table 6.36 Low Autonomy in the Purchasing Decision by Location of Public Relations Service in Externally Owned Plants

Location of Purchasing Decision	Location of Service: Devon & Cornwall	Rest of South-West	London & South-East	Rest of UK	Row Total
Rest of South-West	0 (0.0)	2 (66.7)	0 (0.0)	1 (33.3)	3 (12.5)
London & South-East	1 (20.0)	0 (0.0)	4 (80.0)	0 (0.0)	5 (20.8)
Rest of UK	0 (0.0)	0 (0.0)	0 (0.0)	1 (100.0)	1 (4.2)
Overseas	1 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (4.2)
More than one site	3 (21.4)	3 (21.4)	6 (42.9)	2 (14.3)	14 (58.3)
Column Total	5 (20.8)	5 (20.8)	10 (41.7)	4 (16.7)	24 (100.0)

(Chi-Square = 17.89 Degrees of freedom = 12 Significance = 0.1189)

Number of Missing Observations = 3.

category of firm represents 16 per cent of those that do acquire this service locally. Again, a relatively low degree of autonomy is associated with the use of a service over a greater distance. That is, proportionately many firms are supplied from outside the local area. Thus, our a priori expectations concerning the pattern of service linkage in these low autonomy plants, is supported.

The situation for the high autonomy firms is shown in table 6.37. Here, although the majority of firms do not use a local supplier, proportionately more high than low autonomy plants do receive the public relations service from the local area. A differential result is again produced, with local linkage being more marked in those firms where decision making freedom exists. Moreover, 84 per cent of all firms

Table 6.37 High Autonomy in the Purchasing Decision by Location of Public Relations Service in Externally Owned Plants

Location of Purchasing Decision	Location of Service: Devon & Cornwall	Rest of South-West	London & South-East	Rest of UK	Overseas	Row Total
On site	25 (46.3)	6 (11.1)	18 (33.3)	4 (7.4)	1 (1.9)	54 (96.4)
Rest of Devon & Cornwall	0 (0.0)	0 (0.0)	2 (100.0)	0 (0.0)	0 (0.0)	2 (3.6)
Column Total	25 (44.6)	6 (10.7)	20 (35.7)	4 (7.1)	1 (1.9)	56 (100.0)

(Chi-Square = 3.73 Degrees of freedom = 4 Significance = 0.4433)

Number of Missing Observations = 23.

acquiring this service in Devon and Cornwall are high autonomy plants. We thus conclude that the degree of autonomy seems a relevant discriminatory factor in helping further understand the differential nature of the linkage pattern in relation to this Group one service.

The above has illustrated the relationship between the level of managerial autonomy in the purchasing decision and the location of the Group one service used. We find that level of autonomy does produce a differential result, with proportionately more high than low autonomy plants acquiring these services locally. Clearly, then, where decision making freedom does not exist in these local plants, the tendency is for services to be supplied over a greater distance. Further, proportionately many of those firms receiving a service from the local area are high autonomy plants. Thus, for these Group one services, our a priori expectations, that the local use of business services would be most marked in the plants where freedom to take the purchasing decision exists, are supported by the evidence. In sum, the higher the level of decision making autonomy the more likely are these externally owned plants to make use of local business services. In other words, as decision making freedom is reduced, the tendency to import services from outside Devon and Cornwall is more marked. In relation to the distance effect, then, level of autonomy is a relevant discriminatory factor, ceteris paribus.

Given this, we next consider the organisational effect, so as to establish whether the internalisation of these business services is influenced by differing levels of decision making freedom. That is, do we find a marked difference in the degree to which firms are supplied by other plants in the corporate, by variability in the level of autonomy? A priori, we expect the internalisation of these services to be most pronounced in the low autonomy plants, since, it is believed, that where decision making freedom exists the more likely are plants to seek independent local suppliers. In other words, where on site freedom does not exist, the more probable it is that the corporate headquarters can keep the service activities under control;

hence, business services are supplied from within the corporate group. Do we find the internalisation of these Group one services to be more pronounced in the low autonomy plants?

As table 6.38 shows, of the 22 plants who do not take the purchasing decision locally, 72 per cent receive over one half of their Group one

Table 6.38 Low Autonomy in the Purchasing Decision by the Proportion of Group One Services From Own Organisation

	Proportion of Group one Services		
Location of Purchasing Decision	50% Plus	Less than 50%	Row Total
Rest of South-West	3 (100.0)	0 (0.0)	3 (13.6)
London & South-East	4 (100.0)	0 (0.0)	4 (18.2)
Rest of UK	0 (0.0)	1 (100.0)	1 (4.5)
Overseas	0 (0.0)	1 (100.0)	1 (4.5)
More than one site	9 (69.2)	4 (30.8)	13 (59.2)
Column Total	16 (72.7)	6 (27.3)	22 (100.0)

(Chi-Square = 8.03 Degrees of freedom = 4 Significance = 0.0902)

Number of Missing Observations = 5.

business services from their own organisation. Clearly, internalisation is a relatively strong feature in these low autonomy plants. Thus, the comparatively weak local integration in these plants where decision making freedom does not exist, clearly reflects the fact that proportionately many receive a substantial amount of their services from plants in the same group, located outside of Devon and Cornwall.

The majority of high autonomy plants receive over 50 per cent of

their business services from their own organisation, as table 6.39 shows. Here, even where decision making freedom exists, some managers choose to acquire these specialist services from their own group; thus, reinforcing the view that externally owned plants tend to utilise their own organisation for business services. However, we do find that proportionately more low autonomy than high autonomy plants receive a substantial amount from the same group. In this sense, then, level of autonomy does produce a differential result. In short, we find internalisation to be relatively strong, with it being more pronounced in those plants where decision making freedom does not exist. Thus, in relation to the internalisation of Group one services, level of autonomy, ceteris paribus, seems a relevant discriminatory factor.

Table 6.39 High Autonomy in the Purchasing Decision by the Proportion of Group one Services from Own Organisation

	Proportion of Group One Services		
Location of Purchasing Decision	50% Plus	Less than 50%	Row Total
On site	33 (50.0)	33 (50.0)	66 (97.1)
Rest of Devon & Cornwall	2 (100.0)	0 (0.0)	2 (2.9)
Column Total	35 (51.5)	33 (48.5)	68 (100.0)

(Chi-Square = 1.94 Degrees of freedom = 1 Significance = 0.1634)

Number of Missing Observations = 11.

In the above, we have found that the level of autonomy, with respect to the R and D and purchasing decisions, is a relevant discriminatory factor for both the distance and organisational effects. That is, variations in the degree to which decision making freedom

exists, helps us to further understand the differential nature of the Group one and two service linkage patterns. Thus, proportionately more low than high autonomy firms receive their Group one and two services over a greater distance; and from their own organisation. The high autonomy firms, on the other hand, are characterised by more local contact and the tendency to be internally supplied is less pronounced. In essence, differences in the level of autonomy in these externally owned plants produces marked variations in the extent to which plants are locally supplied, and serviced from the same group. As expected, then, the level of autonomy produces a differential result.

Thus far, we have seen that the local use of business services is most pronounced in independent firms, and in those externally owned plants where decision making freedom exists. Conversely, non local linkage is more typical in externally headquartered plants, and where there are low levels of autonomy. Given this, we now examine the relationship between size of firm and service linkages, so as to establish whether this variable produces a differential result.

6.5 SIZE OF FIRM AND BUSINESS SERVICE LINKAGES IN DEVON AND CORNWALL

The relevance or not of firm size as a discriminatory influence is considered in relation to the distance and organisational effects. We seek to establish whether differences in the size of firm produce marked variations in the tendency for plants to be supplied locally, and receive Group one and two services from their own organisation. As regards the distance effect, we expect a local orientation to be more marked in the smaller plants (Marshall, 1979), since the relatively small size may prevent the setting up of separate service divisions. Thus, the larger the firm the more likely it is to use its

own services, since via economies of scale and the division of labour, it may have its own relevant service departments. That is, the internalisation of these services may be more marked in the larger plants which are more likely to have their own group divisions. In essence, then, we expect proportionately more of the larger plants to receive their services from the same group, and acquire their service requirements over a greater distance, compared with the smaller firms.

The above, however, ignores the possibility of wrong association in this case. This we considered in relation to material linkages in the previous chapter and to clarify the point it is worth briefly restating the argument. The existence of an apparent relationship between size of firm and business service linkages may, instead, reflect an association between ownership status and services. This possibility arises, since, as was illustrated in table 4.1, the larger plants tend to be externally owned. In other words, the tendency for larger plants to acquire services over a greater distance may simply reflect their being externally owned firms. Thus, in an attempt to establish whether or not size of firm is an independent influence, we test for a relationship between firm size and service linkages in externally owned plants alone. If when doing this we find that size of firm does produce a differential result, then we conclude that firm size is a relevant and independent factor. First of all, however, we consider size of firm and service linkages in all plants.

The situation regarding the distance effect, and the first of our Group one services, is shown in table 6.40. In this case, 61 per cent of the smaller firms receive their computing facility locally; whilst 59 per cent of the larger firms do so. A differential result is thus not produced. Size of firm, therefore, is not a relevant discriminatory factor here, since proportionately as many large and

small plants acquire the computing service locally. Thus, our a priori expectation does not hold, as the tendency to acquire this facility in Devon and Cornwall is equally as likely whether the plant be large or small.

Table 6.40 Location of Computing Service by Employment Size of Firm

Size of Firm	Computing Service From: Devon & Cornwall	Rest of South-West	London & South-East	Rest of UK	Overseas	Row Total
1 - 9	11 (73.3)	0 (0.0)	1 (6.7)	3 (20.0)	0 (0.0)	15 (11.2)
10 - 24	15 (55.6)	1 (3.7)	9 (33.3)	2 (7.4)	0 (0.0)	27 (20.1)
25 - 49	12 (60.0)	1 (5.0)	3 (15.0)	4 (20.0)	0 (0.0)	20 (14.9)
50 - 99	14 (56.0)	2 (8.0)	7 (28.0)	2 (8.0)	0 (0.0)	25 (18.7)
100 - 499	24 (60.0)	6 (15.0)	7 (17.5)	2 (5.0)	1 (2.5)	40 (29.9)
500 plus	5 (71.4)	1 (14.3)	0 (0.0)	1 (14.3)	0 (0.0)	7 (5.2)
Column Total	81 (60.4)	11 (8.3)	27 (20.2)	14 (10.4)	1 (0.7)	134 (100.0)

(Chi-Square = 18.73 Degrees of freedom = 20 Significance = 0.5388)

Number of Missing Observations = 232.

In table 6.41 we consider the relationship between size of firm and the source of the legal service. Here, there does exist a marked difference in the tendency to use a local supplier by size of firm. That is, 86 per cent of the smaller plants receive their legal service locally, compared with 58 per cent in the larger firms. Thus, the use of a local service is more marked in the smaller establishments. A

differential result is, therefore, produced. In sum, the larger the firm, the more likely are plants to acquire this service over a greater distance. Our expectation, then, that as size of firm increases the tendency to buy locally is reduced, holds for this service.

Table 6.41 Location of Legal Service by Employment Size of Firm

Size of Firm	Legal Service From: Devon & Cornwall	Rest of South-West	London & South-East	Rest of UK	Overseas	Row Total
1 - 9	94 (93.0)	1 (1.0)	1 (1.0)	5 (5.0)	0 (0.0)	101 (32.0)
10 - 24	65 (78.3)	1 (1.2)	13 (15.7)	4 (4.8)	0 (0.0)	83 (26.3)
25 - 49	28 (65.1)	4 (9.3)	7 (16.3)	4 (9.3)	0 (0.0)	43 (13.6)
50 - 99	21 (65.6)	0 (0.0)	9 (28.2)	1 (3.1)	1 (3.1)	32 (10.1)
100 - 499	29 (59.2)	2 (4.0)	16 (32.8)	2 (4.0)	0 (0.0)	49 (15.5)
500 plus	2 (25.0)	1 (12.5)	5 (62.5)	0 (0.0)	0 (0.0)	8 (2.5)
Column Total	239 (75.6)	9 (2.8)	51 (16.2)	16 (5.1)	1 (0.3)	316 (100.0)

(Chi-Square = 69.05 Degrees of freedom = 20 Significance = 0.0000)

Number of Missing Observations = 50.

