PLACE IN SOCIAL PROCESS: AN EXPLORATORY DATA ANALYSIS OF OUTCOMES FROM LOCALISED LABOUR EXCHANGE

By

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DECLARATION

Except where otherwise indicated
this thesis is my own work.

Anthony Murney
June 1986
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ABSTRACT

The principle tenet of this Study is that place and its role in social process is poorly understood. This is a serious problem in human geography where one of the major tasks is to elucidate the spatial elements in social process. The resulting difficulties are compounded in empirical analysis where the spatial and social are highly disaggregated. Any response must, therefore, address these features of the problem if the situation is to be redressed. A twofold response was formulated. The first, concentrates attention on labour exchange as a key element of social process and investigates spatial differences from the highly disaggregated local perspective. The second involves transferring Tukey’s philosophy of EXPLORATORY DATA ANALYSIS to geographical research. This has been done to overcome analytical rigidities which impede progress where theory concept or data are sufficiently suspect as to cause uncertainty. Implementation of this strategy progresses from comparatively simple and conventional treatments of place in labour exchange to more sophisticated examinations which explore spatial aspects of differentiation in controlled analytical environments.

Substantive investigation of labour exchange, from an exploratory point of view, provides powerful insights into the role of place in labour exchange because it is less constrained than conventional treatments. These insights are manifest through analyses of extent and nature in differentiation between places. Results are of three types: structure in place and social process which establish a prima facie case for more general analysis; structure of place in a widely defined social environment; structure in social process which is sufficiently general as to sustain hypotheses of ubiquitous spatial structure. These interim findings, of merit in their own right, combine to provide a sound foundation for proposition of a model relating place to social process. This model is significant because it reverses the principal tenet of traditional empirical models, which reduce place to the status of an analytical convenience, and argues that it is inherent in considerations of social process.
The role of place in social process has been the subject of geographic research since the discipline's inception. Consequently, much is known about differences between place according to a large number of social variables but this knowledge is strangely *ad hoc*, being of a piecemeal and 'one off' character. Place has been generally recognised as a useful adjunct to social research but not a necessary element of it. The reason is that spatial research falls between two popular extremes: the macroanalytic, where there is a concentration on high level (commonly national) aggregates; and the microanalytic, where individual behaviour is the subject of interest. Both alternatives are attractive because they offer opposite perspectives on social process. The macro proposes general statements from the collective and the micro, models of behaviour from the particular. Recognising that aggregates are composed of actions taken by individuals, the former could be discarded as a distortion of the latter, were it not for the observational limitations of generalisation from the particular. Equally, the microanalytic could be discarded as unsustainable since generalisation from the particular requires gross assumption to standardise for the unique. This is also untenable as it is necessary to legitimise conclusions from the macroanalytic by foundations in individual behaviour. Spatial analysis provides a meso level of research (Holland, 1976) introducing an alterable focus which facilitates analytical transition between macro and microanalytic extremes. Spatial research therefore represents an important adjustment to the limitations of prevalent trends in analysis.

This conclusion leaves little doubt that spatial research is the natural extension of analytical extremes, representing an important development by revealing the analytical role of place in social research. It is clear that place has not been recognised as being of significance in the vast majority of cases and been denegated in some as 'spatial fetishism'. The primary defence against such criticisms is that place is qualitatively distinct from other variables used to analyse social process. These are simply introduced as dimensions of variation which specify process whereas place is a partition of process, transcending all other variables used in its analysis (Smith, 1977). Increasingly sophisticated definitions of place from differing
Epistemological perspectives have also been advanced to increase the concepts' credibility (best exemplified by Tuan, 1977). Although technically supportive of significance, these have had little discernable effect as they do not generally address the role of place in social process as distinct from social research. The role of place in social process must be established if it is to gain credibility in social research.

The most imaginative response to this problem has developed in recent literature which can be typified as theoretico-abstract (grand theory). This has emerged because of dissatisfaction with existing geographic research and attempts to develop theories which explicitly include place in social process from abstract concept (Soja, 1980; Urry, 1981; and also see the edited work of Gregory and Urry, 1985). Though innovative, these treatments of place in social process are of little applied benefit for two reasons. First, they are poorly founded in observation which is at best informal, often relying on casual impressions and abstractions suited to ideological argument. Second, there is a penchant for proposing general relationships which ignore the particular and, therefore, limit insights into the role of place in social process. The result is an over extended theoretical development which has become detached from observation and is very difficult to examine due to the level of debate. An empirical alternative is required to counter this situation.

Unfortunately, empirical approaches to spatial research have been remarkable for their lack of progress in this field and are at least partially responsible for emergence of the theoretico-abstract response. Two grave problems confront empirical analyses of place in social process. Firstly, material from theoretico-abstract treatments is of negligible value in formulation of empirical analyses as there is little reference to spatial or social detail which must characterise such an effort. As a result, any theoretical base is more likely to be founded in constructs designed to generate testable hypotheses but, as will be seen, even these are of minimal use in this case. Exploration, with its emphases on unconstrained search and pragmatism, offers scope for departure from analytical conventions. This is critical as it increases flexibility of response and so the likelihood of unravelling place and its role in social process. The second problem arises from the concept of social process which embraces an extremely broad range of human endeavours. The abstract theorists have few practical difficulties in this regard due to their detachment from detailed observation which increases scope to traverse broadly ranging issues. Empirical responses do not have this advantage and social process must be partitioned into workable elements. Labour exchange is one aspect of social process which is of considerable analytical and human significance. It is arguably central to the operation of social process, providing the link between
formal production and wider facets of social activity through distribution of benefits from work. It has, therefore, been nominated as the main feature of process to be examined in this Study.

The following analysis commences at this point. Its substantive element is primarily empirical, being abashedly pragmatic and inductive in character. It dispenses with the puzzles of grand theory, not as a rejection but of necessity, recognising how little is actually known and the primitiveness of ‘social science’ when faced with truly complex problems. The conceptualisation of place is one of existing divisions in space, seeking to use the available to achieve the attainable and so take steps to unravel the problem of place in social process.

Note to the Reader: A glossary of terms is attached and this should be used as several specialist fields are covered in this Study. Also, the reader may find it useful to proceed directly to the postscript as it explains the longer term context of this Study.
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CHAPTER 1
AN EMPIRICAL INVESTIGATION OF PLACE IN LABOUR EXCHANGE
- THE RESEARCH PROBLEM

The purpose of this Study is to investigate the role of place in labour exchange which is poorly understood because of insufficient empirical work. This can be redressed by empirically seeking structure in the form of outcomes from labour exchange through an exploratory data analysis of extent and nature in local differentiation. Spatial analysis of labour exchange differences is necessary because of serious concerns that aggregate analyses implicitly assume that findings at the national level are applicable at the local level or that local structures can be "unproblematically taken as representative" of higher level aggregates (Urry, 1983, 123). The scale of spatial analysis advocated relates labour exchange to the places in which people live and seeks to uncover evidence of locational structures subsumed in aggregate analyses at the national or state level.

Critical evaluation of the research problem reveals that it embraces five major themes which determine the character of subsequent analysis:

i) A concern with outcomes from the labour exchange process.

ii) An empirical orientation towards the form of differences as opposed to the processes which cause them.

iii) Investigation of not only differences in extent but more importantly qualitative differences in the nature of exchange between local areas.

iv) A fine scale of spatial disaggregation focussing on local differences with a stronger basis in community than higher level aggregations.

v) Transfer of Tukey's exploratory data analysis philosophy, with its ramifications for problem solving, data usage, technical manipulation and interpretation, to spatial research.

With the exception of exploratory data analysis each of these themes has received considerable attention in geographic research but it is the combination of these which distinguishes this Study.

The context for this analysis is nonmetropolitan New South Wales (N.S.W.) for the period 1966-76. This area was chosen because investigation of nature in
differentiation requires the use of large data sets. As will be seen this constitutes a substantial operational problem which is compounded when information from different periods is sought. Nonmetropolitan N.S.W. offers advantages of a substantial number of areas and a high degree of internal diversity. The period 1966-76 was chosen because it embraced the major post war changes in labour exchange experience, ranging from near full employment to severe economic recession. This offers unprecedented scope in postwar years to investigate place under different circumstances. With this context established attention can now be turned to a systematic examination of this Study’s conceptual themes.

The major objective of this Chapter is to elucidate the research problem’s substantive element. This can be done best using the research themes which constitute the problem’s conceptual foundation. The fifth theme, dealing with exploratory data analysis, will be reserved for separate discussion in the next chapter because it provides an important extension of geographic research options.

The remaining four will be examined according to their methodological relationships, with labour exchange being treated first as the common element of place, followed by a review of form/process, as alternative views of the spatial problematic in labour exchange, and extent/nature in differentiation, as contrasting treatments. The problem of place will be examined last in the purely analytical context of selecting a suitable unit for observation and in particular justifying the choice. Examination of thematic material for each element of the Study will be highly selective with the objective being to filter debate and construe it in terms relevant only to formulation of empirical analysis. This means discarding many of the abstract aspects of debate to provide contrast with the more recent discussion of these themes, since applied limitations are not only recognised but stressed.

1.1 The Labour Exchange Process

Labour exchange is the major social process governing the direction of research in this Study. It is a complex social process and has received a great deal of attention with specialist fields developing, such as labour economics, which are exclusively concerned with this phenomena. As these developments have occurred, treatments of labour exchange have become increasingly rarefied and conceptual specifications esoteric. This trend is clearest in labour economics where neoclassical models increased in technical complexity but at the same time became more dependent on general assumptions, narrow preconceptions and high level abstraction. Such models are unsuited to exploration because they impose a rigid structure. An alternative can be proposed to provide a more suitable analytical context. This will
be done by first examining the more conventional model, its sources of limitation and then a more streamlined alternative which is of greater use as a conceptual context for exploration.

In Australia, the mechanism allocating work to individuals and individuals to work is usually described as a labour market. However, as a point of departure, the labour market description is inadequate because the mechanism is not indisputably a market. For the allocation mechanism to be accurately described in this way it must satisfy a number of conditions which become more stringent as the concept of market becomes more precise. At its most basic level the allocation mechanism depends on the existence of price-quantity relationships if it is to be described as a market (Fleisher, 1970; Perlman, 1969). The quantity element of the relationship refers jointly to the quantity of labour requiring work and the quantity of work requiring labour, while the price mechanism operates as the primary device for resolving requirement differences.

In its elementary form, the perfectly competitive labour market, this model of exchange depends on a series of simplifying assumptions which have minimal application in real world situations but without which the model is difficult to portray as an analytical device. For example: homogeneity of labour; remuneration differences reflective of productivity; perfect information amongst workers and employers; and no collusion between members of either group (Rees, 1979). Hurst (1972,18) has observed that such models of exchange are dangerously misleading because they attempt to describe the “social reality of their time”. The models of man which result are dehumanising (Walmsley, 1984; Wallace, 1978) and extremely restrictive (Katouzian, 1980; Bensusan-Butt, 1978). The necessary conditions for portrayal of exchange in terms of neoclassical markets are therefore very difficult to satisfy.

Whilst some of these conditions apply in certain situations they are unlikely to be generally applicable in most. King describes the situation as follows:

Neoclassical economists (e.g. Hicks) treated labour markets as close approximations to the perfect markets described in most elementary text books... Kerr suggests that the ‘natural’ market for labour is quite different: “the average worker has a narrowly confined view of the market and in addition is not an alert participant in it”...a conclusion which is supported by exhaustive empirical research... Traditional models allowed for ‘frictions’ in the operation of labour markets, but substantially underestimated their significance. Moreover, employers typically exercise a certain degree of control over the market, through tacit collusion... Nor is labour homogeneous, even within broad occupational groups.

These considerations cast doubts on attempts to analyse labour markets as a matrix of perfect sub-markets; in each of which a single wage rate prevails and within which workers are willing to move... (1972,13).
It can only be accepted that if the mechanism for allocating labour and work in Australia can be described as a market that it is imperfect and more likely to be representative of the long run than the short (Gregory, 1982).

A second level of debate lies in the challenge which arises from those who claim that the mechanism for allocating labour and work is not dominated by impersonal market forces but human institutions (Miernyk, 1973; King, 1972, 14). This claim can be supported by reference to the uniqueness of labour as a factor of production. Horn states:

...most of us are providers and users of labour services. This human, personal, character of work activity distinguishes labour from the other, inanimate, factors of production - land and capital - and requires us to view it against the social and institutional backgrounds of different countries. (1975, 1)

The essential argument is that the so called imperfections affecting the market have reached a stage where the price mechanism is no longer the sole instrument of allocation. The organisation of workers into unions and employers into industrial associations is frequently used as an example of the market mechanism’s demise because interaction between the two is no longer atomistic but organisational. Alternative market structures, portraying situations of monopolistic or oligopolistic competition, may be more realistic but these are also usually predicated on restrictive assumptions. Though these structures challenge the applicability of the market model, the debate as to whether exchange operates through an imperfect market or institutional framework has not been satisfactorily resolved. Gregory’s recent comment is illustrative:

There has always been a long standing tension in labour economics between those who devote their life to the study of labour markets and tend to emphasise the role of institutions in the determination of wages, and those whose primary interest often lies elsewhere in economics, who tend to emphasise that at the end of the day the labour market is much like any market - excess demand for labour causes the wage to rise in the same way that an excess demand for eggs causes the price of eggs to increase. (1982, 6)

Rather than erroneously describe the exchange problem as being dominated by either market forces or human institutions a more general view of labour exchange is preferred.

A schematic model will be developed here which isolates the key features of exchange without assumptions as to the character of actual allocation mechanisms. The purpose of such a model is to focus attention on major elements of the problem which may be of interest in empirical spatial analysis without becoming
embroiled in the philosophical debate as to desirability of alternative allocation mechanisms (Clark, 1981). A wide range of schematic models already exist but these are unsuitable because: they either assume one allocation mechanisms, as with stock-flow models, and so by implication raise the philosophical debates to be avoided here (Holt and David, 1966, 79; Holt et al., 1977, 18; Gregory and Stricker, 1981); are purpose specific and therefore insufficiently general for this Study (Eisenhawer, 1971; Gleave and Cordey-Hayes, 1977, 18); or are macroeconomic with data requirements which cannot be satisfied at the local scale (see references for stock-flow models and Siedule, Skoulas and Newton, 1965, 5; Mukerjee, 1976). Apart from format these models have been of little conceptual use in this Study.

The model developed in response to this situation is shown in its simplest form in Figure 1.1(a). It proposes a three component view of the labour exchange problem with a 'black box' allocation procedure. The three major components of the problem are (I) requirements for work, (II) requirements for labour and (III) exchange outcomes resulting from resolution of these alternative requirements by the allocation mechanism. This representation of labour exchange offers one major advantage. It subsumes the philosophical debate as to the character of actual allocation mechanisms and their desirability, not by interminable complication but by increased generality. This is important for three reasons: it does not place unrealistic requirements on the data base; allocation mechanisms may differ between localised economies; and it puts the allocation mechanism into a broader conceptual context (a problem often ignored in research oriented solely towards models of its operation). As such it provides a foundation for directing empirical research into specific aspects of labour exchange.

The schema outlined in Figure 1.1(a) ideally applies to individual transactions between those with work and labour requirements. The allocation mechanism incorporated into the model represents the environmental conditions under which exchange occurs and outcomes, the result of exchange efforts. This constitutes a starting point for extensive theoretical discourse on labour exchange and the desirability of varying environmental conditions which impinge upon it. This avenue, whilst developmentally important, is closed to much empirical work because data are usually not available at the scale of individual transactions for interarea studies. As a consequence partial analysis, based on aggregates for individual components of the exchange model, is all that can be attained. Strictly, insight is therefore limited to aggregations of requirement or outcome components of the model for areal or aspatial units.

The various components of the exchange process can be characterised by
Figure 1-1: Three Component Description of the Labour Exchange Process

(a) Simple labour exchange problem

(1) REQUIREMENT FOR WORK

(2) ALLOCATION MECHANISM (resolves the two different requirements)

(3) REQUIREMENT FOR LABOUR

(4) OUTCOMES FROM ALLOCATION

(b) Example of extensions which can be envisaged for the labour exchange description of the allocation problem with variables suited to higher levels of aggregation

- sex
- age
- family size
- work preferences
- physical and mental disabilities
- etc.

- skill composition
- types of firm
- industry composition
- labour/capital ratios
- dependence on protection
- etc.

- employment growth
- quantity of work
- income
- unemployment
- extent of participation
- locational mobility
- etc.

- industrial disputes
- levels of output
- value added
- profitability
- etc.
identifiable elements of the exchange process as shown in Figure 1.1(b). For empirical purposes this is entirely dependent on availability of information for chosen observational units, of which more is said below. It is difficult to assign most features of exchange to any one component of the model because information has not been collected to satisfy its requirements and each variable can be interpreted in numerous ways. For clarity the outcomes component of the model has been further distinguished into two major elements since some information reflects work or labour oriented outcomes from exchange. As can be seen, work and labour requirements vary according to an extreme range of conditional circumstances such as current income, family size, industry and capital-labour ratios whilst outcomes for aggregate units are reflected in diverse factors such as participation and income. The selection used here is deliberately partial as it reflects the problems of empirical analysis where data on many characteristics, even at highly aggregate scales, are not available.

Even the illustrative selection of characteristics used here reveals an exceedingly complex mosaic of labour exchange outcomes and requirements. These, it could be argued, reflect division of labour with its implications for distinction between projects and tasks in the course of production (Walker, 1985, 173). From this point it is conceivable that a conceptual framework concerning the spatial division of labour could be adopted from the abstract theoretical material (Walker, op. cit.; Ward, 1985; Urry, 1985) which has developed in recent times. This is ill-advised for two reasons. Firstly, much of the development has occurred without reference to empirical analysis so that its information requirements cannot be satisfied on an areal basis. Secondly, there is no evidence that general structures reflective of labour division by project, task or area will emerge. Hence the guidance of empirically detached theory may mislead when structured exploration can provide a much needed foundation in formal observation for theoretical developments.

It has been decided in this Study to concentrate attention on only one facet of the labour exchange process, i.e. exchange outcomes from a work requirements perspective. This focus on outcomes from social process is not unusual and is often justified from an indicators or quasi indicators stance (Logan, 1970; 120; Hill, 1977, 63). The attendant arguments relate to such phenomena as impact of the recession (Australia-Committee to Advise on Policies for Manufacturing Industry, 1975; Australia-Study Group on Structural Adjustment, 1979; Linge, 1976; Mellors, 1978) and the role of labour exchange in the distribution of material wealth (Morrill and Wohlenberg, 1971, 49; Gallaway, 1971, 145; Gordon, 1972, 6;
Cox,1976,427-428; Manning,1976,136; Australia-Commission of Inquiry into Poverty,1975,188). However, labour exchange is commonly only one part of such studies and is not an exclusive focus, as in this case. These justifications are of less direct interest in this Study because of its focus on place in labour exchange, being most relevant to the data intensive element of the analysis (see Chapter 2).

It is therefore the spatial element of this analysis which governs subsequent treatments of social process. This has influenced the decision to concentrate on labour exchange and more particularly one component of it. This will be done in three ways. Firstly, the focus on labour exchange is important because it is highly integrated with wider social process (Badcock, Jaensch and Williams, 1977,61). The significance of this was recognised by Shevky and Bell in their classical treatise on spatial differentiation:

...no single set of closely related facts tells us more about a total society as do the statistics discussing the working population. (1955,61)

Spatially, this claim is self sustaining because local areas are microcosms of society as a whole. Identification of substantial differences in place can only be attained through phenomena which are integral to the operation of wider social process. The employment relation is one such phenomenon because it relates labour to capital, people to consumption, consumption to production and one individual to another. The specific focus on work oriented outcomes concentrates on the substance of place which is people (Pred,1985) as opposed to production which would be the case were a labour requirements perspective adopted. This consideration is reinforced by the second where work already done (outside of the indicators movement in industry/occupational structure studies) is closely related to the requirement components of the model. Whilst respecifications have been suggested in the theoretical literature (Walker, 1985) this field is relatively well served. Finally analysis, of outcomes from a work oriented perspective is most practical because data are more readily available than for labour requirement outcomes where spatial analysis are concerned.

This final point raises the problem of data availability mentioned earlier. This is widely accepted as a benign limiting constraint on empirical analysis\(^1\). This is not the case and particularly so in spatial analysis where there is a complete reliance on secondary data. The most obvious effect of this is on the range of

\(^1\)The ideal method of collecting labour exchange data, as in broadly related fields (Rimmer,1969; Colquhoun,1977; Cleland, Goldsworthy and Stimson,1978; Robins,1978; O'Neil,1980), is by generation from primary sources. This approach is only possible where subject matter is seriously prescribed by area or some other feature such as industry. It is therefore not usually applicable where widely ranging interarea studies are concerned
choices available to empirical analysts. The result is a compromise where available data must be reconciled with that desired in order to investigate particular types of problem. Walker (1979,175) has noted this problem and Logan et.al. have summarised the position with regard to one selection as follows:

The variables selected from the 1971 census are far from ideal for the purpose, but represent the best that can be done, with existing census material. (1975,61)

As a result it is often not possible to investigate social phenomena in an interarea environment without distortion.

More seriously however, pursuance of many research directions is seriously restricted because available information has been collected in accordance with some accepted perception of the problem. This is very clearly the case where labour issues are concerned because the market model is so dominant. Information has been collected in accord with the tenets and definitions of this model rather than the more general conceptualisation of labour exchange. This problem has become so severe in Australia for researchers attempting to adopt alternative views that Curtain (1983,30) has been prompted to comment that it has led unemployment research into a cul de sac. The prescriptive character of information and concepts underlying its collection have therefore precluded many alternative treatments of the problem. Spatial analysts are thus confronted with the unenviable task of reconciling existent information with labour exchange research.

The labour exchange process has now been defined and the rationale for examining outcomes from it discussed. As used here it emphasises the exchange problem as opposed to the mechanisms which resolve it. In so doing a context has been developed for direction of research towards outcomes from the exchange process. As this focus on labour exchange outcomes is to be investigated in a spatial framework attention must now be turned to the mode of investigation which, in this case, emphasises spatial form as opposed to locationally disaggregated process.

1.2 Local Form and Process

In focussing on interarea differentiation this Study concentrates on the analysis of form in order to explore the spatial manifestations of labour exchange and by direct implication, the significance of place in social process. Although a longstanding pursuit of geographers it was found that the literature on spatial analysis devoted little attention to the concept of form, its relationship to process or its role in problem solving. References to form and process which were found can
be categorised as incidental, geometric, abstract and applied\(^2\). The most common and least useful references to form and process were incidental, assuming that meaning was understood. This is unjustifiable because there are three generic treatments which can be adopted. The geometric view, popularised by Bunge (1962), is of little value in formulating an empirical study of spatial differences in labour exchange because it is preoccupied with a technical view of form and divorced from social process. The most recent view of this problem is the abstract treatment (Gregory, 1978; Soja, 1980), although more sophisticated than initial efforts it has become esoteric in an empirical sense because of its dependence on complex abstract phenomena. These are so general as to prohibit detailed empirical analysis. As a result, these treatments are of little use in the formative stages of a detailed empirical analysis. In contrast, the applied treatment was designed to support spatial analysis of social phenomena, mainly within the city. Whilst it is not so sophisticated as the abstract treatments it is more relevant in this case. For this reason, the applied concepts have been selected for treatment in this formative stage of research.

Given the emphases in geographic research on spatial analysis, neglect of the form concept is surprising. The reasons for this are unclear but there are indications of an inaccurate preconception in the literature that the form concept is so elementary as to be a foregone conclusion. Adams, Abler and Gould, as pioneers of the applied school, have epitomised this attitude assuming the only application of form to analysis as being description:

> The emphasis in contemporary geography on spatial structure [substitute term for form] is somewhat misleading, because it overemphasises distributions to the neglect of spatial processes which interact causally with them. (1971,60)

This criticism is contextual, applying only where description is the objective of form analyses and valid only where description has been completed with further efforts being repetitive. Analyses of form, however, have the potential to extend beyond description because of the relationship between form and process. Definitions of form and process, in conjunction with this relationship, must then be considered in more detail.

The definitions of form and process used in other studies vary in detail and specificity because they are often task oriented. The definitions to be used here will

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\(^2\)Blaut (1961) identified the existence of two types of space, one absolute, to which geometric views of form are most applicable and another described as relativistic or Kantian, to which the applied or abstract views are most appropriate.
not faithfully reflect those of any general usage but the needs of this Study. The terms used when referring to form also vary, e.g. pattern, structure and morphometry. The need for adherence to one term in this Study is required as the terms pattern and structure have more precise meanings (see below) and cannot be used in the same ‘loose’ manner encountered in the general literature. The form and process concepts have been most used in recent times by urban geographers as a way of partitioning research objectives. Unfortunately many of the discussions, such as that by Bourne (1971,69-74, 133-140), are disappointing as only indirect or brief references are made. Carter’s references improve as they are direct:

form is taken to refer to the morphological or anatomical aspects (of the city)... and process to the functional or physiological aspects. (1972,13)

Though the meaning is clear these definitions of form and process are unsatisfactory because they rely on analogy and as a result lack conceptual precision. Harvey offers a more precise view on the subject:

The technical meaning of the term ‘process’ is rather different from its ordinary everyday interpretation. In the ordinary sense we frequently use process to refer to any sequence of events over time. Such usage has little to recommend it in the context of explanation, for it fails to differentiate between any sequence of events (which cannot be regarded as explaining anything in particular) and a sequence which is connected by some established mechanism (and which can thus be regarded as explanatory). (1969,419)

Unfortunately Harvey is one of those who treats form as a foregone conclusion and only refers to process. By implication, form could be seen as defined by outcomes from sequences of events. Another problem with Harvey’s view is that it is limited to a temporal context and therefore lacks generality. Adams, Abler and Gould advance a more general view of form and process which is not reliant on analogy and is consequently more precise than Carter’s (note: structure is their substitute term for form):

The spatial structure of a distribution is both the location of each element relative to each of the others and the location of each element relative to all others taken together ...(and) spatial processes are mechanisms which produce the spatial structures of distributions. (1971,60)

As this view of the definitions of form and process is both comprehensive and precise it is the one adopted for future reference.

Two kinds of form will be distinguished in this Study because of the importance it is accorded, one being labelled pattern and the other structure. Pattern is the more general of the two and describes any spatial distribution
regardless of meaning. In order to qualify as structure a pattern must contain elements which can be related meaningfully through either spatial association or other features of place. The distinction between pattern and structure is in reality very difficult to make because it is dependent on perception, where all intrinsic characteristics of place are not known. Hence diagnosis of a spatial distribution as being pattern does not imply that it is meaningless at a more general level but that its structuring factors are not immediately apparent.

This problem with analysis of form has been recognised by Gregory (Johnston, Gregory, Haggett, Smith, Stoddart, 1981, 322) who raises the conundrum of equifinality as opposed to multifinality whereby several processes produce similar patterns and similar processes divergent patterns. This problem is greatest where observations are not restricted to specific fields, as has been the case with social indicators, where Hurst (1980, 9) has noted indices so diverse as "sexual deviance (!), suicide, hunger and crime" being used in combination. This problem can be offset by targetting research to more specific social phenomena. It must be recognised in this context that controlled manipulation of form provides one of the few avenues for investigation of spatially disaggregated social process. This is dependent on the relationship between form and process.

The relationship between concepts of form and process has thus far been ignored. Arguably, both are artificial constructs designed to partition empirical analyses into one of two categories for convenience of reference and labelling when in reality they are not clearly separable. In doing so, differences of degree are represented as differences of kind. This is fine for convenience but creates problems as the integral relationship of form and process is ignored. The difficulty which arises is that the two kinds of analysis are treated as though they are independent. Adams, Abler and Gould (1971, 60) deny this possibility arguing that form and process are "circularly causal" with process influencing form and form impinging on process. This relationship has recurred in the most recent abstract combinations of the problem (Soja, 1981; Giddens, 1985) and shows a conceptual convergence of the applied and abstract treatments of form and process. Regrettably the latter cannot be regarded as an extension of the former because the abstract treatments have a very different epistemological base. It is agreed, however, that analysis of form and process are interdependent, with form providing an opportunity to gain insights into process. Indeed this relationship is so close that Blaut (1961) was prompted to claim that form (he used structure) is merely one view of process. Regardless of specificity it is this relationship which sustains the analysis of form as the primary channel for empirical exploration of process.
Irrespective of this relationship, and the recognised power of analyses of form, criticisms akin to those of Adams, Abler and Gould (op.cit.) still persist. Cooper recently expressed his frustration with the current direction in spatial analysis:

Even with the discovery of inequalities in resource distribution within regional and urban systems... regional scientists seem still more concerned with observing spatial differences than with providing convincing societal explanations for why these should occur... Analysis therefore remains at the level of the superficial. (1981,2)

The question which arises in the light of such criticism is: why should the analysis of locational form persist? It could be argued that the study of spatial form has led research into one of Curtain’s (op.cit.) cul de sacs and, through ineptitude of the field’s practitioners, the fruitlessness of this pursuit has not yet been realised. This possibility cannot be denied, and if Zelinsky’s view that the social sciences are “a refuge for mediocre personnel” is accepted, it might even be regarded as likely (quoted in Johnson,1979,161).

If Zelinsky’s view, and so Cooper’s criticisms, are not to prevail by default, three alternative views should be entertained before acceptance. The first of these stems from the social and economic importance of spatial analysis. This argument is conditional and varies in intensity from the level where locational differentiation is seen as being essential to any ‘proper’ understanding of economic or social phenomena, to that where it is supplementary and only a source of casual interest. Cooper (1978,2) all but dismissed this kind of justification arguing that such studies only reflect “the fact of human existence”. This view appears to understate how theory will be developed in the absence of observations concerning this ‘fact’. While the significance of local differentiation undoubtedly provides some justification, it applies equally to empirical investigations of form and process and can therefore not be used as justification for analysing form as opposed to process.

The second alternative arises from the notion presented by Adams, Abler and Gould, that analyses of form are “easier” to manage:

Why geographers are so much more aware of distributions than of the processes which produce them is not clear; it is probably because distributions of static things are easier to observe and record... than the processes which produce them. (1971,60)

This explanation is superficial and supports Zelinsky’s ineptitude view as it doubts the ability of the researcher to identify links between elements of the various patterns. Substantial work has been done on the processes which produce spatial distributions (see for example Haggett, Cliff and Frey,1977) and indicates a strong awareness of this facet of spatial research.
The third alternative seeks a response to the critics in the character of spatial analysis. This has two features: an inherent complexity and a relative immaturity. Taking each in turn, the problems of spatial analysis are greater than those encountered in many aspatial studies because an additional element has been introduced to all propositions, i.e. locational variation, with each area constituting an extra dimension in analysis\(^3\). This point was recognised two decades ago by Blaut in one of the earlier examinations of the form-process debate as it is now understood:

...the scale or magnitude of a geographic problem is necessarily greater than that of any problem concerning the objects themselves. (1961,5)

Blaut's view is a timely reminder of the difficulties faced in spatial research where the sufficiency of form analyses can only be assessed by reference to the diversity of research problems and not the absolute quantity of material processed. Cooper's 'rush' towards direct models of process must be qualified in these terms because they can only be inadequate in the absence of empirical preparation. Contemporary analyses of spatial form are also comparatively immature because access to information and techniques for processing have increased dramatically. The effect is that previous analyses are becoming increasingly crude because they are too highly aggregated in terms of the information used and hypotheses concerning process must also tend to become increasingly inadequate. Unfortunately, these advances have not been supported by greater conceptual control nor has the information increase necessarily been of the needed type. However, spatial analysis has changed and assumptions that sufficient work on form has been completed can only be accepted if previous limitations on detail are also accepted. The difficulty is that regularities used to generate hypotheses (Haggett, Cliff and Frey, 1977,259) may be overly crude and lead to misspecification of process. As the two types of analysis are integral, continued analysis of form is essential if adequate empirical direction is to be provided to theories and eventually, models of process.

An important general question arises from this conclusion: when is it desirable to adopt analyses of spatial form as a channel for investigating social process as opposed testing hypotheses or attempting to model process in space? One basis for judgement would be to accept the approach offering superior insights into locational differentiation, allowing for the limitations of data and theory. Such a proposition is ostensibly sound because the qualifications make it situational. From this it

\(^3\)Zelinsky (Johnson,1979,161) has also recognised the difficulty of the subject matter studied in the "social sciences" as a reason for their slow pace of development.
could be concluded that studies of form might be more desirable under certain circumstances, e.g. when theory is weak or insufficient data are available to model processes at a local level.