An examination of the financial advice service, in table 6.42, reveals that proportionately more small (82 per cent) than large (59 per cent) plants acquire this service locally. As expected a differential result is produced. Again, size of firm, ceteris paribus, seems to be a relevant discriminatory factor, since variations in firm size are associated with differences in the extent to which firms are

serviced locally.

Table 6.42 Location of Financial Advice Service by Employment Size of Firm

Size of Firm	Financial Advice From: Devon & Cornwall	Rest of South-West	London & South-East	Rest of UK	Overseas	Row Total
1 - 9	60 (92.4)	3 (4.6)	1 (1.5)	1 (1.5)	0 (0.0)	65 (29.3)
10 - 24	37 (69.8)	2 (3.8)	10 (18.9)	4 (7.5)	0 (0.0)	53 (23.9)
25 - 49	19 (59.4)	0 (0.0)	9 (28.1)	4 (12.5)	0 (0.0)	32 (14.4)
50 - 99	14 (58.3)	1 (4.2)	6 (25.0)	2 (8.3)	1 (4.2)	24 (10.8)
100 - 499	25 (61.0)	3 (7.3)	12 (29.3)	1 (2.4)	0 (0.0)	41 (18.5)
500 plus	4 (57.1)	2 (28.6)	1 (14.3)	0 (0.0)	0 (0.0)	7 (3.1)
Column Total	159 (71.6)	11 (5.0)	39 (17.6)	12 (5.4)	1 (0.4)	222 (100.0)

(Chi-Square = 46.62 Degrees of freedom = 20 Significance = 0.0007)

Number of Missing Observations = 144.

The next of our Group one services is accounting. In table 6.43 we have support for our a priori expectations, since proportionately more small establishments (82 per cent) use a local accounting service, compared with the larger firms (64 per cent). Here, a relatively high proportion of larger firms acquire their accounting facility locally; although, this tendency is not as marked as in the smaller plants. Thus, as size of firm increases the degree of local contact is reduced. Firm size, ceteris paribus, is a relevant influence in this case.

As far as the export service is concerned, table 6.44 shows that

Table 6.43 Location of Accounting Service by Employment Size of Firm

Size of Firm	Accounting Service From: Devon & Cornwall	Rest of South-West	London & South-East	Rest of UK	Overseas	Row Total
1 - 9	108 (89.3)	4 (3.3)	4 (3.3)	5 (4.1)	0 (0.0)	121 (37.7)
10 - 24	65 (78.3)	2 (2.4)	13 (15.7)	3 (3.6)	0 (0.0)	83 (25.9)
25 - 49	29 (70.7)	0 (0.0)	5 (12.2)	7 (17.1)	0 (0.0)	41 (12.8)
50 - 99	20 (74.1)	2 (7.4)	4 (14.8)	1 (3.7)	0 (0.0)	27 (8.4)
100 - 499	23 (56.1)	2 (4.9)	13 (31.7)	2 (4.9)	1 (2.4)	41 (12.8)
500 plus	6 (75.0)	1 (12.5)	1 (12.5)	0 (0.0)	0 (0.0)	8 (2.4)
Column Total	251 (78.2)	11 (3.4)	40 (12.5)	18 (5.6)	1 (0.3)	321 (100.0)

(Chi-Square = 49.19 Degrees of freedom = 20 Significance = 0.0003)

Number of Missing Observations = 45.

proportionately more small than large firms acquire this service in Devon and Cornwall. Thus, as the theory suggests, the tendency to acquire this service locally is more marked in the smaller plants. Moreover, size of firm, ceteris paribus, acts as a relevant discriminatory factor. Finally, under the heading Group one services we examine the relationship between size of firm and the public relations service. This is shown in table 6.45. Here, a differential result is produced, in the sense that the tendency for firms to receive their public relations service locally is more pronounced in the smaller plants. Thus, as firm size increases the tendency to acquire the public relations service locally is reduced. As expected, size of firm,

ceteris paribus, helps further our understanding of the differential nature of the service linkage patterns in these plants.

Table 6.44 Location of Export Service by Employment Size of Firm

Size of Firm	Export Service From: Devon & Cornwall	Rest of South-West	London & South-East	Rest of UK	Overseas	Row Total
1 - 9	16 (55.3)	3 (10.3)	5 (17.2)	5 (17.2)	0 (0.0)	29 (18.6)
10 - 24	20 (50.0)	5 (12.5)	11 (27.5)	4 (10.0)	0 (0.0)	40 (25.6)
25 - 49	11 (45.8)	2 (8.4)	6 (25.0)	5 (20.8)	0 (0.0)	24 (15.4)
50 - 99	11 (55.0)	2 (10.0)	6 (30.0)	1 (5.0)	0 (0.0)	20 (12.8)
100 - 499	17 (44.7)	5 (13.2)	11 (28.9)	4 (10.5)	1 (2.7)	38 (24.4)
500 plus	3 (60.0)	1 (20.0)	1 (20.0)	0 (0.0)	0 (0.0)	5 (3.2)
Column Total	78 (50.0)	18 (11.5)	40 (25.6)	19 (12.3)	1 (0.6)	156 (100.0)

(Chi-Square = 9.48 Degrees of freedom = 20 Significance = 0.9766)

Number of Missing Observations = 210.

Thus, as far as the Group one services are concerned, our hypothesis regarding the relationship between source of service and size of firm holds. That is, with the exception of the computing service, differential results are produced with, as expected, proportionately more small than large plants acquiring their business services locally. In other words, the smaller the firm, the shorter is the distance over which services are supplied. Clearly, then, for these Group one services, size of firm, ceteris paribus, acts as a relevant discriminatory factor.

Table 6.45 Location of Public Relations Service by Employment Size of Firm

Size of Firm	Public Relations from: Devon & Cornwall	Rest of South-West	London & South-East	Rest of UK	Overseas	Row Total
1 - 9	29 (82.8)	1 (2.9)	4 (11.4)	1 (2.9)	0 (0.0)	35 (22.4)
10 - 24	17 (56.7)	1 (3.3)	9 (30.0)	3 (10.0)	0 (0.0)	30 (19.2)
25 - 49	14 (60.9)	1 (4.3)	4 (17.4)	4 (17.4)	0 (0.0)	23 (14.7)
50 - 99	13 (59.2)	0 (0.0)	7 (31.8)	1 (4.5)	1 (4.5)	22 (14.1)
100 - 499	18 (46.2)	7 (17.9)	12 (30.8)	2 (5.1)	0 (0.0)	39 (25.0)
500 plus	4 (57.1)	1 (14.3)	2 (28.6)	0 (0.0)	0 (0.0)	7 (4.6)
Column Total	95 (60.9)	11 (7.1)	38 (24.4)	11 (7.1)	1 (0.5)	156 (100.0)

(Chi-Square = 30.79 Degrees of freedom = 20 Significance = 0.0579)

Number of Missing Observations = 210.

We now consider the relationship between size of firm and the location of the Group two service, R and D. Is it the case that differences in the size of firm are associated with variations in the degree to which R and D is acquired locally? A priori, we expect the R and D of the larger plants to be carried out on a more centralised basis close to the corporate headquarters; whilst, the local use of this service is more marked in the smaller plants. As table 6.46 shows, proportionately more small (76 per cent) than large firms (50 per cent) acquire R and D in the local area. Size of firm thus produces a differential result. That is, as firm size increases the tendency to receive this service from other local plants is less

Table 6.46 Location of R and D Service by Employment Size of Firm

Size of Firm	R and D from: Devon & Cornwall	Rest of South-West	London & South-East	Rest of UK	Overseas	Row Total
1 - 9	27 (79.4)	0 (0.0)	3 (8.8)	4 (11.8)	0 (0.0)	34 (20.0)
10 - 24	30 (73.2)	0 (0.0)	8 (19.5)	3 (7.3)	0 (0.0)	41 (24.1)
25 - 49	16 (66.7)	0 (0.0)	3 (12.5)	4 (16.7)	1 (4.1)	24 (14.1)
50 - 99	12 (52.2)	1 (4.3)	5 (21.7)	3 (13.1)	2 (8.7)	23 (13.5)
100 - 499	16 (39.0)	3 (7.3)	8 (19.5)	6 (14.6)	8 (19.6)	41 (24.1)
500 plus	3 (42.8)	1 (14.3)	1 (14.3)	1 (14.3)	1 (14.3)	7 (4.2)
Column Total	104 (61.2)	5 (2.9)	28 (16.5)	21 (12.4)	12 (7.0)	170 (100.0)

(Chi-Square = 34.61 Degrees of freedom = 20 Significance = 0.0222)

Number of Missing Observations = 196.

pronounced. Clearly, then, with regard to the distance over which the R and D service is supplied, size of firm, ceteris paribus, seems a relevant discriminatory factor.

The above has considered the relationship between size of firm and business service linkage patterns in terms of the distance over which firms receive their Group one and two services. We find that size of firm produces a differential result, in the sense that proportionately more small than large plants acquire these services locally. Thus, as our hypothesis suggests, as firm size increases the tendency to use a local service supplier is reduced. In short, size of firm, ceteris paribus, seems a relevant factor in helping further understand

the differential nature of these service linkage patterns. However, we do not know whether size of firm acts as an independent influence, since as we mentioned above, the relationship between firm size and service linkage may reflect an association between establishment ownership and business services, as described earlier. Thus, the fact that relatively fewer larger plants are locally linked may reflect their being externally owned concerns. Clearly, if when controlling for ownership status differential results are produced, then size of firm may be seen as an independent influence. We consider this below.

6.5.1 Size of Firm and Business Service Linkages in Externally Owned Plants

6.5.2 The Distance Effect

As far as the Group one services are concerned, we find that proportionately more large than small externally owned plants acquire such services locally. A differential result is thus produced, and it suggests that through economies of scale services are supplied locally in larger firms via corporate and divisional office plants. The smaller firms, on the other hand, seem to rely more on the larger corporate plants located elsewhere to provide these necessary services, especially if the local plant is in the early stages of its development. Here, then, size of firm acts as a relevant and independent influence.

With regard to the location of the R and D service in these externally owned plants, size of firm does not produce a differential result. That is, the tendency to acquire R and D locally is as marked whatever size of firm is considered. Thus, in this case, as the size of firm increases, the tendency to acquire this service over a greater distance is not more pronounced. Here, then, differences in the

R and D service linkage patterns are not further understood by focusing upon variations in the size of plant. It does not, therefore, act as an independent influence for this service.

This examination of the relationship between the location of the Group one and two services and the size of the externally owned plants, reveals that size of firm acts as an independent influence in relation to Group one services, since, here, proportionately more large than small firms acquire such services locally. For R and D, however, a differential result is not produced and the linkage pattern would seem to be independent of firm size. Thus, when controlling for the possibility of wrong association, we find that firm size is a relevant and independent influence for the Group one services, but not for R and D. In sum, then, the differential pattern of Group one service linkages, owes as much to variations in firm size as it does to differences in ownership type. Given this, we now seek to establish whether or not size of firm produces a differential result in relation to the organisational effect.

6.5.3 The Organisational Effect

Here, we examine whether or not variations in the size of firm influence the degree to which business services are internalised. Earlier, we found that the majority of externally owned plants do receive a substantial amount of their services from their own group, with this feature being most marked in those plants where decision making freedom does not exist. Does size of firm produce a differential result? A priori, we expect proportionately more small externally owned plants than large to receive their services from the same organisation, since the larger firms are more likely to possess their own service departments. The smaller establishments, on the other

hand, may not have reaped the benefits of economies of scale and so rely on servicing from other corporate plants.

In table 6.47 we consider the Group one services and find that proportionately more small (80 per cent) than large firms (50 per cent)

Table 6.47 The Proportion of Group One Services from Own Organisation by Employment Size of Firm

Size of Firm	Proportion of Services: 50% Plus	Less than 50%	Row Total
1 - 9	4 (100.0)	0 (0.0)	4 (4.4)
10 - 24	10 (71.4)	4 (28.6)	14 (15.4)
25 - 49	8 (50.0)	8 (50.0)	16 (17.6)
50 - 99	10 (58.8)	7 (41.2)	17 (18.7)
100 - 499	18 (52.9)	16 (47.1)	34 (37.4)
500 plus	1 (16.7)	5 (83.3)	6 (6.5)
Column Total	51 (56.0)	40 (44.0)	91 (100.0)

(Chi-Square = 8.68 Degrees of freedom = 5 Significance = 0.1224)

Number of Missing Observations = 15.

receive over one half of such services from their own organisation. A differential result is thus produced. As expected, then, the tendency to acquire these services from the same organisation is more marked in the smaller plants. This would suggest that the small firms require specialist business services from other plants in their own group until they are large enough to establish their own service departments.

The result in relation to the Group two service is different, in the sense that proportionately more large than small externally owned plants receive a substantial amount of this service from the same group. That is, 62 per cent of the larger firms do so, compared with 38 per cent of the smaller establishments. Again, a differential result is produced, although here it is contrary to that our a priori reasoning suggests. Thus, as table 6.48 shows, the majority of these externally owned firms acquire their R and D from other corporate plants. Clearly, such a situation may have implications for local growth potential. In other words, since the ability to generate new firms may be fundamental to the development of self sustained growth;

Table 6.48 The Proportion of Group two Service from Own Organisation by Employment Size of Firm

	Proportion of Service		
Size of Firm	50% Plus	Less than 50%	Row Total
1 - 9	2 (50.0)	2 (50.0)	4 (4.4)
10 - 24	5 (35.7)	9 (64.3)	14 (15.4)
25 - 49	6 (40.0)	9 (60.0)	15 (16.5)
50 - 99	9 (50.0)	9 (50.0)	18 (19.8)
100 - 499	23 (67.6)	11 (32.4)	34 (37.4)
500 plus	4 (66.7)	2 (33.3)	6 (6.5)
Column Total	49 (53.8)	42 (46.2)	91 (100.0)

(Chi-Square = 6.14 Degrees of freedom = 5 Significance = 0.2926)

Number of Missing Observations = 15.

and that new firm formation is most likely where R and D is active in local firms, a situation where R and D is first carried out elsewhere rather than in the local plant, may limit the potential spin off effects. Thus, the degree to which R and D is acquired from the corporate group may influence the potential for growth in these plants.

As for why proportionately more large than small plants receive this service from the same group does not seem clear. It is tentatively suggested that this may be related to the type of R and D carried out. That is, most of the externally owned plants are relatively large multi product firms, as we saw in table 4.3. Given this, R and D may be undertaken on a centralised and decentralised basis (Twiss, 1974), with longer term basic research carried out in central laboratories, and the more applied work undertaken at the divisional level. Thus, short term development work may take place within each product division in the development labs attached to the smaller production units. This, then, may account for why proportionately fewer small plants receive R and D from other corporate plants. The larger firms, therefore, may be part of an organisation carrying out basic research at central labs from which the local plant adopts new techniques.

The organisational effect is a relatively strong feature in these firms. Further, the above has shown that the degree to which services are supplied by the same organisation, is further understood by focusing upon the size of firm. That is, firm size produces a differential result. More specifically, the tendency to receive a substantial amount of Group one services from other corporate plants is most marked in the smaller plants; whilst, the reverse holds for the R and D facility. Size of firm thus acts as an independent

influence. Overall, then, the internalisation of business services is most pronounced in the smaller externally owned plants.

In this section, we have examined the relationship between firm size and service linkages in terms of the distance over which plants receive their services, and the degree to which they are supplied by other members of the corporate group. It has been shown that, in relation to the distance effect, a differential result is produced, since the tendency to acquire Group one and two services locally is more marked in the smaller plants. That is, as size of firm increases, the tendency to receive the services over a greater distance is more pronounced. Thus, when all firms are considered size of plant helps further identify the differential nature of these linkage patterns. As a result of the possibility of wrong association, we test for firm size controlling for ownership status. When doing this, a differential result is produced in relation to Group one services, with proportionately more large than small plants receiving the services locally. In these instances our a priori expectations are supported. Thus, we consider firm size to be a relevant and independent influence upon variations in the local use of these business services. As far as the organisational effect is concerned, size of firm produces a differential result. Here, for our Group one services we find proportionately more small plants than large receiving these services from their own group; whilst, contrary to our expectation the tendency for the R and D service to be internally supplied is more marked in the larger firms. In short, the degree to which plants use their own organisation is further understood by focusing upon firm size. We conclude, then, that size of firm acts as a relevant discriminatory factor.

6.6 SUMMARY

In this chapter we have attempted to identify variations in establishment business service linkages by focusing upon certain characteristics of the business enterprise. This has been done in relation to two distinct processes; a distance effect and, in relation to externally owned plants, an organisational effect. We find that the degree of local linkage and the extent to which services are drawn from the same organisation is related to the status of the plant, the size of the firm and variations in the level of autonomy in decision making. That is, these key variables help further our understanding of the differential nature of the business service linkage patterns. Thus, the local use of these services is more pronounced in the independent plants, in relatively small firms and in externally owned plants with a high degree of managerial freedom. The degree of internalisation, on the other hand, is more marked in those externally owned firms which are relatively small and in the ones where decision making freedom does not exist.

FOOTNOTES

1. It is possible that some firms with 'in house' services may have not replied to this question. The fact that a high percentage of replies was received, however, in accounting, for example, suggests that this is not an important problem. Nevertheless, it would clearly have been useful in retrospect to have had an 'in house' column.

2. It is not necessary to carry out an investigation of independent firms, since the pattern of linkage is not markedly different within this category of firm. That is, the vast majority of independents exhibit similar linkage patterns.

7. THE IMPLICATIONS FOR GROWTH IN DEVON AND CORNWALL : SOME POLICY RECOMMENDATIONS

7.1 INTRODUCTION

The aim of this research has been to examine the relationship between manufacturing establishment linkage patterns and economic growth in Devon and Cornwall. In essence, the work shows that the degree of establishment linkage for both materials and services in the local area, is primarily a reflection of variations in the ownership status of plants, firm size, the degree of decision making freedom in externally owned plants, the nature of the product and the perception of the external environment by the chief decision maker. That is, the tendency for material and service contacts to be locally oriented, is most marked in relatively small firms, in independent plants and in ones where there is a relatively high degree of decision making freedom at the local level. Thus, it is the implications of these findings for growth in Devon and Cornwall which are of prime concern here. The task at hand, then, is to move towards a location policy which helps promote self sustained development in the context of an economy where linkages are not extensively developed.

Clearly, attaining indigenous development requires, in part, encouraging growth where linkage potential is strong. Since the potential for local contact is most marked in relatively small and locally owned firms, then a move towards self sustained growth requires policy initiatives to stimulate development in this sector. In other words, an important objective of a regional policy should be to encourage growth in small and independent plants, especially via new firm formation. The chapter assumes the following form.

We begin with a consideration of the public authorities role with regard to regional development, since any suggestions for future policy need to be couched in the context of past and present initiatives. This requires an examination of action taken by central

Government, the European Economic Community (EEC) and local authorities to promote growth in the far South-West. Next, we discuss the policy option of indigenising the local economy based upon the encouragement of growth in small and independent firms. Within this programme, the role of technological change in promoting new firm formation is emphasised; whilst, a future policy should be a concerted one, involving both central and local government. Finally, we offer some suggestions for future research in the hope that subsequent work in this area will still more further our understanding of the relationship between linkages and local growth.

7.2 THE ROLE OF THE PUBLIC AUTHORITIES IN REGIONAL INDUSTRIAL DEVELOPMENT

7.2.1 Central Government and the EEC

This section considers initiatives undertaken by the public authorities in order to stimulate development in the far South-West. Firstly, we discuss national and EEC aid before examining the role of local economic agents. It is important that Devon and Cornwall has UK aided status because funding from the EEC is only available to areas which benefit from UK regional policy. Of particular concern at the moment, then, is Government suggestions for changes to the regional aid package, as outlined in the December 1983 White Paper, since this may affect the nature and extent of aid available in the local area. A Government decision is expected in late 1984 and the salient features of the proposed changes, with respect to the local economy, are outlined in the following discussion.

For a number of years the purpose of the industrial location policy has been to improve the economic prospects of the depressed

and peripheral parts of the country. Essentially, the policy attempted to move work to the workers in the belief that mobile plant would play a key role in boosting employment growth. Such reasoning is clearly out of phase with the prevailing philosophy of achieving growth through the mobilisation of indigenous potential.

A number of arguments were put forward in favour of a regional policy. One related to the idea of congested urban areas. These, it was felt, may act as a constraint upon growth owing to relatively high labour, land and transport costs in the urban areas. Thus, firms may benefit by moving to the less congested parts of the country. Consequently, in the 1960's policy aimed at attracting firms away from the South-East and West Midlands and to the so-called 'problem' regions, such as the far South-West. A second argument stated that regional policy may lead to faster national growth. Britain, it was claimed, had been growing relatively slowly compared with our Western counterparts because of labour supply constraints. That is, unlike France, for example, Britain no longer had a labour surplus on the land to supply growing industries. However, such reserves were readily available in the problem regions, owing to the relatively high levels of unemployment. Thus, a development policy in these areas would utilise labour reserves and increase national growth. A further factor relates to the problem of inflation. Labour constraints in the South-East, it was argued, bid up wage levels which could be transmitted to the rest of the economy via national agreements. A policy, therefore, of dispersing firms and jobs, and so reducing the demand for labour, would ease the pressure for higher wages; hence, inflation may be reduced. Clearly, this would lessen the balance of payments constraint and so boost growth prospects.

There were, of course, counter arguments put forward against such

a policy. These included claims that production costs would be relatively high at a new location; that there would be low levels of efficiency; and a potentially slower rate of capital accumulation, owing to the imposition of controls on the location of industry in the faster growing areas. Despite such views, a strong regional policy operated, especially in the period 1963 to the mid 1970's. The measures adopted included development controls in the prosperous areas; factory building in the problem regions and a variety of capital and labour subsidies. In recent years, the policy has been diluted with the abolition of the Regional Employment Premium and a reduction of the assisted areas map; although the Regional Development Grant (RDG) still exists to potentially aid the local area. On this subject, the benefits of the RDG for local firms were in the order of £2 million between 1979 and 1982. Further, Devon County Council received £27,800 in RDG to 1982. Apart from the RDG, the local economy also qualifies for aid via Regional Selective Assistance; the Office and Service Industries Scheme; the In Plant Training Scheme; Government advance factories; help to promote the tourist industry and loans from the British Technology Group to small firms to help innovative activities.

As mentioned above, the Government is proposing changes in the nature of the regional policy package. In essence, the recent White Paper seeks to update the structure of assistance to industry by making a more effective use of scarce funds. In seeking views on Government assistance, the paper differentiates between those capital intensive projects associated with few jobs, and the 'genuine' job creating enterprises reliant upon Government help for their operation in problem regions. Further, it is believed that the transfer of jobs from one area to another shows no additional real benefits. The paper,

therefore, proposes that grants be approved only for projects which create new productive capacity, or increase existing capacity or effect a change in the product, process or service. Clearly, then, investment which induces no change in output would no longer qualify for grants. As far as the effects for the local economy are concerned, Devon County Council identify four main issues of significance. First, greater emphasis is proposed to be placed upon selective assistance as opposed to development grants. Next, more grants are to be available for job creating projects. Thirdly, in addition to the present qualifying industries, it is proposed to bring certain services within the ambit of assistance; and finally, the nature of the assisted areas map and the means of definition may change (Devon County Council, 1984). Clearly, any reduction in the assistance from regional policy goes hand in hand with reduced funding from the EEC.

Even leaving this Government attitude aside, academics have begun to question the nature of the policy package in the light of changes in the economic situation. Essentially, the policy is based on the assumption of growth nationally. Today, of course, such an assumption is no longer necessarily valid, and it questions the desirability of a traditional type of policy. In Devon and Cornwall increasing levels of Government support for certain parts of the area were accompanied by rising employment levels. However, it would be misleading to ascribe the growth in employment to regional policy. Indeed, rather than regional policy strongly influencing local employment growth, its effect has perhaps been more noticeable in influencing other sorts of business decision. For example, there is evidence pointing to the positive influence of regional aid upon locational decisions (D'Abbs, 1974; Spooner, 1972); whilst, a survey by Gripaios (1984) shows assisted area status to be a major

perceived advantage of a location in Devon and Cornwall.

We can say, then, that traditional measures achieved some success in the context of national growth (Marquand, 1980). However, such matters seem largely irrelevant today when demand is flat both nationally and internationally. Clearly, with substantial increases in unemployment in the once prosperous areas, there seems no longer a case for diverting employment from, say, the West Midlands, to the far South-West. Thus, even past successes may be thought of as partial (Storey, 1983).