Unfortunately, the situation which prevails in geographic research is more complex because the antecedents of socio-spatial theories, designed to conceptualise process, are questionable on three grounds. Firstly, conceptualisations of process are often founded in informal observation of outcomes from process with the consequence that they only have the status of informal hypotheses or sets of hypotheses. As a result, formal analyses of outcomes from process are more reliable because they generate formal hypotheses. Secondly, theories developed in this manner are applicable to only the circumstances of the original observation yet as theories they are, by implication, more general than formal hypotheses and thus, applicability is overstated. Thirdly, contemporary theory is inevitably partial whilst process is holistic. This requires an assumption that process can be partitioned when this may result in substantial distortion. As a result, the foundations of theory embracing process must be established before it can be accepted that analyses of form have been sufficient to merit hypothesis testing or modelling.

Analysis of social process, through investigation of areal form, is substantially more important than generally recognised when spatial disaggregation is introduced because it has the capacity to provide insights into spatially disaggregated process which would be otherwise unobtainable. This arises from the empirical overlap between form and process which is seemingly ignored in what is an inherently artificial distinction. The merits of analyses of form increase markedly when their justifications are considered and the problems with theoretical treatments of process highlighted. The widely accepted concern with empirically specifiable models of spatially disaggregated social process appears to be distinctly premature in many fields where the rudiments of form have not been thoroughly documented. It remains then to consider the options available for analysis of form. There has been a preoccupation with analyses of extent in differentiation deriving from geography’s ‘atlas tradition’. This has been unfortunate because, although analyses of extent have proven exceedingly useful, differences in nature between places have received very little emphasis. It is to these choices, as an extension of analysis of form, that attention must now be directed.
1.3 Local Differentiation: The Concepts of Extent and Nature.

Form and process are the objects of spatial analysis but the concepts of extent and nature in locational differentiation jointly constitute means for investigating it. Though indirectly referred to in literature on topics so diverse as regionalisation, social area analysis and spatial indicators, they remain implicit and ill defined. The effect, as with form and process, is lack of precision in use and a poor understanding of relationships between the two. This can only lead to confusion concerning the role of place in social process. As a result, the concepts of extent and nature in differentiation, and factors confusing their empirical application, must be examined.

Turning first to the concept of extent in spatial differentiation. This is generally recognised as referring to degrees of locational distinction according to one dimension of variation, such as unemployment or employment growth. The key feature of this view is its reliance on one aspect of areal character to document distinctions of place. This is acceptable where interest is restricted to one aspect of social process. Conversely, utility diminishes as the limitations of such an interest are recognised in the context of complex social process and more representative views of form are sought. This concept is comparatively simple and well understood through the socio-economic atlas tradition which has been largely responsible for documenting spatial distributions. Nature in differentiation is poorly understood by comparison because it is alien to the atlas tradition. The simplest treatment of nature in differentiation is to assume that it is a direct extension of the extent situation whereby nature is introduced to analyses by incorporation of additional dimensions. This is insufficient because nature in differentiation is concerned with the essence of place as manifest through the operation of particular social processes such as labour exchange. As such, it is not concerned with degrees of difference on particular dimensions but in the types of place which exist as more general distinctions. The shift is therefore qualitative, influencing not only the objectives of analysis, which combine to elucidate place, but also interpretation, with a focus on the role of place in social process. Even at this level of definitional abstraction both concepts are conceivably straightforward but it is associated issues which complicate this and these must now be examined.

Usage of the terms extent and nature in the empirical study of areal differentiation is complicated at three levels of consideration. The first arises

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4 Tregilgas (1976) for example makes direct reference to these concepts but his treatment is limited. The essential distinction between extent and nature in this study of unemployment differences is that differences of degree exist between areas but that each area may have different types of unemployment.
through their relationship to the concepts of form and process which provides a framework for expression of the relationship between extent and nature in differentiation. The view which results is shown in Figure 1.2 and consists of three types of relationship: those between form-process and extent-nature (I); form-extent and form-nature (II); and extent-process as opposed to nature-process (III). Turning to the first type (I) of relationship, analyses of form and process are classified as objectives because they constitute 'ends' in research. From the previous discussion, analysis of form is viewed as an intermediate objective since it is designed to provide insights into process rather than empirically model aspects of it. As objectives of research, form and process are represented as extremes on a continuum since, as established earlier, form is an outcome of process and therefore elemental to it. It can therefore be concluded that analyses of form are elementary treatments of process with convergence of analytical extremes being dependent on sophistication (i.e. an unsophisticated or illconceived model of process may provide poorer insight into operation than a thorough analysis of form).

**Figure 1-2:** Relationship Between Extent and Nature in Differentiation Relative to the Distinction Between Form and Process

The second type of relationship (II) is between extent and nature in differentiation with investigation of either being treated as 'means' of search because they enable different levels of form analysis to be implemented. As with form and process, extent and nature in differentiation are portrayed as extremes on a continuum. The proposition is that investigations of extent in differentiation are highly rarefied treatments of nature. As these become increasingly complex divergent sources of information can be related to reveal more about the character of place until they attain a qualitatively different status through the complexity of
issues involved. The key feature in this transition is integration, recursive
treatment, as with socio-economic atlases, will only produce multiple studies of
extent. Extent and nature in differentiation are, like form and process, artificial
constructs with the greatest scope for analysis being between extremes.

The type (II) and (III) relationships in Figure 1.2 relate analyses of form and
process to investigations of extent and nature in differentiation. The type (II)
relationship has already been intimated with extent and nature supplying the means
for analyses of form to provide insights into process. The form extent relationship
is the most limited avenue for exploration as it is less general than the form-nature
alternative. It follows that of the type (III) relationships nature-process is most
satisfactory since the empirical character of place is treated more comprehensively.

This is the ideal situation which is not necessarily relevant in all applied
research with qualifications stemming from the stage of development reached. This
includes such factors as availability of data, useful theory, suitable techniques and
previous empirical research. At the earliest stages of research in any particular field
analyses must concentrate on elementary investigation of form before any attempt is
made to incorporate nature into differentiation or empirically model process. Even
in later stages of research analyses of form are necessary to provide insights into
process without the burden of modelling, update impressions of form or examine
information collected on 'new' subjects. As a more specific guide, empirical research
must progress from analysis of form to process and investigations of extent to
nature.

The second level of definitional complication arises from the applied sphere
where distinctions between studies of extent and nature in differentiation are
unclear. Superficially this may not appear difficult with analysis of extent relying
on one axis of differentiation and nature more than one. Difficulties arise in
associating place with one, or alternatively, numerous axes of differentiation because
these can be treated in different ways. This problem can be illustrated by reference
to two examples. Firstly, consider an apparent study of extent in differentiation
where an initial axis, representative of labour force participation for example, is
decomposed by introducing an extensive disaggregation by age and sex. Is the
study of decomposed observations one of extent or nature in differentiation?
Secondly, an individual axes is chosen as the basis for areal differentiation because
it is thought to be highly intercorrelated with a range of diverse phenomena, as
with unemployment in a regional development context (see Chapter 4). Again the
same question arises.

Whilst there is no definitive response to these problems the position may be
clarified as follows. A set of variables relating to one topic or dimension of variation has a greater conceptual resemblance to study of extent because its emphasis is on detail rather than the diffuse character of place. To qualify as a study of nature in differentiation attention needs to be shifted from a given conceptual axis. Accepting this, the second example demonstrates a situation where an apparent study of extent in differentiation is, in fact, a surrogate for analysis of nature in differentiation, if surrogate status can be established, since application is not restricted to one axis. These solutions are useful because they demonstrate that the apparent need not coincide with the actual in applied research.

Unfortunately, this raises another problem which is the definition of axes or dimensions of variation. At a gross level, for example, the labour exchange process could be described as a dimension of more general social process. Resolution of this problem is difficult because information can be reconfigured by changing concept definitions, or phenomena being monitored can change relative to definitions, so fixed distinctions cannot be made. The solution adopted is by necessity operational and involves acceptance of existing information classifications, with the dimension being defined as the maximum level of generically consistent aggregation without resort to creation of composite variables. This result is tentative because it requires adherence to available information structures rather than those which might be desired. As such, it is reflective of limitations in the current stage of social research.

The third level of definitional complication is more specific and concentrates on nature in differentiation as it has been used in geographic research. Extent in differentiation is well understood because of its simplicity but the absence of a generally accepted concept of nature in the literature has resulted in confusion and a loss of perspective as to its origins.

Concepts akin to that of nature in differentiation have been recognised in geography under other guises, primarily as an element of the research work on regionalisation. Grigg exemplifies this in referring to Herbertson's work on physical regionalisation which became a pillar of geographical thought on the subject of place:

Herbertson in his celebrated paper of 1905... tried to divide the whole world into regions on the basis primarily of its physical features. He pointed out that whilst there existed several divisions of the world upon the basis of single features, such as climate and vegetation, the actual environment man lived in was composed of a great many elements... (1967,465)

This corresponds strongly with elementary views of nature in areal differentiation.
Though somewhat crude in adopting the expanded extent type of approach, where
nature is introduced into analyses in discrete units rather than as a qualitative
change in treatment, it shows an established perception of the concept. More
sophisticated treatments are to be found in the early French school of regional
geographers with development of the *pays* concept which sought to relate man and
environment.

The clearest systematic treatment of nature in differentiation, as opposed to
extent, did not however arise until the 1950's with emergence of Whittlesey's (1954)
work on regionalisation. As can be seen from Figure 1.3, he distinguished between
three types of regional concept. The first of these, the single feature region, is
most akin to differentiation on the basis of extent because reference is made to only
one dimension at any point, e.g. population growth, and it is on this basis that
partitioning occurs. At the other extreme, he refers to the total region (or
*compages*) which is identified according to all human occupancy characteristics.
Between these extremes he recognises an intermediate mode of regionalisation which
is based on more than one feature but some number less than the total range.
This lies on the continuum between extent and nature.

![Regional units](image)

**Figure 1-3:** Categories of Regions (Whittlesey)

Burgeoning of the quantitative revolution in social research, with resultant
claims to the status of science (and so 'social science'), produced a new generation
of attempts to incorporate nature, as well as extent, into analysis. This was not
restricted to geography but also affected other disciplines, such as economics, where
there was growing dissatisfaction amongst some practitioners with the use of

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5Haggett (1965,212-224) has used Whittlesey's synthesis in a broader sense to aid locational description
without regionalisation by reference to 'single-component' and 'multi-component' mapping. An extension of
the atlas tradition of socioeconomic mapping in geography has been to seek more parsimonious
representations of form through postulation of underlying structures identified via factor analysis (Badcock,
Jaensch and Williams, 1977). This is a significant departure from reliance on single component maps of
extent in differentiation.
traditional economic aggregates, e.g. gross domestic product. Dissatisfaction arose because these aggregates ignored critical costs and benefits of production, such as damage to the environment, the value of domestic labour and distribution of the benefits from production. The result was a series of new measures designed to better record the nature of developments, focussing on concepts of economic welfare, net economic welfare, net national welfare and net beneficial product (Horn, 1977, 8). Many such formulations have proven conservative and unimaginative. Knox has argued a need for expansion of these approaches:

National and regional well being in western societies has traditionally been assessed by reference to income levels, together with rates of unemployment, demographic growth and industrial growth. Recently, however there has been an awareness that these indicators may reflect only some of the elements of prosperity, welfare and opportunity relevant to the quality of life in such societies implying that any satisfactory examination of relative well being should also consider aspects of socioeconomic health and social welfare. (1978, 233)

The response has been most clearly manifest in development of a multidisciplinary social indicators movement with geographers contributing substantially to its spatial component. Developmental work by geographers has treated such diverse topics as exploration of international development patterns and economic regionalisation, whilst parallel work in other disciplines included the pioneering research by Shevky and Bell (1955) on social area analysis. The diversity of purpose and method in locational studies is reflected in their various descriptions, ranging from the familiar topic of economic regionalisation to others such as social indicators (Land and Seymour, 1975; Armstrong, 1982) territorial indicators (Lewis, 1968), needs indicators (Isserman and Brown, 1975) and quality of life indicators (Heady, Holmstrom and Wearing, 1982). Differences between these methodologies are often more semantic than actual with the main differences stemming from application.

It might have been expected that with such diversity the indicators literature would provide a powerful stimulus to the philosophical discussion of extent and nature in differentiation. Unfortunately, this is usually not the case and discussion of these concepts is extremely underdeveloped. Commentary on extent and nature is cursory, often serving indistinguishably as justification and explanation for multivariate manipulation of socio-economic data. Handbooks, such as that by Sullivan and Feldman (1979) pay little attention to these concepts whilst seemingly preoccupied with technical method. This paucity of discussion results from one of the following reasons: it may be assumed that a full and adequate discussion exists elsewhere in the literature and further discussion would be repetitive; the logic of
the techniques employed in multivariate analysis might be thought sufficient explanation; or as yet, the theoretical or conceptual underpinnings may be so undeveloped as to inhibit discussion. Lavers and Williams (1972) and Bebbington and Davies (1980(a);1980(b)) contend that, in spite of the quantity of literature which could be used to support the first and second reasons, the third is most likely to be applicable because so little is known of nature in differentiation.

Recognition of extent and nature has occurred in one of three ways. In the first, reference is indirect and the difference between extent and nature only becomes apparent through introduction of the data set or techniques to be used, as in one of Berry's earlier studies:

The approach is to take 43 variables thought to be significant in the analysis of economic development... (1960,78)

This tendency can be found to a greater or lesser extent in other studies such as those of Grove and Roberts (1980) Logan (1969) and Sorensen and Weinand (1983). The second type of recognition focusses on the possibility that areal problems are broader than conventional treatments suggest and consist of a number of parts; for example, as Hill points out:

It is widely recognised that quality of life encompasses economic, social, political, environmental and psychological considerations. (1977,62)

Other studies reflecting this attitude include those of Smith (1977), Knox (1978,234) and Vinson and Homel (1976,2). The third treatment of these concepts is more general, representing locational differentiation as an abstract phenomenon which is inherently "multidimensional" (Walmsley,1980,32; Walker, 1979,175) and must therefore be analysed in this context.

These alternatives reveal three approaches to the introduction of nature into analysis of spatial differentiation. In the first, introduction is largely de facto and nothing more can be said to typify the view of nature adopted. The second and third, by contrast, can be seen respectively as: reductionist, because nature is seen as a sum of parts; and holistic, since it is arguably indivisible, being not just a sum of parts but a complex reality in its own right. Though the third is a more accurate portrayal of spatial differences, as it does not assume place can be partitioned for analytical purposes, the second offers the only practical solution for applied analysis.

Having established that nature in differentiation has been a theme in spatial analysis, its oblique exposition is the major concern. Little can be done retrospectively but commencing with the factors identified here greater control can
be exercised over subsequent empirical applications. In recognising the concepts of extent and nature in differentiation as integral to investigations of spatial form, the actual subject of such research, place, has been ignored. As place is critical to any empirical analysis it must be discussed to finalise description of the substantive research problem.

1.4 Localised Labour Areas and Small Scale Locational Analysis.

Detailed exploration of place in social process requires that space be partitioned into small scale observational units if important elements of pattern are not to be obscured. This Study departs from the regional convention in geography by seeking to use a smaller scale of unit which may be typified as local. As with much of the earlier work, this requires a general abandonment of more abstract concepts as these cannot be reconciled with available material. The resultant treatment of place is therefore operational, stemming from the pragmatic division of space into mutually exclusive elements. The result is not a definition of place but a framework for gaining insight into the composition of space. Though this pragmatic approach may circumvent indefinite conceptual debate it generates two other problems. First, specific partitions of space have serious operational ramifications and choices must be examined carefully. Second, relationship of the term local to one partition of space is difficult because the term is insufficiently precise to provide detailed guidance in selection of a suitable observational frame. Each of these problems must be evaluated if a justifiable choice is to be made.

1.4.1 Selection of Observational Units for Spatial Analysis

Variant types and scale of observational unit do not produce analytically identical results. This problem is well recognised in spatial research (Haggerstrand, 1967; Harvey, 1969; Herbert and Johnston, 1976) but its significance is often ignored in empirical analysis. Perfunctory references such as the following are common:

The regional analysis used here is based on the Department of Labour's 22 employment districts... (Forer, 1979, 77);

These groups of local authorities (LA) were examined separately... (Holterman, 1978, 231);

The units of analysis for this study are the 95 communities with 100,000 or more inhabitants... (Isserman and Brown, 1979, 141)

This should not be treated as sought after evidence of neglect or implied argument that type and scale of observational unit are unimportant. Rather, it results from
limitations of choice (Spence, 1968, 90), which for all practical purposes result in determinate decisions. Nevertheless, unquestioned acceptance of the available can have significant ramifications for spatial research. These will be briefly highlighted so that the type and scale of area chosen can be examined in this context.

Scale of observational unit has received most attention when the selection problem is examined. In Australian work, Logan et al. highlight the view of many others in recognising the broad ramifications of scale choices:

As suggested previously, the choice of the unit of observation is very important as it acts as a filter. While variations at a scale larger than this unit will be identified, variations at a frequency of less than the scale of the observational unit will be missed. (1975, 42)

Identification of the scale problem has given rise to the notion of ecological fallacy (Smith, 1977, 270) in spatial analysis where increasing variance has been noted with decreasing magnitude of observational units. This becomes serious where a finding is attributed to the population of a place when scale conceals important variations. Boal (1976, 52) has illustrated the significance of this in his work on Ghettoisation, where ethnic concentrations in the population are obscured by inappropriate scale choices. Hagerstrand (1967, 19-21) has suggested another version of the problem with diffusion data, where the number of origins and destinations which can be envisaged is largely a function of scale. Harvey (1969, 383) had generalised both propositions, arguing that scale of observational unit is generally significant in perception of spatial pattern. Unfortunately, this problem cannot be avoided simply by ‘correct’ choice of scale because partitions of space are usually ‘arbitrary’ or designed for ‘logistical purposes’ (Herbert and Johnston, 1976, 14). Social phenomena to be investigated may not correspond with existent scales and even the best choice may still be ecologically fallacious to some degree.

It cannot be assumed that scale is the only critical factor in selecting appropriate observational units for spatial analysis. Type of unit is of equal importance for two reasons. Firstly, each type of area has been created to serve specific purposes, e.g. administration, planning or service delivery, and therefore assumes certain factors about the population such as accessibility or homogeneity. These judgements are based on acceptance of largely hypothetical relationships between members of the population which reflect communities of interest, with not only association between members of the population but also external agencies. The first task of the analyst is to identify those communities of interest which are most

6 Such fallacies can arise from excessive aggregation, use of inappropriate boundaries and unsuitability of specific data to spatial representation.
likely to be of use at any particular scale. This facet of the selection decision is closest to the abstract material on place because it determines the configurations of population which are presented for comparison. Secondly, the type of area is largely responsible for availability of specific information. Wholesaling distribution regions may be the most useful for investigation of industry and its relationship to spatially distributed consumers, but they are of little use for analysis if corresponding information on the characteristics of consumers is not available.

Rather than complicate selection, as might be anticipated, introduction of these factors simplifies it. This occurs because very few partitions of space satisfy requirements for information, configuration of population and views at specific scales of observation. As a consequence very few options are available at any one scale, with acceptance of one or other usually reflecting some degree of compromise.

From these comments it can be seen that the problem of actually selecting a scale and type of area for empirical analysis is very important. Selection of the local scale for use in this Study must therefore be examined with regard to its analytical implications because it is not simply a source of variation but a deliberate choice designed to attain specific ends.

1.4.2 Localised Labour Areas - A Framework for Spatial Analysis

Local analysis of spatial differentiation offers a largely unrealised opportunity to gain insights into the role of place in labour exchange. For the benefits of this type and scale of analysis to be realised the definition of local, in an analytical environment, must first be realised so that the type of observational unit used and the reasons for its acceptance can be appreciated.

Though there is acceptance and use of the term local in a contemporary sense its meaning is variant and therefore imprecise. The only universally agreed upon factors in conventional definition are that local areas are more highly constrained in a spatial sense than related concepts such as the region and they are associated with communities, for example ‘towns’ or ‘districts’\(^7\). The result is a confusion of ideas with some, such as Bell and Newly (1975,139), arguing the concept to be redundant and, somewhat finely, where clarity is lacking, that it is replaceable by the equally unclear concept of community. Others, such as Clark (1981) and Fleisher and Rhodes (1979), working in an American context, implicitly accept the concept as being the standard metropolitan statistical area (S.M.S.A. - pop. 250,000+) while yet others, such as O’Connor (1981,1), associate metropolitan

suburbs with "contained local economies". In the light of such diversity it is very
difficult, if not impossible, to develop a universally acceptable definition.

Lever, though accepting the market terminology of conventional economics,
proposes one of the most purposeful definitions encountered because it is directly
applicable to labour exchange:

The local labour market has been defined as the spatial range of
employment opportunities open to a worker without changing his place of
residence. It will be affected by income, by the availability of transport
and by the extent of knowledge about alternative employment
opportunities... (1980,37)

The advantage of this definition is its overtly operational character, imposing only
two conditions for the identification of local areas: residential fixity of labour and
a spatial range constrained by journey to work patterns. Each of these has
unspecified implications for definition of the local concept. In the first case,
residential fixity is not only operationally necessary but conceptually significant
because it is responsible for the development of social and economic relationships
necessary for the reproduction of labour (Walker,1985) and manifest in communal
cohesion. In the second case, there is an implicit sphere of activity measured
according to travel necessary to maintain participation in the formal economy.
Lever's definition arises directly from the work of Smart (1979) and is founded in
the principles of functional regionalisation (Langdale,1975; Logan et.al.1975). The
operational advantage of this treatment is demonstrable in Australian research
through the applied efforts of O'Connor (1981;1982) and O'Connor, Chaffey and
Nankervis (1982) in both metropolitan and nonmetropolitan situations. The effect is
to strengthen the general argument for empirical adoption of this concept of
localism.

Unfortunately, this definition has three major disadvantages which limit its
applied utility. Firstly, as an operational construct, it is intended to be generally
applicable. This is not so because journey to work data are required for
specification of local labour areas in an interarea context. These are only available
for metropolitan areas in the period under review, the O'Connor, Chaffey and
Nankervis (op.cit.) study of nonmetropolitan Victoria requiring extensive use of
survey data. Secondly, journey to work data provide only a surrogate for
information describing how far individuals would travel as opposed to how far they
do travel. As there may be substantial discrepancies such information is only
directly suited to investigation of commuting patterns in nonmetropolitan areas
(Lonsdale,1966; Holmes,1971) and locational containment of labour in metropolitan
areas (Sams and Beed, 1983). Thirdly, local boundaries are ambiguous because individuals are prepared to travel different distances and location of residence differs for each individual. As a result, identification of exhaustive, mutually exclusive boundaries is impossible. This is not serious where the purpose is to establish a spatial range for one area but creates inordinate difficulties where a framework is needed for interarea analysis. Combined, these difficulties preclude application of this definition because, although it provides useful insights into the concept of local observational units, it is analytically impractical.

Since Lever’s treatment, ostensibly the most appropriate, is both unacceptable and unattainable, the issue of alternatives must be raised. The responses to three questions may be of use in nominating an alternative suited to the needs of this Study. First, can the labour exchange process be spatially partitioned into components which are temporally stable, areally exhaustive and mutually exclusive? From the criticisms of Lever’s definition and subsequent attempts at solving the problems (op.cit.) the likelihood of this is minimal as labour exchange is constantly in flux, spatially fluid and reliant on the behaviour of individuals with differing characteristics. A compromise can therefore be proposed where a meaningful spatial framework is superimposed on labour exchange for the purpose of monitoring spatial differences. Second, is there scope for such a framework from existent partitions of the study area? The material in Appendix A indicates there are a substantial number of spatial partitions which, because of data availability, may be suitable. Third, are there definitional factors which are common to the description of any observational unit as local? Amorphous as the concept appears, there are two such factors: places which are spatially constrained in area so as to be smaller in relative terms than other levels of observation, such as regional level; and an affinity between people within local boundaries, providing substance to the earlier requirement for a meaningful spatial framework. Definition of the term local which results from these three responses is one by default. It refers to situations where an existent type and scale of observational unit, which is both small and representative of affinity between people, is assigned the status local.

The statutory local government area (amended for boundary changes over time) has been chosen from the available configurations of spatially discriminant boundaries and the framework is shown in Figure 1.5. The local government area was chosen for three reasons. Firstly, of all substate observational units it is the only one for which a formal administrative structure exists. As such, it is the smallest unit for which collective action is taken by State and Federal levels of government. As an extension of this, it is the lowest tier of government at which
public responsibility is taken for human welfare through locationally specific revenue raising measures and service provision (McPhail, 1968). As a result, the populations of these areas act as common denominators for concerted public action from three tiers of government. Secondly, as a direct corollary of this, local government provides the lowest level of formal response to these overtures through elected representatives who are (ideally) sensitive to the needs of constituents. Local government may also act as a source of initiative where common concerns have not been addressed by higher tiers of government (Donnison, 1981; O'Brien, 1981, 1982; Uren, 1983). Thirdly, as a consequence of this twofold situation, a body of data has been accumulated at this level which is comparable to that available at higher levels without the same risks of ecologically fallacious representation. These three factors combine to qualify the local government area as the smallest socially cohesive observational unit available for analysis of labour exchange outcomes.

The course of action adopted here is therefore to localise labour exchange by partitioning it in accordance with a given configuration of existent spatial boundaries. As these partition labour exchange variables, and differences in place are expressed in these terms, individual places will be referred to as localised labour areas. This does not produce a set of local labour areas but reflects a need for compromise between the conceptually desirable and empirically attainable. As such it offers a formidable alternative to Lever's functional view because it does not rely on rigid definition of the imprecise and transfer of this into an analytically difficult framework.

The issue which remains outstanding at this point is, were any other areal frameworks suitable as an analytical base and if not, what were their disadvantages? The main disadvantage of all other substate areal units is the absence of an extensive administrative and decision making facility. The statistical division, however, has a very attractive property through its definition as:

A reasonably homogeneous region characterised by identifiable social and economic links between inhabitants and between the economic links within the region, under the unifying influence of one or more major cities or towns. (ABS, ii, Ref. 2.17.08)

This advantage is offset by the fact that the statistical division has been generally perceived, true to original intent, as regional in character (Maxwell and Peter, 1982) and so is larger in scale than required. This view can be supported empirically (Murney, 1979) as the statistical division obscures extensive variations at the local government scale and so is arguably ecologically fallacious from the perspective of smaller, though demonstrably important, observational units. Other large scale
Figure 1.4: Local Scale Areal Framework For Nonmetropolitan N.S.W.
units, such as the electoral division and the Commonwealth Employment Service office area, are also of such magnitude as to have regional connotations (Jeffrey and Webb, 1972) with similar problems but not the homogeneity advantage. The electoral division does have the advantage of political representation but this is negated by the absence of an internal administrative structure while Commonwealth Employment Service office areas have unusual configurations and unsystematic boundaries.

Of the smaller areal units, census collectors districts are elemental to most higher levels of observation. These were not used because they are too numerous for processing, have negligible significance for community groups and partition more meaningful levels of observation into trivial elements for interarea analysis. Other small areal units, such as postcode and locality districts, were not considered because of serious boundary problems in nonmetropolitan areas. Competing frameworks, such as those based on ridings, parishes and counties, were excluded because data availability is poor. From these comments it would seem there is little alternative to the use of local government as the fundamental unit of observation.

The local government area has been selected in preference to all other observational units as the fundamental basis for this analysis. The outcome is a framework which localises the labour exchange process in accord with communal boundaries. This response was adopted for analytical purposes because the only alternatives created serious operational problems. It offers significant advantages because the type of area is: meaningful in communal terms; small enough to reduce the likelihood of ecologically fallacious statement without introduction of trivial detail; and administratively significant enough to provide an established data set comparable with that obtainable for larger areas.

1.5 Conclusion

The role of place in social process and more specifically, labour exchange, is poorly understood. Spatial analyses have proceeded without clear specification of their role in social process. This is a very difficult problem since place and social process are both extremely complex. The object of this Study is not resolution of the problem but constraint of alternatives for model development by search of detailed observation as opposed to abstract theorisation. The problem embraces four themes, each offering options which can be combined in a variety of ways to determine the character of analysis. Inappropriate combination of research options can produce operationally intractable formulations of the problem because all options
are not analytically compatible given differences in research progress between thematic fields. The combination adopted has been specified carefully to minimise these difficulties, concentrating on the outcomes component of labour exchange and relating this to its locational foundation through investigation of spatial form, as opposed to a premature concern with models of spatially disaggregated process.

This position is sustainable because analysis of form has been expanded in two ways. First, the Study seeks to incorporate not only spatial differences in extent, which have been well examined for some aspects of the labour exchange process, but also differences in nature between areas. Second, small areas will be used in all spatial analyses to reclaim detail subsumed by manipulation of observations for larger areas. The purpose of subsequent interest in local patterns of differentiation is to preclude unnecessary distortion of the role place has in labour exchange. In choosing to combine these themes in this way much of the preceding theoretical and empirical work has become peripheral, leaving the Study in a precarious position as regards development of an operational framework. Exploratory data analysis offers one of the few tenable philosophies capable of supporting such an analysis and it is this which must now be introduced to the Study.
APPENDIX A
AREAL OBSERVATION UNITS IN AUSTRALIA

As a starting point the areal data presentation system used by the A.B.S. is presented in the Table below, along with examples of other scales and types of areal units used by other agencies such as the post or electoral offices. Here, the A.B.S. organisation of areas will be termed systematic because each succeeding scale exhaustively combines elements of the last in a hierarchical fashion. The others will be termed unsystematic because, although they exhaustively partition the nation, states or other regional configurations, they do not usually relate to other scales of disaggregation.

Taking the systematic areal units first, they range in scale from the census collector’s district (C.D.), an area defined according to census collector workloads (containing approx. 300 dwellings - but less in rural areas), to the nation. As a crude guide to scale there are nationally (for recent censuses) in excess of 20,000 C.D.’s, approximately 1000 local government areas and in the vicinity of 60-70 statistical divisions (S.D.), depending on particular censuses. In addition, the A.B.S. releases data for less commonly used units such as the locality (common postal addresses), sections of state, and various disaggregations by degree of urbanisation. Through the incorporation of unsystematic observational units some types and scales of observational unit have parallels, some of which are referenced in Table A.1. Hence there are a number of options at these lower levels, depending almost entirely on data requirements. Some of these options extend well beyond the range shown here, e.g. wholesale regions for suppliers of goods, but because data are available on a limited basis they could only satisfy a highly specialist demand and would be difficult to reconcile with the systematic data base. A.B.S. has assisted in overcoming some of these difficulties by producing approximations to unsystematic areal partitions, e.g. electorates and postcode areas. It can be seen then that the type and scale of observational unit to be used here is by no means the only alternative and must therefore be viewed as part of a broader framework for spatial analysis.
Table A-1: Types of Areal Observation Units in Australia.*

<table>
<thead>
<tr>
<th>TYPES OF AREAL UNITS</th>
<th>SYSTEMATIC (A.B.S.)</th>
<th>UNSYSTEMATIC (admin. purposes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CENSUS COLLECTORS DISTRICTS (CD's)</td>
<td></td>
<td>- local government administrative units such as ridings and parishes are intermediate to CD's and L.G.A.'s while postcode areas are either intermediate or parallel in scale to L.G.A.'s.</td>
</tr>
<tr>
<td>LOCAL GOVERNMENT AREAS (L.G.A.)</td>
<td></td>
<td>- state and federal electorates, commonwealth employment office areas agricultural divisions (e.g. N.S.W. Pasturers Protection Board Districts) and taxation regions are usually intermediate or parallel in scale to SD's.</td>
</tr>
<tr>
<td>STATISTICAL DIVISIONS (SD)</td>
<td></td>
<td>- states, territories and the nation are often default observational units (and many smaller scales) for large private enterprises through annual reports, the stock exchanges etc.</td>
</tr>
<tr>
<td>STATES AND TERRITORIES</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NATION</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Unsystematic areal units come in many forms and only examples are presented here. Also lesser units, such as the A.B.S. statistical subdivision, L.G.A. part and locality, have been excluded.
Geographical analysis of complex areal problems have been debilitated by the absence of a framework to support the common objective of searching pattern for structure (Johnston, 1985). Search procedures are required under numerous circumstances but especially where theory, concept and data are deficient. The purpose here is to transfer a research philosophy, EXPLORATORY DATA ANALYSIS, to geographical research. This provides a formal legitimisation for the search oriented research activities rightfully attempted by geographers under many circumstances. Unfortunately, the absence of such a framework has resulted in analytical problems because there has been minimal scope for the reconciliation of the desired research objective of mastering social process and its operation with those which are attainable and capable of providing well founded insights into its operation. The philosophy of exploratory data analysis contends that search, with its characteristic pragmatism, is not only justifiable but a necessary stage of research where problems are complex or simply underdeveloped. This philosophy and its adoption will be discussed in three parts, the first examining its definition and development with the remaining two treating its transfer to spatial research and this analysis in particular. These will examine the reasons for adopting an exploratory stance, consider the interpretative ramifications of this and explain the actual approach to be used.