As we have seen, many plants established in the local economy have been externally owned branches, which although helping to diversify the industrial base of the area, does little to diversify the technical management or skill base, which may be seen as a precondition for self sustaining growth (Watts, 1981). Further numerous branch plants prove to be marginal and, therefore, vulnerable to reductions in demand. In recent years, many have closed and this is especially a problem for an area such as Devon and Cornwall. On this point, Payne (1982) cites the vulnerability to closure of the new manufacturing firms attracted to Devon and Cornwall in the 1950's and 1960's. In his survey, employment in new firms opened pre 1971 fell by 10 per cent between 1979 and 1980. This may be attributed to a reduction in output by those establishments which had chosen to make little investment during the 1970's. For example, Rank Toshiba in Plymouth had a peak employment of 2,000 in the 1970's; but by 1984 this had fallen to one quarter of the peak figure. Corporate restructuring of this type is a common feature of multi plant firms behaviour and raises questions concerning the role of regional policy in subsidising such trends.

In sum, the argument is not that a regional policy is no longer

required, but that there is room for doubt as to the long term and 'real' benefits of the conventional approach. In other words, a stronger dose of more of the same seems irrelevant to regenerating a local economy in the context of national recession. We now turn to a consideration of the nature of aid available to Devon and Cornwall from the EEC.

In essence, the EEC seeks to reduce the imbalance between richest and poorest regions; improve communications between regions of the Community; reduce the reliance upon imported energy sources from outside the EEC; expand new industries and improve the environment. Since 1973 assisted areas of the UK have qualified for European aid under the auspices of the Regional and Social Funds, the European Agricultural Guidance and Guarantee Fund and the European Investment Bank. Aid from these bodies totalled £109 million between 1975 and 1982; with the money being used on projects such as the Exeter Airport extension; the provision of British Rail improved facilities for rolling stock and the Plymouth to Roscoff Ferry link.

Devon County Council continues to benefit from grants from the Regional Development Fund and loans from the Investment Bank. However, it is now also considering taking advantage of revised regulations under the Social Fund, to boost employment prospects directly. Further, Devon and Cornwall have begun moves to acquire Government recognition of a special status for the far South-West as a separate statistical region from the remainder of the South-West region. The reasoning behind such action is that, if future assistance is assessed on a regional basis, the relative overall prosperity of the region as a whole masks the economic problems of Devon and Cornwall, who would be disadvantaged in the amount of assistance they receive. In Devon between 1976 and December 1983 the County Council received

grants totalling £2.5 million for infrastructure works. A further £1,350,000 has been approved by the European Communities; whilst, in January 1984 approval was given to a grant of £1 million for the first phase of the Roseter Conference Centre at Torquay. Moreover, Plymouth City Council has received grants totalling £3 million from the EEC in the period 1980 to 1984.

The Devon and Cornwall economy has, then, received development aid from both central Government and the EEC over a number of years. National assistance has mainly taken the form of development grants; whilst, EEC aid has largely comprised infrastructure programmes which may be more relevant in helping indigenous growth during recession. More recently, however, emphasis has been placed on the need for Government to introduce more selective assistance in the light of national recession. Questions have been raised regarding the relevance of a conventional regional policy in the present economic climate, although it is important for an area such as Devon and Cornwall to maintain aided status, since without it EEC funding is not available. A further strand of public support comes via the local authorities. This we consider below.

7.2.2 Local Authority Initiatives

Local authority action in Devon and Cornwall has been at the level of both County and District Council. With the recent exception of the Devon and Cornwall Development Bureau[1], and ITSW scheme (below), joint ventures by the local authorities have not been typical; hence, although fundamental growth objectives may be similar in each county, development programmes tend to have been initiated independently. Consequently, a consideration of local

authority intervention is undertaken separately, beginning with Cornwall.

By the time of the 1980 Cornwall County Structure Plan, policies were aimed essentially at boosting employment prospects in the area. A number of courses of action have been adopted to achieve this end. For example, publicising the attractions of and opportunities in Cornwall for new industry, especially from overseas; developing an Industrial Development Service to supply information and co-ordinate industrial development; allocating sites for industrial expansion by the private sector, developing sites equipped with the necessary services; and making representations to central Government encouraging full utilisation of the available assistance. Further, the scope of the promotional activities, and the budget of the County Council Industrial Development Service, have been increased in recent years (Cornwall County Counil, 1980). In essence, then, Cornwall has adopted a combination of policies typical to many local areas, with special emphasis being placed upon promoting investment from outside; providing advanced factories; allocating land for employment development; setting relatively low rates and providing tax incentives.

As far as Devon is concerned, the County Council also recognises the need to create a favourable climate for investment in industry and commerce, so as to stimulate employment. This may be achieved by encouraging existing firms and attracting new businesses. Further, the authority views land use policies as a prime factor in enabling infrastructure provision and locational advantages to be exploited. All agencies, whether public or private, operate their investment policies within the framework of the County Structure Plan. The Plan also identifies those areas where land and infrastructure resources are likely to be made available. Further, it also provides a basis

for the County Council to make a case to central Government for the provision of financial resources to assist in the implementation of the policies and proposals included in the Plan (Devon County Council, 1984).

The distribution of land for employment development covers the period 1976 to 1991; whilst, the rolling forward of the Plan will consider how much, if any, additional employment land is required for the period 1991 to 1996. Thus, the policies and proposals in the Plan aim to ensure a supply of serviced employment land in the County in accordance with the strategy and settlement policies. Further, the Council recognises the important contribution that small units of industry can make to rural areas. To this end, policies exist permitting the establishment or extension of employment units via rural settlements, including the conversion of existing buildings. Moreover, the Plan views the development of advanced factories as playing a valuable role in local growth.

More recently, however, a further dimension has been added. Cornwall, along with Devon County Council and Plymouth City Council, have set up Information Technology South-West (ITSW), in the belief that new information technology holds the key to future growth. It is argued that ITSW can provide an answer to the traditional problems of the area. In doing so, the programme has two main objectives. First, to eliminate the problem of remoteness using modern telecommunications, and, hence, create a new focus for self sustaining growth based upon a particular range of 'message intensive' office and service jobs. The second is to develop the potential for undertaking such jobs in small, dispersed communities including new 'office parks', cottage offices and even in the home. The Councils admit that it is the first objective which has the greatest priority.

Thus, in order to enhance the telecommunications infrastructure, it is proposed to create the South-West Area Network Service (SWANS). In principle, this would make parts of Devon and Cornwall into an extension of the London telephone exchange. Further, although such a development is in its very early stages, both counties recognise that this scheme should be a key component of any future plan for the area.

As for the District Councils, all recognise the need for additional jobs in their areas and to varying degrees have made land available; provided housing for key workers; undertaken promotional activities and other employment creation schemes. All of the Councils are undertaking a programme of identifying land for future employment purposes and this also provides for new plans in all five areas of major change. Further, the role of local plans in providing a publicly accepted commitment to the provision of employment sites cannot be overestimated (Devon County Council, 1984). Local plan preparation is, therefore, a key element in the implementation of employment policies.

Apart from employment promotion via the County and District Councils, the Development Commission, in the shape of the Council for Small Industries in Rural Areas (COSIRA), plays a local role. It has suggested that initiatives would be of assistance in promoting employment prospects in rural areas and, in the future, it sees the following as especially relevant. First, the creation of an Employment Forum in which both Districts and County could consider future employment opportunities; plus, levels of investment needed over a five to ten year period. Within this forum, consideration could be given to the impact of new technology, the role of service industries and the suitability of smaller centres for the accommodation of employment. Second, Devon's role in education for business needs to

be examined; and, finally, the co-ordination of business advice through key people, with ideas being discussed before proceeding with new business ventures.

Numerous other organisations are active locally in the promotion of employment or in providing advice. Some operate with assistance from local authorities finance. In Devon, for example, the Community Council encourages participation at parish level and the Dartington Trust operates various schemes of employment regeneration. Further, voluntary bodies, such as the East Devon Small Industries Group, attempt to raise awareness of the opportunities available for employment development. Moreover, the County Council says that it will continue to aid and encourage any organisation whose aims are to develop and promote employment in the County.

In the above, we have considered the major policy initiatives carried out by local economic agents in Devon and Cornwall to promote employment growth. Essentially, the intervention consists of conventional local practices, such as the provision of advanced factories and employment land, tax allowances and so on. However, it is intended to introduce a more integrated strategy for planning future employment development. All agents stress the need to boost information technology in the far South-West, so as to promote growth via service and information intensive industries. Such a programme raises the question as to the extent to which development can occur via service industries. Thus, it is necessary to have information concerning the role of new firms in the service sector in terms of their wealth and employment creating effects. Moreover, in an area such as Devon and Cornwall, devoid of major urban centres, a large responsibility for service development would fall upon Plymouth; even though the results (not reported previously) of this study suggest that the

local use of business services is no more pronounced in Plymouth firms than it is in firms located elsewhere.

As part of the discussion on the nature of public assistance to manufacturing industry in Devon and Cornwall, it has been necessary to consider the type and extent of aid already available. Thus, we have outlined the nature of intervention at the national, EEC and local level. Whilst a UK regional policy clearly has a role to play in promoting development in a peripheral area, its usefulness has recently been questioned. This is because there are doubts as to the relevance of a conventional approach at a time of economic recession. Moreover, as mentioned above, moves are afoot to alter the criteria upon which aided status is based, and any such change may seriously reduce the level of assistance, not only from central Government, but also from the EEC. The local authorities are concerned with boosting employment prospects through the provision of land and factories; whilst, it is also hoped to promote development via new message intensive service industries. This, then, is the context in which present policy is couched.

Thus, whilst local policy makers refer to achieving self sustaining growth, there seems little or no detailed reference as to how this may be achieved, except via the provision of land, promoting information technology and service development. In other words, the linkage dimension seems to be ignored. Since the results of this work suggest that the potential for manufacturing linkage in Devon and Cornwall is most marked in relatively small and independent firms, policy perhaps needs to be geared to encouraging growth and technical change in this sector, since this then raises the likelihood of new firm formation, and, hence employment growth. Clearly, a concerted policy initiative is necessary and one which seeks to promote the

local area's indigenous potential. The rationale for such an argument is set out below.

7.3 AN APPROACH TO GROWTH IN DEVON AND CORNWALL

A major factor in attaining self sustained growth is that the local economy has the ability to generate new firms as economic and technical conditions change. The ability for new firm formation is most likely where technological change is common within local firms. Moreover, development along such lines requires the existence of local linkage, since induced growth stems from technical progress in leading firms which act as a catalyst for other establishments via the backward and forward linkages of the industry or sector. Given this, any development strategy requires both a linkage and technological dimension. Clearly, since the results of this research suggest that local linkage is most pronounced in small and independent plants, then a policy package which discriminates in favour of such firms would appear to be necessary. That is, direct policy in such a way that creates favourable conditions for technical advance in small firms, and at the same time recognises those areas of linkage potential. Before examining this in more detail, we mention briefly why there needs to be a new emphasis with regard to regional policy.

7.3.1 Regional Policy in a Recession

As argued above, the demise of the manufacturing sector in recent years seriously questions the assumptions upon which regional policy has been based. Further, the problem is compounded owing to nearly all manufacturing industries being in relative decline. Thus, the impact of rising unemployment in the less prosperous areas has been dramatic with areas such as Tyne and Wear losing half their manufacturing

jobs in four years (Storey, 1983). Given that there does not seem to be any real prospect of an upturn in the near future, the wisdom of continuing with the type of regional policy we have had since the 1930's must be questioned.

The problem is that those arguments upon which policy was based (the labour constraint view, the inflation argument, and the moving of work to the workers) seem less relevant now. Thus, a different approach to regional aid is necessary. An alternative policy should explicitly recognise the need to help indigenise local economies and operate in conjunction with local initiatives. Clearly, this requires some form of innovation oriented policy, so as to promote development in those sectors with growth potential. In chapter 2 we discussed the relationship between linkages, technical change and economic growth. Here, we consider this within the framework of policy aimed at promoting development in small firms.

7.3.2 Small Firms, Technical Change and Indigenous Economic Growth

As we have seen in this study, the industrial structure of the Devon and Cornwall economy seems biased towards smaller sized firms. Not only this, but such firms tend to be independently owned. Thus, a small firms policy is also largely a policy aimed at independent plants. However, as this research has shown, some small firms are externally owned; hence, any small firms development programme does not necessarily exclude non independent firms. Moreover, as we have seen, the tendency to buy and sell substantial amounts locally is more marked in the smaller externally owned plants. Thus, external ownership per se need not necessarily have a detrimental effect upon the local economy.

As mentioned above, initiatives favoured by local authorities

have been the provision of premises, the clearing of land and in the local development of infrastructure. Increasingly, however, local, as well as central Government, has recognised the need to assist small firms. Below, we consider the response of central and local agents to the idea of promoting small firms. The focus upon small premises by local authorities is partly a response to the particular characteristics of the Devon and Cornwall economy and its high level of dependence on small businesses and self employment. Further, the rationale for local initiatives such as providing loans, grants and industrial mortgages, is that a local authority is unable to influence by its own policies the national or international climate. The investment or closure decisions taken by national or MNE's are generally taken outside Devon and Cornwall. Thus, the local authority has little choice but to accept such decisions, even though they fundamentally affect the economic prosperity of the local area.

A focus upon small firms potentially has positive attractions to a local authority. First, it has been shown that, as a group, small manufacturing firms have provided an increasing proportion of total employment in the manufacturing sector (Storey, 1983). Second, small businesses are frequently owned by local voters; hence, assistance has clear electoral implications. Further, it is possible for local politicians to visibly help small firms by being seen opening new factory units. However, local authorities need to bear in mind research findings relating to the long term viability of such firms. At least 30 per cent of small businesses fail to survive the first four years; the median level of employment of wholly new businesses is ten employees; the median new firm exhibits no tendency to raise its employment after being established for five years; the probability of a new business reaching 100 workers in ten years is between

one half and three quarters of one per cent; and there is little or no evidence of more rapid growth in the high technology sectors (Storey, 1983).

As for central Government, the Department of Trade and Industry has responsibility for a small firms policy. There are several aspects to the small firms programme. First, to foster a more positive attitude towards self employment and entrepreneurship and a clearer understanding of business opportunities in the community. Next, to improve tax incentives and promote the flow of finance to small firms; and, third, to identify legislative and administrative burdens affecting small businesses (Department of Industry, 1983 b). Within the small firms programme, moves to greater industrial efficiency means first, providing an information and business advisory service for small firms; and testing whether a finance gap exists for small establishments by evaluating the pilot Loan Guarantee Scheme (Department of Industry, 1983 a).

Promoting opportunities for innovation is a further Government approach. For small firms this involves a technology transfer from larger firms and academic centres, plus assistance in the use of micro computers (Department of Industry, 1983 b). Further, small firms require accessible and inexpensive information and advice. The Government believes there is a role for both the public and private sectors in this area and has outwardly promoted small firm needs. Thus, there exists a policy package for aiding the development of small firms. Whilst this is welcome, it does not adequately reflect local growth constraints or the role small firms can play in the local growth process. The salient features of this, with regard to evidence from this study on Devon and Cornwall firms, are discussed below. Before this, however, it is necessary to consider the debate

on the contribution which small firms can make to a local economy.

Although the move towards the development of indigenous potential does not exclusively mean small firms, it is evident that such firms have a significant part to play. Given this, of prime concern is the extent to which small firms contribute to meeting the employment needs of local residents. Relevant here, then, is whether small firms draw upon labour from the local area more than large ones. This may be the case if small and independent plants tended to require the sort of skills possessed by urban residents situated in Plymouth. This is important because in designing policies for economic regeneration one needs to identify initiatives which are likely to increase the employment of the disadvantaged residents of the area.

A major potential problem with a small firms policy relates to displacement. Since small firms tend to have a narrow market area, as is the case for such firms in this study, any increase in small firm activity in selected areas is likely to displace other, mainly small firm activity, within a fairly narrow area. To the extent that this is the case, encouraging small firms may stimulate activity at the expense of other firms (Lloyd and Dicken, 1982). However, there may be positive effects in terms of increased efficiency and dynamism.

If small firms do have a role to play, then how much should be expected of them? Doubts as to the merits of small business in creating employment have been expressed based upon research in different areas of the UK (Gould and Keeble, 1984; Lloyd and Mason, 1984; O'Farrell and Crouchley, 1984). Further, it is suggested that there are differences between areas in the number of small firms, the birth rate and the potential contribution to development. However, there is disagreement as to why this should be. Some see the birth

rate as positively associated with occupational structures (Gould and Keeble, 1984; Whittington, 1984); whilst, others focus on the size distribution of enterprises (Fothergill and Gudgin, 1984; O'Farrell and Crouchley, 1984). Such evidence, then, suggests that small new firms only offer prospects of significant employment gains in the medium to long term. Given this, the provision of premises in the local economy may, in the longer run, prove a cost effective way of raising employment.

Research, specific to the Devon and Cornwall economy, has been carried out on the type of small firms occupying these advanced factories. Generally speaking, the tenant of these units is an established manufacturing firm employing around six workers and which has moved from another part of the local area (Perry and Chalkley, 1984). Further, whilst such units may provide an environment in which young firms can grow, they have been less successful in helping to create new businesses. Shaw and Williams (1984), in a study of Cornish industrial estates, found a substantial number of manufacturing firms who had far ranging search procedures for choosing their premises. In the light of this, an indigenous development policy, may need to monitor the effect of location upon business decisions, especially as over one third of firms considered their present location had problems of poor general accessibility.

Thus, in advocating a policy to stimulate growth in small and independent firms in Devon and Cornwall, we should consider the doubts raised against their job creating potential, at least in the short term. However, a small firms policy per se may not be a problem, but rather the type of activities which policy has sought to promote. In other words, a failure to encourage technical advance and local linkage. Below, we consider ways in which technical change at the

small firm level may lead to indigenous growth effects.

Clearly, a major part of the economic problem in the far South-West is the apparent inability of some manufacturing sectors to create and maintain sufficient jobs to occupy all those people actively seeking employment. In other words, there is an inability to bring the supply and demand for labour into equilibrium at a socially acceptable level. In order to rectify this situation, public assistance has aimed at redressing the imbalance. However, it has not provided the necessary impetus for self sustatined growth. The failure of Devon and Cornwall and national policy to provide adequate employment could be related to the relatively low level of technological advance in products and processes within manufacturing firms, a factor generally neglected in regional policy instruments. That is, little attention seems to have been given by the public authorities to the possibility that pre production costs associated with technical development are higher in peripheral areas, and, therefore, a factor inhibiting growth (Goddard, 1983).

A priori, it would seem reasonable to suggest that prospects for employment depend to a significant degree upon equal opportunities for firms to participate in technological advance. Within manufacturing, evidence suggests that technical change does not take place at an equal pace in all industries (Freeman, 1974). Further, within specific industries the ability to produce and to adopt new technology varies between firms (Le Heron, 1973). Moreover, this work suggests that the tendency to undertake R and D varies by both type and size of firm. Thus, if the rate of technological advance can vary between nations, industries and firms, then it seems appropriate to suggest that it may also vary between regions, simply because of spatial variations in industrial structure and/or entrepreneurship. Clearly, implications

for local growth follow. Rapid technological advance by firms in the local economy can induce benefits in terms of higher local income and output, an increased ability to trade and an improvement in the competitive position of firms (Goddard, 1983). In other words, failing to produce or adopt new products could mean losing out on increased product demand, with consequent losses of revenue, potential profit and employment. In the longer term, such lags may result in a lower standard of output, employment and living conditions for the indigenous population. This, therefore, increases the dependence upon transfer payments from central Government. In effect, then, lagging areas become threatened as the market of indigenous establishments are eroded by technology based competition.

Technological change, however, is only one element in promoting local growth. It must, therefore, be considered in conjunction with other factors influencing industrial activity. Even so, given that the above scenario is accurate, then technological change has a fundamental role to play in the future development of the local economy and for indigenous employment prospects. Further, it is particularly relevant when policy to aid peripheral areas by conventional means is hampered by recession. That is, public spending is constrained and mobile plants are no longer a major source of new jobs or potential entrepreneurs. In this situation, the responsibility for growth necessarily falls upon manufacturing already located in Devon and Cornwall. Development, then, may be determined by the ability of such industry to bring about technical change. Thus, it is in this respect that the results of this work pertaining to R and D may be most useful. However, old structures, old institutional arrangements and old policies could prove disadvantageous to the exploitation of new technologies. Clearly, many such impediments are inherently local in nature and

overcoming them may help promote a national economic revival.

Whilst such impediments may exist, a recognition of them in the formulation of policy does not necessarily follow. However, this would seem to be required if local firms are to participate more in new technology and new products. Despite this, we have shown in table 5.34 that high technology firms, as represented in MLH's 352 to 354, do exist in the local economy, and moreover, there has recently been talk of Plessey moving production to Devon and Cornwall. Perhaps small firms in these high technology sectors may act as a basis for medium to long term significant indigenous employment growth through indigenous innovation. Further, we have seen in table 5.34 that those plants in the high technology Instrument Engineering sector are mostly independent and small firms. Thus, where there is strong local linkage potential the likelihood of new processes and products being diffused into the local economy is increased. However, as Oakey (1981) has shown, local linkage in such high technology sectors is not necessarily strong. In the following, we consider some of the criteria which the public authorities need to bear in mind when formulating policy initiatives.

As regards the level of intervention, it is hoped that the economic policy strands of both central and local government will be brought together in concerted programmes of action to tackle the problems of particular localities in their regional context. Thus, rather than focusing upon development grants, the emphasis needs to switch to more selective assistance, whereby an appraisal is made of the contribution of each investment to the goals of local development. Technological progress will form only one element of such a strategy. Other considerations need to include, the relationship of the investment and the firm to the local economy and to employment generation. How may

such assistance be evaluated in the case of Devon and Cornwall? It needs to be considered in the context of certain characteristics of manufacturing establishments in the local economy, and this is where the findings of this work become especially relevant.

Thus, based upon this research, we know that there is a sample relationship between employment size of establishment and ownership status. That is, as table 4.1 shows, a large majority of the largest employers are externally owned plants. Given a significant Chi-Square statistic, it would be reasonable to assume that this pattern holds for the rest of the population of firms. In effect, therefore, this work has shown that most of manufacturing employment is in non locally owned companies. Clearly, this situation arose from the establishment of branch plants during periods of previous high industrial movement and the acquisition of local companies by firms outside the area. Thus, the prospects for employment would not appear strong given the tendency of branches to close in recession. A further feature of these local firms which this research has highlighted, is the fairly low representation of higher order managerial functions, such as R and D, investment and marketing. Moreover, as we have seen, such decisions tend to be taken outside the local area; whilst, it is the more routine decisions on production and purchasing, which are more likely to be taken at the local level. For self sustained growth we need the key decisions to be taken locally.

We have also found there to be a relatively low demand for business services in manufacturing firms. This is especially true in independent plants; whilst, many externally owned plants acquire such services and R and D from outside the local area or from other corporate plants located elsewhere. Further, we have discovered weakly developed local material linkages, with less than 40 per cent

of all firms buying and selling substantial amounts locally. Thus, since many firms purchase in national markets the local multiplier is far from being maximised. Clearly, these findings question the ability of the local economy to attain self sustained growth based upon linkage development. However, the tendency to have established backward and forward links is most marked in small plants. In sum, then, there exists a local environment in which there are poorly developed linkages, both for materials and services, a high proportion of employment in externally owned plants, and a lack of local decision making with respect to high order functions.

Such a corporate situation may well contribute to an overall local industrial environment within which rapid responses to economic and technological change is difficult. The ownership structure of manufacturing, plus the characteristics of firms' operations suggest an employment pattern with a limited representation of occupations like research, marketing and other white collar specialisms. Thus, a lack of dynamic personnel and key entrepreneurs. That is, it may be that those skills necessary for innovation and diversification are not at hand. Given this, it becomes even more urgent for public agencies to identify those small and independent firms with growth potential in terms of the degree of local linkage and the ability for technical advance. Not only has this work indicated that local linkage is a reflection of variations in organisational strategy and structure, but it has also shown that the degree of linkage may also reflect a product influence. That is, as table 5.35 shows, the pattern of local backward and forward linkage varies by industry type. However, for most SIC orders the linkage patterns do vary by ownership status and size of firm; hence, they may be seen as independent influences. Even so, in some cases, notably Instrument Engineering, the linkage

pattern may reflect a lack of input suppliers (Oakey, 1981). Given this, our work suggests that local agents, when seeking to attract such growth firms, should also attempt to attract a complement of input suppliers. Clearly, this would improve the possibility of matching in the production process. In most SIC groups, however, linkage potential is highest in small and independent firms.