2.1 Exploratory Data Analysis - Definition and Development.

Exploratory data analysis represents one of the most important analytical developments for geographic research since the quantitative revolution. This is not because of increasing sophistication in the procedures advocated but because it offers scope for recovery of gains lost through adherence to inflexible research doctrine. As a philosophy of numerical analysis it has developed through the work of Tukey and his associates and is confined to a limited literature. One advantage of this is
that definitions are relatively consistent between exponents with differences usually reflecting specific refinements. As Tukey's work is expansive, shorthand definitions are best obtained from others. Austin provides one of the more recent definitions:

Exploratory data analysis is essentially a search for pattern or structure, the detection of which should stimulate further questions about the relevance of the pattern to the particular problem (1981,1)

Andrews, by way of comparison, states that:

Exploratory data analysis is the manipulation, summarisation, and display of data to make them more comprehensible to human minds, thus uncovering underlying structure in the data and detecting important departures from that structure.(1978,97)

There is substantial agreement between these views and others, such as Gordon's (1981,5), that the major objective of exploratory data analysis is to search data sets to discover pattern or structure. Whilst there are, as Andrews has pointed out, parallels with conventional statistics the major distinction lies in the fundamental objectives of each: exploratory data analysis being search oriented and conventional statistics, from a priori theory, test oriented. Austin's definition and subsequent elaboration (Austin,1981,2) makes this point most succinctly, arguing that the ultimate objective of exploratory data analysis is "hypothesis generation" as opposed to the more conventional task of "hypothesis testing".

Putting these shorthand views into context Tukey defined two forms of data analysis, one being exploratory and the other confirmatory. Confirmatory Data Analysis seeks to answer the question: "with what accuracy are the appearances already found to be believed?" (Tukey,1973,1). The principle difference between confirmatory and exploratory data analysis is that in the former probability statistics must be used to assess results with an emphasis on proof. This differs little, if at all, from conventional statistics which could be seen as a subset of confirmatory data analysis.

There are two major types of objection to reliance on confirmatory approaches to data analysis. The first is methodological and arises from the stress on proof. For this to be meaningful two conditions must be satisfied in addition to standard statistical assumptions. First, hypotheses must have a sound basis in theory so that source and meaningfulness can be established. Where supporting theory is not stated the research frame necessary to justify testing is either improperly specified or unstatable because of insufficient information. If this second circumstance exists, proof cannot be claimed since any number of competing hypotheses of equally unfounded standing may be 'fruitfully' tested. Exploration may therefore be
necessary to establish a basis for theory. Second, data must be of sufficiently high quality to sustain exacting tests. Where distortions of the data base exist, or are suspected, such tests are of little benefit since results are not accurate enough to justify application. Exploration by contrast simply relies on available data to provide indications of direction and magnitude to suggest regularities in pattern.

The second type of objection stems from a concern over the necessity to prematurely accept testing with the assumptions this imposes. Gordon highlights this issue in his work on numerical taxonomy:

...the rationale is that data have many properties and one does not wish to concentrate too early in the analysis on formal tests related to just some properties. (1981,6)

The major difficulty with application of tests, assuming that the above conditions have been satisfied, is that it requires acceptance of "extensive prior assumptions" (Austin,1981,2). These may be problematic in even aspatial analysis, as Hartwig and Dearing argue in introducing their handbook on exploratory data analysis:

...there ought to be a healthy statistical scepticism, an awareness that even widely used statistical techniques may have unreasonable hidden assumptions about the nature of the data at hand.(1979,9)

The seriousness of this problem in earlier spatial studies has been recognised by Openshaw and Gillard:

Nearly all the quantitative techniques used in geography, planning, and the social sciences are applied without any detailed knowledge either of their robustness to violated statistical assumptions or of the effects of subjective decisions made at various stages in their application. (1978,101)

Each of these objections highlights a disjunction between the problems to be solved and the methodological application of available technique. It is this observation which is at least partly responsible for the emergence of exploratory data analysis. As Tukey argued in an early paper on the subject:

...statistics needs continually to compare its own logical structure with the logical structures currently used or being put into use by science, engineering, business... (1954,708)

Exploratory data analysis has therefore developed out of a need to imbue applied research with a flexibility which philosophically encourages progress. It is in this vein that Tukey commented in a later paper:

What is needed is progress, and the unlocking of certain rigidities (classifications?) which tend to characterise statistics today. (1962,7)

The reason for developing a field of exploratory data analysis has been the need to
introduce a flexibility which will assist in reconciling the tasks and methods of problem solving.

It should be emphasised that exploratory data analysis, though having technical foundations in statistics, is indisputably quite different. Although distinctions are not so clear in the earlier literature on the subject (Tukey, 1954) equation of the two fields has been labelled fallacious by later exponents (Hartwig and Dearing, 1979, 9). The distinction, even where statistical techniques are used, is one of application and interpretation. As Tukey and Wilk point out:

Many bodies of data require routine handling, not data analysis, and can be rightly approached with specific narrow questions. In dealing with them, some facets of formal statistics are more nearly appropriate, and have proved much more useful. (1966, 696)

They continue to argue that by contrast exploratory data analysis “must adapt itself to what people can and need to do with data” and conclude that “data analysis can gain much from formal statistics”, but only if the connection is “loose”.

There is a misconception that exploration is simply description. Andrews (1978, 97), in drawing a parallel between exploratory data analysis and descriptive statistics, failed to recognise the interpretative difference in approaches. He claimed that because both seek to summarise and represent data they are similar, with exploratory data analysis only going beyond this in searching for structure and anomalies. Apart from ignoring the differences in purpose, this view understates the significance of search which requires the discovery of structure. Discovery is not a foregone conclusion, as assumed in description, with Tukey and Wilk (1966, 697) observing that, “most of the work actually done turns out to be inconsequential, uninteresting, or of no operational value”. Exploration is undertaken because of ignorance and, whilst description may be one result, hypothesis generation and question formulation are more likely outcomes.

From an application point of view, confirmatory solutions to analytical problems are aesthetically pleasing because they index uncertainty. This benefit is illusory where theories are inadequate to the task of realistic modelling, poor data hinder hypotheses testing, or problems are so inherently complex that models or tests are partial in the extreme. It is only on rare occasions that characteristically ‘untidy’ socio-economic problems have ‘tidy’ solutions. More commonly solution is “difficult, cumbersome and complex” (Tukey and Wilk, 1966, 695). Recognitions such as these have had little impact on perpetuation of confirmatory models because of what Wallace (1978, 97) describes as the psychological appeal of escaping ambiguity. As literature on the subject of exploratory data analysis is relatively sparse,
individuals have contributed disproportionately to subsequent refinements of the broad concepts discussed so far. Development has been in two directions. The first strongly reflects foundations in a technical field and is perhaps the least imaginative and so less capable of realising its analytical potential. This sort of refinement can be typified as technocratic and has resulted in the development and collation of techniques which might satisfy the objectives of exploratory data analysts. The impact of these developments has been most apparent in the release of handbooks (McNeil, 1977; Hartwig and Dearing, 1979; Mallows and Tukey, 1980) and mainstream texts (Mosteller and Tukey, 1977) which refine the philosophy indirectly by reviewing its technical material. The second source of conceptual refinement is in the area of philosophical development. This has not progressed appreciably beyond the pioneering work of Tukey (1954; 1962; 1973) because the technocratic influence has been dominant. While the need for technical development to support the philosophy at its current stage is obvious, philosophical development is also needed if stagnation is to be avoided.

In considering the development of exploratory data analysis it should be noted that the concept is not new, nor necessarily restricted in origin to statistics. Whilst these features may apply to the formal exposition of exploratory data analysis, similar concepts have emerged elsewhere in response to similar problems. Tukey and Wilk (1966,695) recognise this and have related the concept of exploratory data analysis to experimentation and observation, linking it closely with the learning process. Considering the geographic perspective, there are a number of instances where the parallels with formal exploratory data analysis are remarkable. Hagget, for example, in discussing the assumptions of “Locational Analysis in Human Geography” (1965) comments:

These (assumptions) are concerned with the need to look for pattern and order in geography, ... (1965,1)

In doing so, he paraphrases the earlier quoted definitions of exploratory data analysis. Harvey, examining the range of “explanatory forms” available to geographers, describes numerous situations where the primary mode of analysis is exploratory. Referring to cognitive description, for example, which he defines as the “collection, ordering and classification of data”, (Harvey, 1969, 79) it is argued that this approach (one well recognised by exploratory data analysts) is a response to situations of deficient or primitive theoretical development where the major objective is by default, exploration. As none of the other models of explanation listed are explicitly confirmatory or dependent on probability theory, each is also open to exploratory uses.
The incidence of analyses which could be termed exploratory is much higher in geography and other ‘social sciences’ than first realised. Studies which could be termed exploratory are usually characterised by three features: subject fields where theory is underdeveloped; large data sets referring to extensive arrays of variables; and most importantly, the application of numerical techniques where probability paraphernalia are either not available or go unused. In spatial research the earliest type of exploratory data analysis was thematic mapping, a technique still used but in computerised form, for production of socio-economic atlases. A major difference between these and formal exploratory data analysis is the frequent absence of interpretation. However, a recent trend towards this is encouraging (Houghton, 1979). More sophisticated exploratory studies, combining large numbers of spatial patterns, are to be found in the literature on factorial ecology (e.g. Webber and Craig, 1978; Grove and Roberts, 1980) where techniques, such as principal components, factor analysis and clustering applications, are commonly encountered. Rummel’s portrayal of the problems faced by analysts demonstrates why such approaches are popular:

Confronted with entangled behaviour, unknown interdependencies, masses of qualitative and quantitative variables, and bad data, many social scientists are turning towards factor analysis to uncover major social and international patterns. (1967, 444)

Few studies using factor analytic techniques pay more than scant attention to significance testing, many are weakly premised in theory and demonstrate an inductive logic, all symptomatic of a need for a formal philosophy of exploratory data analysis. Though not always, there has been a widespread recognition that outcomes from studies such as these are tentative. Logan et.al., in their discussion of regional boundaries and their permanence, make this point admirably:

...no set of regions should be regarded as final, rather it is the best set that can be defined at a given time. As new knowledge, both in terms of theory and data, is acquired, regions need to be redefined. (1975,28)

Paradigms in both statistics and geography have proven to be important in the innovation of exploratory data analysis. Earlier, it was stated that exploratory data analysis is distinct from statistics as opposed to being a development within it. In addition to application and interpretation, which jointly constitute use, exploratory data analysis also differs from statistics in many of the numerical techniques which are used. The question which arises is: do these constitute sufficient grounds for recognising exploratory data analysis as a new field? The alternative is that these indicate a paradigm conflict within the same discipline as
Johnson (1971) has described in economics. There is evidence this might be the case since both approaches are competing in similar fields. Tukey’s original papers were largely addressed to statisticians, with the apparent aim of eliminating rigidities within the discipline and attuning it to the needs of other disciplines. Criticisms and demands likely to threaten the status quo of the dominant paradigm within a discipline are usually received unfavourably by conservative practitioners (Kuhn, 1962; Barnes, 1985). The most probable result is rejection of these ideas or isolation in a less powerful subfield, as appears to have happened.

How then can paradigm developments, conflicts or revolutions in other disciplines influence those in geography? In this particular instance there are two conceivable influences. The first, and most direct, is that as the quantitative revolution in geography developed there was an increasing demand for numerical methods (Gregory, 1978; King, 1969). For these, geographers turned largely to statistics and transferred the techniques and methodologies of the dominant paradigm, in many cases more suited to the contrived experimental work of some physical sciences. The result was adoption of often inappropriate methods and techniques while those more suited to the analytical problems of geography remained largely undiscovered or ignored. The second influence was more subtle and stems from the widespread adherence to scientific method in geography (Moss, 1979) where there has been a strong preference for deductive analysis (Popper, 1959; Braithwaite, 1968). This is evident in Harvey’s discussion of the Hartshornian orthodoxy:

It appears to run from the study of unordered observations (the facts) through classification and generalisation, to the formation of principles which may then be used to assist in the explanatory description of areas. The strength of such a route depends entirely on the power of inductive logic and it appears therefore to be a rather weak route to the formation of valid general statements ... (1969,78).

This preference is consistent with statistical method (Kennedy, 1983,14), reinforcing tendencies towards deductive analysis because a priori theorising, regardless of quality, precedes hypothesis testing (Skinner, 1985,11). By contrast, exploratory data analysis is inductive, depending on formal interrogation of observations for initial insight. This approach is less likely to gain unbridled acceptance in a paradigm unable to cope with the uncertainty of hypothesis generation as opposed to its tradition of positive conclusions.

There is a great deal of confusion as to whether exploratory and confirmatory analyses are clearly divisible as inductive and deductive in rationale. Problem formulation in exploratory analysis, for example, could be construed as theory
development so that exploration, though not testing hypotheses, is inherently deductive. This supposition only holds where problem formulation satisfies the requisites of theory with definitions, postulates and axioms being stated and formally integrated (Kennedy, 1983). If this is the case, emphasis could be shifted from searching for hypotheses to hypothesis testing, in which case exploration should be replaced by confirmation. Otherwise, treatment of problem specification as theory overstates its value since it is incapable of providing guidance necessary for confirmation. Equally, to argue inductiveness in confirmation is misleading because hypothesis testing first requires hypothesis generation. The question is one of theoretical adequacy. If theory is unspecifiable from previous observation then confirmation is inappropriate with exploration being misleadingly construed in deductive terms. Confusion therefore arises from the difference between what researchers actually do as opposed to what they should do.

Decisions as to whether deductive analysis is superior to inductive analysis are not universally applicable to all research situations. While Harvey criticises induction as "weak" this view is only valid if two conditions apply. The first is where the objective of induction is to arrive at a "general statement" or "law" as would be the case where there is adherence to scientific method (Magee, 1973). This is clearly not the objective of exploratory data analysis where emphasis is on investigation, questioning and hypothesis generation. The second is where the requisites for a deductive analysis can be satisfied and, in particular, where there is a well founded theoretical framework capable of sustaining meaningful hypotheses. Unfortunately, even where theoretical frameworks exist they are all too often defective. These deficiencies have two sources. First, theory is commonly retarded by comparison with the complexity of phenomena being analysed so that its application under many circumstances is of dubious value. This problem is exacerbated by latent ideological stances (Katouzian, 1980), which are incorporated into such theory and remain unstated, supporting the status quo (Wallace, 1978; Hurst, 1972). The second source of deficiency arises from the empirical bases of theory because there is heavy reliance on informal observation. The ramifications for true theory can be devastating because definition may be inaccurate with the effect that postulates are misguided and axioms wrong or empirically unjustifiable. Since these theories are based on informal observation it follows that they are informal as opposed to formal theories stemming from formal observation. The role of exploratory data analysis is, therefore, to contribute towards the generation of formal theory.

It is clearly fallacious to argue that poorly based deductive analyses are, ipso
facto, superior to all inductive analyses. Each, therefore, has a place in applied research. Inductive analyses are preferred where theoretico-conceptual frameworks are weak, problems complex or data poorly understood while deductive analyses are most effective where research has reached an advanced stage of development.

Figure 2-1: The Applied Research Relationship Between Inductive (Exploratory) And Deductive (Confirmatory) Analysis.

The scope for an exploratory stage in all research has long been identified as Losch’s comment suggests:

...there is also speculation and philosophising where the frontiers of the calculable are crossed, and especially where the meaning of the whole is to be interpreted. (1939,xv)

Whilst it would be desirable to incorporate a confirmatory stage of analysis in all studies, Losch’s contention is that this cannot always be done because of the type or magnitude of problem being investigated. Rather than ignore important phenomena or fields of inquiry because of perceptual or technical difficulties he advocates adaptation to the less calculable. Introduction of such adaptations is not simple because the problems addressed and methodologies used can prove irreconcilable with those falling into the realm of the calculable. This conflict has been noted by Gordon with reference to exploratory and confirmatory data analysis in the context of multivariate classification (an exploratory technique):

Few classification studies which draw general conclusions about the nature of the data have been followed by more rigorous confirmatory analysis on new data. (1981,7)

The choice to move beyond the confines of confirmatory analysis and perhaps even
to cross Losch's frontiers of the calculable may lead to studies which are exclusively exploratory.

By way of summary it would be incorrect to assume that inductive and deductive analyses, and so their exploratory and confirmatory counterparts, constitute diverging paths in applied research. As shown in Figure 2.1 the two are closely associated in the learning process. Induction, whether it be formal or informal (as with simple problems), provides an empirical foundation for meaningful hypotheses which act as a starting point for theory development and so subsequent deductive stages in analysis. Carter recognised elements of this process in rudimentary form:

...construction of models often results from a backlog of accumulated information, although every such accumulation does not inevitably lead to such a construction and attempts are made then to digest material by means of classification, rather than integrated models. (1972,46)

Where deduction is only partially successful, or alternatively so successful as to justify an expansion of the subject under study, there is then a need for additional exploration to fill gaps or suggest new directions. These two methods of investigation are often not seen as related because problems are so complex as to permit only one stage of analysis to be used at one time or, in the case of simple problems, the inductive phase is informal. Hence, just as induction and deduction relate so do the philosophies of exploratory and confirmatory data analysis. The problem solving relevance of each is not described by universally invariant rules but determined by individual research needs.

2.2 The Appropriateness of Exploratory Data Analysis for Investigating Localised Labour Area Differentials.

The discussion so far has concentrated on the definition of exploratory data analysis and its development but little attention has been devoted to when exploratory data analyses are appropriate. Discussion of suitability is important because it completes definition through reference to application. Definitionally, application is extremely important because inappropriate choices can impair research. Sayer has argued that:

One of the most basic causes of the inadequacy of the models we have criticised [regional science models] is the misguided attempt to make the 'soft' sciences 'hard', to equate social science with 'natural science' and therefore, to use an inhibiting methodology. (1976,249)

The major problem where numerical analyses are concerned is that results which
should be presented as exploratory or tentative are portrayed in a confirmatory way. Failure to recognise the distinction between exploratory and confirmatory analysis, as Grigg warns, can produce inappropriate application of not only method but results:

Herbertson intended his system (climatic classification) to be exploratory, to be tested by later workers, and not to be accepted as a final and complete system. (1967,499)

Replication of Herbertson’s difficulty can only be avoided by establishing the conditions under which exploration is appropriate.

The simple response to this problem is that exploration is appropriate when confirmatory analyses are inappropriate. This situation prevails under two conditions: where theory, concept and empirical research is not sufficiently developed to support confirmatory analysis; and when the quality of data is so unverifiable as to call the merit of confirmation into doubt. Where either or both of these circumstances have been identified interpretation must be adjusted accordingly since it cannot be expected that confirmatory modes of interpretation apply. Each of these issues will be treated in turn with specific reference to spatial analysis.

2.3 Localised Labour Research - Problems of Theory and Concept.

As analysis of extent and nature in differentiation is the fundamental means of gaining insight into the role of place in labour exchange, the empirical component of this Study is fundamentally concerned with complex form. The major requirements of any theoretical, conceptual or empirical framework are very exacting. They must be capable of providing guidance in the definition, selection, expression and weighting of a wide array of labour exchange characteristics. The usefulness of existing propositions diminishes rapidly where any of these conditions are not satisfied. Few, if any, can be satisfied directly because little research has addressed the issue of differentiation in localised labour exchange. The work which has been done concentrates on highly specific topics, is highly fragmented and makes little effort to incorporate nature into analyses of form. This, of itself, is sufficient to justify an exploratory approach but there are four general deficiencies afflicting the available theoretical, conceptual and empirical frameworks which impair the scope for confirmatory analysis with detailed areal data in Australia. These apply

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1Reference to theoretical, conceptual and empirical aspects of accumulated research is an operational generalisation which refers to any pre-existing research capable of supporting confirmatory analysis. This is done so that consideration is not restricted to the narrow concept of pure theory.
primarily to interarea analyses which are much more complex than intra-area analyses. The latter must theorise or represent findings for only one area without reference to the complications which beset a set of different areas.

The first is the failure of a comprehensive and integrated body of work to emerge which could have provided a reference point for developments in more specific fields. The affects of this deficiency have been noted by Sayer in discussing regional science:

One of the chief barriers to progress in regional science is the very thing which is least discussed by regional scientists, that is, the mode of abstraction - what should be studied, what should be left out and how it should be conceptualised. (1976,250)

References to this kind of deficiency can also frequently be found in the more general literature, with Isserman and Brown (1979,139) claiming that measurement of "community needs is a problem in search of a method" and Rhind arguing that:

For many variables our theory is so underdeveloped that we cannot yet suggest a reasonable basis for disaggregation. (1978,129)

Others, such as Haynes (1975,66) concur, complaining there is "no clear idea of which variables are relevant and which particular characteristics in a system should be isolated". From this it is clear there is concern over the inability of the theoretical and empirical frame of spatial research to provide answers to key questions, especially in the relationship between topics and the nomination of priorities. Haynes (1975,66) asserts that this reflects the current state of analysis and spatial research has not yet passed the first stage of scientific development "with any degree of rigour". Herbert and Johnston offer a similar view with respect to analyses of urban structure:

How then can this mosaic be unravelled to provide descriptive information on the urban structure - itself perhaps generative of hypotheses concerning its origins - and inputs for analytical work on the role of the sociospatial environment or other social processes ...Answers to this question are invariably located in the pragmatic research world ... (1978,13).

The state of socio spatial research is then primitive by comparison with the problems being addressed. Reliance on pragmatism is only to be expected as a stage in the development of a more comprehensive and integrated theoretical base. There is here a clear place for exploratory data analysis as the search for a synthesis continues.

The second deficiency is the dearth of analyses at the local scale. Transfer of theories and concepts is difficult as these are too gross and have unrealistic data
requirements. The problems are evident from the experience of neo-classical regional economists, such as Richardson (1969), who attempted to apply macroeconomic principles to the regional scale. Many of these exercises were of only limited success as Logan (1970, 117) has noted, arguing that geographical differences in economic activity are "difficult to explain" in terms of international trade models because they do not adequately account for the mobility of labour and capital. In essence, Logan has observed that scale is instrumental in concept definition.

Further difficulties can be illustrated with reference to the core-periphery theories developed and used by Myrdal (1957) Hirschman (1958) and Freidmann (1966) which have been given some currency in Australia through the work of Stilwell (1974). The theory purports to explain development differences and acts as a framework for explanatory mechanisms such as cumulative causation. Stilwell found this theory useful for decomposing Australian states into core and peripheral regions on the basis of a division between metropolitan and nonmetropolitan areas. This otherwise useful theory cannot be applied at the local scale because its fundamental spatial division is too large. While this whole Study could be typified as an investigation within the periphery, the organisational utility of the model is largely foregone as it was originally specified with international and national scales as its focus. This problem is exaggerated because of the truism that as scale diminishes, data availability becomes increasingly limited (variety of problems subsequently recognised, e.g. Stohr and Taylor, 1981; Gore, 1984). The model is, therefore, restricted increasingly to the realms of theory and has been argued elsewhere "any model is just as good as its empirical frame of reference" (Berry, 1960, 78). Transfer of higher scale theories is undesirable because of an inability to take advantage of their conceptual benefits and satisfy their data requirements.

The third deficiency of the theoretical, conceptual and empirical frame is that it is heavily dependent on work from outside Australia. This can effect investigation in two ways. One is conceptualisation of the labour exchange process where international differences are apparent. Horn has discerned this phenomenon and warned of potential pitfalls:

Labour economics has a strong national bias to the extent that the application of economic rules is greatly influenced by the people, institutions and traditions of respective countries. The many American texts, for instance, are of no direct relevance to the present Australian situation in their treatment of racial differences, structural unemployment and collective bargaining ... (1975, i)

Gallaway (1971, viii) confirms this view in prefacing his work on labour economics
where he claims to have produced "an image of American labour markets". This is not to argue that these works have no heuristic value, indeed they do, but they should not form the fundamental bases for examination or elucidation of Australian problems where parallels with other countries, such as Britain or the U.S.A., may be superficial. If this problem is to be overcome, an Australian theoretical framework must be developed.

Another aspect of this problem is important in conceptualisation of locational differences. As yet, very little work has been done in Australia on locational differentiation. This applies particularly to small area research and to specialist fields such as labour exchange. The detailed spatial distribution of many socially significant variables, such as income, are as yet virtually unexplored beyond the level of simple mapping. In filling some of these gaps, though only for urban Australia, the Department of Home Affairs and Environment (1983, v) has noted this absence, claiming that its work is "a first attempt to describe differences". Walmsley (1980, 7), commenting on the state of indicators in Australia (a subject in receipt of substantially more attention than spatial differences in labour exchange because of its broader base), concurs with this general view. Reliance on theories, concepts or empirical results appropriate to other countries increases the probability of misspecifying not only form but process.

The "regional problem" framework (Brown and Burrows, 1977; Holland, 1976), so popular overseas, provides an excellent example of an inappropriate framework when applied to Australia (Butler and Mandeville, 1981). This conceptualisation was formulated in Europe (especially Britain) and to a lesser extent the U.S.A. where it has been used as a justification for regional policy intervention. Its main argument is that regions containing large numbers of people (literally hundreds of thousands or millions) are disadvantaged because of widespread and long term failures in the regional economy. Examples of such areas include Appalachia (U.S.A.), the Mezzogiorno (Italy) and North East Britain. Transfer of such a framework without exploration is compositionally fallacious because it assumes the Australian situation fits this model. As will be seen in the unemployment analysis to follow, areal differences in Australia have been less spectacular, confined to smaller populations, less clearly identifiable and so more ephemeral. There is little to be gained by confusing the Australian situation with those found overseas. Christensen's empirical work supports this conclusion:

What was perhaps most clear from the studies undertaken was that unemployment experience in Queensland needs to be analysed in its own context, no complete analogy could be drawn with experience in the United
Kingdom for example, where industrial structure and history differed considerably from our own ... (1973,138)

She continues to argue that "the precise problem must be identified before solutions can be applied." In effect, this requires a typology of areal differences 'cut' to Australian circumstances rather than 'cutting' Australian circumstances to foreign specification.

The final, and possibly most important deficiency in the framework needed to sustain confirmatory analyses of areal differentiation is, as pointed out earlier, the inability of theory and concept to cope with complex social and economic reality. This can be illustrated by reference to the social indicators literature which offers one of the closest parallels to this Study because it attempts to incorporate nature in differentiation into assessment. Several practitioners have expressed serious reservations as to the adequacy of theory and concept. Smith criticised the field, claiming that:

The problem here is that, despite certain similarities in the views expressed, there is no generally accepted social theory setting out precise conditions unambiguously defining human well being along with their weights. (1977,31)

Most other commentators agree with this view, Armstrong (1982,5) pointing to the absence of a model "to guide the selection of social indicators" and Walmsley (1980,35) stating unequivocably that there "is no a priori guidance as to which dimensions of human existence should be singled out for study". Responses to this absence of a useful theory are instructive. Walmsley (1980,35) continues his earlier comment to conclude that the task of the social scientist is to identify the minimum of social theory and to admit that this falls well short of "an actual model". Others adopt a far more pragmatic position and define operational sets of indicators related to variant conceptualisations of human need, stemming from the requisites of public policy, or particular client groups in the community (Armstrong,1982; Knox,1978; Isserman and Brown,1979). In Isserman and Brown's (1979,140) terms, these are "largely piecemeal" and "case at a time" in fashion and fit Smith's earlier comment. Edwards (1975,280) puts this search for theory into a useful context suggesting that social scientists will not find the definitive framework they so urgently seek because the phenomenon they are attempting to monitor is, in all probability, constantly changing in nature and manifestation.²

²A large number of task specific models for regional analysis have been ignored in this discussion because it would be tedious to review them since all were rejected. They include economic base models, input/output analysis, shift/share analysis and regional simulation models. Rejection was for one or more of three reasons: only suited to intra-area analyses, refer to a narrow range of variables; or require restrictive assumptions. Many of these are, in fact, exploratory but used definitively on the basis of technical sophistication.
Taylor's suggestion for future directions in the indicators field demonstrates a strong methodological parallel with that outlined in Figure 2.1:

Hopefully theories will generate need for a data base. Data itself might suggest new theories so separate progress in both areas would not be counter productive. (1980,236)

Due to the paucity of previous work on localised differences in the labour exchange process, the approach being adopted in this Study is clearly of the data based kind and, more particularly, exploratory in outlook.

Confirmatory analyses have continued unabated in spite of these difficulties because they are an inherent element of conventional scientific method. This, however, is not sufficient because the risks of misconception have been highlighted as the generality of scientific method has been justifiably attacked:

There are two things wrong with regarding the study of human social life as a science on par with the natural sciences. One is that this produces a mistaken view of what human beings are like, as capable, reasoning actors who know a great deal about why they act as they do. The other is that it contributes to a tendency which Habermas sees as general in modern intellectual culture - an overestimation of the role of science as the only valid kind of knowledge that we can have about either the natural or social world. (Giddens,1985,18)

Exploratory research has, in the past, fallen victim to the very phenomenon which it seeks to eliminate, proneness to acceptance of unsustainable, preconceived ideas.

In adopting a decidedly empirical approach to the investigation of localised labour area differentials it is not intended, in Berry’s terms (1960,78), to deprecate the theoretical and empirical framework which has developed. By demonstrating some of the inadequacies of the broader framework of spatial analysis, in the absence of one referring specifically to labour exchange differentials at the local scale, it has been possible to show the potential for introducing a formal exploratory mode of analysis. Acceptance of the need for such an approach does not preclude the application of confirmatory or definitive approaches but it does show that many studies of this genre, especially those based on weak theory or non probabilistic models, may be more aptly described as exploratory. By virtue of its flexibility, exploratory data analysis can be applied where the theoretical base is weak and the transfer of theory or loose concepts, as a substitute, is of marginal benefit. Under these circumstances formal hypotheses generation and question development are more advantageous than application of the traditional analytical tenets of post war geography.
2.3.1 Localised Labour Research - Considerations in Using Secondary Data.

Even if theoretical, conceptual or previous empirical developments were capable of sustaining confirmatory analyses, it is unlikely that data requirements could be satisfied in a large number of interarea analyses. Exploratory data analysis offers a major alternative to confirmation under such circumstances because it entails an inherent qualification of findings through its emphasis on question development and hypotheses generation from formal observation.

More specifically, there are two reasons for accepting this alternative. Firstly, spatial analyses rely exclusively on secondary data\(^3\). As only a limited range of information is available it is not possible to operationalise a large proportion of theories. This problem increases in severity as the size of observational units is decreased because information becomes even more restricted, as for example, national surveys become inoperable\(^4\) and administrative records unreported. Tregilgas argued that research below the state level was at best precarious:

A prime reason for accepting the use of State borders is that a thorough analysis requires considerable information and statistical data. If these data are only collected on a State, rather than a sub-State, basis there is no serious alternative to the use of State boundaries in such an analysis. In fact, such data constraints are much in evidence in Australia. Sub-national data are relatively scarce... therefore severely limiting sub-State analysis to untestable hypotheses and summary guesses. (1976,4)

Hence the strong bond with theory so necessary for true confirmation is in serious jeopardy.

Secondly, since spatial analysis is dependent on available data, these must be accepted on this criteria rather than judgements concerning quality. This does not provide a carte blanche to ignore quality, rather, it suggests that research philosophies must be adjusted to account for deficiencies as correction may not be possible. Mosteller, Elashoff and Elashoff, indicate such adjustments may need to be significant with data related to human behaviour:

Psychologists sadly say that even under the most carefully controlled conditions, laboratory animals do as they please. Humans do even worse. (1978,210)

Social data are commonly ‘partial’, ‘soft’ and ‘noisy’, treating issues of great complexity or with highly intangible components which confuse a variety of

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\(^3\)Secondary data are those which are collected and tabulated before release while primary data are released in original format. With secondary data there is minimal control over what is measured, how this is done or how results are presented.

\(^4\)The Labour Force Survey, for example, can only be disaggregated to metropolitan and nonmetropolitan regions for each state because sampling frames are of limited scope.
phenomena. Where measurement is in doubt the benefits of confirmatory analyses are undermined by inaccuracy in original observations.

It is the second of these issues which is of the greatest interest because it governs what should be done with information as opposed to what is done. The problems of secondary data will now be expanded upon. These will first examine sources of distortion recognised in census material by the Australian Bureau of Statistics and second additional sources of distortion which, though widely recognised, are frequently ignored.

The Australian Bureau of Statistics commonly recognises five distorting influences on census results, the degree of recognition and discussion varying between influences. Two of these influences effect only the 1976 census and stem from the fact that the majority of results were derived from a 50% sample of census returns. The reasons given for this unprecedented action (although an earlier British census was processed in this way) vary from insufficient resources to fully process the results, to qualms concerning the accuracy of results. Regardless of reason, this action was irresponsible and unjustifiable as censuses are only taken every five years. Extensive resources are devoted to their collection and they provide the only detailed information available on the Australian population at the small area scale. The resulting limitation is that sampling error is introduced as most aggregates are sample estimates rather than counts. These errors are largest for small areas and become less important as totals increase in magnitude. A discussion of this problem is presented in documents supporting release of the census (A.B.S., 2129.0 Extract). Responses to this situation have produced undesirable compromises which would otherwise have been unnecessary. These have included only the use of larger population areas in analyses (see appendices Stricker and Sheehan, 1981) which artificially truncates the spatial distribution of social variables and produces a biased view of local differences. Another is to weight all estimates by population size. However, this has the side effect of systematising all variables so that in nonmetropolitan areas the urban hierarchy is indelibly imprinted on all local patterns. Easy and direct use of this census has therefore been foregone if there is a desire to include small areas in any spatial analysis. The position adopted in this Study has been to assume the quality of the data to be generally low and incorporate small areas in an unweighted fashion searching for only the broadest of

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As many of these comments will be directed at the census material, because it is the most common and readily available source of locational data, they should not be misinterpreted as criticisms solely applicable to this source. Similar deficiencies can be found in many other sources.
Another problem of lesser importance also stems from this situation where collector's district results were rounded before release while local government aggregates were produced from other unrounded estimates (A.B.S. Cat No 2131.0.44). As it was thought desirable to retain direct compatibility between the collector's district and local government area scales in this Study it was decided to produce local government area estimates from the collector's district tapes. The advantages of this course are that it facilitates consistent exploration to the smallest areal unit available if needed, emphasises the areal focus of the Study and retains a facility which is available in all earlier censuses. However, this course requires an acceptance of the level of accuracy at the collector's district scale. This is not difficult to accept as the rounding differences are not statistically significant and the collector's district is the fundamental unit of areal observation.

A third set of problems arise from the absence of a stable framework for collection and presentation of census results which are at least superficially compatible over time. These vary in distorting influence from negligible (but tedious and time consuming to eliminate) to significant (tedious and impossible to eliminate). In the first category are the problems of different area sequences and configurations on tapes, different character code representations on (BCD, EBCDIC, ASCI) and organisations of variables for areal units between censuses. These problems, summarised in Figure 2.2, can be overcome by using different procedures to read tapes, careful application of sorting routines and selectively reading data in ordered sequences. The second set of problems are due to boundary changes at all levels between censuses but of particular interest here are those affecting local government areas. Where these occur there are two options: reconstruct original boundaries from collector's districts; or amalgamate the local government areas affected until a common boundary is reached. Reconstruction from collector's districts is not always possible as original boundaries need not be compatible with 'new' local government areas as neither set is stable over time. Extensive 'correction' was required in this Study, with the amalgamation method being used (Figure 2.2).

The distorting influence of these otherwise unavoidable corrections is that some areas are no longer local government but amalgamations of two or three local

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6. This discussion assumes the random sample to be good across all variables and for areas with vastly different characteristics. If this were not so, and there is no information to confirm it, a variety of new problems would arise in regard to over or under representation of groups in the population.

7. Response to several personal communications with the Australian Bureau of Statistics.
Figure 2-2: Standardisation of Sequencing and Local Scale Boundaries for 1966, 1971 and 1976 Censuses.
Where the national boundary charges the area, the affected areas were aggregated by p"

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A subroutine written by W.J.W. Naugton. Department of Economic History, School of Social Science, A.N.U. used the same
governments. Under these circumstances, they can only be described as local government 'like'. This is not difficult to reconcile with the local government area framework especially when it is realised that many of these have changed status since commencement of this Study.

The remaining two sources of distortion have an important feature in common and so can be discussed jointly. Both represent a form of error, one collection and the other presentation, which may vary between location and census, hindering areal and temporal comparisons. The first is underenumeration, i.e. people who, for some reason, have not been included in the census; and the second is that census results have been largely presented on a de facto basis (place of enumeration) as opposed to a de jure basis (place of residence). The real danger of both distortions is their selectivity with reference to particular groups in the population, for example homeless people and underenumeration or the short term mobile with de facto/de jure differences. The scope for correction across all three censuses is minimal with correction factors being available on only a limited basis. Any correction on these terms would be unsatisfactory because state level factors are too gross for application to local areas and partial knowledge for specific variables is of limited benefit unless relationships to other variables are understood.

Having recognised these five problems with the major source of secondary data the question which arises is: are there more? There are, however, they differ from this first group in not being as widely acknowledged, very difficult in many cases to substantiate and, as with those already discussed, usually intractable. Although most refer directly to census data, they can also be expected with other sources of secondary data and may be encountered in many primary data sets. In all, twelve other sources of distortion can be suggested (see Mosteller, 1976; Elashoff and Elashoff, 1978; Duncan, Cuzzort and Duncan, 1961):

i) **Nonresponse to questions** - This results from the failure of individuals to answer specific questions either because the question is not understood or because of ethical objections. The difference between non response and under enumeration is that the magnitudes of non response are identifiable but as, with under enumeration, a satisfactory solution is not available.

ii) **Uncertainty** - Questions requiring highly specific answers present an illusion of precision but in many cases responses are uncertain or ephemeral. Examples include questions requiring recollection or detailed information (such as information on non wage or salary income).

iii) **Variations in what is collected** - This can change in degree from alterations in question format which may produce slightly different responses to the situation where established questions are struck from the census schedule or new ones added.
iv) Variations in response classification - Responses from similar or identical questions asked at different times have been classified differently in each census, e.g. the industry classification was changed between 1966 and 1971 along with the presentation of data on unemployment while in 1976 the distinction between self employed and employers was eliminated.

v) Attitudinal response differences to identical questions - This is largely self explanatory and refers to attitudinal differences which emerge over time or between groups due to such effects as development of the women’s movement or the existence of intercultural differences.

vi) Conceptualisation of variables to be measured - Conceptualisation of what is to be measured may differ significantly depending on the definitional exigencies adopted. For example, the current definition of unemployment may be regarded as quite different to that which would seek to incorporate hidden unemployment with important ramifications for what is measured.

vii) Inadequate classification of responses - While meaningful questions may be asked and useful information collected, categorisation of responses may not be useful. For example, responses classified by place of enumeration or place of usual residence may be less desirable for labour exchange studies than results classified by place of work.

viii) Self enumeration basis of census - Self enumeration, whilst the most economical form of data collection, leaves a broad scope for interpretative licence. The absence of a scrutineer limits quality control with values and judgements of respondents increasing in significance.

ix) Errors of coding and processing - Coding and processing of results is tedious and error prone. Whilst these problems can be corrected with primary data there is little which can be done when suspicious results are encountered with secondary data. As validation of Australian Bureau of Statistics matrix tapes has been minimal and problems have been encountered on some tapes these data must be regarded with suspicion.

x) Censuses are temporally punctiform - As censuses are taken at only one point in time responses are subject to unknown seasonal influences and irregular events.

xi) Tampering with collection procedures - Secondary data, especially those from administrative records, are particularly subject to tampering. For example, unemployment registrations have been influenced by attempts to reduce the number of registrants and, at one point, the series was abolished, supposedly because of inaccuracies but with strong political overtones.

xii) Inappropriate use or user error - The final type of distortion to be recognised here is that introduced by users who, failing to consider the limitations of their data, use it inappropriately or, because of undetected problems, use it in error.

Doubtless many more sources of distortion could be identified by considering different situations, other sources of secondary data or more specific versions of the issues already raised.
The distortions in observation discussed thus far are not the preserve of this Study but apply generally to all spatial research using secondary data. Ideally, each of these should be assessed and eliminated, as with some of those discussed earlier. Were this Study a highly aggregated national analysis, where post enumeration surveys or comparable series could be used for correction, or only a few distortions suspected, this could be attempted. However, neither of these conditions apply. The problem is that whilst there is a widespread awareness of these distortions they are commonly assumed inconsequential and no adjustment in analytical stance is adopted. Changing the emphasis from confirmation to exploration facilitates adjustment because results are expressed, in accordance with their limitations, as questions and hypotheses. Mosteller and Tukey argue the need for such an adjustment by observing, with reference to Student's seminal work on confirmation, that inappropriate application results in overstatement and invariably oversimplification:

The main value of Student's work lay in (i) showing that one could deal with small samples, (ii) giving numbers for how much this mattered in an important case, and (iii) providing tables for that case. Against this, his work, not by his own choice, made it too easy (iv) to neglect "if...assumptions hold", (v) to overstress the "exactness" in other problems, and (vi) to fail to attack the problems of multiplicity. (1977,22)

They continue to argue that "vague concepts" (in this case governed by the quality of observation) determine the value of "precise concepts", indicating that "exactness" is illusory under these circumstances. Exploratory data analysis is, therefore, more appropriate because it reconciles the quality of findings with results and so responds to Sayers' (1976) call for a 'softer' social science to deal with 'soft' problems. The question inevitably arises as to whether these are the 'stuff' of confirmatory or definitive analyses.

2.3.2 Exploration and Adjustment in Interpretative Stance

The predominant mode of analysis in empirically oriented geographic research is confirmatory. The problem with this is that interpretation or use of information is largely predetermined as the type of answers sought influences the type of questions asked. This is unsatisfactory here because the purpose of research is to explore the role of place in labour exchange, not document spatial differences on individual variables. Successful alteration to mode of interpretation is contingent upon capacity to depart from entrenched paradigm values as required by the purpose of research. Exploratory data analysis offers grounds for augmented interpretative flexibility on both counts because it accepts the value of question
development and hypothesis generation whilst accommodating the purpose of searching for structure. This contrasts starkly with the common orientation in spatial analysis where the predominant value is testing for differences in defined structure with the purpose of confirming existence or otherwise of preconceived situations. Adherence to one rigid mode of interpretation in spatial analysis can only be sustained by assumption. The assumptions involved are clearest in the spatial application of indicators and since it is these which are troublesome they will be evaluated to set the stage for a more flexible treatment of observation.

The interpretative demands of the conventional indicators approach are often unwieldy because they have a normative penchant. This means variables must be interpretable in terms of status conditions such as ‘good’ or ‘bad’. Where this can be done the relevant variables may be assigned as indicators because they reflect status conditions. Ascription of status in this way requires satisfaction of at least three assumptions (see Knox, 1975, for an alternative treatment).

First, each of the variables to be used as indicators must be associable with some concept of performance, that is, have a framework of values within which status judgements can be ascribed. Many such frameworks are informal and relate directly to everyday social norms with the ascription of status being an ostensibly simple matter. Heady, Holmstrom and Wearing challenge such applications, expressing serious reservations:

...despite the appearance of objectivity, a troublesome assumption is made, namely that the well being of the nation is improving to the extent that the indicators show that people live longer, pass through more years of education, or have better plumbing in their houses and is declining to the extent that there is a crime wave, more drug taking and more divorces. At bottom this assumption is troublesome because ‘objective’ indicators are taken to be measures of subjective psychological states. (1983,6)

The scope for overcoming this criticism is not great in even broad indicators studies where diverse phenomena may be incorporated (see Smith, 1977; Walmsley, 1980; and Cutter, 1985 - for content analyses of social indicators studies) and a wide array of secondary data are available. It is even less where only one element of social process is to be investigated, as in this case, since fewer sources of information will be available and those used out of necessity are less likely to have normative correlates.

Second, any variable nominated as an indicator of status will have a ‘stand alone’ capacity by which unambiguous interpretation will be possible. This assumption stems directly from the first and imposes an additional condition which effectively prohibits the use of variables which cannot be interpreted unambiguously
without reference to other variables. Where this cannot be done, simplistic interpretation will result in incorrect conclusions. For example, a concentration of low income females in an area could suggest a concentration of female poverty or conversely it could indicate a concentration of double job holding by household partners (husband-wife) where supplementary female income is responsible for relative affluence. Human behaviour is complex and very often conditional on the actions of other people, events and opportunities so that the potential for simple interpretation of variables is more likely to be the exception than the rule.

Third, there is a strong concept-measurement relationship. In essence this refers to the faithfulness with which concepts to be used as indicators are represented by the measures of them. The importance of this assumption has been underlined by Horn:

The degree of validity depends on the extent to which change in the indicator is matched by a corresponding change in the element of well being under consideration ...(O.E.C.D.,1977,4)

As argued in the previous section, the strength of the concept-measurement link is in doubt, these doubts increasing with the complexity of variables and degree of spatial disaggregation. As the potential for measurement distortion has already received detailed attention, and will be illustrated in later chapters, further discussion of this assumption is unnecessary.

Were this interpretative stance to be accepted, the effect would be to prohibit investigation of nature in differentiation and so preclude higher level search for the role of place in labour exchange. The reason for this is purely operational since so few dimensions of variability, from the constrained range available on local labour exchange, could satisfy these assumptions that analysis would default to one of degree in differentiation. An alternative is therefore necessary which does not rely on these assumptions. The flexibility afforded by exploratory data analysis assists in this because conventional values are of little merit if they cannot be reconciled with the information available for analysis.

The main alternative to conventional interpretation can be traced to 'fringe' developments in the indicators literature where similar obstacles have been encountered in satisfying these assumptions. The preoccupation with normative results is replaced by an interest in the wider understanding of place. This is consistent with the general view of data analysis where one of the tasks is to look beyond the 'visible spectrum' of the accepted in search of regularities in the unknown. This more liberal view of data analysis has been argued by Horn from United Nations sources:
The conventional approach traditionally acknowledged only the final justification, whereas satisfaction of curiosity and the need to gain an understanding place are important prerequisites for well conceived research. Hill's (1977,64) distinction between "normative indicators" and "neutral statistics", where the latter are defined as "data of a non-normative nature", reinforces the notion of there being no compulsion to accept the conventional mode of interpretation. Taylor (1980) also accepts a number of uses for socioeconomic data and quotes Carlisle's typology of indicators, i.e. predictive, problem oriented, evaluative and informative. The first three are more conventional as they are oriented towards normative judgement and so more suited to the action criteria listed above. The informative type of use, "the purpose of which is to describe parts of the social system", is more suitable because it is compatible with the objective of search oriented investigation where preconceived notions are of limited value and findings may be of uncertain merit.

The point of this alternative is to shift attention from the purely normative role of information and direct it towards the search for structures which may provide insights into the role of place in labour exchange. It recognises the need for manipulation of information because it is related to social process and, therefore, characteristic of it. There is minimal reliance on preconceived status associations with subsequent dependence on 'exact' concept-measurement relationships and hence, data of irrefutable integrity. Rather, this orientation is designed to use available information which has a less defined affinity with social process. As most small area data are not of guaranteed quality, this procedure assumes that whilst exactness may be in doubt, loose affinity is sufficient to provide insight into unexplored structure. The emphasis on nature in differentiation is designed to alleviate the worst excesses of any particular series by introduction of others. This response is not new to geography but is formally recognised here as an acceptance of limitations to analysis.

The relationship between the philosophy of exploratory data analysis and characteristic modes of interpretation is two-way, with the former facilitating interpretative adaption which, in turn, encourages exploration. This interpretative stance departs from the normative penchant of most contemporary indicator studies which, through prior assumptions concerning status conditions, focus on variables and their distribution in space. Rather, its intention is to reverse this by providing a focus on place. Since the primary concern is no longer with status differences for variables but their use in combination to suggest place, this application has a more
direct line of descent from the atlas tradition in geography than the indicators movement.

2.4 Structure in Exploratory Data Analysis - An Approach to the Investigation of Localised Labour Area Differences in Australia.

Problems encountered with the development of spatial analysis include: deficiencies of theory, concept and data; rigidities in interpretative stance; and the introduction of assumptions which cannot be satisfied. As a result, it could be justifiably asked whether exploration should be abandoned until conditions improve? In addressing this question it should be understood that these are not simply problems of this Study but more general to spatial analysis. As these general circumstances are unlikely to change in the foreseeable future the only option is to proceed. This raises the next pressing issue which is relationship of the research problem to an operational framework for exploration.

Without an adequate operational framework, exploratory data analysis is in serious danger of becoming directionless and producing unintegratable findings as it lacks the guidance of a priori theory. Creation of an operational framework requires conversion of the research problem into a series of manageable and related subquestions which embrace the major issues raised. This has been done and a schematic overview shown in Figure 2.3 with each of the questions being shown as a critical element in analysis of the problem.

The first critical feature of the framework (Figure 2.3) refers to the Study's formative stage which includes all material discussed to this point, i.e. formulation of the research problem, explanation of its main features and adoption of a suitable analytical approach. This stage is amongst the more intricate and perhaps the most important because all else follows from it. As all of the relevant content material has already been examined in detail this stage needs no further discussion. The second critical issue progresses to the need for an understanding of issues which are likely to impinge upon local observations. There are two factors of major concern, one arising from shifts in macroeconomic performance and the other public efforts to alter structure of space economy. It is necessary to address the question of macroeconomic behaviour because the period of interest was chosen for its economic dynamism, with consequent ramifications for perspectives on place in labour exchange. More specifically, the analysis of extent (see below) concentrates exclusively on specification of place in labour exchange according to the unemployment dimension. This dimension offers scope for normative interpretation of place in the context of more general macroeconomic shifts in performance.
Figure 2-3: Operational Framework
- Scheme of Issues and Sub-Questions
Decomposed From Original Research Question.

ORIGINAL RESEARCH QUESTION
ISSUE extent and nature of localised labour area differences
RESEARCH QUESTION What our explanatory data analysis reveal about localised differences in the labour exchange process for non-metropolitan NSW for the period 1966-76?

ISSUE Background
SUBQUESTION What is the macroeconomic background to the current crisis?
What is the locationally discriminant policy background to spatial analysis in Australia?

DATA INTENSIVE
DATA EXTENSIVE

ISSUE Unemployment and localised labour market performance.
SUBQUESTION What is the concept of unemployment, how is it measured and how has it been used in locationally discriminant studies?
SUBQUESTION What is the pattern of local unemployment differentials and how durable are they cross-sectionally and longitudinally?

ISSUE Analytical strategy, technique and data selection for multidimensional exploration.
SUBQUESTION What analytical strategy is most suitable for a data extensive analysis of localised labour area differences and what techniques and data can be combined to achieve the objectives of exploration?

ISSUE Area structure identification.
SUBQUESTION Can any meaningful organisation of localised labour areas be identified and if so what is it and how does it vary?

ISSUE Attribute contribution to weak patterns or structures.
SUBQUESTION What are the contributions of individual and collective sources of differentiation to observed patterns (and if meaningful-structures) of localised labour area differentiation?

CONCLUSIONS AND HYPOTHESES CONCERNING METHOD AND LOCAL STRUCTURE
Character of the period must therefore be established to illustrate judgements concerning diversity of influence and establish context for normative interpretation. The second is important because of possible influences on the structure of local areas and a more general interest in the types of policy initiated in the past. There is a clear need to understand the influence of locationally discriminant policies on spatial distributions because they may determine patterns observed in spatial analysis. Collectively the macroeconomic and locationally discriminant policy issues provide a point of departure for this analysis to move from the known and relatively familiar to the unknown and uncertain.

The third critical feature of the operational framework shown in Figure 2.3 reveals a major analytical choice between data intensive and extensive analyses of spatial differentiation. This choice stems from the way data are used to gain insight into the role of place in labour exchange. Data intensive analyses of form are those which investigate unidimensional aspects of differentiation whereas data extensive analyses investigate differences from a wider array of dimensions. Data intensive analyses can use large numbers of variables but these must be derived from dimensionally related sources through decomposition of variables into sets, combination of related variables into higher level overviews and use of representational differences to modify distributions. Data extensive examinations have a far greater capacity for generation of derived variables because source is not constrained to one dimension of variation. The importance of these two alternatives is that they facilitate implementation of analyses oriented towards investigations of extent or nature. Although considerations of extent and nature do not depend on the number of variables used, the scope for incorporating considerations of nature in differentiation is increased in data extensive analysis. It is therefore more likely that analyses of extent in differentiation will be data intensive while those of nature tend to be data extensive.

The two approaches present very different analytical problems. The range of simple techniques for intensifying images through the creation of derived variables, though useful in data intensive situations, are patently unsuited where data extensive analyses are the object. In data intensive situations the objective is to gain a detailed understanding of form with regard to only one aspect of areal differentiation. In data extensive situations individual aspects of differentiation, and their particular variables, are of less direct concern because it is general patterns of coincidence which are the subject of study. While the objective in both situations is to enhance understanding, the paths may be very different.

It has been decided to adopt both data intensive and extensive approaches
because they emphasise different aspects of differentiation. Data intensive approaches provide a useful precursor to complex analyses of form because, in examining one dimension of variation, a familiarity can be established which is not otherwise obtainable. This creates an awareness of shortcomings in the concept-measurement relationship and forms of interarea variation which might be expected (i.e. a control).

The dimension chosen for data intensive investigation of place in labour exchange is localised unemployment differences. This dimension was chosen because: it gained prominence as a result of economic recession (next chapter); is arguably representative of broader disparities; and is widely accepted in other studies. The unemployment issue can be decomposed into two subquestions. The first asks what is the concept of unemployment, how is it measured and how has it been used in previous spatial analyses? Only once this question has been addressed can a substantive examination of unemployment and its previous applications in spatial analysis of labour exchange be attempted. The second inquires as to the form of unemployment differentials with the emphasis on place being introduced through an orientation towards durability of form under differing cross sectional and longitudinal circumstances. Without knowledge of durability, impressions of form are of limited value because they may be so ephemeral as to produce misleadingly simple views of place in labour exchange. This stage of analysis is important because it will not only provide insights into the role of place in labour exchange but an important guide to differences which might be expected in more sophisticated and complex treatments of nature in differentiation.

Returning to Figure 2.3, the alternative path to exploration of extent is to confront the issue of nature in differentiation through a data extensive analysis. Three critical issues form the basis of this course. The first is that of analytical strategy, technique and data selection for multidimensional exploration of localised labour exchange differences. This issue translates into a general subquestion asking what analytical strategy is most suitable for a data extensive analysis of localised labour area differences and what techniques and data can be combined to achieve the objectives of exploration? The term strategy refers to the combination of analytical tools and techniques necessary for the achievement of a stated objective. Discussion of strategy was not required for the data intensive analysis because exploration has developed most in this direction. As yet, there is very little published material suggesting exploratory strategies for data extensive situations. This does not constitute a significant obstacle to exploration because, as should be apparent by now, exploratory data analysis is as much a use of numerical
techniques and an attitude to application as it is a development of new exploratory

As a result, there has been little difficulty in adapting strategies and their associated techniques from other fields. Numerical taxonomy has been chosen as the strategic approach. It has received widespread application to a variety of problems and offers a high degree of flexibility. Geographic uses of the techniques available to initiate this strategy have been less than imaginative, with the effect that exploratory potential has gone largely unrealised. The problem of data selection receives much attention at this stage of analysis since, in applying this strategy and its various techniques, there is a need to understand the quality of what has been selected, i.e. how it has been chosen and its likely limitations. The major difference between the discussion of data for the purpose of extensive, as opposed to intensive, analysis is that individual variables are assigned a low priority. There is a tendency to ignore this feature of data extensive analysis with the result that outcomes are assigned generality and status well beyond that warranted.

The data extensive path in Figure 2.3 is completed by two closely related elements of analysis which provide different perspectives on the role of place in labour exchange. The first concentrates on place affinities, seeking variant impressions of form which may provide insights into a stable structure of interarea differences and so the role of place in labour exchange. This whole question of spatial structure is highly tentative where nature is introduced into differentiation because results may not be amenable to interpretation. The reasons for this vary from absence of a general structure to the presence of one so complex that the confluence of factors involved defies interpretation. The second element of analysis is contingent upon success of the first, redirecting attention from spatial affinities to the attribute patterns which correspond with given spatial structures. This seeks to identify individual and collective sources of differentiation between areas and their more general meaning.

The effect of this two stage analysis is a separation of structures evident from spatial and social perspectives. The object is to maintain a distinction between the two which will minimise confusion whilst permitting a thorough search for spatial structure in what is an analysis of place. This not only shifts the conventional orientation in social research but provides two sets of differently construed observations to constrain synthesis of place and its role in labour exchange. Synthesis at this level of exploration should not be treated as a foregone conclusion because it relies on empirical identification of structure from two perspectives and sufficient grounds for relating them. Data extensive analyses are replete with
unresolved theoretical, conceptual and technical difficulties. These alone would be sufficient to prohibit many types of analysis but where the problem is nature in differentiation, research is far into the realm of exploration.

2.5 Conclusion.

In this Chapter, the principles of exploratory data analysis have been discussed and the justifications for its use have been treated in some detail. Exploratory data analysis is fundamentally a research philosophy for dealing with the uncertainties which result from inadequate problem solving information, be it through poorly developed concept or theory, inadequate empirical research, weak data or because of the overawing complexity of research questions. It is as much a philosophy for problem solving as a repository for search oriented techniques which do not unnecessarily commit researchers to restrictive assumptions. The two sources of uncertainty given prominence in this Chapter were the inapplicability of work in other fields or countries to the problem of investigating localised labour area differences in Australia and the difficulties of using available secondary data to investigate this problem. The objective in outlining these problems has not been to condemn the work which has been done in other fields nor has it been to suggest that investigation in this field should be abandoned through lack of sound observation. Rather, it has been to reveal the operational parameters which the researcher must come to terms with in formulating investigative work. Once these parameters are considered the problem is clearly one of what to do when the best methodological approach (presumably confirmatory data analysis) is inappropriate or unworkable? By applying the philosophy of exploratory data analysis it is maintained that adequate use of what is available to achieve the attainable is superior to improper use to 'achieve' the desirable. As such, exploratory data analysis provides opportunities to reconcile the attainable and desirable while maintaining a structured approach to analysis through specification of an operational framework as a substitute for theoretically based analysis.
Small economies are susceptible to shifts in their macroeconomic and public policy environment's because they lack the 'mass' necessary to resist change. Susceptibility varies according to breadth of influences, strength and the structure of small economies. An awareness of factors impinging on individual places is necessary as they may influence perceptions of spatial structure and so the role of place in labour exchange. Actual transfer of effects is of less interest due to this Study's concentration on the character of place.

Two effects are significant in this Study. The first is shifts in macroeconomic behaviour. These are of interest because the period of study has been chosen to highlight differences in place which are likely to be greatest where general environmental circumstances of local economies are shifting most dramatically. Whilst these cannot be directly related to the analysis of nature in differentiation, as so little is known of their effect on most of the variables used, they are important in putting the analysis of unemployment into a more general context. This is especially so since it offers some scope for simple normative interpretation. This is of minimal concern for analysis of nature in differentiation as interest is with complex treatments of place. The second is operation of locationally discriminant policy initiatives which may influence structure of the space economy by deliberate public control of activity. The likely effectiveness of such policy must be established to determine the magnitude of changes in structure which can be ascribed to deliberate intervention. Each issue will be considered separately, macroeconomic shifts in performance being reviewed first, with an examination of key locationally discriminant policy initiatives following.

3.1 Macroeconomic Malaise in the 1970's - Stagflation.

Shifts in post war macroeconomic behaviour have been greatest from the mid 1960's to 1970's with the period up to the early 1970's being one of growth followed by decline. This is part of a longer term profile of 'boom' and 'bust' (Boehm, 1979; Jolley, 1976; Kasper, 1976; Clark, 1975; Butlin, 1970) but is more variable
since it combines the worst features of both, with marked deterioration in activity and inflation to create an intractable 'stagflation' (Martin, 1979; Mandel, 1977; Perkins, 1977). The spatial manifestations of this impinge on the view of place which results from spatial analysis and, more specifically, proposed normative interpretation of extent in differentiation. The two factors of greatest significance in this Study are timing and severity of macroeconomic shifts in behaviour since they indicate the source of diversity in spatial observation over time and provide a context for normative use of unemployment indices.

As onset of 'stagflation' is the most important feature of this period it will be the primary focus of attention. The detailed characteristics of this problem are at best confused and, at worst, elusive. However, its general features have been documented by the Institute of Applied Economic and Social Research (I.A.E.S.R.):

i) At the beginning of 1975 the Australian economy remains caught in the twin problems of rapid inflation and sharp recession (1974,3).

ii) Throughout the first nine months of 1976 the Australian economy has remained virtually stagnant with output and employment increasing only marginally and unemployment rising ... the economy seems poised for a further modest downturn in the next nine months so that a self sustaining recovery from the current recession does not seem to be in prospect before the second half of 1977. (1976,3)

These statements indicate concern with four main features of the problem: employment stagnation; output stagnation; inflation (price instability) and the coincidence of all three. Each of these will be discussed in turn but as the employment and output patterns are similar only the employment and inflation features will be examined in combination.

3.1.1 Employment, Output and Inflation

Employment Stagnation.

Employment problems of the 1970's have been a major component of national distress. This can be examined using the civilian labour force series and estimates of employment from the national labour force surveys. The difference between the

\[1\] "In recent months the underlying course of the Australian economy has been difficult to monitor, with various indicators pointing in different directions and no clear trend readily discernable." (I.A.E.S.R., 1976,3).

\[2\] A further view is expressed that one major reason for this is contractionary government policy designed to reduce the inflation rate.

\[3\] These broad features have been common to most O.E.C.D. countries and have been documented by McCracken et al. (1977), Mandel (1977), Reddaway (1977) and in various O.E.C.D. 'Economic Surveys'.
two provides an indication of unemployment trends. As can be seen from Figure 3.1, the labour force and employment series were highly synchronised during the late 1960's and early 1970's. This harmonic relationship deteriorated rapidly in the mid 1970's as the two series diverged and became more erratic with consequent development of an unemployment gap.

In elaborating this general description it was found that the two main series could be most efficiently described by second degree polynomials as they could be partitioned into two periods, one prerecessionary and the other, recessionary. However, it was concluded that because of marked change over the period two linear trends could be superimposed (using OLS regression techniques) upon each series. This offered two advantages: first, simple performance descriptions, highlighting changes over the period, could be extracted; and second, hypothetical situations useful in contrasting actual with desired performance could be generated.

The first advantage can be realised by putting events into a more general context. This can be done by postulating three simple scenarios between levels of change in labour force and employment from linear summaries of trend behaviour. These cover the full range of developments from near full employment situations, as experienced in Australia from the 1960's until early 1970's, and are as follows:

i) EMPLOYMENT DEFICIENCY SCENARIO - labour force (LF) and employment (E) trends diverge over time (t) resulting in a move away from full employment.

ii) EMPLOYMENT STABILITY SCENARIO - labour force and employment trends correspond over time and maintain full employment.

iii) EMPLOYMENT EXCESS SCENARIO - labour force and employment trends converge over time and result in excess full employment.

The two extremes (i and iii) have adverse effects since the first generates unemployment and so material hardship for those with work requirements and the second causes labour 'bottlenecks' which restrict growth and cause wage inflation. Employment deficiency has two sources, an increase in the supply of labour (labour force) relative to demand (employment):

\[
\frac{LF}{t} > \frac{E}{t}
\]

The prerecession and recession distinction was made on the basis of inflections in both series. (Note: series from two sources were used because of information availability for the period under study).
or a reduction in demand for labour relative to supply:

\[ \frac{E}{t} < \frac{LF}{t} \]

Similarly excess employment has two sources, a reduction in supply relative to demand:

\[ \frac{L}{t} < \frac{E}{t} \]

or an increase in demand relative to supply:

\[ \frac{E}{t} > \frac{LF}{t} \]

The most desirable situation is where none of these circumstances develop and:

\[ \frac{E}{t} = \frac{LF}{t} \]

described above as the stability scenario.

The labour force - employment situation of the 1966-74 period is best described by the stability scenario where the level of change in labour force is similar to the level of change in employment. Figure 3.1 shows the trends for this period diverging slightly (summarised quantitatively in Table 3.1), indicating a minor departure from the stability scenario. It is obvious from Figure 3.1 that the 1974-79 period adheres strongly to the employment deficiency scenario. As can be seen from Table 3.1, the average level of change (\( \beta_1 \)) in the labour force was almost 2.5 times higher than for employment. It is patently clear from the composition of this difference in employment and labour force terms that employment deficiency arises from both the proposed demand and supply sources and is not restricted to one as may have been expected. A comparison of the indices for both periods shows that whilst growth in demand has fallen sharply, growth of supply has fallen to a much lesser extent, the effect being a joint impact of demand and supply on employment performance. The decline in \( r^2 \) values in the second period, particularly for the employment series, reinforces the earlier observation of erratic macroeconomic behaviour. Under these circumstances, widening of the unemployment gap from \((B_2, D_2)\) to \((B_3, D_3)\) was inevitable. The excess full employment scenario is notable by its negligible occurrence throughout the period, indicating the absence of long duration swings towards excess demand for labour. Hence, the labour situation can be described as stable to weak throughout the period.