As well as recognising the need for a small firms policy, this study has highlighted a number of other issues which may be examined by the funding agency. For example, does the public investment involve a new or improved product, or does it involve new process machinery? If process innovation is involved, does this bring product benefits such as greater reliability? Does the parent company have its headquarters in Devon and Cornwall? Has local management freedom to take decisions relating to new investment and R and D? Are there R and D facilities on site? Do independent and small firms demand business services? Is there a high degree of corporate internalisation of material inputs and outputs? Do externally owned plants buy services primarily from their own group? It may be worthwhile, then, for the public authority to adopt such criteria when evaluating an investment programme.

Clearly, a central theme of the above argument is the need for technological advance in the local economy. This includes the initial R and D and on to the innovation and diffusion processes. The findings of this research do not allow us to make a contribution to a discussion on each aspect of the technical change process, since we only have information pertaining to the use of R and D. Even here, we do not know whether firms use 'in house' R and D or rely upon advice from elsewhere. However, our results do suggest a limited R and D effort through which products are developed, refined and modified, especially

in independent plants; whilst, the tendency in externally owned plants is to acquire the service from other corporate establishments located outside Devon and Cornwall. Thus, the problem is that, to an extent, it is only through R and D departments and through specialist personnel that establishments can capitalise upon current aid for product development, and make the best use of advisory services. There seems, therefore, sound reasons for supporting further R and D activities in local firms. If this is not always possible, expert advice may be able to substitute for 'in house' R and D effort.

Related to this point is the role that high technology branches, such as Texas Instruments, Sperry Gyroscope and Plessey, for example, should play in the local economy. Clearly, it would be naive to suppose that Devon and Cornwall would not happily welcome more such high employment branch plants. Thus, the question is to get the balance between these and indigenous plants correct, and so maximise the advantages of such incoming plants. Given that, very new technologies are not produced by small firms, then the policy objective could be to integrate them into the diffusion process at an early point in time. Public assistance may help such firms become 'early adopters' of innovations produced elsewhere. In other words, we should aim at integrating the new technologies into the existing production process. The question then becomes how can we improve the diffusion of technology from such firms to the local indigenous ones? It would seem that this is most likely in those plants with strong local linkages. However, as we know, linkages are not greatly developed in the high technology plants or in externally owned firms. Neither is there a tendency for local material linkage to be more marked in the high autonomy plants. Even so, we know that 75 per cent of those externally owned plants who do buy locally have decision making freedom. Perhaps, then, the

potential for devolving information to other local plants is most likely in high autonomy firms. Local agents could, therefore, target policy at those externally owned plants in growth sectors where decision making freedom exists, and this may help boost linkage potential and the rate of diffusion. In effect, although our results on this for material linkages are not conclusive, the potential benefits of the new growth industries may depend upon the nature of decision making, since the greater the decentralisation and, therefore, the higher the local autonomy, then the greater the likelihood that new technology will be diffused into the local economy.

It is also necessary to consider the demand side to any strategy. This is so, because information supply strategies tend to have little effect if small firms are unable to gather, screen and process the information offered and implement new technological concepts. Aid could, therefore, strengthen the demand capacity of small and medium sized firms. That is, those characteristics which determine information behaviour, search processes and so on. A further implication of this is that an innovation oriented regional policy needs to be delivered close to the firm. This is because many of the factors important in the innovation process touch upon sensitive internal characteristics of private firms, such as attitudes, information behaviour, management styles ... and may not be easily understood by central Government (Ewers and Wettman, 1980).

In sum, policies designed to encourage growth and technical change in small firms will help stimulate new firm formation and boost employment prospects and linkage potential. Public assistance requires a technical dimension; whilst, policy makers need to recognise those corporate conditions which make for indigenous growth. Further, there needs to be a concerted programme of intervention at both national and

local level. Nationally, an innovation oriented regional policy could, via Regional Technology Centres, identify the key problems faced by peripheral areas and especially the local impediments to growth, as highlighted in this research. It would then be the task of the local authorities to implement the investment programmes close to the firm. Thus, public aid becomes more selective, focusing upon potential growth areas as identified by the degree of local linkage, the nature of the product, the ability to participate in technical change and adopt new techniques, and so on.

7.4 SOME CONCLUDING REMARKS

Whilst advocating initiatives to foster self sustained growth based upon local linkage potential, we should not lose sight of the fact this research has shown that manufacturing linkages in Devon and Cornwall are relatively poorly developed. Since, then, many firms are operating in national markets, it would be reasonable to assume that growth in the UK economy will be an important factor in the health of the local economy. In terms of service development, external ownership may have a detrimental effect. The fact that externally owned plants tend to obtain business services from outside Devon and Cornwall, plus the relatively limited demand for such services in independent plants, may act as a constraint upon the service sector. Thus, of particular concern is the problem of access to specialist business services. As we have seen, the tendency is for company headquarters to be located in the South-East and the relatively high degree of internalisation of services within corporate organisations means this sector tends to be highly concentrated and remote from the local area. Given this, and the resulting lack of a highly developed service sector, there is a danger that only those firms that can survive without

regular contact with high order business services will be attracted to Devon and Cornwall. In the light of these findings, it would seem necessary to increase manufacturing demand for business services and encourage externally owned firms to place more service demands locally. The former may be achieved by expanding the service requirements of independent plants. That is, an increase in the use of R and D and computing, for example, could lead to demand being placed locally, providing supply could match this. It would, then, increase and not simply redistribute demand. Clearly, if the area did develop into a service centre this would attract substantial private sector office employment.

As for changing the buying patterns of the externally owned sector, then clearly this is more difficult, especially given the extent to which services are internalised. However, one possible solution would be to attempt to change the nature of ownership in the local economy (Storey, 1983). In other words, encourage branch management to buy out the local plant. Clearly, this would have the effect of extending the local ownership of industry and potentially reduce the number of job losses which stem from the externally owned sector. Moreover, a change in ownership would boost the potential for local linkage and, therefore, self sustained growth. Given the likely lukewarm response of the private sector financial institutions to such a scheme, then obviously public funding becomes necessary. This could take the form of selective assistance and may be given when the following conditions are met: the local management wish to purchase the works from a parent located outside the area; the parent wishes to sell the works; the plant would otherwise close since there is no suitable alternative purchaser; and the private financial sector is not prepared to advance capital on the required scale as it believes the risk too great. Such

a programme, then, may help indigenise the local area.

In supporting a programme to stimulate growth in small firms, it should be borne in mind that a likely cause of small company failure is mismanagement. Thus, the local authority needs to be able to predict those companies which will 'fail'. That is, avoid providing public money to companies that have the financial characteristics of 'failure'. This may perhaps be identified by the rate of employment growth in the first five years from start up. Clearly, rapid employment growth would tend to suggest an increase in demand in some sectors or the introduction of new products and so on. An improved knowledge of small firm activities and linkage potential would thus lead to a more sophisticated targetting policy.

In essence, a small firms policy should aim to help indigenise the Devon and Cornwall economy, so that major corporate decisions relating to R and D, investment and employment are taken locally to a greater extent than this research has shown to be the case. This approach will yield benefits over a long period. However, although small firm initiatives should be left to local government primarily, there needs to be greater discrimination than has been exercised previously. Since the majority of net new jobs in the small firm sector is likely to come from relatively few firms, assistance and advice must be directed towards these firms, rather than be spread thinly and ineffectively across the population of smaller firms. Thus, local agents should encourage those firms with the greatest linkage potential and capability for technical advance, instead of promoting policies designed simply to maximise the number of new firms created, since this may lead to a large displacement. A task, then, for local authority researchers is to be able to estimate the net increase in new jobs, both within the local economy and nationally, and be able

to attribute them to the provision of assistance. In short, the level of displacement has to be assessed before it is possible to determine the effectiveness of a small firm policy in local development.

This research has suggested a number of potentially important issues for consideration by policy makers when formulating a strategy for local growth. For example, they need to bear in mind the fact that there appears to be weakly developed local linkages; a limited amount of high order decision taking; a relatively low potential for service development and so on. Thus, of particular importance is the understanding of new firm formation and the role of small and independent firms in the local economy. A successful policy, then, needs to be founded upon an understanding of how new firms come to be founded, who forms them, the motive for firm formation and the potential of new firms in relation to the general objective of improving the performance of the local economy. Clearly, local and national authorities should recognise the constraints upon economic growth, relating to the nature of the corporate environment as suggested here, and when there is no scope for policy to remove them.

Even though this work has identified factors which influence the local linkage structure and, therefore, has contributed to an understanding of the relationship between local linkages and economic growth, there is scope for further research in this area. In future, it would be especially useful to have information on the extent to which local firms undertake 'in house' R and D; the extent to which new products and processes are introduced in small firms; the role of plant technology in shaping linkage patterns; employment patterns in the high technology population of firms; and, more detailed information on the nature of the external environment in influencing linkages. As we know, industrial research may be carried out at a number of

levels; hence, any future work may well seek such information on a large sample of firms, or select a particular growth sector, say micro electronics, and carry out a smaller case study. In short, it is hoped that this work, through contributing to our understanding of the relationship between manufacturing establishment linkages and the move to self sustaining growth in Devon and Cornwall, will provide for a more sophisticated location policy; whilst, at the same time suggesting important areas for future work.

FOOTNOTES

1. This is an organisation comprising representatives of the Devon and Cornwall County Councils and the Plymouth City Council. It pools resources to market the area for potential inward investors.

APPENDIX A

THE DEVON AND CORNWLL ESTABLISHMENT QUESTIONNAIRE

PLYMOUTH POLYTECHNIC INDUSTRIAL
LINKAGE PROJECT (PLIN)

1. NAME OF PLANT/FIRM:-

ADDRESS:-

TELEPHONE NUMBER:-

S.T.D.: Person to contact at this location:
Number: Position of contact:
Telex: Extension:

NATURE OF BUSINESS:-

NUMBER OF YEARS ESTABLISHED:- ☐

NUMBER OF EMPLOYEES AT THIS LOCATION (Please tick the relevant box):-

1 - 9	10 - 24	25 - 49	50 - 99	100 - 499	OVER 500
☐	☐	☐	☐	☐	☐

2. IS THIS ESTABLISHMENT:- (a) INDEPENDENT ☐ OR

(b) PART OF A GROUP ☐

PLEASE TICK THE RELEVANT BOX.
IF YOU HAVE TICKED BOX (b), WHERE IS THE GROUP'S H.Q.?

IF YOU HAVE TICKED BOX (b), PLEASE INDICATE WHERE THE MAJOR DECISIONS ARE TAKEN IN RELATION TO THE FOLLOWING ACTIVITIES BY TICKING THE RELEVANT BOXES. *1

	AT THIS ADDRESS	REST OF DEVON/ CORNWALL	REST OF SOUTH WEST *2	LONDON/ SOUTH EAST	REST OF U.K.	OVERSEAS
RESEARCH AND DEVELOPMENT						
INVESTMENT						
PURCHASING						
MARKETING/ SALES						

*1 More than 1 box per line may be ticked
*2 Somerset, Avon, Dorset and Wiltshire

3(a) WHAT GOODS AND SERVICES DOES YOUR ESTABLISHMENT PRODUCE?
(Please rank in terms of total turnover)

	GOODS AND SERVICES.
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

(b) APPROXIMATE ANNUAL SALES (LAST CALENDAR OR FINANCIAL YEAR).
Please tick the relevant box.

UNDER £50,000 ☐
£50,000 - 250,000 ☐
£250,000 - 1,000,000 ☐
OVER £1 MILLION ☐

(c) DISTRIBUTION OF SALES (APPROXIMATE %)

DEVON AND CORNWALL ☐
REST OF SOUTH WEST ☐
LONDON AND SOUTH EAST ☐
REST OF U.K. ☐
OVERSEAS ☐

(d) DO YOU THINK YOU COULD INCREASE YOUR SALES IN DEVON AND CORNWALL?
YES/NO
IF NO, PLEASE GIVE REASONS

4(a) TYPES OF SUPPLIES USED IN THE PRODUCTION PROCESS*
(Please list the most important items in terms of value).

	RAW MATERIALS AND SEMI MANUFACTURES (e.g. food products, chemicals, sheet metal, plastic extrusions, wood, etc.)	CAPITAL EQUIPMENT e.g. lathes, process machinery, etc.)
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

* Including those supplied by other establishments of your group.