Persistence of the deficiency scenario has had serious labour exchange consequences. These could be portrayed in numerous ways but the method adopted here is an opportunity cost construct which compares desirable with actual
performance. Where actual performance is less than desired the shortfall provides an indication of opportunity cost. In this case, desired performance can be associated with the stability scenario and by extrapolation compared with that in the later period. Two elements of opportunity cost can be illustrated from Figure 3.1 by contrasting the extrapolated linear descriptions of the 1966-73 period with the actual trends of the 1974-79 period. First, employment dislocation, as represented by the

Figure 3-1: Employed Persons and Civilian Labour Force Estimates 1967-79, Australia.

While the assumption that employment and labour force change are linear functions of time is hardly realistic it is useful for illustrative comparisons. This point also applies to the inflationary and output arguments which follow. These simple arguments assume all factors constant at prerecession levels. This is not highly unrealistic for the sake of short term comparisons because its sole purpose is to emphasise the magnitude of short term changes.
Table 3-1: Average Levels of Change ($\beta_1$) for Labour Force and Employment Time Trends 1966-73 and 1974-79, Australia.

<table>
<thead>
<tr>
<th></th>
<th>1966-74 $r^2$</th>
<th>1974-79 $r^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labour Force (LF)</td>
<td>37.1 (0.99)</td>
<td>20.3 (0.93)</td>
</tr>
<tr>
<td>Employment (E)</td>
<td>35.2 (0.99)</td>
<td>8.2 (0.67)</td>
</tr>
<tr>
<td>LF-E</td>
<td>1.9</td>
<td>12.1</td>
</tr>
</tbody>
</table>

Note: 1) Coefficients of average quarterly change are $10^3$ magnitude.
2) All statistics significant at the 1% level of probability and differ from their respective counterparts by the same magnitude.

1979 unemployment gap, can be assessed by reference to the unemployment gap which would have existed had the 1966-73 trends continued. The result of recession in terms of foregone opportunities to use labour in production, social dislocation and personal frustration is obviously gross. This point can be reinforced by contrasting actual employment in the second period ($B_2$) with its original course ($A_2$), where the difference is so great that the extrapolated level of prerecessionary employment easily exceeds the total 1979 labour force. Second, the divergence between extrapolated and actual labour force sizes raises the issue of hidden unemployment. The large reduction in labour force growth with onset of the recession suggests the possibility of induced withdrawals due to the increased difficulty of finding employment. Although a proportion of this difference is due to such factors as reduced immigration and legitimate withdrawals from the labour force, the rapidity of reduction in labour force size indicates a marked increase in domestic hidden unemployment. The unemployment costs of the economic crisis noted thus far are, therefore, likely to be understated.

Output Stagnation.

The retarded level of economic performance which has dominated most of the 1970's is also apparent in aggregate output and therefore national wealth. Two direct measures, deseasonalised gross domestic product (GDP) and gross non farm product (GNFP) at constant prices, have been chosen to describe this situation. An indirect view of gross farm product (GFP) can also be graphically attained from the
difference between these two series. As before, the observation period has been partitioned to highlight differences between prerecession and recession, with linear trends being used to summarise each (Figure 3.2). The main difference between these two periods, as might be expected from employment patterns, is in their trend levels of growth, with those of the second period showing a notable decline over their counterparts in the first. Table 3.2 shows that the average level of growth in GDP and GNFP were very closely related in the 1966-73 period but that they diverged in the second with the share of GDP contributed by GNFP declining significantly. This is consistent with conclusions arrived at elsewhere (Linge, 1979; Australia-Study Group on Structural Adjustment, 1979, 1-5; Australia-Industries Assistance Commission, 1976, 73) which argue manufacturing has been strongly effected by the recession and that 'shake out' is likely to be most severe in places with high concentrations of manufacturing industry.

As with employment, opportunity cost can be used to indicate severity of the recession. Comparison of trends describing output in both periods (by extension of those in the first into the second7) shows that the hypothetical product of the economy would have well exceeded the actual product by 1979 (so much that hypothetical GNFP would have surpassed actual GDP). Reverse extrapolation of second period trends back into the first shows that the actual level of wealth obtained by the 1970's would have been delayed by more than a decade. The economic crisis which developed in the early 1970's has, therefore, had serious consequences for wealth generation in the Australian economy.

Inflation (Price Instability)

Turning finally to price instability, the most commonly used index of inflation has been the Consumer Price Index (CPI). This measure is unsuited to general application since it is narrowly based on metropolitan data and only monitors price

---

6 The Australian definitions of these aggregates are:

1 GDP - "...is the total market value of goods and services produced in Australia within a given period after deduction of the costs of goods and services used up in the process of production but before allowances for the consumption of capital."

2 GNFP - "That part of GDP arising from production in all industries other than agriculture and services to agriculture."

3 GFP - "That part of GDP arising from production in agriculture and services to agriculture."

7 Approaches similar to this have been used to measure the 'GDP gap'. (Kasper, 1976, 24-26; McCracken et al., 1977, 81).
Table 3-2: Average Levels of Change ($\beta_j$) in GDP and GNFP for the Periods 1966-73 and 1974-78. Australia

<table>
<thead>
<tr>
<th></th>
<th>1966-73</th>
<th>$r^2$</th>
<th>1974-78</th>
<th>$r^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP</td>
<td>167.5</td>
<td>(0.99)</td>
<td>104.0</td>
<td>(0.94)</td>
</tr>
<tr>
<td>GNFP</td>
<td>166.4</td>
<td>(0.99)</td>
<td>94.8</td>
<td>(0.94)</td>
</tr>
<tr>
<td>GDP-GNFP</td>
<td>1.1</td>
<td></td>
<td>9.2</td>
<td></td>
</tr>
</tbody>
</table>

Note: 1) Coefficients of average quarterly change are $10^4$ magnitude.

2) All statistics significant at 1.0% level probability and differ from their respective counterparts by the same magnitude.

shifts in goods and services produced for consumption. Instead, implicit price deflators ($I$), derived from national accounting aggregates, were preferred. The index adopted was calculated quarterly using deseasonalised data and is of the form:

$$I = \left( \frac{V_c}{V_k} \right) \times 100$$

$I$ = implicit price deflator

$V_c$ = value of aggregate (a) at current prices (c)

$V_k$ = value of aggregate (a) at constant prices (k)

Two deflator series were chosen to illustrate the differential influences of price instability in major sectors of the Australian economy. Those chosen were derived for GNFP and GPP, with the latter being included as a graphical contrast to GNFP.

The discernable pattern of price instability for GNFP (Figure 3.3) has been one of mounting pressure which shifted from a 'creeping' inflation in the 1960's to a more rapid distortion of prices in the mid to late 1970's (Martin, 1979, 71, 78). A closer examination of shorter duration consistencies shows that the overall trend can be decomposed into three linear segments which represent stages in development of

---

8Price indices are available for other sectoral divisions of the economy but implicit price deflators are more convenient where constant price adjustments have already been made.

9Gross Domestic Product (GDP) was not used because GNFP displayed a similar profile.
the problem\textsuperscript{10}. These represent three inflationary scenarios where the average level of increases ($\Delta I/t$) differ dramatically (trends have been extended in this case to highlight divergences between scenarios). The first (a,a) shows the desired inflationary situation which prevailed in the 1960's with only small quarterly increases. This gave way in the early 1970's to a situation of serious deterioration (b,b) followed by a 'cooling off' stage(c,c). These inflationary trends reveal two important characteristics of the crisis' development. First, since the vast majority of price changes in GNFP have been positive, there have been persistent inflationary pressure over the whole period. Second, while average increases differ markedly, those for the latter two stages show a serious deterioration in the inflationary situation. The opportunity cost situation, in terms of foregone stability, is obvious from Figure 3.3 and needs no further treatment. This, in conjunction with the problems already discussed, marks the onset of stagflation and development of the most intractable economic problem to face Australia in recent history\textsuperscript{11}.

3.1.2 Stagflation - Coincidence of Distress

From the previous discussion it is possible to envisage the coincidence of performance problems responsible for the intractable character of the current economic crisis. Two seasonally adjusted indicators, the implicit price deflator for GDP (IGDP) and quarterly changes in male employment, ($\Delta E$), have been used to illustrate the stagflationary element of the problem\textsuperscript{12}. The bi-variate performance

\begin{equation}
I_{GNFP} = \alpha_0 + \alpha_1 t + \epsilon
\end{equation}

accounted for 90% of the variance, whereas one of the form:

\begin{equation}
I_{GNFP} = \alpha_0 + \alpha_1 t + \alpha_2 t^2 + \epsilon
\end{equation}

accounted for 99% of variance.

$\alpha_0$, $\alpha_1$, $\alpha_2$ are parameters, t units of time and $\epsilon$ error term.

\textsuperscript{10}This series was more suited to polynomial representation than the two previous patterns (but linear decomposition was preferred for simplicity. For example, an equation of the form:

\begin{equation}
I_{GNFP} = \alpha_0 + \alpha_1 t + \epsilon
\end{equation}

accounted for 90% of the variance, whereas one of the form:

\begin{equation}
I_{GNFP} = \alpha_0 + \alpha_1 t + \alpha_2 t^2 + \epsilon
\end{equation}

accounted for 99% of variance.

\textsuperscript{11}The GFF deflator series reveals a totally different inflation profile, displaying several instances of major deflationary behaviour as opposed to two minor occurrence in the GNFP series. This shows that inflationary pressures vary greatly between sectors of the economy and reinforces two notions basic to this Study. Firstly, it illustrates that aggregate and disaggregate patterns are not necessarily homogeneous and secondly, aspatial entities, such as economic sectors which usually have spatial manifestations, influence interarea patterns. From this it is reasonable to propose that the impacts of turmoil, over the period of interest, are likely to have had spatially differential effects.

\textsuperscript{12}Employment growth has been chosen in preference to unemployment because, whilst the latter is more commonly used and offers the advantage of a more stable time series, it is a less direct measure of employment pressure and is subject to the vagaries of hidden unemployment. The male employment series was chosen for illustrative purposes because of its pronounced downturn in the later 1970's.
classification in Figure 3.4 can be divided into two coincident performance groups, the first displaying satisfactory performance on both counts, in contrast to that of the second which is equally unsatisfactory. It can be seen from Figure 3.4 that the quarterly increment in IGDP for the years after 1971 was substantially larger than for the earlier period and that several instances of negative employment change occurred after 1974 as opposed to experiences of the earlier period. As IGDP increases became larger in the early 1970's, formal labour exchange fell into crisis in the first quarter of 1974, taking a sharp plunge for the ensuing four quarters. Employment growth seemed to recover in the second quarter of 1975, with inflationary pressures remaining strong, this only being a prelude to a sequence of later plunges. These quarterly fluctuations were summarised using an inflation-employment path identified by locating the mean IGDP and ΔE coordinates for the two periods and relating them in Figure 3.4. This path highlights the shift from low inflation-high employment growth to high inflation-low employment growth. The simultaneity of these problems encapsulates the dilemma presented by the economic crisis which has developed in Australia.

This review of the macroeconomic situation from the mid 1960's to 1970's has revealed the timing and severity of economic crisis. Timing varies slightly depending on the series monitored but the main 'slide' commences in the period 1972-74. Minor perturbations occur which have often resulted in premature predictions of a return to earlier trends. This has not occurred and the inflexions apparent in each of the original series are their major features. Severity has been established by contrasting trends and using the opportunity cost approach to highlight gains foregone. These have been substantial and when, considered collectively, indicate a deep and widespread malaise.

3.2 Locationally Discriminant Policy Impacts on Areal Form.

Locationally discriminant policies, which distinguish between places, are of critical importance in spatial analysis because they can influence areal form. All public policies are spatially discriminant to some degree, depending on the spatial distribution of target groups. The majority of such policy effects are unrecognised and treated as inconsequential by-products of intervention. However, Australia has a long history of locationally discriminant policy intervention which ranges from the closer settlement policies of the nineteenth and early twentieth century (Jeans,1975; Connors,1970; Smailes and Molynieux,1965) to the regional development policies of recent times (Logan and McKay,1981; Day,1977; Searle,1974; Ryan,1973; Walsh,1971). Many of the earlier policies have had far reaching effects. In the
interests of simplicity these will be treated as environmental parameters of the current period and accepted as given. Recent policy developments present a confusing series of initiatives arising from uncoordinated and sometimes competing efforts operating in different parts of Australia and at different levels of government. A complete resume of the various policies is not warranted as they are discussed elsewhere (Searle and Wilmonth, 1982; Lloyd and Troy, 1981; Harris and Dixon, 1978; Logan, 1978; Dabor, 1975; Searle, 1974; Walsh, 1971; Lonsdale, 1973). However, the bases of locationally discriminant policy will be illustrated in two parts with reference being restricted to nonmetropolitan N.S.W. where possible. The first briefly overviews policy initiatives from each tier of government and the second demonstrates the types of policy instrument used at an interarea level in nonmetropolitan N.S.W.

3.2.1 Federal, State and Local Policy Trends

In the post war period the early 1970's stand out as one of an expenditure hiatus for locationally discriminant policy at all levels of government but with the major initiatives arising at the Federal level. The broadest sense of this development is best conveyed by contemporary comments:

(in reference to pre 1970)

For the most part, the period between 1949 and the late sixties was a wasteland for urban and regional development. (Lloyd and Troy, 1978, 23);

(in reference to post 1975)

However the greater propensity to cut capital outlays explains only a part of the steep decline in outlays, especially for urban and regional development. These were the programs which reflected most clearly the ideological stance of the Whitlam government. (Scotton, 1980, 20);

(in reference to the whole period)

Indeed, in many ways the decentralisation-cum-urban and regional planning and development wheel has turned full circle. (Day, 1977, 38).

These illustrate general perceptions of the situation with its rise from low levels of interest to high, followed by a slump to levels on par with those experienced in earlier times.

The motivations for this interest, discernable from public debate on the subject, have included equity (equalisation of opportunity between areas) and efficiency (removal of impediments to growth in regional economies). More particularly, aspects of the debate have concerned metropolitan pathologies (congestion related) and more traditional issues, such as defence, and perceived, though not experienced, superiority of nonmetropolitan lifestyles.
At a Federal level, the 1972 election campaign provided the main stimulus to debate and heightened interest as both parties identified a nexus between metropolitan and nonmetropolitan issues through an urban and regional development platform (Logan, 1978). Neutze argued this has not always been the case:

Decentralisation was generally regarded as a policy to benefit nonmetropolitan areas ... (1974, 9).

The newer policy prototypes catered, at least conceptually, for current and often related problems in both metropolitan and nonmetropolitan areas. Amongst these were:

i) issues of wealth redistribution, which characterise periods of rapid growth and full employment (late 1960's);

ii) relief of metropolitan growth pressures;

iii) the reduction of perceived, if not adequately measured nonmetropolitan inequalities.

The Minister for Urban and Regional Development’s budget speech, 1974-75, elaborated these points:

Programs of urban and regional development for 1974-75 constitute another significant step forward in the Australian government’s continuing interest in the problems of the cities, the progress of the various regions of the Australian continent and the more equitable and efficient allocation of resources and the improvement of the quality of community life. (Australia-Department of the Treasury, 1974, 62).

Motivation for locationally discriminate policy has a diverse base and it is for this reason that it successfully encapsulated the desires of widely ranging interest groups.

Federal Government Initiatives

In the mid 1970's a number of spatially explicit policy initiatives were supported including; formation of the National Urban and Regional Development Agency (N.U.R.D.A.), the Growth Centres Program; the Area Improvement Program (A.I.P.); the Australian Assistance Plan (A.A.P.); Regional Economic Development Scheme (R.E.D.S.), and the Scheme for Special Assistance to Nonmetropolitan Areas (S.A.N.M.A.) (Troy, 1978). Changes in the composition of urban and regional expenditure during the 1970's make it impossible to establish a temporally consistent series for evaluation of commitment.

However, it is possible to gauge the magnitude of Federal interest in locationally discriminant policies and the subsequent withdrawal from these using
Table 3-3: Federal Budgetary Outlays ($million) on Urban and Regional Development 1974-75 to 1976-77, Australia.

<table>
<thead>
<tr>
<th>Outlays</th>
<th>1974-75</th>
<th>1975-76</th>
<th>1976-77</th>
</tr>
</thead>
<tbody>
<tr>
<td>Growth Centres</td>
<td>64.7</td>
<td>72.1</td>
<td>33.0</td>
</tr>
<tr>
<td>Urban, Regional and Environmental</td>
<td>378</td>
<td>408</td>
<td>256</td>
</tr>
<tr>
<td>Urban, Regional and Environmental as % of total</td>
<td>2.1</td>
<td>1.9</td>
<td>1.0</td>
</tr>
</tbody>
</table>

Source: Australia-Department of the Treasury (1976,3,64)

1976-77 budget information. Table 3.3 shows this pattern with the rapidity of withdrawal under conservative government in the financial year, 1976-77, being its most striking feature. Consequently many of the Labor Government schemes were dismantled on short notice leaving lower tiers of government with the task of minimising short term dislocation to joint expenditure projects. Thereafter the responsible agency (Department of Urban and Regional Development) was abolished to be replaced by a ‘care taker’ department, Environment Housing and Community Development. This was later disbanded and its functions were discontinued or distributed to other departments. This Federal foray into locationally discriminant policy is arguably more significant than suggested by direct commitment since it provided a stimulus to policy action by lower tiers of government.

State Government Initiatives.

The policy profile for N.S.W. during the period of interest differed significantly from that at the Federal level. Although exact comparisons are not possible because of divergent objectives, methods of implementation and data limitations, there is ample material on the subject to show that State policies have been active over a much longer period and, at least superficially, more directed towards tangible objectives. The stated policy has been one of decentralising economic activity from metropolitan to nonmetropolitan areas. These policies stem from the immediate Post War period with the proposed objective of encouraging balanced development between metropolitan and nonmetropolitan areas. Whilst there has been a semblance of direction in the policy, as strategies of dispersed and then selective decentralisation were proposed, the objective of balanced development has been poorly articulated. Badly formulated strategies have resulted, so whilst the N.S.W.
expenditure profile has been longer than its Federal counterpart, the policy affects have been desultory. Daly highlighted the deficiencies of this effort as follows:

The policies so far employed by the government have been slightly mixed in orientation, unsuccessful in practise and peripheral to the major problems. (1973,6)

Russell has gone further to conclude that:

In reality, this form of government influence (decentralisation policy) has had a negligible impact on the distribution of human activities. (1975,3)

Lloyd and Troy described the policy in extremely negative terms as an:

...attempt to spread population widely across nonmetropolitan areas by offering driblets of assistance for new industries. (1978,25)

The low level of financial commitment contended in this comment can be demonstrated from Table 3.4 where State expenditure levels are shown as a proportion of the household income aggregate (national accounts) for N.S.W. These levels of expenditure have been negligible by comparison to the stated objective of managing balanced State development. Given the lack of direction and precision in this policy the only consolation is perhaps that expenditure has not been greater.

Table 3-4: Total Expenditure Under State Development and Country Industries Assistance Act (SDCIAA) 1969-70 to 1977-78, N.S.W.

<table>
<thead>
<tr>
<th>Year</th>
<th>C.I.A. Fund* Expenditure $</th>
<th>Constant 1974-75 Value ($mil)</th>
<th>As Proportion of ** Total Household Income</th>
</tr>
</thead>
<tbody>
<tr>
<td>1969-70</td>
<td>5 064 404</td>
<td>8.61</td>
<td>0.06</td>
</tr>
<tr>
<td>1970-71</td>
<td>5 739 557</td>
<td>9.24</td>
<td>0.06</td>
</tr>
<tr>
<td>1971-72</td>
<td>5 500 985</td>
<td>8.23</td>
<td>0.05</td>
</tr>
<tr>
<td>1972-73</td>
<td>5 116 696</td>
<td>7.19</td>
<td>0.04</td>
</tr>
<tr>
<td>1973-74</td>
<td>10 101 611</td>
<td>12.47</td>
<td>0.06</td>
</tr>
<tr>
<td>1974-75</td>
<td>14 232 681</td>
<td>14.23</td>
<td>0.09</td>
</tr>
<tr>
<td>1975-76</td>
<td>6 696 622</td>
<td>5.82</td>
<td>0.03</td>
</tr>
<tr>
<td>1976-77</td>
<td>9 755 356</td>
<td>7.48</td>
<td>0.04</td>
</tr>
<tr>
<td>1977-78</td>
<td>18 840 028</td>
<td>13.38</td>
<td>0.07</td>
</tr>
</tbody>
</table>

Source: N.S.W-Department of Decentralisation and Development, 1977-78.

Note: *Expenditures adjusted by public sector price deflator (A.B.S.,5204.0,1978,3).

**Aggregate household income for N.S.W. (A.B.S.,5205.0,1978,46). Selected because it is a standard national accounting aggregate against which comparisons can be made.

Though State policy has been institutionally separate from Federal policy it
has not been independent of it. A *prima facie* case for the operation of an induction effect, which resulted from increased Federal participation in locationally discriminant policy formulation, is demonstrable from Table 3.4. This has operated through a number of channels including joint expenditure projects (Scotton, 1980, 7) and a revitalised interest in the policy at a State level (Eisbauer, 1974). The induced element of the profile is not separable from Table 3.4 but a distinct increase in annual expenditure, coinciding with early Federal developments, is evident. An unanticipated increase in State expenditure occurred as Federal expenditure declined, resulting perhaps from the Federal withdrawal from jointly funded schemes, e.g. the growth centres project (Scotton, 1980, 7). It can therefore be argued that State policy is not, as may be thought, autonomous.

Local Government

Local government has had a different role in the formulation and development of locationally discriminant policy because it has not only been a source of policy but a vehicle for it. The Local Government Act of 1919 established the most extensive basis for locationally discriminant policy this century. It has rarely been viewed in these terms because its primary function is to operate as part of the State level administrative apparatus. As such, local government is involved in crucial aspects of community development encompassing fields so diverse as infrastructure provision, physical planning and, more recently, social and economic aspects of planning (N.S.W.-Department of Local Government; 1970-1979; King, 1953, 22-23; McPhail, 1968). Local government has developed two functions in these fields, one as a 'clearing house' for local initiatives (through its elected representatives) and another as a delivery system for initiatives instituted at higher levels of government. The significance of local government as an agent of

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13 Two hypothetical models of the induction process can be envisaged: Model A shows the situation where state expenditures increase or decrease in response to Federal expenditures; Model B illustrates a situation where the initial induction effect is followed by a secondary effect, due to Federal withdrawal from jointly funded programs.
development should not be underrated. As can be seen from Table 3.5, where the value of selected grants to local government are shown, financial support for local government is much higher than for State level decentralisation (see Table 3.4).

Table 3-5: Structure of Select Grants to Local Government 1969-70 to 1977-78. N.S.W.

<table>
<thead>
<tr>
<th>Year</th>
<th>Grants to Local Govt. &amp; C’wealth Funds</th>
<th>Unemp. and Relief Assistance</th>
<th>Unemp. Relief</th>
<th>Area Improvement Program</th>
<th>Special Council Employment Scheme</th>
<th>Total</th>
<th>Total as a % of State Household Income</th>
</tr>
</thead>
<tbody>
<tr>
<td>1969-70</td>
<td>100 000</td>
<td>(2.23)</td>
<td>(97.67)</td>
<td></td>
<td></td>
<td>4 293 135</td>
<td>0.05</td>
</tr>
<tr>
<td>1970-71</td>
<td>100 000</td>
<td>(1.41)</td>
<td>(69.47)</td>
<td>(29.12)</td>
<td></td>
<td>7 016 745</td>
<td>0.07</td>
</tr>
<tr>
<td>1971-72</td>
<td>100 000</td>
<td>(0.88)</td>
<td>(47.11)</td>
<td></td>
<td>(52.00)</td>
<td>11 317 278</td>
<td>0.10</td>
</tr>
<tr>
<td>1972-73</td>
<td>100 000</td>
<td>(0.42)</td>
<td>(23.01)</td>
<td>(1.57)</td>
<td>(75.00)</td>
<td>23 892 582</td>
<td>0.19</td>
</tr>
<tr>
<td>1973-74</td>
<td>100 000</td>
<td>(0.97)</td>
<td>(59.69)</td>
<td>(0.56)</td>
<td>(38.75)</td>
<td>10 259 366</td>
<td>0.07</td>
</tr>
<tr>
<td>1974-75</td>
<td>100 000</td>
<td>(0.27)</td>
<td>(18.05)</td>
<td>(57.65)</td>
<td>(23.70)</td>
<td>37 050 088</td>
<td>0.19</td>
</tr>
<tr>
<td>1975-76</td>
<td>100 000</td>
<td>(0.22)</td>
<td>(16.20)</td>
<td>(63.31)</td>
<td>(12.94)</td>
<td>46 211 756</td>
<td>0.21</td>
</tr>
<tr>
<td>1976-77</td>
<td>100 000</td>
<td>(0.17)</td>
<td>(13.48)</td>
<td>(86.36)</td>
<td>(12.29)</td>
<td>59 393 360</td>
<td>0.23</td>
</tr>
<tr>
<td>1977-78</td>
<td>100 000</td>
<td>(0.14)</td>
<td>(12.36)</td>
<td>(82.62)</td>
<td>(4.69)</td>
<td>3 413 757</td>
<td>0.26</td>
</tr>
</tbody>
</table>


Note: percentage divergences due to rounding.

The major difference between higher tier policies and those instituted through local government is the diversity of responses possible. This offers a major advantage over higher level policies as perceived needs within communities can be satisfied. However, local government can be criticised as being parochial in its responses, focussing on local aspects of problems which may be far larger in their impact. Implementation, however, can be criticised as uncoordinated, lacking the higher level strategic approach needed to solve interarea problems. The worst facets of this deficiency are ameliorated through coordination of funds allocated from the State. There are two main sources of external funding for development oriented work. The first relates to task specific fund allocations and the second untied grants to equalise the quality of service provision between areas (N.S.W.-Department of Local Government, 1978, 21-24; N.S.W.-Local Government Grants Commission, 1977, 19-27). Untied grants can be used more innovatively as the community has a role in establishing priorities. Local Government Grants Commission procedures, though simplistic, attempt to account for two types of local government problem:

---

14See Fagence on local government:
"The conceptual horizon of the elected members is constrained by a similar set of circumstances". (1978,83)

As a result the local view tends to be parochial.
It is important to recognise that councils have two kinds of needs. There are needs resulting from inherent disabilities, which exist because of particular circumstances, or conditions, prevailing in the area and which will continue from year to year. Then there are needs that can be satisfied by providing a particular work or amenity and which, subject to maintenance will remain satisfied. (1980.9)

The principle of assessing local government requirements, according to such factors as revenue and expenditure disadvantage, has gained acceptance and this has had a role in coordinating fund impacts. This can be seen in Appendix B where local grant combinations in different areas have been loosely structured according to need and preparedness to use such funds.

The general impression of locationally discriminant policy intervention over the period of interest is one of instability with 'start-stop' interest in the field. Strategies for locationally discriminant policy have, as a consequence, been poorly formulated and badly executed. The local tier of government has provided the most consistent long term vehicle for community initiatives and, though less coordinated than might be desired, it has offered great scope for response flexibility.

3.2.2 The State Development and Country Industries Assistance Act - An Illustration of Policy.

The scope for systematic discrimination between places is greatest for higher tiers of government because these do not rely on disparate initiatives from locationally distinct sources. The potential for these policies to influence structure of the space economy in nonmetropolitan N.S.W. has gone largely unrealised in the overview treatment adopted so far. This should be examined because the scope of policy and its failure to operate effectively can be confused. Redress can be achieved by examining the scope of such policy in the context of its implementation.

The only reliable source for such an assessment is the legislation governing policy since Departmental and Ministerial sources are deliberately vague in order to protect enterprises competing for funds. Several acts empower locationally discriminant policy intervention in N.S.W. 15, the principal one being the State

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15 Other State acts operating over the period are:

1 Regional Organisation Act, 1972;
2 Growth Centres (Development Corporations) Act, 1974;
3 Albury Wodonga Development Act, 1974;
4 Growth Centres (Land Acquisition) Act, 1974;
Development and Country Industries Assistance Act of 1966 (SDCIAA). This can be decomposed into its fundamental elements and reorganized into a systematic framework showing the potential, in contrast to actual operation, of locationally discriminant policy. As the Act does not specify policy variables, target variables or combinations of these, they must be implied through statements of objective and the policy instruments described to attain this end.

Systematised decomposition and reorganisation of the SDCIAA (Figure 3.5) reveals a potentially powerful basis for locationally discriminant policy in nonmetropolitan N.S.W. Fundamentally, attainment of the Act's objective depends on manipulation of two very broad target variables, one being increased availability of resources necessary for production and the other, costs of inputs to secondary industry in nonmetropolitan N.S.W. This general focus is sound with the stress on resource availability being to remove bottlenecks in the relocation or expansion of industry and cost, to increase the competitiveness of nonmetropolitan locations. Attainment of desirable shifts in these target variables is well supported through the nomination of a wide range of policy instruments which have a capacity to influence specific aspects of the broad target variables. This wide coverage of policy instruments and variables is 'healthy' because it provides a high degree of flexibility in the way target variables can be influenced and so the objectives of policy achieved. This is important because situational differences in activity can be taken into account as needed. Flexibility is further increased by allowance of scope for control by different developers. This is significant because different types of developer may be necessary for different types of project, with some operating at the firm level and others involving several areas and numerous types of firm. The overall integration of policy elements is sound with no logical disjunctions being apparent.

Effectiveness of the SDCIAA can be called into question on two grounds. First, the Act depends on operation of complex cause-effect relationships at every stage of action. As there is no information available to assess the strength and direction of relationships, effectiveness is entirely dependent on assumption. For assessment purposes, sensitivity of most critical relationships is therefore unknown, so effectiveness of the SDCIAA must also be treated as unknown. Any problems which do exist are likely to be compounded by a paucity of knowledge on the side effects of influencing particular policy variables, for example, on other firms in a

16 These fundamental elements are the policy objective (its reason for being), target variables (which must be influenced to achieve the objective), policy variables (which must be influenced to affect changes in target variables), policy instruments (used to change target variables) and portfolios of policy measures (collective view of instrument combinations).
PORTFOLIO OF POLICY MEASURES

POLICY INSTRUMENTS

POLICY VARIABLES

TARGET VARIABLES

POLICY OBJECTIVES

Direct assistance to established or intending country industries

Indirect assistance to established or intending country industries

MINISTER AS DEVELOPER

To assist firm developments the Minister may:

- Grant or lend money to country industries at rates approved by the Treasurer;
- Provide subsidised transport for use by country industries;
- Provide payroll tax rebates to eligible country industries;
- Guarantee loans to country industries for site acquisition;
- Guarantee loans to country industries for construction or improvement of buildings;
- Guarantee loans to country industries for plant acquisition;
- Guarantee loans to country industries to cover building rental;
- Provide finance for research which will assist the objects of the Act;

As developer the Minister may:

- Procure the use of, or dispose of sites under such terms as thought fit;
- Develop sites, e.g. subdivide, plan and service which will be used by country industries;
- Construct or improve buildings to be used by country industries;
- Procure the use of, or dispose of plant or other capital equipment to be used by country industries;
- Provide finance for research which will assist the objects of the Act;

The Minister may enter into an agreement to provide finance for:

- Local councils to develop such land, e.g. subdivide, plan and service (s.m.t.);
- Local councils to construct or improve buildings for use by country industries (s.m.t.);
- Any person to provide services, i.e. roads, drainage, sewerage, water, gas, or electricity;
- Any person to carry out research to assist the objects of the Act;

Components of the Public Agenda (1968), N.S.W.

Figure 3.6: Schema Showing the Fundamental Policy
region. Effectiveness of the comprehensive policy described in Figure 3.5 is consequently difficult to establish because of a refusal to release information.

The second concern arises from crudity in specification of the policy's objective. The issue of how instruments and variables should be applied is unspecified so that development strategies can be adopted which do not maximise potential. There is an indication from the sparse information available on assistance that this has occurred. It is most obvious when expenditure under SDCIAA is compared with statement of objective since the resources devoted are simply inadequate to the magnitude of the task. This is more worrying when the spatial disbursement of funds is considered. Although no direct information is available on actual funds distributed or the type of assistance granted, the names and addresses of those receiving assistance have been revealed. These have been mapped in Figure 3.6 and reveal two disturbing features of resource use. First, relatively scarce resources have been dissipated amongst a large number of places in nonmetropolitan N.S.W. The effect is that many locations receive small 'one-off' grants of assistance which are not designed to have a lasting effect. As a consequence, it is most unlikely that the SDCIAA has markedly influenced structure of the space economy. Second, whilst the policy is proposed as a stimulant to nonmetropolitan development, there is evidence of higher assistance concentrations in the vicinity of metropolitan areas such as the central coast and Canberra. Though to be expected because of higher industry concentrations in these areas, this reinforces metropolitan expansion by assisting fringe development rather than decentralising industry to spatially distinct locations. From these observations there is a case for concluding that locationally discriminant policy is in accord with the 'natural' development process, the effects of which it seeks to ameliorate.