(b) SOURCES OF SUPPLY*

SUPPLIES	SOURCES: APPROX.% PURCHASED FROM EACH AREA				
	DEVON/ CORNWALL	REST OF SOUTH WEST	LONDON/ SOUTH EAST	REST OF U.K.	OVERSEAS
RAW MATERIALS AND SEMI MANUFACTURES					
CAPITAL EQUIPMENT					

* Including those supplied by other establishments of your group.

(c) APPROXIMATELY WHAT PERCENTAGE, IF ANY, OF TOTAL SUPPLIES ARE PROVIDED BY OTHER ESTABLISHMENTS IN YOUR ORGANISATION? ☐

(d) IF MOST OF YOUR SUPPLIES ARE PURCHASED FROM OUTSIDE DEVON AND CORNWALL, WHICH OF THE FOLLOWING APPLY?
(Please tick the relevant boxes).

SUPPLIES ARE PROVIDED OR ORDERED BY PLANTS IN YOUR ORGANISATION LOCATED ELSEWHERE ☐

NO KNOWN LOCAL SUPPLIERS. ☐

LOCAL SUPPLIERS ARE NON-COMPETITIVE IN TERMS OF:-

(a) QUALITY ☐

(b) PRICE ☐

(c) OTHER (Please specify) ☐

ANY OTHER REASONS:-

5(a) SERVICES USED*: PLEASE TICK THE MAJOR SOURCE OF EACH SERVICE USED BY YOUR ESTABLISHMENT.

SERVICES	DEVON/ CORNWALL	REST OF SOUTH WEST	LONDON/ SOUTH EAST	REST OF U.K.	OVERSEAS
GROUP 1: Computing					
Legal Services					
Financial Control					
Accounting					
Export Services					
Public Relations					
GROUP 2: Research & Development					
GROUP 3: Haulage					
Office Cleaning					
Plant Hire					
Waste Disposal					

*Including those supplied by other establishments of your group.

(b) APPROXIMATELY WHAT PERCENTAGE, IF ANY, OF EACH SERVICES' GROUP IS SUPPLIED BY OTHER ESTABLISHMENTS IN YOUR ORGANISATION?

	%
GROUP 1	☐
GROUP 2	☐
GROUP 3	☐

(c) APPROXIMATE TOTAL PURCHASES OF GOODS AND SERVICES PER ANNUM (LAST CALENDAR OR FINANCIAL YEAR). Please tick the relevant box.

Under £50,000	☐
£50,000-250,000	☐
£250,000-1,000,000	☐
OVER £1 million	☐

6. IF YOU INTEND TO INCREASE PRODUCTION WITHIN THE NEXT FIVE YEARS, WOULD THIS ENTAIL:

(a) AN INCREASE IN YOUR LABOUR FORCE? YES/NO
(b) THE PURCHASE OF NEW PLANT/MACHINERY YES/NO
(c) THE USE OF NEW RAW MATERIALS/COMPONENTS? YES/NO
(d) AN INCREASE IN FLOORSPACE? YES/NO

7(a) DO YOU FIND ANY PROBLEMS WITH YOUR PRESENT LOCATION?

YES/NO

IF YES, PLEASE SPECIFY

(b) USING THE FOLLOWING LIST, PLEASE RANK IN ORDER OF IMPORTANCE THE ADVANTAGES OF A LOCATION IN THIS AREA. (PLEASE USE NUMBERS 1-8, 1 BEING THE MOST IMPORTANT).

ACCESS TO CHEAP LABOUR ☐

ACCESS TO SKILLED LABOUR ☐

ACCESS TO SPECIALIST SERVICES ☐

A PLEASANT WORKING ENVIRONMENT ☐

ASSISTED AREA STATUS ☐

OTHERS (PLEASE SPECIFY):-

(a) ☐

(b) ☐

(c) ☐

8. OTHERE AREAS OF THE COUNTRY HAVE A CAPACITY REGISTER IN WHICH THEY ADVERTISE AND RENT OUT SPARE CAPACITY (e.g. MACHINE TIME). WOULD YOU BE INTERESTED IN SUCH A SCHEME IN THIS AREA? (Please tick the relevant box/boxes):-

AS A USER ☐

AS A SUPPLIER ☐

NO ☐

APPENDIX B

The Chi-Square Test

Chi-Square is a test of statistical significance and helps us to determine whether a systematic relationship exists between two variables. It is not a measure of association and no causality is implied. In short, it measure the extent to which the observed frequencies in a contingency table deviate from those we would expect by chance, given that the null hypothesis of no correlation is true. A statistically significant Chi-square value allows us to say with a certain degree of confidence that the booked events in the table are not the product of two independent random variables. This test is most appropriate when both variables are measured at the nominal level. In some cases our variables are measured at both nominal and ordinal levels. Here, the Chi-square test may be used but the statistics are calculated as if both variables are measured at the nominal level. However, no technical error is made since the properties of level of measurement are cumulative. A research problem may arise though because this procedure does not use all the information that is readily available in a higher level score.

REFERENCES

Archer B.H. (1976) The Anatomy of a Multiplier, Regional Studies 10, 71 - 77.

Archibald G.C. (1967) Regional Multiplier Effects in the United Kingdom, Oxford Economic Papers 19, 22 - 45.

Armstrong H. and Taylor J. (1978) Regional Economic Policy and Its Analysis. Philip Allan.

Averitt R.T. (1968) The Dual Economy : The Dynamics of American Industry Structure. New York.

Boudeville J.R. (1965) Problems of Regional Economic Planning. Edinburgh University Press.

Braithwaite J.L. (1968) The Post War Industrial Development of Plymouth : An Example of The Effect of National Industrial Location Policy, Transport Institute of British Geographers 45, 39 - 50.

Britton J.N.H. (1974) Environmental Adaptation of Individual Plants : Service Linkages, Locational Environment and Organisation, in Hamilton F.E.I. (Ed) Spatial Perspectives on Industrial Organisation and Decision Making. Wiley.

Britton J.N.H. (1976) The Influence of Corporate Organisation and Ownership on The Linkages of Industrial Plants : A Canadian Enquiry, Economic Geography 52, 311 - 324.

Browning J.E. (1980) How To Select a Business Site. McGraw Hill.

Brownrigg M. (1973) The Economic Impact of a New University, Scottish Journal of Political Economy 20, 123 - 139.

Brownrigg M. (1976) The Sub-Regional Income Multiplier Model, Economics 1, 3 - 14.

Buswell R.J. and Lewis E.W. (1970) The Geographical Distribution of Industrial Research Activity in The UK, Regional Studies 4, 297 - 306.

Chinitz B. (1961) Contrasts in Agglomeration : New York and Pittsburg, American Economic Review 51, 279 - 289.

Cochran W.G. (1954) Some Methods for Strengthening The Common Chi-Square Tests, Biometrics 10, 417 - 451.

Cornwall County Council (1979) County Structure Plan Report of Survey. Truro.

Crum R. and Gudgin G. (1977) Non Production Activities in UK Manufacturing Industry, Commission of The European Communities, Regional Policy Series, 3.

D'Abbs P. (1974) North Devon 1966 - 1974. Aspects of Social and Economic Change. Community Council of Devon, Exeter.

Department of Industry (1983a) Strategic Aims. Department of Industry, London.

Department of Industry (1983 b) Divisional Objectives. Small Firms Division, Department of Industry, London.

Devon County Council (1983) Employment in Devon. Exeter.

Dicken P. (1976) The Multiplant Business Enterprise and Geographical Space : Some Issues in The Study of External Control and Regional Development, Regional Studies 10, 401 - 412.

Dicken P. and Lloyd P.E. (1976) Geographical Perspectives on United States Investment in The UK, Environment and Planning 8, 685 - 706.

Dixon R.J. and Thirlwall A.P. (1975) A Model of Regional Growth Rate Differences on Kaldorian Lines, Oxford Economic Papers 27, 201 - 214.

Emery F.E. and Trist F.L. (1965) The Causal Texture of Organisational Environments, Human Relations 18, 21 - 32.

Ewers H.J. and Wettman R.W. (1980) Innovation Oriented Regional Policy, Regional Studies 14, 161 - 179.

Feller I. (1975) Invention, Diffusion and Industrial Location, in Collins I.and Walker D.F. (Eds)Locational Dynamics of Manufacturing Activity, 83 - 107, Wiley.

Fothergill S. and Gudgin G. (1984) Geographical Variation in The Rate of Formation of New Manufacturing Firms, Regional Studies 18, 203 - 206.

Freeman C. (1974) The Economics of Industrial Innovation. Penguin.

Gardner G. (1978) Local Surveys for Social Planners. Open University Press.

Gilmour J.M. (1974) External Economies of Scale, Inter Industrial Linkages and Decision Making in Manufacturing, in Hamilton F.E.I. (Ed) Spatial Perspectives on Industrial Organisation and Decision Making, 335 - 363, Wiley.

Goddard J.B. (1980) Industrial Innovation and Regional Economic Development in Britain, Centre for Urban and Regional Development Studies Discussion Paper 32, University of Newcastle upon Tyne.

Goddard J.B. (1983) Technological Innovation in a Regional Context : Empirical Evidence and Policy Options, Centre for Urban and Regional Development Studies Discussion Paper 55, University of Newcastle upon Tyne.

Goddard J.B. and Thwaites A.T. (1983) Unemployment in The North, Jobs in The South - The Regional Dimension To The Introduction of New Technology, Centre for Urban and Regional Development Studies Discussion Paper 54, University of Newcastle upon Tyne.

Gould A. and Keeble D.E. (1984) New Firms and Rural Industrialisation in East Anglia, Regional Studies 18, 189 - 201.

Green D.H. (1977) Industrialists Information Levels of Regional Incentives, Regional Studies 11, 7 - 18.

Greig M.A. (1971) The Regional Income and Employment Multiplier Effects of a Pulp and Paper Mill, Scottish Journal of Political Economy 18, 31 - 48.

Gripaios P. (1984) Location in Devon and Cornwall : An Analysis of Firm Perception, in Gripaios P. (Ed) The Devon and Cornwall Economy, South-West Papers in Geography 10 (forthcoming).

Gudgin G. (1976) Establishment Based Data in Studies of Employment Growth and Location, in Swales J.K. (Ed) Establishment Based Research Conference Proceedings, Centre for Urban and Regional Research Discussion Paper 22, University of Glasgow.

Gudgin G. (1978) Industrial Location Processes and Regional Employment Growth. Saxon House.

Hagerstrand T. (1966) Aspects of The Spatial Structure of Social Communication and The Diffusion of Information, Papers and Proceedings of The Regional Science Association 16, 27 et seq.

Hansen N.M. (1967) Development Pole Theory in A Regional Context, Kyklos 20, 709 - 725.

Haug P., Hood N. and Young S. (1983) R and D Intensity in The Affiliates of US Owned Electronics Companies Manufacturing in Scotland, Regional Studies 17, 383 - 392.

Healey M.J. (Ed) (1983) Urban and Regional Industrial Research - The Changing UK Data Base. Geo.

Hermansen T. (1972) Development Poles and Related Theories : A Synoptic Review, in Hansen N.M. (Ed) Growth Centres in Regional Economic Development, 160 - 204, MacMillan.

Hickson D.J., Pugh D.S. and Pheysey D.C. (1969) Operations Technology and Formal Organisation : An Empirical Reappraisal, Administrative Science Quarterly 4, 378 - 397.

Hirschman A.O. (1958) The Strategy of Economic Development. Yale University Press.

Hoare A.G. (1975) Linkage Flows, Local Evaluation and Industrial Geography : A Case Study of Greater London, Environment and Planning 7, 41 - 58.

Hoare A.G. (1978) Industrial Linkages and The Dual Economy : The Case of Northern Ireland, Regional Studies 12, 167 - 180.

Holland S. (1976) Capital versus The Regions. MacMillan.

Howells J.R.L. (1984) The Location of R and D : Some Observations and Evidence From Britain, Regional Studies 18, 13 - 29.

Jackson J. (1963) Surveys For Town and Country Planning. Hutchinson.

Jacobs D. (1974) Dependence and Vulnerability : An Exchange Approach To The Control of Organisations, Administrative Science Quarterly 19, 45 - 59.

Kaldor N. (1970) The Case For Regional Policies, Scottish Journal of Political Economy 17, 337 - 348.

Kaldor N. (1975) What is Wrong With Economic Theory? Quarterly Journal of Economics 89, 347 - 357.