In conclusion, there is a highly specialised mechanism for implementation of locationally discriminant policy in nonmetropolitan N.S.W. Although this has potential to restructure the space economy, insufficient information is available for a thorough evaluation of effectiveness. Not withstanding, the material which does exist indicates grounds for serious reservation. This is heightened when the general context of locationally discriminant policy in Australia is considered with overall lack of commitment and coordination being key features. It is most unlikely, in this environment, that locationally discriminant policy has had any significant effect in the post war period.
3.3 Conclusion

Awareness of high level influences on structure of the space economy is necessary since they are at least partially responsible for its state and so the observations upon which analysis of place are founded. High level shifts in economic performance are of significance in this Study since their timing and severity partition observations into two periods. An appreciation of this is necessary, particularly in the next chapter, as it partitions observations into distinct categories where influences are broader than any one source. Though these cannot be easily discerned with less specifically economic variables, as equally general processes may operate to confound simple impressions, a contextual awareness is necessary where labour exchange is concerned. The general effects of locationally discriminant policy are negligible by comparison since they are not "well articulated" or "strongly applied" (Logan et.al.,1975) and in recent years all but non-existent. As a result they are of little account in this analysis of place.
Table B-1: Structure of Grants to Select Local Government Areas, 1969-70, 1974-75 and 1977-78.

<table>
<thead>
<tr>
<th>Local Areas</th>
<th>Year</th>
<th>Grants to Assist</th>
<th>Local G'ment Assistance Fund</th>
<th>C'wealth Funds</th>
<th>Unempl. and Drought Relief</th>
<th>Unempl. Relief</th>
<th>Area Improvement Program</th>
<th>Special Council Employment Scheme</th>
<th>Total as % of Ordinary Service rates</th>
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</thead>
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<td>Dubbo (c)</td>
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<td>(4.01)</td>
<td>(95.01)</td>
<td>(30.40)</td>
<td>(69.60)</td>
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<td>(57.480)</td>
<td>(233.00)</td>
<td>4.03</td>
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<td></td>
<td>1974-75</td>
<td>1 000</td>
<td>23 950</td>
<td>113 000</td>
<td>(60.22)</td>
<td>(6.68)</td>
<td>(57.480)</td>
<td>(233.00)</td>
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<td>352 000</td>
<td>(69.60)</td>
<td>(60.22)</td>
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<td>(233.00)</td>
<td>(233.00)</td>
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<td>51 500</td>
<td>112 000</td>
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<td>(73 500)</td>
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<td>(73 500)</td>
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<td>(73 500)</td>
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<td>1974-75</td>
<td>375</td>
<td>30 000</td>
<td>184 000</td>
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<td>(80 600)</td>
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<td>495 000</td>
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<td>1977-78</td>
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<td>(69.60)</td>
<td>(82.17)</td>
<td>(69.60)</td>
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<td>(51.200)</td>
<td>(71 200)</td>
<td>29.99</td>
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</tbody>
</table>

* Boundary change (1.4.77) necessitated incorporation of Blaxland Shire into 1969-70 and 1974-75 Figures.

** Boundary change (1.1.76) necessitated incorporation of Patrick Plains Shire into 1969-70 and 1974-75 Figures.
Analysis of unemployment concentrates attention on hardship induced by shortages of formal work. Place and labour exchange can be related through this medium by analysis of unemployment's spatial form. This invariably has a strong normative overtone, is exclusively dependent on extent in differentiation and is data intensive by definition. The normative character of most unemployment analyses stems from their emotive subject matter and the scope for familiarity which arises from data intensive orientations. The utility of normative judgements in spatial analysis is another matter since conventional treatments of place do not recognise the need for integration of numerous perspectives. More sophisticated treatments are necessary if normative judgements are to be reliably associated with place. These must relate different views of form, searching for constants which are evident regardless of perceptual idiosyncracies. This contrasts with established approaches where one perspective on differentiation is accepted as documenting place in social process. If place is to be ascribed normative significance the bases for judgement must be carefully established if oversimplification is to be avoided. Once done, equal care must be taken with the specification of spatial form to establish the stability of place perceptions. This can only be achieved by adopting a wider perspective through search for common denominators which sustain judgements that may otherwise reflect conceptual or observational idiosyncracies.

Thorough analyses of form is more than simple examination of spatial distribution. The purpose of this Study is to use analysis of unemployment form to gain insights into the role of place in labour exchange according to extent in differentiation. This will be done in two ways. First, by examination of concept and evaluation of justifications for its normative use in widespread spatial analysis. Second, by empirical investigation of place, through analyses of alternative perspectives on the unemployment problem, form constants (Iden, 1967) can be sought which are cross sectionally resistant to idiosyncracies of concept, measurement and representation, and longitudinally, to temporal change.
4.1 Unemployment - The Concept and Justifications for Normative Applications

Unfortunately the advantages of data intensive analysis are often only partially realised. Whilst normative application is wholeheartedly embraced this is commonly done without sufficient knowledge of the concept being used. The clearest example in unemployment research is the widespread tendency to associate the meaning of unemployment with its operational definitions but not the factors which underlie these (Clark, 1981; Tregilgas, 1976).

The meaning and significance of socially distasteful problems, such as unemployment, have been undermined because narrow operational definitions have been substituted for more relevant meanings. Whilst compliance with this default meaning of unemployment has not been complete (Steinke, 1973; Stevens, 1963; Windshuttle, 1978) widespread ignorance has resulted and impinged upon popular justifications for normative use. These justifications have been even more poorly treated with the result that unemployment has attained a level of applied generality which is often unsustainable. It has been associated with concepts, such as regional economic performance, to the exclusion of other factors significant in monitoring such phenomena. Cheshire has observed this in the British context:

Unemployment differences have almost been the regional problem; they have certainly been used as a key indicator, indeed, until recently perhaps the only indicator of regional imbalance. (1973, 1)

Clark (1975, 32) has described this as a trait of the British experience and Stilwell (1980) has clearly been perplexed by such preoccupations when factors such as income, housing and health have been of equal or greater relevance to the problem. There is an indisputable need to examine the concept of unemployment more closely and the justifications for normative application if these abuses are to be avoided or recognised.

4.1.1 Towards a Concept of Unemployment

The difficulties of arriving at a satisfactory definition of unemployment have been long recognised with Stevens (1963, 142) observing similar difficulties to Pigou (1933, 2) over a time span of thirty years. The major difficulty is that widely accepted definitions of unemployment have basically remained unchanged since the 1930's when Keynes (1936) challenged the prevailing classical orthodoxy. Subsequently there has been ample scope to expand on this but surprisingly little has been done. The objective here is to show the limitations of conventional definition by developing a sensitivity to possible extensions of concept.
Keynes' principal argument was that involuntary unemployment\(^1\) exists when the number of people desiring work at current money wages and price levels exceed the quantity of labour in demand (Kahn, 1976, 21). The currency of this view can be seen from Barrett Smith's definition which redirects the concept towards individual situations (as opposed to the identification of aggregates):

Unemployment is defined as a situation in which people are willing to work for the prevailing wage but cannot find work. Unemployment so defined recognises the value of leisure and the right of an individual not to work if this is his preference. (1974, 11)

Similar conceptualisations have subsequently been used as the basis for operational definitions where measurement is needed. Long term consistency and widespread acceptance must not be confused with adequacy of definition.

These definitions are narrow in conceptualisation and universally crude in application as they rely on the use of simple criteria in identification of a complex phenomenon. The inadequacy of this approach can be demonstrated by reference to such criteria as the willingness of unemployed people to work under prevailing conditions (specifically at given real wages). This criteria is only justifiable where remuneration is a socially acceptable function of productivity. It is of questionable validity where working conditions are exploitative or an affront to human dignity. Many similar objections can be raised as existent definition is supportive of the status quo regardless of social and economic justice.

These problems aside, definition remains internally inadequate as its purpose is to dichotomise the population into employed and unemployed groups of individuals, with the latter being conditional on the former. There is a need to focus exclusively on characteristics of the unemployed if satisfactory definitions are to be obtained by expansion of the concept's meaning. This can be done in two ways. Firstly, by decomposing the original definition according to additional criteria so as to heighten identity of the concept and secondly, by specifying its significance in terms of normative judgements concerning collective and individual impacts.

The first of these can be termed typological specification because it uses set criteria to characterise unemployment. The advantage of this approach is that the unemployment concept no longer refers to a homogeneous group of people but individuals with systematic features in common. Many such typologies can be envisaged but six are commonly encountered in the literature. These are shown, with examples, in Table 4.1. They cover a diverse range of unemployment topics.

\(^1\)Voluntary unemployment is said to exist where individuals choose not to work under prevailing conditions.
which include source of problem, social characteristics of those most likely to be influenced, attitudes to the condition (personal and collective), degree of impact, identifiability and responses to unemployment. Each of these categories elucidates one facet of the problem and expands real, as opposed to definitional, meaning.

The benefits of typological specification can be illustrated by reference to the \textit{DEGREE} typology in Table 4.1 (there being little need for detailed discussion of each typology as examples and references are provided). The assertion in this case is that unemployment is not an absolute and individuals can be partially unemployed if they do not have the quantity or quality of work required for attainment of life goals. This shows that unemployment, as an absolute state, is an analytical specification and not reflective of broader differentials within society. Similar modifications to the original definition can be suggested from each of the typologies, showing the complexity of actual unemployment. The difficulty with typological specifications of unemployment is they are task related and lack the integration needed to provide a comprehensive definition capable of conveying a refined meaning of concept.

These definitional treatments are unacceptably clinical and succeed in dehumanising the concept of unemployment by abstracting from its human source. They simplify the problem rather than convey its meaning because this supports the need for analytical manageability. The true definition or meaning of unemployment can only be found in its effects on people. It could be argued that this does not constitute definition but merely an examination of effects. However, it must be asked how useful a definition of an inherently human condition is without reference to its manifestations. This creates a difficult problem because individual experiences of unemployment are likely to vary greatly so that no simple aggregate definition is feasible. Whilst common factors could be sought, this results in distortion because it is the combination of factors for each individual and the personal weights which these have that represents individual experience and so cumulatively, social meaning.

Judgements concerning the meaning of unemployment vary greatly with perspective, for example John F. Kennedy described it as "national disgrace" (Ross, 1964,1), Liebow as "infringement of an uncompromised human right" (1965,11) and Sinfield as "the mistreatment of the minorities through the values held and choices made by majorities" (1976,22). However these are external views of unemployment and whilst sympathetic, do not express meaning for those effected. Very little work has been done which provides an experiential insight into the meaning of unemployment, apart from Maurer's seminal oral history, where numerical treatments were supplanted by reference to personal feelings (1979,1).
### Table 4-1: Commonly Encountered Typologies of Unemployment.

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<thead>
<tr>
<th>Sources of Disaggregation</th>
<th>Typical Categorisations</th>
<th>Examples of Use</th>
<th>Comments</th>
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</thead>
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<td>CAUSALLY derived</td>
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<td></td>
<td></td>
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<tr>
<td>specifications of</td>
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<td>unemployment</td>
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<td>Butler (1978a)</td>
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<td>Gruen (1978)</td>
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<td>This disaggregation has widespread acceptance, verging on the doctrinaire. Causal typologies do not always take this form and often only one category is the focus of study. This method has only been developed for time series analysis.</td>
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Though incapable of complete definition, because individual experiences and perceptions vary so greatly, this intensely personal compendium provides a widely based insight into the meaning of unemployment in western society. This may be supplemented by piecemeal works from Britain (Seabrook, 1981) and Australia (Brewer, 1975). Extracts illustrate personal aspects of the concept’s of meaning:

i) I was persuaded that I must be not only as bad as the company must have thought I was to fire me, but much worse than that. Probably the world’s worst. Probably I didn’t deserve to live... It’s the brutality (of being fired). It may be more like rape than death. (Grace Keaton in Maurer, 1979, 5)

ii) Maybe my Protestant work ethic is getting to me. I always get the feeling that people at the unemployment office think I’m a bum or something. (Dick Franco in Maurer, 1979, 111)

iii) If you’ve not got work, everything seems to mock you. It might be me but you feel it. The television, the adverts, everything. The papers are full of the lives of millionaires, the shops are full of things you can’t afford... It makes you feel humiliated... (anon in Seabrook, 1981, 7)

iv) It [unemployment] makes you feel a lesser class of person. People call you bludger and it makes you feel bad. (anon in Brewer, 1975, 56)

v) ...its O.K. being able to sleep in every day. (anon in Brewer, 1975, 56)

vi) When it happened, I felt terrible. I felt shattered. Even though I hated the job at the end, I felt very insecure, very scared. (Al Salvatore in Maurer, 1979, 140)

Whilst this sequential reference to individual perspectives on unemployment may seem tedious it is but a small sample of condensed views. Many take several pages to summarise and it is only through such exposure that an impression of unemployment emerges. True definition of unemployment embraces a range of emotions: fear, frustration, anger, bewilderment and degradation, which eventually impinge on perceptions of self worth. In these terms unemployment might be defined as personal tragedy but even this is incongruous because of views such as (v) above. Though the unemployed can be identified according to the simple criteria, as in the conventional and typological treatments, it cannot be defined by them. Unemployment is obviously far broader and can be represented as one state of human being. Any movement towards a comprehensive definition of unemployment will require detailed research designed to reveal intricacies rather than represent generalities. Meanwhile spatial analysts can only use the available material and be aware of the shortcomings which result from research based on incomplete definition.

The problem of defining unemployment is more complex than the original
definitions suggest. Whilst these can be variously partitioned to highlight different features of the phenomenon, they maintain a clinical treatment which inhibits conceptualisation. Humanistic perspectives circumvent this by introducing a broader range of 'soft' meanings which assist in articulating the concept by giving meaning at a personal level. Although empirical analyses of secondary data are largely restricted to operational definitions this review is important in raising limitations which otherwise distort normative applications of the concept.

4.1.2 Unemployment - Justifications for Normative Analysis

Unemployment has been used as a normative indicator of performance in a wide variety of fields, including general economic health (Tregilgas, 1976, 2), development progress (Pullen, 1966) and labour exchange success (Clark, 1975). Horn has argued that:

Unemployment is regarded as the touchstone for the performance of the economy, for the adequacy of the market system and of economic policy designed to offset market failure. (1975, 109)

and Hewings has observed:

It (unemployment) has received attention, though not always continuous or convincing, since the 1930's because, as Hall...has pointed out, 'It became clear that unemployment was the single most important indicator of the economic stress in an industrial economy'. (1977, 5)

Attention here will be restricted solely to labour exchange applications because as Smith concludes in recognising its normative importance:

...unemployment correlates weakly with many other possible indicators of economic health. (1968, 183)

Two justifications can be advanced for normative use of unemployment in a labour exchange context and will be known as the traditionalist and welfare alternatives.

The traditionalist justification for normative use of the unemployment concept arises from the view that unemployment is a direct index of imbalances between labour demand and supply within a market framework. As such, it is not applicable to more general models of labour exchange. The assertion is that highly competitive markets^, theoretically, allocate all labour to work. Where this does not occur, unemployment results with the market solution being judged suboptimal.

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^The highly competitive market model is an extension of the perfectly competitive model of competition. It relaxes the assumptions of perfect competition, recognising that imperfection is an ongoing characteristic of labour exchange not an aberrant state occurring infrequently. For the sake of exposition, the assumptions have been relaxed and not eliminated so that the model assumes, for example: incomplete but expansive information; divisibility of resources but not complete divisibility; and extensive but not atomistic competition.
since it is indicative of poorer performance than obtainable. The principle tenets of this argument can be demonstrated by assuming an initial condition of near full employment. Minor imperfections in the allocation mechanism, e.g. inadequate information or mobility of resources, will prevent attainment of absolute full employment. That is, there will be a full employment level of unemployment. Where the market mechanism is distorted by gross imperfections, unemployment will be much higher and the effectiveness of the market lower. Regardless of minor imperfection and their source, all changes in unemployment from the full employment level can be ascribed to either ceteris paribus shifts in the demand for or supply of labour. It is imbalances between the two which are immediately responsible for any change in the overall position. Unemployment can then be categorised as demand unemployment ($U^d$) or supply unemployment ($U^s$). The first of these is inversely related to shifts in the demand for labour and the second is directly related to shifts in the supply of labour. The advantage of this conceptual dichotomy is that the effects of ceteris paribus shifts in demand or supply on unemployment can be considered separately.

The initial situation is portrayed in Figure 4.1 where the full employment equilibrium (E) of labour demand ($D_1^d, D_1^s$) and supply ($S_1^d, S_1^s$) is shown in (i). The attendant unemployment levels associated with full employment (N) are shown as $U^d_1$ and $U^s_1$ in (ii) and (iii) as points on hypothetical unemployment response paths ($RP^d_1, RP^d_2$), ($RP^s_1, RP^s_2$) to ceteris paribus shifts in demand or supply. These two components combine to give total unemployment. The impact of imbalances between the demand for and supply of labour can be illustrated in this framework by introduction of major rigidities which interfere with the near perfect operation of market forces. This will be done by holding real wage levels constant in a short run context where one or other of supply and demand is held constant while its counterpart is subjected to shifts. The actual plausibility of such an event is high and could result from emergence of nationwide trade union or employer groups who resist wage changes under a variety of circumstances.

As real wages are inflexible it will now be impossible for the market to attain equilibrium with the consequence that shifts in demand or supply will result in a performance gap, expressible in unemployment terms and proportional to the imbalance between supply and demand. For example in Figure 4.1(i) where a slump in demand from ($D_1^d, D_1^s$) to ($D_1^d, D_1^s$) occurs with supply and wages ($W_1$)

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3These may result from several sources including the development of new markets, changes in competitiveness, demographic shifts in population structure, technological innovation or discovery of new resources.
Figure 4-1: Traditionalist Justification for Normative Use of Unemployment as an Index of Labour Exchange Performance.

Note: Band of interdeterminacy due to slight initial in imperfections.
fixed, an imbalance \((E, I)\) develops between actual demand and supply. This results in a substantial increase in unemployment from \(u'^{d}_{t}\) to \(u'^{d}_{d}\) (some increase would result even where a new equilibrium were found because of exaggeration in imperfections, e.g. extended job search). On a similar basis, increases in demand from \((D_{t}, D_{d})\) to \((D_{t+1}, D_{d+1})\) can be seen to create an imbalance \((E, I)\) where excess requirement for labour \(N_{e}^{d}\) results. This model leaves little doubt that unemployment is responsive to demand/supply imbalances and is an index of the efficiency with which the market allocates labour.

Normative interpretation stems from this because inefficiency results in foregone production opportunity and higher costs of production than necessary. Unlike commodity markets, incidence of unemployment is also a direct index of inequity because inefficient market operation results in some people being unable to satisfy their requirements for work\(^4\).

These normative judgements, however, are predicated on an assumption that the allocation mechanism is in fact a highly competitive market. Where this is so, the unemployment index is analytically inadequate for the model outlined because it represents a net effect of demand/supply changes. This obscures the elements of process upon which the model’s utility is predicated so that unemployment indices are of minimal diagnostic benefit. Hence, while there is a knowledge of process, there is a logical disjunction between this and the index being used. In short, other indices directly reflective of labour demand and supply would provide better insights into operation of the market mechanism. Where the allocation mechanism is not a perfectly competitive market but, for example, a psuedo-market dominated by powerful vested interests (Nevile and Warren,1984), acceptance of this basis for normative judgements is extraordinarily difficult for two reasons. Firstly, while focussing attention on the problem of unemployment, it distracts attention from the true allocation process. Secondly, unemployment may not be reflective of market effectiveness but fluctuations in power of the elite or changes in preference by a small proportion of the population. The traditionalist justification for normative judgement is fragile and obscurifist, being associated with a complexity of conceptually incidental paraphenalia.

An alternative to the traditionalist justification for using unemployment in a normative role is the welfare justification. This view stems from Thatcher’s

\(^4\) Theoretically, this result may not even occur in a perfectly competitive market effected solely by a wage freeze. Perfect information, divisibility of resources and atomistic competition would be sufficient to ensure that work loss would be shared equally by all individuals to result in a form of underemployment. Hence, the equity justification would not be applicable and could not be used to support the traditionalist argument.
argument that unemployment is a "measure of the number of people in need or
distress, giving cause for social concern"(1976,83). The bases for judgement
underlying this claim are that since unemployment causes hardship and labour
exchange is largely a social phenomenon, collective concern is a direct consequence
of the initial condition. As a corollary, concern should be proportionate to the
magnitude of unemployment, with high levels of unemployment inducing greater
levels of hardship. Normative judgement is therefore a direct function of
unemployment, with an orientation towards the 'casualties' of exchange failures
rather than as an indirect index of cause.

This view offers three advantages over the traditionalist approach. Firstly,
judgements are suitably general to encompass the humanistic concerns discussed in
concept definition. As the major orientation is towards hardship, this may
incorporate not only material considerations but emotional crises associated with
unemployment. The importance of this is underlined by Beveridge (1944,28) where
it is argued that the major costs of unemployment are social, human and
interpersonal. This is a very important departure from traditionalist stances as
normative merit stems from meaning as opposed to definition.

Secondly, it is general to all modes of labour exchange because specific process
is not assumed. This is a marked improvement on the traditionalist justification in
a spatial context because allocation mechanisms may vary between place and the
rigid assumptions of the market model can be discarded. This imbues analyses with
a greater degree of flexibility since concern can be directed towards the problems of
unemployment without having to discern the structure of local labour exchange
mechanisms. As this is often impossible from an interarea perspective, exchange, as
portrayed from traditionalist stances, may be inappropriately construed as market
based. This only adds to the myriad of assumptions, most of which are
unsustainable. The only assumption required for application of the welfare
justification is that hardship is associated with unemployment and this is generally
sustainable (Windshuttle,1979).

Thirdly, the welfare justification operates solely on the basis of equity
considerations and avoids confusion with issues of efficiency. This is important
because unemployment is widely held to accentuate existing inequities. Sinfield
(1976,222) synthesises this view admirably when considering the issue of how much
unemployment "the country" can stand by his response that "the country" is not
asked to "stand unemployment" because impacts are not uniform. He agrees with
Liebow's stance that:
Unemployment is directional and selective, it strikes from underneath and particularly at the bottom of society. (1956,1)

The operation of this process can be illustrated in a market context for one sector of the economy from Figure 4.2 where the susceptibility of lower wage labour to shifts in sectoral demand ($D^s$) are shown. In this example, the sectoral supply of labour ($S^s$) has been decomposed into three distinct classes ($S_1, S_2, S_3$) relaxing assumptions of labour supply homogeneity. These three classes of supply are qualitatively different with $S_1$ being the least skilled and $S_3$ most skilled. Labour, in the lowest skill level, is relatively plentiful and hence attracts a lower wage whilst in the higher skill categories it is increasingly scarce because of barriers to entry, e.g. costs of education. In this model it will be assumed that labour supply in the higher skill categories is also increasingly wage inelastic because of personal investments in skill development and the time required for skill attainment (e.g. three years or more for tradesmen). Under these conditions, a decrease in aggregate demand would have greater employment ramifications for $S_1$ than either $S_2$ or $S_3$ workers because of differing wage elasticities of supply, low wage labour being faced with severe cuts in their standard of living or abandonment of employment. This is aggravated as the least skilled individuals are often made redundant first so that in effect demand shifts are biased, as in the shift from $D_1^s$ to $D_2^s$ in Figure 4.2, to impact most heavily on those in lower income jobs. These are most often specific groups in the community such as ethnic minorities, women and youth who have had the least opportunity to develop formal skills or attain them informally through work experience. This links the concept of unemployment to more general neglect of human needs.

The welfare justification for normative judgement is often only implied and invariably confused with the efficiency component of the traditionalist view. These two views have been disentangled because the welfare justification is more robust and uses available information in an unambiguous way by concentrating exclusively on the incidence of hardship rather than the processes responsible for it. This is important since it does not necessitate restrictive assumptions, is suitably general as to embrace humanistic concerns and does not ignore the possibility of 'soft' elements in the problem, such as prejudice or discrimination.

It has been argued that the definition of unemployment is far from simple and that meanings associated with it are emotive and diverse. Normative uses have been widely proposed yet often poorly specified. Two justifications have been

\[^5\text{Whilst this is a highly stylised representation it is in accordance with general theories of productivity.}\]
Figure 4-2: Effects of Aggregate Demand Shifts on Qualitatively Different Components of Labour Supply.

presented. The first bases normative judgements on efficiency of market allocation while the second concentrates on the social significance of unemployment from an equity viewpoint. Both are potentially useful but it is the second, with its inherent value judgement that unemployment gives cause for social concern, which will be adhered to in this Study. It is for this reason that unemployment will be used to monitor the spatial form of outcomes from localised labour exchange processes and so assign meaning to place.

4.2 Unemployment and the Spatial Form of Localised Labour Exchange Differences

Empirical emphases in this investigation of areal unemployment differences are directed towards the identification of form constants which indicate invariant unemployment performance in localised economies. The search for form constants can be implemented by controlled manipulation of cross sectional and longitudinal information. In the first instance, this will facilitate control for idiosyncracies related to concept, measurement and representation, while in the second, response to temporally differential stimuli. For manageability, the search for form constants must be limited in both the cross sectional and longitudinal cases. In the first, analysis is limited to one year and in the second, concerned mainly with one definition of unemployment for multiple years.
The cross sectional limitation is necessary for simplicity as analysis is complicated by reference to multiple definitional bases. The observation point chosen was 1976 as it relates most closely to the period of rapid change (inflexions in series discussed in Chapter 3), before and after which trends are similar. This observation point is of greatest normative significance for the period because it is one of most rapid economic deterioration. The longitudinal constraint is also necessary for simplicity but is enforced by the availability of only one definitional base for the study period. It is therefore purely fortuitous that sufficient secondary information is available to provide a nexus between cross sectional and longitudinal analyses of form. Without this there would be little scope for meaningful analysis of unemployment as a robust, though narrowly based, index of place.

4.2.1 A Cross Sectional Review of Unemployment Form - 1976

Specification of areal form in a cross sectional framework is difficult because different views and definitions of unemployment may lead to variations in observed pattern. Sheehan and Strieker have recognised the difficulties associated with identification of the unemployed:

In spite of the almost universal tendency... to speak of the level of unemployment, there is no single objective measure which gives the 'true' level of unemployment... Different criteria might be employed to determine whether a person is working (for example, does a few hours helping a friend for pay count as working?) or whether a person is actively seeking work (is asking friends about jobs actively seeking work?), and different unemployment measures emerge when different criteria are used. (1980,29)

Consequently, three sources of cross sectional information will be used in this Study. All three subscribe to the operational definition of unemployment discussed earlier but concentrate attention through different criteria. Respectively, these stem from formal efforts to identify the labour force status of all individuals in the population, record the number of individuals seeking assistance from the Commonwealth Employment Service (C.E.S.) to obtain work, and record the number of individuals in receipt of welfare payments because of unemployment. These indices are based on different procedures which can be summarily described as:

i) private preparedness to divulge unemployed status and a capacity to satisfy public criteria to be classified as unemployed;

ii) private preparedness to divulge unemployment status, recognition of a need for assistance in obtaining work or public income support, a perception that public assistance will be beneficial and a capacity to satisfy public criteria for assistance;

iii) satisfaction of public criteria for income support due to unemployment and a private preparedness to divulge receipt of assistance.
These procedures approach the problem differently but target a similar group within the population. However, their conceptualisation and measurement differ markedly.

The various public criteria, which must be satisfied in establishing these conditions are well documented but the private criteria, which individuals satisfy before divulging labour force status or taking direct action to obtain public assistance in obtaining work or income support, are conjectural at best. The first and third of these definitions were taken from the census and have the same problems as all census data discussed earlier and further illustrated in Chapter 5. The second is not generally available for local areas but is derived from transaction records of the C.E.S., originally developed for administration of funds under the Regional Employment Development Scheme\(^6\). This information suffers from similar disabilities to those of C.E.S. data which are more fully discussed elsewhere (Australia-Advisory Committee on Commonwealth Employment Service Statistics, 1973). These three sources provide the only material on locally disaggregated impacts of unemployment for 1976.\(^7\) All are capable of providing indices of unemployment although each is idiosyncratic and representative of specific treatments of the problem.

Numerical representation is also of significance when exploring areal form as this can result in different impressions of pattern. Two representations are commonly encountered. The first is a reliance on absolute incidence of unemployment whilst the second proportionally transforms incidence to ratio format. Both are important as the first reveals absolute concentrations of hardship and the second relative concentrations\(^8\). Proportional transformations of unemployment are usually carried out by re-expression as a proportion of the total labour force. This was found to be unsatisfactory in areally disaggregated nonmetropolitan situations because large proportions of the labour force are self employed in rural areas and, therefore, not at risk of unemployment according to conventional definition\(^9\). For this reason, all proportional transformations were based on the wage and salaried component of the labour force. All incident references to unemployment

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\(^6\)Collation of information for this scheme ceased shortly after it was abolished. Surviving records were often incomplete and remain unpublished.

\(^7\)The Department of Social Security releases additional information but only by postcode districts for this period.

\(^8\)Transformations other than proportional are also available to overcome specific distributional problems, e.g. skewing. Transformations have been used widely in this and subsequent chapters but only maintained where absolutely necessary.

\(^9\)By contact with a business, even one running at a loss, the self employed are classified as having work.
concentration will subsequently be referred to by the symbol $U$ while proportionally transformed variations will be referred to by $\mu$. These will be superscripted by the terms $C$, $E$ and $B$ to denote the operational definitions being used (i.e. standard census, C.E.S. and benefit recipients) and subscripted by numerals to identify the year, e.g. 76 for 1976.

4.2.1.1 Unemployment Form: an Empirical Introduction to Areal Differentiation

The initial objective is to gain an impression of extent in differentiation between areas according to unemployment. This will be done by reference to dispersion of outcomes, areal concentrations of unemployment and spatial distribution. Elias (1978,89) has argued that much of the theoretical and empirical confusion in dissertations on unemployment arises from choices made between incident and proportionate representations. This situation is complicated here by the range of definitions which can be considered. As a result, it is difficult to select a view which provides a suitable introduction to the form of areal unemployment differences. The incident version of the conventional census definition was chosen because it provides the most direct and least specialised representation. This will be supported by indirect reference to the $U^C$ and $U^B$ distributions and followed by an examination of proportionate distributions on a similar basis.

Table 4-2: Incident Concentrations of Nonmetropolitan Unemployment by Contrast to Ranked Distribution of Areas.

<table>
<thead>
<tr>
<th>Quartiles</th>
<th>$U^C_{76}$</th>
<th>$U^E_{76}$</th>
<th>$U^B_{76}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$Q_1 + Q_2$</td>
<td>22.7</td>
<td>20.5</td>
<td>20.0</td>
</tr>
<tr>
<td>$Q_3 + Q_4$</td>
<td>77.3</td>
<td>79.5</td>
<td>80.0</td>
</tr>
<tr>
<td>$Q_4$</td>
<td>57.3</td>
<td>59.1</td>
<td>58.9</td>
</tr>
</tbody>
</table>

The distribution was partitioned on the basis of quartile dispersion about the median and transferred to its original spatial context in Figure 4.3. Even a brief glance at the key to this Figure (where quartile values are indicated) shows interarea unemployment differentials to be highly dispersed (about a median of approximately 100 people), though the distribution is highly skewed with the upper
quartiles showing dramatic increases in unemployment level and accounting for the *largesse* of observed differentials. The conceptual significance of these differentials is underlined for all three distributions in Table 4.2 where the upper quartile of areas account for 57% or more of nonmetropolitan unemployment while the two lower quartiles only account for approximately 23%. Having established that differences are large, regularities are also evident in the guise of spatial continuities, indicating that systematic spatial polarisation is a feature of the incident unemployment distribution. Six characteristics are identifiable as spatially distinct regions in terms of high (above median) and low (below median) unemployment. These are shown in Figure 4.3 and can be loosely labelled in regional terms as:

<table>
<thead>
<tr>
<th>HIGH $U_{76}^C$</th>
<th>LOW $U_{76}^C$</th>
</tr>
</thead>
<tbody>
<tr>
<td>I NORTH COAST</td>
<td>IV SOUTH WEST</td>
</tr>
<tr>
<td>II SOUTH COAST</td>
<td>V FAR NORTH WEST</td>
</tr>
<tr>
<td>III MID-FAR WEST</td>
<td>VI FAR SOUTH WEST</td>
</tr>
</tbody>
</table>

The ramifications of this for the distribution of unemployment are that substantial groups of continuous places are markedly ‘worse off’ in welfare terms than others. Similar results, though with minor thematic variations, were obtained for $U_{76}^E$ and $U_{76}^B$ (Appendix C).

The conceptual significance of spatial continuity from incident patterns may arise from a simple relationship to the communal mass of localised economies. If this is the case, only the incident variables will be of any normative interest as proportionate transformations will be relatively homogenous. This possibility was examined using population ($P$) as a surrogate in a simple regression context where an association between $P_{76}^C$ and $U_{76}^C$ was sought. As the first result in Table 4.2 indicates, this proposition is likely to be true because the two distributions are highly associated. A brief examination of the scatterplot in Appendix D suggests that this finding oversimplifies the association due to differences in dispersion between population size categories. As a result, the observations being described were decomposed into three categories to reflect small, medium and large local economies, the actual delineation being somewhat arbitrary. Nevertheless, this was effective as it showed marked differences with the lower population categories, which

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10 Spatial autocorrelation is not an issue as the technique is being used to describe correspondence for local areas rather than using local areas as a basis for estimation of parameters in a general relationship (Johnston, 1978, 260). This point is relevant to subsequent descriptive applications of the technique.

11 This pattern is common to both the other unemployment variables used in this Study.
dominate the distribution (87% of places), showing sizeable reductions in compatibility. At very best, this effect operates for the largest population centres but detailed examination of pattern (Appendix D) reveals considerable scope for variation. Incidence of unemployment is therefore not a simple function of human mass but only crudely related and not systematic in a linear sense.

Proportionality transformations designed to highlight relative differences in the severity of unemployment is therefore justifiable as it will reveal different impressions of areal form. This is likely to be even more important when the basis for transformation is tied to those 'at risk' of unemployment, to the exclusion of others, because of departure from the simple view of human mass. The question of interest is: how will transformation effect the original perception of form?

Normatively this is significant because if departures are large, performance judgements must be reconsidered as key elements of spatial form may be subject to change. The transformed spatial series were subjected to the same treatment accorded the incident distributions with the results for $\mu^C_{76}$ in Figure 4.4, showing marked proportionate dispersion (about a median of approximately 8.0% for $\mu^C_{76}$), aspatially comparable in magnitude with that for the U series. The upper quartile (Table 4.4) accounts for less nonmetropolitan unemployment than before but, nevertheless, there is still a strong bias with 25% of areas ($Q_4$) accounting for 40% of aggregate nonmetropolitan unemployment. Examination of Figure 4.4 shows there

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**Table 4-3: Association Characteristics for $P^C_{76}$ and $U^C_{76}$**

<table>
<thead>
<tr>
<th>N</th>
<th>$r^{2*}$</th>
<th>$B_1$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 -39000</td>
<td>150</td>
<td>0.88</td>
</tr>
<tr>
<td>0 -5000</td>
<td>80</td>
<td>0.46</td>
</tr>
<tr>
<td>5001 -10000</td>
<td>40</td>
<td>0.37</td>
</tr>
<tr>
<td>10001-39000</td>
<td>30</td>
<td>0.71</td>
</tr>
</tbody>
</table>

Note: $r$ significant at 1% level for all partitions.

Calculated in unweighted form as:

$$I_{76} = (U_{76}^{1-n} \sum_{j=1}^{n} U_{76}) \times 100$$

for each of the C,E and B series.
Table 4-4: Proportionate Concentrations of Nonmetropolitan Unemployment by Contrast to Ranked Distribution of Areas.

<table>
<thead>
<tr>
<th></th>
<th>$I^C_{76}$</th>
<th>$I^E_{76}$</th>
<th>$I^B_{76}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$Q_1 + Q_2$</td>
<td>34.5</td>
<td>12.3</td>
<td>29.3</td>
</tr>
<tr>
<td>$Q_3 + Q_4$</td>
<td>65.5</td>
<td>87.7</td>
<td>70.7</td>
</tr>
<tr>
<td>$Q_4$</td>
<td>39.4</td>
<td>43.8</td>
<td>44.5</td>
</tr>
</tbody>
</table>

is again evidence of spatial continuity. However, the effects of transformation (see Appendix F) have been variant with substantial departures from the incident pattern. This calls into doubt the generality of incident and proportionate patterns.

Fluidity of the spatial situation can be investigated best by a comparison of Figure 4.4 with 4.3 where differences between $u^C_{76}$ and $U^C_{76}$ are apparent. The first point to be made is that one high (II) and two low (V, VI) unemployment regions have been seriously eroded by transformation, with several members reversing unemployment status relative to the median (homogenising effect due to size of 'at risk' group). Offsetting this, the consistencies which remain indicate core areas where status has proven invariant under transformation. This situation is common to the other two series (Appendix E). However, the instability of pattern between incident and proportionate representations has serious ramifications since there are qualitative differences between them.

An extension of this is that smoothing, due to generality of the quartile classification and its subsequent reduction to high and low groupings, may understate divergence, as finer detail shifts are not evident. The regional consistencies which have emerged are obviously facilitated by generality of classification. As can be seen from Figure 1.5, the major impact of transformation at a detailed level has been to shift many low incident areas into high proportionate value ranges (proximity of observations to vertical axis for higher value categories). This is especially important in the more sparsely populated western region of the State (III) since this factor is responsible for its expansion into surrounding regions when proportional transformation is affected. A reverse, but minor effect, is also evident for a small number of areas with large incident but low proportionate levels of unemployment (proximity of observations to horizontal axis for higher value categories).
This brief review has shown that the alternative definitions and representations of unemployment uniformly reflect marked differences in concentration between areas with 25% of places accounting for 40%-50% of the nonmetropolitan problem. Areal regularities were apparent for all spatial series in the guise of spatial continuities. Unfortunately, continuities differ between incident and proportionate series. All incident series proved to be comparable, suggesting that form constants were identifiable from three differential perspectives. Normatively, this is significant because any particular view of form would substantiate similar normative judgements concerning welfare induced distress. This is a simple problem but one which is rarely addressed and essential in analyses of place. Proportionate transformation shows the prematurity of accepting incident consistencies as a foundation for normative judgements. There is evidence of widespread consistency between proportionate patterns but these depart markedly from incident patterns, raising serious doubts as to the generality of form constants. This concern is heightened as detail in comparison between incident and proportionate series is increased because differences in pattern are highlighted. The identification and manipulation of form constants is therefore likely to be a difficult matter.

4.2.1.2 Unemployment Differentials : A Cross Sectional Appraisal of Form Constants.

Comparatively informal analyses of pattern have put the issue of form constants and their identification into an applied context. These must now be evaluated formally if place, as specified by normative differences in extent, is to be given concrete meaning in labour exchange. This will be done in two stages. The first will rely on broad categorisations of areal unemployment outcomes to provide a general view of form constants. The second, recognising the potential of broad categorisations to ‘smooth’ observations, will reclaim information foregone in the broader comparisons by using more detailed observations for fewer variables. Combined, these two levels of treatment have potential to indicate the upper and lower extremities bounding the recognition of form constants.

Stage one of this evaluation presents a difficult exploratory problem. It requires retention of generality, simultaneous reference to numerous variables and preservation of a spatial framework whilst minimising the potential for misconceived intimations of causality. A procedure derived from multidimensional contingency table analysis and termed *multiple characteristic mapping* has been applied to overcome this problem. In essence, it provides a facility for comparing alternative views of spatial form and reveal constants as a net result of areal differences and
Figure 4-5: $u_{76}$ Transformations Against Incident $U_{76}$ Variables.
similarities. The advantage of this procedure over conventional multidimensional contingency table analysis is that output is transferred to a spatial framework where areal status has greater meaning.

As multiple characteristic mapping derives from the concept of multidimensional contingencies it has the advantages of extending exploration into multiple facets of variability, simplicity and robustness. This technique was applied in three separate situations: to a comparison of all incident patterns (three-way contingency); all proportionate patterns (three-way contingency); and a combination of incident and proportionate patterns (six-way contingency). To simplify these increasingly complex patterns only the qualitative distinction between high and low (relative to median) unemployment was used.

All outcomes from these comparisons can be categorised into one of two groups, as shown in Table 4.5. These refer to consistent and inconsistent performance on any of indices. Those which are consistent correspond across all indices of unemployment for each contingency whilst those which are not diverge on one or more. The value of this distinction is that areas with inconsistent unemployment records can be isolated as having indeterminant profiles, i.e. neither uniformly ‘good’ nor ‘bad’ in terms of unemployment induced welfare distress. This may result from either differences in concept, measurement or representation. The advantage of isolating analytically indeterminant areas in this way is that attention can be concentrated on uniformly high or low unemployment areas, i.e. those of most and least welfare concern. Normative interest centres exclusively on the stability of patterns as this is indicative of elements which emerge regardless of concept, measurement and representational differences.

Table 4-5: Classification of Areas by Unemployment Profiles.

<table>
<thead>
<tr>
<th>Consistent Unemployment Profile</th>
<th>High Unemployment Presence of Unemployment Induced Welfare Problem</th>
<th>Low Unemployment Absence of Unemployment Induced Welfare Problem</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inconsistent Unemployment Profile</td>
<td>Indeterminant Outcome . changes due to concept, measurement or representation . proximate to class boundary</td>
<td></td>
</tr>
</tbody>
</table>
Figure 4-6: Multiple Characteristic Classification of Local areas for 1976 Unemployment Outcomes.
Substantial numbers of places do not fall into the indeterminant category in both of the three way maps in Figure 4.6 (a) and (b), indicating widespread coincidence of areal patterns where one or other representation is maintained throughout. This supports the initial findings from informal comparison in the previous section. Areas with recurrently identifiable unemployment induced welfare problems are highlighted by comparison to those without, emphasising the consistency of concept and measurement. Analytically, this is reassuring because it indicates that unemployment form is not greatly influenced by the idiosyncracies of concept and measurement. It suggests similar kinds of problems are evident from different perspectives. Interarea differences are therefore not so ephemeral as to change with the perspective adopted by the observer. The six way classification shows a significant deterioration in form constants which is to be expected as the bases for classification increase in complexity. This aside, the general indication is that representational idiosyncracies have a greater effect on form constants than either concept or measurement differences.
The main feature of all three multidimensional maps is that persistent core areas of high and low unemployment have become apparent, although somewhat circumscribed, in the six way contingency. The interesting characteristic of both three way classifications is that transformation of unemployment, results in an expansion of consistently high unemployment areas at the expense of areas where concentrations have been previously judged as low. This indicates a differential effect in the size of ‘at risk’ groups in local populations (but neither simple nor linear) so that areas with small populations and therefore small labour forces, which have low incident levels of unemployment, shift into the high concern category. Transformation, in this instance, has served to generalise the perception of unemployment induced distress.

The six dimensional contingency reverses this by rationalising pattern through redefinition of consistency criteria. This rationalisation is important because it reveals the hardest core of areas where unemployment has been consistently high or low, irrespective of changes in concept, measurement and particularly, representation. These areas can be seen as representing a streamlined view of form elements which have the greatest welfare significance in either a positive sense, because of consistently high concentrations, or a negative sense, because of consistently low concentrations. The pattern of high unemployment areas, which are of the greatest welfare concern, has remained relatively stable throughout this formal manipulation of differences with the key areas being in the two coastal locations (I,II) and the mid far west (III). These regions have consistently more serious problems than the rest of nonmetropolitan N.S.W. and constitute the most intractible elements of unemployment induced welfare distress.

The multidimensional classification of areas discussed thus far, simplifies the range of interarea differences to provide a higher level of generality. Unfortunately, this results in information loss which may obscure elements of the association between concept-measurement combinations (representation already having been compared at a detailed level in Figure 4.5). The type and strength of such associations can be investigated using simple regression to describe the coincidence of patterns for local areas. This approach is suitable because it could be proposed that different concept-measurement combinations are attuned to similar facets of the unemployment problem and, therefore, responsive to similar factors. Consequently, variance in one would tend, linearly, to explain variance in the other. The elasticity of any linear function describing such associations should tend to unity where definition and results of measurement are similar, such that:
One of two effects can be identified from this. The first is evidence of consistency
at a detailed level through high levels of correspondence and the second, divergences
between series due to differences in conceptual sensitivity to actual unemployment or
measurement inadequacies.

As the primary concern in unemployment analysis is welfare distress, the most
liberal specification of area based dislocation was selected for detailed examination.
The transformed representation of unemployment is most suitable for more specific
exploration as its breadth of areal coverage minimises the likelihood of excluding
areas with welfare problems. Three simple linear scenarios can be proposed to
investigate associations:

\[ u_{76}^B = \beta_0^B + \beta_1 C + \epsilon \]
\[ u_{76}^B = \beta_0^B + \beta_1 C + \epsilon \]
\[ u_{76}^E = \beta_0^E + \beta_1 C + \epsilon \]

These cover the range of possible combinations if assignment of dependent and
independent status to variables is not of particular interest. Where such choices
must be made there are priorities for assigning variable status and these are
reflected in the linear constructs described. In the first two, \( u_{76}^B \) is assigned
dependent status on the basis that unemployment benefit receipts are likely to be a
function of the general unemployment situation. In the third case, \( u_{76}^E \) is assigned
dependent status on the presumption that \( u_{76}^C \) is the more reliable of the two since
it results from direct interrogation of the population.

The most useful exploratory tools for such an exercise are not the simple
indices which summarise synchronous or deviant tendencies of unemployment series
but the scatterplots produced as a prelude, since these show actual differences on
continuous scales. An examination of the plots in Figure 4.7 reveals tendencies
toward the kind of linearity proposed. To assist comparisons with the foregoing
work, scatterplots have been overlain with a quartile (Q) grid so observations for
location coded areas can be examined in their original classes. As very few
observational units are to be found in the sectors defined by \( Q_3, Q_4 \) on either axis
the distributions are relatively confined and likely to yield at least moderate indices

\[^{13}\text{This is not of great importance as the essential proposition is that cross sectional measures are}
\text{identifying the same phenomenon, i.e. areal differences in unemployment. Also, brief inspection of}
\text{scatterplots will reveal evidence of heteroskedasticity but this is of little concern as the constructs defined}
\text{here have a purely descriptive role for original data.}\]
of association. This is qualified by the spreads which are evident in central quartile sectors so that it is very difficult to systematically assess general consistency or trend on the basis of any association. Application of the simple regression constructs is, consequently, justifiable as a summary device.

The indices derived for this purpose (Table 4.6) predictably describe only moderate adherence to the ideal suppositions (This can be seen graphically from Figure 4.7 where equivalence intervals ($\beta_1 = 1.0$) can be compared with the interval describing actual associations). As may be expected, the two census series ($u^B_{76}, u^C_{76}$) are most highly associated (see $r^2$ values) because they derive from the same source, with the consequence that measurement differences are minimal. It could be proposed, with some caveats, that unexplained variance is due to conceptual differences between the two indices. There are large reductions in association between the remaining indices which is understandable as they derive from different sources.

The elasticity indices ($\beta_1$) behave in an intelligible manner though two out of three depart from the ideal. Those for the ($u^B_{76}, u^C_{76}$) and ($u^B_{76}, u^E_{76}$) constructs have values of $\beta_1 < 1.0$ ($\beta_1 = 1.0$ marked in Figure 4.7) in both cases. This is due to the differing conceptual bases of the indices: i.e. the proportion of individuals in receipt of unemployment benefits should conceptually be lower than the proportion who are unemployed as not all receive unemployment benefits\textsuperscript{14}. By contrast, the elasticity of the ($u^E_{76}, u^C_{76}$) construct approximated the ideal proposed which, in this case, is to be anticipated as both indices target the general population of unemployed people rather than subsets\textsuperscript{15}.

Hence, a situation has been identified where two sets of comparisons most highly associated through measurement sources depart from elasticity expectations most strongly, whilst that which is least associated, adheres most directly to elasticity expectations. Departures on one criteria at a detailed level are alternatively compensated for by compliance on the other. As a result, whilst there

\textsuperscript{14}A brief glance at the ideal elasticities in Figure 4.7 shows that, in some cases, benefit recipients have exceeded the number of unemployed recorded on broader indices. Occurrences of this kind are conceivable as criteria for minimal labour force participation may not exclude individuals from receiving unemployment benefits. Whilst penetration ratios (Dow and Dicks-Mireaux,1958; Tregilgas,1976) were calculated and analysed little can, or should, be made of this situation without further information as the issue of ‘dole bludging’ is invariably resurrected with no conclusive findings.

\textsuperscript{15}Probability tests are not essential in exploration but have been included for completeness. In addition to those appended in Table 4.4, to test the difference between $\beta_1$ values and unity (equivalence) showed that the ($u^B_{76}, u^C_{76}$) and ($u^B_{76}, u^E_{76}$) indices were significantly different from the ideal elasticity whilst that for ($u^E_{76}, u^C_{76}$) was not (1% level of significance). Significance tests are of minimal value with large numbers of observational units as the linear model becomes asymptotically efficient and all results tend to attain significance.
Figure 4-7: Selected \( \nu_{76} \) Combinations with Descriptive Regression Fits, Equivalence Intervals \( (\beta_1 = 1.0) \) and Quartile Classes.
Table 4-6: Linear Propositions for Cross Sectional Unemployment Consistency.

<table>
<thead>
<tr>
<th></th>
<th>$u_{76}^B, u_{76}^C$</th>
<th>$u_{76}^B, u_{76}^E$</th>
<th>$u_{76}^E, u_{76}^C$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$B_1$</td>
<td>0.88</td>
<td>0.58</td>
<td>1.03</td>
</tr>
<tr>
<td>$r^2$</td>
<td>0.80</td>
<td>0.63</td>
<td>0.55</td>
</tr>
</tbody>
</table>

Note: $r$ significant at 1% level in all cases. $B$ significant at 1% level in all cases.

are detail disparities between series there is ample evidence of consistent, as opposed to divergent, behaviour. It can be seen from the scattergram and summary indices that the consistency patterns indentified by multiple characteristic mapping are not mere coincidence induced by 'smoothing' but categorical effects stemming from systematic associations between concept-measurement combinations.

Multidimensional classification of areas on the basis of high and low unemployment ratings generalises patterns of interarea differentiation at the risk of information loss. The magnitude of this problem was assessed by examining the distribution of unemployment using three transformed series which were chosen for their welfare significance. The degree of generality appeared justifiable from consideration of the resultant patterns because undeniable consistencies were identified. It is reasonable to propose that universal stability is not a feature of areal unemployment differences when concept, measurement and representation are modified. However, robust form constants emerged which partition cross sectional views of space into three distinct types of place. These initially stem from a categorisation of places as having consistent or inconsistent unemployment profiles. The latter can be dismissed as normatively indeterminant whilst the former can be separated into high and low unemployment core areas. Only the high unemployment areas are normatively significant because of their welfare distress associations and it is this which is the key feature of structure in the space economy.

4.2.2 Unemployment and Longitudinal Form 1966-76

Structure of the space economy is not simply a cross sectional phenomenon, it has a longitudinal element. Identification of cross sectional form constants must be qualified in this environment because they may be longitudinally ephemeral with significance of place in labour exchange shifting over time. Longitudinal analyses are 'fickle' by comparison to their cross sectional counterparts because source of
unemployment is subject to change. This is especially serious here as the period over which unemployment related distress is being investigated was one of marked shifts in macroeconomic performance (Chapter 3). There are established reasons why longitudinal consistencies might be expected (Thirlwall, 1969; Pearlman, 1969; Richardson, 1969; 1976; 1977; Butler, 1978). These are usually based on the substantive judgement that labour exchange differences between areas derive from the sectoral structure of regional economies which shift slowly due to substantial investments in productive infrastructure. Consequently, areas with labour exchange problems at one time have a tendency to be problematic at later stages. It should be recognised that such arguments are necessarily tenuous because they assume persistence of causal phenomena. The literature (e.g. Holland, 1976; Brown and Burrows, 1977; Butler and Mandeville, 1981) shows that this is not unreasonable over short periods as so called problem regions seem to persist irrespective of policy initiatives to enforce 'desirable' changes. There are then grounds for expecting form constants to exist not only cross sectionally but longitudinally.

The data available for examination of long term persistence over the period 1966-76, at a local level, is restricted to the 1966, 1971 and 1976 censuses. These three sources are crudely comparable and partition the period into two five year segments so insights can be obtained into progressive shifts over time. It is not possible to introduce differences in concept and measurement to longitudinal analysis because the necessary information is not available. This is not a serious problem because longitudinal investigation is very complex without attempting to expand it. Absence of such material therefore imposes controls for concept and measurement whilst encouraging exploration of differences over time and representational changes in this context.

The shifts which took place between 1966 and 1976 are best summarised by reference to differences between the two sub-periods 1966-71 and 1971-76. These highlight the main areal features of emerging economic recession. To facilitate identification of main differences over the period two indices, one for each of the two five year periods, have been calculated as \((U_t^C - U_{t-n}^C) / U_{t-n}^C\).100 (where \(t\) refers to most recent observation point and \(t-n\) to some preceding point). These show the degree of shift in unemployment. Frequency distributions (Figure 4.8) based on areal changes for the two indices proved to be all but non overlapping with those in the first being constrained to a much lower range than those for the second. This is indicative of increased pressures on the labour exchange process in the second period. The impact can be easily seen by comparison of the means and respective standard deviations. It should also be noted that changes in the first
period adopt both negative and positive values. This reflects a shift in the first period from a situation approximating full employment to one of economic crisis in the second.

The multiple characteristic mapping approach to exploration provides the most useful introductory avenue for manipulating form. As with the previous analysis, this can be done using two three-way classifications for each of the $U_{76}^{C}, U_{71}^{C}, U_{66}^{C}$ and $u_{76}^{C}, u_{71}^{C}, u_{66}^{C}$ situations, which control for representation, and one six-way classification which combines all of these elements and introduces both representations. As in the previous section, the median has been used to distinguish between more and less serious unemployment situations. The difference between this analysis and that which preceded it, is form constants must persist over a long period and be intransigent under a variety of circumstances.

Despite duration of the time period and economic turmoil, longitudinal regularities are evident from Figure 4.9 with marked incident concentrations of high and low unemployment. Concentrations of adversely effected areas are obvious in the west and north of the State and amongst urban areas or those with large populations and presumably larger 'at risk' groups. Many of these long duration unemployment cores 'filter' out when data are proportionally transformed. This is especially significant for urban areas and others influenced by size factors, indicating that mass of localised economies was more important in determining incidence in prerecessionary periods. Predictably, the number of long term adversity areas continues to fall when subjected to six-way classification. In spite of this the west of N.S.W. remains intact as a core area of uniformly high unemployment from 1966 to 1976. Consistencies at this level are, perhaps, the most important revealed so far because those in the cross sectional analysis refer to coincidence in concept-measurement combinations and identify adversely effected areas at one point in time. Those identified in the longitudinal analysis are of far greater welfare significance because, though they are based on only one concept-measurement combination, they show that some areas have experienced relatively serious unemployment dislocation for long periods. This creates greater cause for concern as it identifies difficulties which are longitudinally intractable.
Figure 4-8: Frequency Distribution for \( (U_{71}^C - U_{66}^C / U_{66}^C) \times 100 \) and \( (U_{76}^C - U_{71}^C / U_{71}^C) \times 100 \).
Figure 4-9: Multiple Characteristic Classification of Local Areas for 1966, 1971 and 1976 Unemployment Outcomes.
Since there is a *prima facie* case for the existence of longitudinal consistencies, the question remains as to how robust these are when subjected to detailed comparison. This problem differs from the cross sectional analysis as the same criteria cannot be applied and there are a wider range of options to be investigated. As a result, analysis will adopt a different format, searching for structure by evaluation of widely ranging consistency proportions which seek association between longitudinal patterns. Simple regression will be used in a 'search mode' with indices detecting linearities which can only emerge where local economies are consistent in their receptiveness to macroeconomic stimuli. This must be qualified by reference to original scatterplots where other types of association may be revealed. These have not been presented, in the interests of economy, but inspection supported application of simple linear summary indices. All consistency propositions take the general form:

\[ P^U_t - P^U_{t+n} \]

where \( P^U \) represents performance on unemployment indices. The rationale for this general proposition is similar to that described earlier where it was explained that later period performance may be related to what precedes it. Four specific aspects
of this proposition can be envisaged when the economy moves from a period of near full employment to one of deterioration:

i) unemployment levels or rates in earlier periods are positively associated with unemployment levels or rates attained in later periods;

ii) unemployment levels or rates in earlier periods are positively associated with the magnitude of changes which follow;

iii) unemployment changes from earlier periods are positively associated with the levels which follow in later periods;

iv) unemployment changes in earlier periods are positively associated with unemployment changes in later periods.

All of these propositions are based on one more general proposition, that weak performance in a period of economic stability is likely to be exacerbated in one of deterioration. Qualifications are easy to envisage, e.g. areas with unemployment performance problems in earlier periods may not be so responsive to employment pressures in later periods because weak industries may have already shed all surplus labour. These propositions are not definitive but provide a conceptual baseline for research.

Results for twenty five\textsuperscript{16} empirical versions of the four original propositions (which include combinations of incident and transformed variables) are shown in Table 4.7. An overview of results indicates that support for the general consistency proposition is far from unqualified. Only nine of the $r^2$ values exceed 0.30 and several are approximately 0.00 for any practical purpose. However, as these $r^2=0.00$ values do not apply uniformly to all propositions it is not possible to reject the overall consistency proposition. This is problematic only because it complicates otherwise simple interpretative scenarios, where acceptance or rejection of the consistency proposition is complete with relatively simple ramifications. Since this has not proven to be the case, it is necessary to examine the empirical versions of these propositions more closely. This will be done according to the four sets of propositions specified above.

The proposition that factors influencing areal unemployment in some previous periods will persist through the long term finds some support in the incident combinations of Table 4.7. The areas with highest incident levels of unemployment in 1966 remained so as nonmetropolitan N.S.W. moved into the 1970's and it was these areas which accounted for most of the 1976 problem. The proportionate

\textsuperscript{16}More were investigated but this particular set was chosen as it was representative of the wider set. All distributions were transformed as needed but this had minimal effect. Where possible, these were not used in order to maintain simplicity and access to original observations.
propositions however, offer little support for this as longitudinal associations are uniformly weak. The factor responsible for the long term incident consistencies is arguably the size of 'at risk' groups in larger population areas, as found earlier.

The possibility of prior unemployment levels or rates influencing the magnitude of future increases is canvassed in part two of Table 4.7. The contention is that areas with high unemployment levels are most likely to be responsive to cyclical increases in labour exchange distress and that low level or rate areas will be least responsive. With the exception of one construct this notion is soundly rejected. That offering support indicates $U_{71}^{C}$ is a reasonable explanator of $(U_{76}^{C} - U_{71}^{C})$ and that the relationship is relatively elastic. On past experience, failure of the corresponding proportionate proposition intimates that the observed consistency is again size related. However, if this were the case, it could be expected that $U_{66}^{C}$ would be a better determinant of $(U_{71}^{C} - U_{66}^{C})$, particularly given the strength of the $(U_{71}^{C} - U_{66}^{C})$ association in one part of the table. The structural influence of large population areas might, therefore, be less pervasive where temporal changes in unemployment are small. This results from absence of strong shifts in aggregate performance which would otherwise be manifest in communities. As a consequence, aggregate pressures for systematic change are minimal so that individual area shifts are idiosyncratic, reflecting individual circumstances in each.

The third set of tests reverse the second proposition by presupposing that increments in previous periods influence later levels of performance. In other words, the areas experiencing the largest increases in an earlier period will be characterised by the most serious levels at some later time. This might appear true by definition but for the confounding factor of differences in initial unemployment states. From the above, this version of the general proposition should be sensitive to post cyclical factors. Again, the majority of specific constructs fail to support this notion. Two constructs, $U_{76}^{C}(U_{76}^{C} - U_{71}^{C})$ and $u_{76}^{C}(u_{76}^{C} - u_{71}^{C})$, reverse this pattern. Since the matched incident and proportionate results concur it is improbable that this consistency is due to the structural effect of large 'at risk' concentrations. Their reference to the period of movement away from full employment reinforces the notion that patterns were erratic in the earlier full employment period because changes were small by comparison with final levels and rates of unemployment. Hence, the source of change was not large enough to have a systematic effect comparable with that in the later period.

This raises the issue of consistency in local responses to widespread cyclical shifts in performance of the labour exchange process. Specifically, this proposition suggests that areas of lowest unemployment increase in periods of stability will
<table>
<thead>
<tr>
<th>Expected Relationship</th>
<th>$\hat{\beta}_1$</th>
<th>$r^2$</th>
<th>t level</th>
</tr>
</thead>
<tbody>
<tr>
<td>$U_{71}^C \rightarrow U_{66}^C$</td>
<td>0.9</td>
<td>0.75</td>
<td>0.00</td>
</tr>
<tr>
<td>$U_{76}^C \rightarrow U_{66}^C$</td>
<td>0.9</td>
<td>0.79</td>
<td>0.00</td>
</tr>
<tr>
<td>$U_{76}^C \rightarrow U_{71}^C$</td>
<td>0.9</td>
<td>0.76</td>
<td>0.00</td>
</tr>
<tr>
<td>$\mu_{71}^C \rightarrow \mu_{66}^C$</td>
<td>0.8</td>
<td>0.31</td>
<td>0.00</td>
</tr>
<tr>
<td>$\mu_{76}^C \rightarrow \mu_{66}^C$</td>
<td>+</td>
<td>0.28</td>
<td>0.00</td>
</tr>
<tr>
<td>$\mu_{76}^C \rightarrow \mu_{71}^C$</td>
<td>+</td>
<td>0.25</td>
<td>0.00</td>
</tr>
<tr>
<td>$U_{71}^C - U_{66}^C \rightarrow U_{66}^C$</td>
<td>-</td>
<td>0.00</td>
<td>0.32</td>
</tr>
<tr>
<td>$U_{75}^C - U_{71}^C \rightarrow U_{71}^C$</td>
<td>2.2</td>
<td>0.61</td>
<td>0.00</td>
</tr>
<tr>
<td>$\mu_{71}^C - \mu_{66}^C \rightarrow \mu_{66}^C$</td>
<td>-</td>
<td>0.04</td>
<td>0.01</td>
</tr>
<tr>
<td>$\mu_{76}^C - \mu_{71}^C \rightarrow \mu_{71}^C$</td>
<td>+</td>
<td>0.00</td>
<td>0.25</td>
</tr>
<tr>
<td>$(U_{71}^C - U_{66}^C / U_{66}^C) \rightarrow \mu_{66}^C$</td>
<td>-</td>
<td>0.13</td>
<td>0.00</td>
</tr>
<tr>
<td>$(U_{76}^C - U_{71}^C / U_{71}^C) \rightarrow \mu_{71}^C$</td>
<td>-</td>
<td>0.23</td>
<td>0.00</td>
</tr>
<tr>
<td>$U_{71}^C \rightarrow U_{71}^C - U_{66}^C$</td>
<td>+</td>
<td>0.12</td>
<td>0.00</td>
</tr>
<tr>
<td>$U_{76}^C \rightarrow U_{71}^C - U_{66}^C$</td>
<td>+</td>
<td>0.01</td>
<td>0.07</td>
</tr>
<tr>
<td>$U_{76}^C \rightarrow U_{75}^C - U_{71}^C$</td>
<td>1.3</td>
<td>0.97</td>
<td>0.00</td>
</tr>
<tr>
<td>$\mu_{71}^C \rightarrow \mu_{71}^C - \mu_{66}^C$</td>
<td>0.8</td>
<td>0.50</td>
<td>0.00</td>
</tr>
<tr>
<td>$\mu_{76}^C \rightarrow \mu_{71}^C - \mu_{56}^C$</td>
<td>+</td>
<td>0.02</td>
<td>0.04</td>
</tr>
<tr>
<td>$\mu_{76}^C \rightarrow \mu_{76}^C - \mu_{71}^C$</td>
<td>1.0</td>
<td>0.80</td>
<td>0.00</td>
</tr>
<tr>
<td>$\mu_{71}^C \rightarrow (U_{71}^C - U_{66}^C / U_{66}^C)$</td>
<td>+</td>
<td>0.17</td>
<td>0.00</td>
</tr>
<tr>
<td>$\mu_{76}^C \rightarrow (U_{71}^C - U_{66}^C / U_{66}^C)$</td>
<td>+</td>
<td>0.00</td>
<td>0.28</td>
</tr>
<tr>
<td>$\mu_{76}^C \rightarrow (U_{76}^C - U_{71}^C / U_{71}^C)$</td>
<td>+</td>
<td>0.09</td>
<td>0.00</td>
</tr>
<tr>
<td>$U_{76}^C - U_{71}^C \rightarrow U_{71}^C - U_{66}^C$</td>
<td>+</td>
<td>0.00</td>
<td>0.34</td>
</tr>
<tr>
<td>$\mu_{76}^C - \mu_{71}^C \rightarrow \mu_{71}^C - \mu_{66}^C$</td>
<td>-</td>
<td>0.04</td>
<td>0.01</td>
</tr>
<tr>
<td>$(U_{76}^C - U_{71}^C / U_{71}^C) \rightarrow (U_{71}^C - U_{66}^C / U_{66}^C)$</td>
<td>-</td>
<td>0.20</td>
<td>0.00</td>
</tr>
<tr>
<td>$(U_{76}^C - U_{71}^C / U_{71}^C) \rightarrow \mu_{71}^C - \mu_{66}^C$</td>
<td>-82.8</td>
<td>0.34</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Note: † incident variables transforms were used
exhibit this feature in periods of deterioration and vice versa. This proposition can be investigated by examining the relationship between unemployment changes for the periods 1966-71 and 1971-76 which may be treated as indices of responsiveness to changing aggregate circumstances. The most successful outcome from the various constructs used to examine this proposition explained only 34% of later period responsiveness with the least successful failing to attain statistical significance. This indicates only limited support for the proposition that local factors, consistent over time, may synchronise area responses to aggregate shifts in economic performance.