Karaska G.T. (1969) Manufacturing Linkages in The Philadelphia Economy : Some Evidence of External Agglomeration Forces, Geographical Analysis 1, 354 - 369.

Keeble D.E. (1969) Local Industrial Linkage and Manufacturing Growth in Outer London, Town Planning Review 15, 163 - 188.

Keeble D.E. (1972) Industrial Movement and Regional Development in The United Kingdom, Town Planning Review 43, 3 - 25.

Keeble D.E. (1976) Industrial Location and Planning in The United Kingdom. Methuen.

Krumme G. and Hayter R. (1975) Implications of Corporate Strategies and Product Cycle Adjustments for Regional Employment Changes, in Collins I. and Walker D.F. (Eds) Locational Dynamics of Manufacturing Activity, 325 - 356, Wiley.

Lasuen J.R. (1972) On Growth Poles, in Hansen N.M. (Ed) Growth Centres in Regional Economic Development, 20 - 50, MacMillan.

Le Heron R.B. (1973) Best Practice Technology, Technical Leadership and Regional Economic Development, Environment and Planning 5, 735 - 749.

Le Heron R.B. and Schmidt C.G. (1976) An Exploratory Analysis of Linkage Change Within Two Regional Industries, Regional Studies 10, 465 - 478.

Leibenstein H. (1966) What Can We Expect From A Theory of Development? Kyklos 19, 1 - 21.

Leigh R. and North D.J. (1975) A Framework For The Study of The Spatial Aspects of Acquisition Activity in Manufacturing Industry, Industrial Location Research Project Working Paper 1, Middlesex Polytechnic.

Leigh R. and North D.J. (1978) Regional Aspects of Acquisition Activity in British Manufacturing Industry, Regional Studies 12, 227 - 245.

Leontief W.W. (1951) The Structure of The American Economy, Second Edition. Open University Press.

Lever W.F. (1972) Industrial Movement, Spatial Association and Functional Linkages, Regional Studies 6, 371 - 384.

Lever W.F. (1974 a) Regional Multipliers and Demand Linkages at Establishment Level, Scottish Journal of Political Economy 21, 111 - 122.

Lever W.F. (1974 b) Migrant Industry, Demand Linkages and The Multiplier : Some Paradoxes in Regional Development, Centre for Urban and Regional Research Discussion Paper 12, University of Glasgow.

Lever W.F. (1974 c) Manufacturing Linkages and The Search for Suppliers and Markets, in Hamilton F.E.I. (Ed) Spatial Perspectives on Industrial Organisation and Decision Making, 319 - 335, Wiley.

Lloyd P.E. and Dicken R. (1982) Industrial Change : Local Manufacturing Firms in Manchester and Merseyside. Inner Cities Research Programme, Department of The Environment, London.

Lloyd P.E. and Mason C.M. (1984) Spatial Variations in New Firm Formation in The United Kingdom : Comparative Evidence From Merseyside, Greater Manchester and South Hampshire, Regional Studies 18, 207 - 220.

Loether H.J. and McTavish D.G. (1980) Descriptive and Inferential Statistics. Allyn and Bacon.

Malecki E.J. (1980) Corporate Organisation of R and D and The Location of Technological Activities, Regional Studies 14, 219 - 234.

Malecki E.J. (1981) Science, Technology and Regional Economic Development : Review and Prospects, Department of Geography Mimeo, University of Oklahoma.

Mansfield E. (1968) The Economics of Technical Change. Longmans.

Marquand J. (1980) Measuring The Effects and Costs of Regional Incentives, Government Economic Service Working Paper 32.

Marshall J.N. (1979) Ownership, Organisation and Industrial Linkage : A Case Study in The Northern Region of England, Regional Studies 13, 531 - 557.

Mason C.M. (1981) The Creation of An Establishment Based Data Bank For South Hampshire. Final Report SSRC Grant HR 6796. Department of Geography, University of Southampton.

McCrone G. (1969) Regional Policy in Britain. Allen and Unwin.

McDermott P.J. (1976) Ownership, Organisation and Regional Dependence in The Scottish Electronics Industry, Regional Studies 10, 319 - 335.

McDermott P.J. (1978) Changing Manufacturing Enterprise in The Metropolitan Environment : The Case of Electronics Firms in London, Regional Studies 12, 541 - 550.

Milleti D.S. and Gillespie D.F. (1976) An Integrated Formalisation of Organisational Environment Interdependencies, Human Relations 29, 85 - 100.

Mindlin S.E. and Aldrich H. (1975) Interorganisational Dependence : A Review of The Concept and A Re-examination of The Findings of The Aston Group, Administrative Science Quarterly 20, 382 - 392.

Moseley M.J. (1973) The Impact of Growth Centres in Rural Regions - An Analysis of Spatial Flows in East Anglia, Regional Studies 7, 77 - 94.

Moseley M.J. and Townroe P.M. (1973) Linkage Adjustment Following Industrial Movement, TESG 64, 137 - 144.

Myrdal G. (1957) Economic Theory and Underdeveloped Regions. Duckworth.

Nevin E., Roe A.R. and Round J.I. (1966) The Structure of The Welsh Economy. University of Wales Press.

Northern Region Strategy Team (1976) Growth and Structural Change in The Economy of The Northern Region Since 1952, Technical Report 4.

Oakey R.P. (1981) High Technology Industry and Industrial Location : The Instruments Industry Example. Gower.

Oakey R.P. (1984) Innovation and Regional Growth in Small High Technology Firms : Evidence From Britain & The USA, Regional Studies 18, 237 - 251.

Oakey R.P., Thwaites A.T. and Nash P.A. (1980) The Regional Distribution of Innovative Manufacturing Establishments in Britain, Regional Studies 14, 235 - 253.

O'Farrell P.N. (1980) The Mobilisation of Indigenous Potential : Towards a Complementary Regional Strategy, Department of Town Planning Papers in Planning Research 9, University of Wales Institute of Science and Technology.

O'Farrell P.N. and Crouchley R. (1984) An Industrial and Spatial Analysis of New Firm Formation in Ireland, Regional Studies 18, 221 - 236.

Osborn R.N. and Hunt J.F. (1974) Environment and Organisational Effectiveness, Administrative Science Quarterly 19, 231 - 246.

Paelinck J. (1965) La Theorie du Development Regional Polarise, in Cahiers de L'ISEA, 5 et seq.

Payne R. (1982) Manufacturing Investment and Macro Economic Change : A Comparative Study of Devon, Cornwall and The North-East, in Shaw G. and Williams A.M. (Eds) Economic Development and Policy in Cornwall, South-West Papers in Geography 2, 43 - 50.

Perroux F. (1955) Note on The Concept of Growth Poles, Economic Appliquee 8, 307 et seq.

Perroux F. (1971) Note on The Concept of Growth Poles, in Livingstone I. (Ed) Economic Policy for Development, 278 - 289, Penguin.

Perrow C. (1961) The Analysis of Complex Organisations, American Sociology Review 26, 854 - 865.

Perry M. and Chalkley B. (1984) Property Provision and Economic Development in Cornwall : A Survey of The Occupants of New Small Factory Units, in Gripaios P. (Ed) The Devon and Cornwall Economy, South-West Papers in Geography 10 (forthcoming).

Plymouth City Council (1984) The Case For Plymouth to Retain Assisted Area Status. Plymouth.

Prais S.J. (1976) The Evolution of Giant Firms in Britain. Cambridge University Press.

Pred A.R. (1965) The Concentration of High Value Added Manufacturing, Economic Geography 41, 108 - 132.

Pred A.R. (1977) City Systems in Advanced Economies. Hutchinson.

Pugh D.S. and Hickson D.J. (Eds) (1976) Organisational Structure in Its Context, The Aston Programme 1. Saxon House.

Rabey G.F. (1978) Industrial Linkage and Communication Flows : An Organisational Communications Approach to The Geography of Enterprise, Centre for Urban and Regional Development Studies Discussion Paper 5, University of Newcastle upon Tyne.

Richter C.E. (1969) The Impact of Industrial Linkages on Geographic Association, Journal of Regional Science 9, 19 - 28.

Robson B.T. (1973) Urban Growth : An Approach. Methuen.

Rodwin L. (1963) Choosing Regions For Development, in Fredrick C.J. and Harris S. (Eds) Public Policy 12.

Schmookler J. (1966) Invention and Economic Growth. Harvard University Press.

Shaw G. and Williams A.M. (1984) Manufacturing or Service Industries? An empirical Analysis of Firms on Industrial Estates in Cornwall, in Gripaios P. (Ed) The Devon and Cornwall Economy, South-West Papers in Geography 10 (forthcoming).

Sinclair M.T. and Sutcliffe C.M.S. (1978) The First Round of The Keynesian Regional Income Multiplier, Scottish Journal of Political Economy 25, 177 - 186.

Solow R.M. (1957) Technical Change and The Aggregate Production Function, Review of Economics and Statistics 39, 312 - 320.

South-East Joint Planning Team (1971) Strategic Plan For The South-East 1. HMSO.

Spooner D.J. (1972) Industrial Movement and The Rural Periphery : The Case of Devon and Cornwall, Regional Studies 6, 197 - 215.

Spooner D.J. (1974) Some Qualitative Aspects of Industrial Movement In A Problem Region in The UK, Town Planning Review 45, 68 - 83.

Steele D.B. (1969) Regional Multipliers in Great Britain, Oxford Economic Papers 21, 268 - 292.

Steele L.W. (1975) Innovation in Big Business. New York.

Stewart J.C. (1976) Linkages and Foreign Direct Investment, Regional Studies 10, 245 - 258.

Storey D.J. (1983) Regional Policy in A Recession, National Westminster Bank Quarterly Review November, 39 - 47.

Streit M.E. (1969) Spatial Association and Economic Linkages Between Industries, Journal of Regional Science 9, 177 - 188.

Swales J.K. (1981) A Kaldorian Model of Regional Growth, Strathclyde Discussion Papers in Economics 2, University of Strathclyde.

Taylor M.J. (1973) Local Linkage, External Economies and The Iron Foundry Industry of The West Midlands and East Lancashire Conurbations, Regional Studies 7, 387 - 400.

Taylor M.J. and Wood P.A. (1973) Industrial Linkage and Local Agglomeration in The West Midlands Metal Industries, Transport Institute of British Geographers 59, 129 - 154.

Terreberry S. (1968) The Evolution of Organisational Environments, Administrative Science Quarterly 13, 590 - 613.

Thirlwall A.P. (1972) Letter to 'The Times' 5th April 1972.

Thirlwall A.P. (1980) Regional Problems Are 'Balance of Payments' Problems, Regional Studies 14, 419 - 425.

Thomas M.D. (1972) Growth Pole Theory : An Examination of Some of Its Basic Concepts, in Hansen N.M. (Ed) Growth Centres in Regional Economic Development, 50 - 82, MacMillan.

Thompson J.D. (1967) Organisations in Action. McGraw-Hill.

Thwaites A.T. (1978) Technological Change, Mobile Plants and Regional Development, Regional Studies 12, 445 - 461.

Thwaites A.T. (1982) Some Evidence of Regional Variations in The Introduction and Diffusion of Industrial Products and Processes Within British Manufacturing Industry, Regional Studies 16, 371 - 381.

Thwaites A.T. (1983) Technological Innovation in A Regional Context, Centre for Urban and Regional Development Studies Discussion Paper 55, University of Newcastle upon Tyne.

Townroe P.M. (1972) Some Behavioural Considerations in The Industrial Location Decision, Regional Studies 6, 261 - 272.

Townroe P.M. (1975) Branch Plants and Regional Development, Town Planning Review 46, 47 - 62.

Twiss B.C. (1974) Managing Technological Innovation. Longman.

Vernon R. (1966) International Investment and International Trade in The Product Cycle, Quarterly Journal of Economics 80, 190 - 207.

Watts H.D. (1981) The Branch Plant Economy : A Study of External Control. Longman.

Whittington R.C. (1984) Regional Bias in New Firm Formation in The UK, Regional Studies 18, 253 - 256.

Wilson T. (1968) The Regional Multiplier, Oxford Economic Papers 20,. 374 - 393.

Wood P.A. (1969) Industrial Location and Linkage, Area 2, 32 - 39.

Wood P.A. (1978) Industrial Organisation Location and Planning, Regional Studies 12, 143 - 152.

Woodward J. (1958) Management and Technology. HMSO.

Woodward J. (1965) Industrial Organisation : Theory and Practice. Open University Press.