In addition to these analyses a further manipulation was attempted. It evolved as an extension of multiple characteristic mapping which used differences at an early point in time to create expected spatial distributions (at a quartile level) for a later point. These were then compared with actual distributions. The exercise had mixed success with the best result having a projection accuracy of approximately 40% and the lowest 20%. This supports the general finding that detailed longitudinal consistencies have been eroded over longer periods. The importance of this lies not in the inability to produce a satisfactory projection but, as with the six-way classifications, in the welfare significance of those areas with unremitting unemployment problems. These persist in spite of the multitude of analytical criteria which must be satisfied to highlight a truly intractable core of areas consistently influenced by unemployment induced welfare distress.

The main reason which can be proposed for this breakdown in association between pre and post 1971 events is that the sources of unemployment changed between the two periods from one where frictional and structural influences were dominant to the next where demand deficiency was the major problem (Ross, 1964). This is obvious from the employment series in Chapter 3 where the first period is plainly one of near full employment, and only the latter two effects could operate on a wide basis and the second, which is one of rapid deterioration due to not only a national but international problem. The type of factors responsible for unemployment are therefore qualitatively different and so, by definition, are the main features of spatial pattern. From this it can be argued that localised economies are serving as transmission mechanisms (Casetti, King and Jeffrey, 1971) for different types of phenomena over time. This is compounded by the magnitude of change which is sufficient to 'swamp' the detail of earlier spatial patterns for all but the strongest size related phenomena.

\[\text{\footnotesize{17}}\text{Combinations seeking association between differently represented variables (incident and proportionate) had, as expected from the cross sectional analysis, little success. These explorations were extended into multiple regression applications but these resulted in only minor improvements and were beset by collinearity problems.}\]
Detailed longitudinal consistency propositions should not be discounted on the basis of these findings. A supplementary investigation of longitudinal consistencies using data for seven months between 1974 and 1976 (see Appendix G) was undertaken to find if there were obvious detailed consistencies within a period of uniform performance change (in this case, labour exchange deterioration). The number and selection of observation points was entirely dependent on availability of C.E.S. information produced for the R.E.D. scheme. Any finding must be qualified by the short duration of intervals between observation points, but this offers the advantage of much shorter intervals than the five year intercensal period. It was found that the temporal association between areal series increased dramatically. The degree of association is shown graphically in Figure 4.10 where severity rankings and values for two observational points, twelve months apart, are plotted. Whilst this departs from the ideal (shown by inset), mainly through shifts in rank, there is ample evidence of comparative consistency in rates of unemployment. The generality of this proposition increases considerably when shorter duration associations are sought as shown by the $r^2$ values in Table 4.8. These results leave very little doubt that longitudinal consistencies are evident in short term situations where there are no overriding macroeconomic changes. This provides qualified support for the explanation of longer term inconsistencies at the detailed level.

From this examination, it can be seen that longitudinal consistencies in spatial form are much weaker than those found in the cross sectional analysis. This is especially so for detailed comparisons but is to be expected as factors other than conceptualisation, measurement and representation impinge on patterns being compared as spatial patterns change in response to temporally different circumstances. Inconsistency in form over time indicates that local phenomena are fundamentally unstable due to the scale of event being monitored, i.e. they do not manifest sufficient mass to systematically withstand high level change. When duration between observations is reduced to the very short term, form consistency increases to very high levels as macroeconomic shifts do not attain sufficient magnitude to 'swamp' the effects of local structures. Long term inconsistencies also diminish when more general, cruder bases for comparison are used, as in multidimensional mapping which, though less exacting, emphasise the qualitative distinction between places specified in unemployment terms. Concentration on inconsistency detracts from the significance of consistencies which are identified because it ignores the intractable character of unemployment problems which afflict many areas. These, of course, would remain unidentified were this analysis preoccupied with cross sectional causality or conventional approaches to the analysis of form.
Figure 4-10: Short Term Consistency Longitudinal Consistency

$u_{74,10}^E$ and $u_{75,10}^E$
Table 4-8: Linear Associations ($r^2$) Between Areally Disaggregated Series.

<table>
<thead>
<tr>
<th>Proposed Association</th>
<th>$r^2$</th>
<th>Proposed Association</th>
<th>$r^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$U_{T511}^E \leftarrow U_{T519}^E$</td>
<td>0.84</td>
<td>$\mu_{T511}^E \leftarrow \gamma_{T519}^E$</td>
<td>0.85</td>
</tr>
<tr>
<td>$U_{T512}^E \leftarrow U_{T511}^E$</td>
<td>0.94</td>
<td>$\mu_{T512}^E \leftarrow \gamma_{T511}^E$</td>
<td>0.73</td>
</tr>
<tr>
<td>$U_{T61}^E \leftarrow U_{T512}^E$</td>
<td>0.96</td>
<td>$\mu_{T61}^E \leftarrow \gamma_{T512}^E$</td>
<td>0.75</td>
</tr>
<tr>
<td>$U_{T62}^E \leftarrow U_{T61}^E$</td>
<td>0.96</td>
<td>$\mu_{T62}^E \leftarrow \gamma_{T61}^E$</td>
<td>0.82</td>
</tr>
<tr>
<td>$U_{T67}^E \leftarrow U_{T62}^E$</td>
<td>0.93</td>
<td>$\mu_{T67}^E \leftarrow \gamma_{T62}^E$</td>
<td>0.64</td>
</tr>
<tr>
<td>$U_{T810}^E \leftarrow U_{T87}^E$</td>
<td>0.85</td>
<td>$\mu_{T810}^E \leftarrow \gamma_{T87}^E$</td>
<td>0.74</td>
</tr>
</tbody>
</table>

Note: 1) † Incident variables logarithmically transformed  
2) All results significant at the 1% level

4.3 Conclusion

This analysis has involved a data intensive investigation of areal unemployment differences as a basis for exploration of place in labour exchange. In opting to use unemployment for this analysis it was found that the conceptual coverage of conventional unemployment definitions was inadequate because they were limited in scope. This does not disqualify unemployment from use as a device for gaining data intensive insight into place but raises doubts as to the generality of traditionalist applications. In so doing it has shifted attention to the more robust welfare justification for analysis.

What then has been learned about the role of place in labour exchange? Two types of place have been identified from cross sectional and longitudinal perspectives. The first demonstrates inconsistent behaviour and the second, by contrast, consistent behaviour with identification of uniformly high and low unemployment areas. The cross sectional and longitudinal perspectives cannot be integrated because of deficient information but they do provide a conceptual framework, documenting the unknowns of place in labour exchange and the results which might be anticipated (Figure 4.11). Were form to be dominated by inconsistencies, especially in longitudinal comparisons, the role of place in labour exchange would be questionable. However, as a survey of the place possibilities shows, inconsistency from one perspective can be countered by consistency from another. As analyses become more complex, consistent impressions of place become more elusive and it is this ‘grey field’ which must receive more attention in future studies with subsequent partitions of
inconsistency by degree. Unfortunately, actual categorisations of place according to these criteria fall into the ‘unknown’ category, but emergence of consistencies within the realm of ‘knowns’ suggests that place is not benign in labour exchange. This analysis highlights the limitations of conventional analyses of form by indicating the true complexity of place through ascription of meaning in conditional, as opposed to unconditional, welfare terms. This concentrates attention on one type of place, the high unemployment core areas which are of greatest welfare concern.

The applied significance of this analysis is that empirically sustainable hypotheses or propositions have arisen from each of its elements. These can be synthesised into a more general proposition with important ramifications for the formulation of programmes designed to alleviate unemployment in periods of slow growth or stagnation (Clavel, Forester and Goldsmith, 1980; Chisholm, 1976). The introductory examination of unemployment form revealed a great range in the areal impacts of unemployment and a disproportionately heavy concentration in comparatively few areas. Formal manipulation of cross sectional patterns reinforced this showing that impressions of concentration varied in accordance with the

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**Figure 4-11:** A Data Intensive View of Place in Labour Exchange Using Unemployment from Cross Sectional and Longitudinal Perspectives (Knowns and Unknowns).

<table>
<thead>
<tr>
<th>CROSS SECTIONAL PERSPECTIVE ON PLACE (C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>INCONSISTENT PROFILES (I)</td>
</tr>
<tr>
<td>LOW UNEMP</td>
</tr>
<tr>
<td>H_L, L_C</td>
</tr>
<tr>
<td>L_L, L_C</td>
</tr>
<tr>
<td>l_L, L_C</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>KNOWNS</th>
</tr>
</thead>
<tbody>
<tr>
<td>H = High</td>
</tr>
<tr>
<td>L = Low</td>
</tr>
</tbody>
</table>

H = High
L = Low

Figure 4-11: A Data Intensive View of Place in Labour Exchange Using Unemployment from Cross Sectional and Longitudinal Perspectives (Knowns and Unknowns).
empirical rigour of consistency definitions to be satisfied for the identification of form constants. This result was again reinforced when cross sectional criteria were replaced by a series of long term longitudinal alternatives which emphasised the persistence of unemployment in a number of areas. Detailed reviews of consistency in all but the very short term resulted in erosion of pattern but, this again, only served to highlight the importance of areas with consistent unemployment problems rather than a blanket solution because severity is highly variable and priorities empirically manipulable. This engenders a capacity to identify varying types of ‘hard core’ unemployment areas dependent on concept, measurement, representation and periodicity of observation which permits a selectivity of expenditure in times of retarded performance when public resources are scarce and withdrawal from locationally discriminant policy widespread.

Whilst data intensive investigations are clearly useful, these two perspectives have served to highlight their major weakness which is, by concentrating on only one facet of variation they are incapable of suggesting a more general fabric of differentiation. All questions and hypotheses refer exclusively to the unemployment situation so that the objective of searching out a widely based framework of areal differentiation can only be achieved by assuming unemployment differences to be representative of many others. A more satisfying level of investigation capable, of providing the bases for more general questions and hypotheses can only be obtained by introducing nature into differentiation.
Quartile 1 (200)
Quartile 2 (110)
Quartile 3 (250)
Quartile 4 (1200)

Diameters indicate total numbers of wage & salary earners.

Figure C-1: Map of 1/6 for Metropolitan N.S.W.
APPENDIX D
Figure D.1: Plot of $p_{C}$ against $p_{76}$.
Figure E.1: Map of $\tau_E$ for Nonmetropolitan NSW.
Figure F-1: Unemployment Frequency Distributions for Nonmetropolitan N.S.W.
Figure G-1: Time Series for $U^E$ Data
Exploration of unemployment differences provided important insights into the role of place in labour exchange which were of normative merit and previously undocumented. Strictly, these were applicable to only one dimension of the labour exchange process, dwelling on differences of extent rather than nature. The original treatment of labour exchange argued that outcomes from the process were multidimensional and better represented by analysis of nature in differentiation. Incorporation of additional dimensions into differentiation is important because it constitutes a movement towards conceptual reality but this must be 'traded-off' against the simplicity and normative merit of data intensive analyses. Exploration of nature in differentiation is complex. Development of an operational framework which facilitates search for structure presents a significant challenge. It requires the selection of an analytical strategy compatible with the goals of research, adoption of techniques which actualise the strategy and selection of information to be combined with technique. The result is a myriad of possibilities. The purpose here is to reduce these to manageable proportions by showing how the problems of developing an exploratory framework were resolved.

This will be done by reducing the problem to its three main elements: strategy, technique and data specification. Strategy refers to the integral framework which provides a vehicle for solution of research problems, in this case, isolation of place in labour exchange. Technique is the foundation of strategy because it provides the formal channel for its implementation. Given the particular objectives of individual technical applications which are combined for strategic purposes, they should collectively provide a detailed statement of strategy. Data specification is the final stage in strategy implementation with information operationalising
technique. Andrews (1978,97) argues this to be one of the most important stages in exploration. Availability and imperfections in source distinguish between the appropriateness of exploration as opposed to confirmation. For this reason, data specification must receive extensive consideration.

5.1 Numerical Taxonomy - An Analytical Strategy

Exploration of nature in differentiation must proceed with similar flexibility to that demonstrated in the data intensive analysis of extent in differentiation. The problem, however, is more complex because social perspectives on place are inherently multidimensional with each dimension embracing a wide range of elements. Selection of a research strategy is primarily dependent on purpose. This is plainly defined in the introduction as being use of nature in differentiation to explore place in labour exchange. This requires that places be distinguished in accordance with nature in differentiation.

The resultant research strategy is described in Figure 5.1 where two levels of analysis are envisaged, one to distinguish place and the other, to explore patterns which result. Conceptually, the first level is comparatively simple. It requires that the identifiable features of place be ‘mustered’ and organised in a systematic manner so differences in place can be indexed. Once this has been achieved differences can be analysed by examining place in search of observational continuities which relate places or discontinuities which separate them. Both produce impressions of place and, more importantly, associations between places which enable simplification.

This strategy is commonly used in documentation of place (Grigg,1967) but its exploratory applications have been minimal. Pattern identified through one iteration is often inviolably associated with structure. This is dangerously simplistic with data extensive sets of information because the breadth of material differentiating areas is so great. An exploratory version of this strategy offers scope for widely based interrogation of differences between place so that identified patterns can be searched in more detail and evaluated for robustness (priority (p) 1 links in Figure 5.1). This can be done through three channels. First, by analysing differences, selected as preferred views of continuity or discontinuity, in the context of all differences between places (p2). This concentrates attention on the link between original differences and those selected for preferred views (p3). Second, by investigating preferred views of difference between places from analysis of original features used to specify differences (p4). This concentrates attention on two links: that between identifiable features of place and their use in differentiation (p5); and that between these differences and preferred views of place (p6). The final channel
manipulation of synthesis to search detail of SPATIAL pattern and evaluate robustness

identifiable features of PLACE

differences between PLACE

simplification?

manipulation of synthesis to search detail of SPATIAL pattern and evaluate robustness

preferred view of continuities between PLACES

preferred view of discontinuities between PLACES

diagnostics?

PLACE in labour exchange

Figure 5.1: Research Strategy for Analysis of Place in Labour Exchange.
expands treatment of place by comparing results from preferred views to provide a more general perspective on place (p7). In accordance with previous statements, place and its identification cannot be treated as a foregone conclusion of spatial analysis. This can only be established by careful evaluation of differences between all places being examined.

Exploration of place in labour exchange is analytically very different in logic to conventional description of differences between them. The latter progresses sequentially towards conclusion whilst the former must retain a capacity to probe place in order to establish the character of relationships. This necessitates a research strategy which is iterative and not rigidly sequential if emphases on place are to be maintained. Without this, analyses invariably revert to examination of social variables with place as an attribute of them. The rationale for exploration of place in labour is to ensure that social variables are treated as characteristics of place.

The techniques collectively represented as numerical taxonomy provide the closest technical parallel to this statement of strategy, being defined as:

...grouping by numerical methods of taxonomic units into their taxa on the basis of their character states. (Sneath and Sokal, 1973,4)

Later developments of this field have extended its applications into a search mode of analysis. Applications of this technical strategy are to be found amongst both geographers (Johnston, 1978; Smith, 1975; Spence and Taylor, 1970; Harvey, 1969; King, 1969) and others (Williams, 1976; Harbough and Merriam, 1968; Smart, Meacock and Lambert, 1974; Dale and Webb, 1975; Gauch and Whittaker, 1981). Geographers have used the strategy for region building (e.g. Logan et al., 1975; Spence, 1968) and creating typologies of locational units (Nelson, 1955; Stone, 1961; Smith, 1965(a); 1965(b); Dixon, 1978; Sorenson and Weinand, 1983; Australia-Department of Home Affairs and Environment, 1983). Widespread preoccupation with conventional application has resulted in the exploratory potential of numerical taxonomy being largely overlooked. Gordon argues for a change in direction with reference to analysis of numerical discontinuities through classification:

At a deeper level, the results of a classification study could enable an investigation to formulate some general hypotheses to account for observed data. In this context it is useful to regard classification as a form of exploratory data analysis, in the sense of Tukey (1977). (1981,6)

Earlier work by geographers suggested this exploratory potential. Mather and Doornkamp commented that:
Cluster analysis (classification) may be regarded as a device for generating hypotheses ... (1970,163)

with other work by Berry (1960) being indisputably exploratory. Recent work at the Commonwealth Scientific and Industrial Research Organisation’s Division of Water and Land Research (Australia-C.S.I.R.O. Annual Report, 1982,37-38)\(^1\) has concentrated on development of taxonomic techniques with an enhanced capacity to search for structure. Numerical taxonomy is highly suited to exploration because of its capacity to facilitate the numerical manipulation of multidimensional data sets without undue dependence on limiting assumptions.

An in depth account of numerical taxonomic strategy is unnecessary as it has been competently detailed elsewhere (Gordon,1981; Sokal and Sneath,1973; Cormack 1971; Wanatabe,1969). The essential proposition in numerical taxonomy is that entities, such as objects, individuals or areas, can be distinguished according to their characteristics (Clifford and Stephenson,1975; Rummel,1967; Johnston, 1978). Characteristics for any set of objects may be represented as axes defining an abstract space with each characteristic constituting an axis. Coordinates for each entity are defined by its values on each of the characteristics so that it is possible to transpose entities into a specific character space. This proposition is illustrated in Figure 5.2 where four observational units are plotted with respect to three character axes \(x_1, x_2, \) and \(x_3\). From this, it is possible to conceive of the differences or similarities between entities in terms of all three characteristics. Differences between entities can be represented simultaneously on all axes. For example, in Figure 5.1 the euclidean distance (\(\Delta\)) between entities is shown. This example can be extended to any number of characteristics so that there is a basis for complex comparison between entities. The multiple characteristic differences and similarities computed from these spaces form the bases for higher levels of analysis.

These multiple characteristic spaces have been variously labelled hyperspaces (more than three axes), A-spaces (attribute defined) or taxonomic spaces (by purpose) with the entities represented being referred to as observational taxonomic units (OTUs). Here such spaces will be termed taxonomic, but observational units will retain their earlier designation as localised labour areas because of its generic value.

A fully defined taxonomic space is only representable where all the characteristics of an observational unit can be identified and measured. It is unlikely that a fully defined taxonomic space could be established for socio-economic

\(^1\)Harvey noted this potential use approximately a decade before:

"...classification may be regarded as a means of searching reality for hypotheses." (1969,326)
entities. Even if all the necessary characteristics could be identified, accurate assembly would be difficult because of problems in weighting observations. The taxonomic spaces encountered here and elsewhere are, therefore, best described as imperfect. The usual method for defining such spaces is to make initial reference to theory where the relevance of characteristics is indicated (Harvey, 1969, 332). Where theoretical guidance is lacking decisions are usually pragmatic. In either case, the taxonomic space defined as a result of the character selection procedure is purpose specific. A common problem is that purpose is unclear (Harvey, 1969, 326), resulting in operationally defined taxonomic spaces which are ascribed an unwarranted representativeness.

The terminology used in numerical taxonomy for referring to observations differs from that used with other analytical strategies. This difference must be clarified before discussing taxonomic strategies in more detail if confusion is to be avoided. In common usage, the concept of a characteristic equates most closely with that of a variable. There are, however, two crucial differences. The first is that the term characteristic shifts emphasis from the feature being observed, as is usual with variables, to the observational unit or units (e.g. local areas) for which the observation is made. The result is that characteristics are treated as features of an observational unit so that the unit does not merely constitute a basis for observation. The second difference is that characteristics can be treated at two levels, either being referred to as attributes or dimensions (Figure 5.3). The term attribute refers to individual characteristics, such as the female unemployment rate.
for 1976 or the proportion of families with incomes below $2,000^2$. The term dimension is collective and refers to any set of attributes drawn from a common conceptual source, e.g. income or unemployment. Higher level reference systems of this type have been widely used in multivariate indicator studies, such as those of Drewnowski (1974) and “The Presidents Commission on National Goals” (1960), where they have proven useful in generating discussion. This distinction between attributes and dimensions is important as it suggests two levels at which taxonomic space can be treated, one being operational and the other conceptual.

![Diagram](relationship-between-characteristic-attribute-dimension.png)

**Figure 5-3:** Relationship Between the Terms Characteristic, Variable, Attribute and Dimension.

Having considered the elementary tenets of analytical strategy, two variant procedures have developed with regard to its implementation. These were identified by Spence and Taylor (1970) and were termed “Berry’s three stage procedure” and “Sokal’s two stage procedure”. The difference between the two is that Berry’s procedure requires a stage of orthogonalisation to produce a set of transformed independent attributes before a matrix of interentity distance (term used interchangeably with dissimilarity) measures is produced for subsequent taxonomic manipulation. Sokal’s procedure utilises only the final two stages. Unfortunately, in documenting this divergence, Spence and Taylor do not resolve the difference. It is important this be done because Berry’s three stage procedure has gained a degree of currency in geography whilst Sokal’s has been widely accepted in other disciplines.

---

^Variants of this view exist, for example: 
“...the term attribute is conventionally extended beyond its normal statistical usage to include variables and variates and different types of attribute.” (Lance and Williams, 1968, 31)
Berry's orthogonalisation stage is necessary because of a reliance on euclidean distance to represent interentity differences. It involves the establishment of a correlation matrix for original attributes which is then subjected to a principal components transformation to produce a matrix of orthogonal (or independent) attributes. The justification for this transformation is to produce a set of independent attributes before calculating an interarea distance matrix. The two stage strategy is criticised because the principles of euclidean geometry cease to operate where the axes defining a given taxonomic space are intercorrelated. This point can be demonstrated diagramatically from Figure 5.4. It can be shown that the cosine of an angle between any two intersecting axes \((X_1, X_2)\) and \((x_1, x_2)\) of unit weight is equivalent to the correlation between them (Smith, 1975, 316). The cosine of 90° is equivalent to a correlation of 0.0, with greater or lesser angles indicating intercorrelation between axes. Two situations are portrayed in Figure 5.4, one where axes are orthogonal and another, where they are intercorrelated. The euclidean distance calculated for the differences between A, B in (i) and a, b in (ii) will be identical because the form of this coefficient is:

\[
D_{A,B} = \sqrt{D_1^2 + D_2^2}
\]

\[
D_{a,b} = \sqrt{d_1^2 + d_2^2}
\]

and in this case \(D_1 = d_1\) and \(D_2 = d_2\). A glance at Figure 5.4(ii) clearly shows that the distance a, b is smaller than that for A, B in (i). From this, it can be argued that the euclidean distance calculated for Figure 5.4(ii) misrepresents the shortest straight line distance between the two points.

The question arises as to why this transformation has been ignored by those advocating a two stage strategy. There are two reasons. First, euclidean distance
is but one conceptualisation of interentity differences. The euclidean metric is only a special case of a more general class of metric distance functions known as Minkowski metrics (Coombs, Dawes and Tversky, 1970, 61-64). Where axes are intercorrelated, euclidean distance defaults to a particular form of another special case of the Minkowski. This is the manhattan class of measure which will be discussed in more detail in the next section. As a consequence, the real criticism of studies using the euclidean metric, in situations where intercorrelated axes define the taxonomic space, is not that the distance measure is invalid but that it constitutes a poor choice of the manhattan measure where better alternatives may be available.

The second reason for ignoring the orthogonalising transformation in the two stage strategy stems from the problems it creates. The first relates to the difficulty of arriving at the true (or correct) interpretation of the ‘new’ characteristics produced from transformation. As the ‘new’ characteristics are purely mathematical constructs (Gould, 1981, 250; Reddy, 1982, 25) with several interpretations, selection of the correct one may be purely fortuitous, especially where this must be done for a large number of new characteristics. The second problem is that in defining a taxonomic space where all axes are orthogonal, it is claimed redundant observations are eliminated. A characteristic is said to be redundant if its variation, or a part thereof, coincides with that of another, but this condition only holds where the new characteristics are equally weighted\(^3\). This may not be desirable because each of the new characteristics explain differing proportions of the original variance. Effects which permeate a large number of the original observations are given equal weight to those influencing only a few\(^4\). Dixon was prompted to comment that:

The inclusion of two or more highly correlated variables in the analysis amounts to weighting the concept they measure by a factor of two. This is considered acceptable as any concept which reappears in many variables should be weighted accordingly. (1978, 83)

Obviously, indiscriminant weighting may be totally unwarranted where the transformed data are to be used in extended exploratory analyses. The final problem is the orthogonalising transformation suggested in the geographical literature (Johnston, 1978; Smith, 1975 and King, 1962) is only sensitive to linear associations. Therefore, so-called orthogonal variates may be functionally interdependent where

\(^3\)Differential weighting according to explained variance is possible but self defeating as ‘new axes’ are then given the same weight as uncombined originals

\(^4\)A practise which has arisen in an attempt to avoid the worst excesses of this approach is to dispense with those components accounting for relatively small proportions of the variance. The judgement supporting this action is that these components represent ‘noise’ (Johnston, 1976, 23; Smith, 1975, 315). Such judgements should not be taken lightly as many of the lesser components may subsume meaningful variation.
data are effected by nonlinearities (Norris, 1971; Austin, 1971). These problems indicate that this transformation is not one suitable to all situations and should not be undertaken as a matter of course.

Sokal's two stage strategy is preferred in this Study primarily because it is more suited to exploratory data analysis. It offers greater flexibility since it is not heavily prescriptive in regard to preprocessing or distance coefficient selection. This flexibility affords a greater range of options in the way techniques are combined, a major asset in developing a sound exploratory strategy. Also, the absence of a mandatory transformation stage ensures the nature of the original data set is preserved. Transformations, especially the powerful ones suggested in the three stage strategy, have a capacity to change the very nature of the original data set. Such changes are of critical importance where the objective is exploratory data analysis, as neither the form of original data nor associations between observational units or characteristics is understood.

5.1.1 Application of Analytical Strategy (Numerical Taxonomy) - Techniques

In opting to use Sokal's two stage strategy key decisions concerning selections of technique influence the character of analysis. These key decision points are shown in Figure 5.5 which is a replica of Figure 5.1 with technical specifications replacing general descriptions of task. Actual selections of technique which operationalise each stage include choice of: dissimilarity measures; classification procedures, which analyse discontinuity patterns; ordination procedures, which do the same for continuity; and diagnostic applications, which facilitate thorough search of structure. The first of these terms is conceptually straightforward but the remaining three are more complex. As a result, these will be discussed broadly as a prelude to detailed examination of techniques in analytical sequence.

Classification, often referred to as cluster analysis, partitions entities into classes on the basis of similarities or differences between them and can subsequently be used to systematically allocate 'new' entities to established classes (Clifford and Stephenson, 1975, 26). Variations on this theme exist as outlined by Everitt:

classification is considered to be the process of allocating entities to initially undefined classes so that individuals in the same class are, in some sense, similar to one another. (1979, 169)

This view demonstrates the suitability of classification to the type of problem presented by the nonmetropolitan labour area data. Classification can be used in...

---

Figure 2-5: Critical choices to be made in technically a social Type Two Stake Strategy.
several ways (see Harvey, 1969, 331; Everitt, 1974, 3) but there is agreement in informed circles on its use as an exploratory tool. Wischert, referring to cluster analysis, argues:

Cluster analysis is an exploratory method for helping to solve classification problems. Its use is appropriate when little or nothing is known about the category structure in a body of data ... Cluster analysis is a tool of discovery. It can be used to reveal associations and structure in data which, though not previously conceived, are nevertheless sensible and useful when found. (1978, 1)

Ordination, the second processing option in Figure 5.5 is defined as:

the disposition of individuals in a reduced space, the original of which was defined by a series of axes corresponding to the number of properties studied for these individuals. (Clifford and Stephenson, 1975, 30).

As with classification, ordination has several uses (Dale, 1975) with the most common being its role in reducing dimensionality so that entities can be graphically represented in a simplified taxonomic space. This provides a facility for identification of entity associations where common factors are responsible for continuities in distribution of entities.

It is commonly believed that classification and ordination are alternatives, the former being used with data sets where entities are distributed discontinuously and the latter continuously. Harvey ascribes this view to Grieg-Smith:

.... some writers emphasise a difference between classification proper - in which it is possible to classify elements into relatively homogeneous classes - and what they term ordination - which involves making divisions on a continuum. (1969, 334)

This stance is difficult to justify in applied situations because only rarely will a data set be characterised exclusively by one or other of these features. Williams and Lance support this view:

....over a wide range of problems concerned with the extraction of patterns the approaches [classification and ordination] are complementary; and both are necessary, since it can seldom be known in advance which approach will be the more profitable. (1968, 42)

There is consequently a developing consensus in numerical taxonomy that classification and ordination are complements because they are sensitive to different features of any data set. As a result, both are used in this Study. Diagnosis, the final term requiring formal definition, is the investigation of outcomes from high level analysis of differences between entities, i.e. classification and ordination. Diagnosis can be undertaken in three ways: by contrasting different approaches to
classificiation or ordination; contrasting results from classification with ordination; or use of techniques with specifically diagnostic applications in classification, ordination or both. Diagnostics directly relating ordination to original attributes (effecting links p4, 5 and 6 in Figure 5.1) are not used in this Study. They are difficult to apply because ordination involves a complex transformation of data and is of doubtful reliability under many circumstances. The purpose of diagnosis is to gain a greater understanding of discerned pattern. Only when diagnosis has been carried out, can search for structure in data have been thorough and comprehensive.

5.1.2 Representation of Interarea Differences - Dissimilarity Measures

The first step in affecting Sokal's two stage strategy is to select a measure which adequately represents the differences between observational units in taxonomic space. These must be derived from a raw data matrix \( A_1 \):

\[
A_1 = \begin{bmatrix}
    x_{11} & x_{12} & \cdots & x_{1s} \\
    x_{21} & x_{22} & \cdots \\
    \vdots \\
    x_{n1} & \cdots & x_{ns}
\end{bmatrix}
\]

of \( n \) entities and \( s \) attributes. The measures representing differences between each of the entities in \( A_1 \) form a symmetrical \( n \times n \) distance matrix \( D_1 \):

\[
D_1 = \begin{bmatrix}
    d_{11} & d_{12} & \cdots & d_{1n} \\
    d_{21} & d_{22} & \cdots \\
    \vdots \\
    d_{n1} & \cdots & d_{nn}
\end{bmatrix}
\]

of differences between each entity and all others. These matrices are known by a variety of names depending on the form of distance measure used. These are usually of three kinds; similarity measures which increase as differences between entities decrease; dissimilarity measures which increase as differences increase; and association measures which are responsive to coincidence regardless of distance in taxonomic space.

The problem of selecting a representative measure is far from simple. There are three major obstacles to a rational selection. They are the vast array of
measures available, the absence of a comprehensive literature documenting and comparing these measures and the poorly developed knowledge of general and statistical properties of many measures\(^6\) (Sneath and Sokal, 1973, 116-147; Clifford and Stephenson, 1975, 49-82). These difficulties are offset by one major advantage to the exploratory data analyst. Measures can be selected which are most suitable to the features of specific problems, thus introducing a level of flexibility not encountered in more conventional statistical analysis. This flexibility operates through three main channels:

i) measures can be selected to suit the type of data being used, i.e. binary, multistate, ordered multistate or numeric;

ii) features of the data being used can be directly incorporated into the measure, reducing the need for transformations to ‘massage’ the data set into a suitable form, e.g. transformations to minimise the influence of outliers;

iii) purpose specific weights can be applied to differences so that not all differences need be weighted equally.

The first is of benefit because dependence on one kind of measure, regardless of data type, is significantly reduced. Numerous examples of this application can be found in the literature from other disciplines such as botany (Dale and Webb, 1975) agriculture (Williams, 1976) and archeology (Hodson, 1969) where enhanced flexibility has been used to great effect. The second is important because in reducing the need for transformation, the original nature of the data set is retained whilst the measure used to represent differences is altered as needed. This is critical in exploratory data analysis because, for example, removal of outliers alters a property of the data set which is then unrecoverable. The third feature is of significance where differences of kind are thought to exist in the data set so that it may be desirable to weight these in accordance with qualitative distinctions. This can be crucial in determining analytical emphases which may be ignored under other circumstances.

As data selection is not examined until the next section, it is necessary to pre-empt part of this discussion by describing the general features of data if distance measures are to be seen in context. These are similar to those of the unemployment data used in the previous chapter, consisting of four features:

i) the data are numeric in that measurement is on a continuous scale for

\(^6\)The major implication of this last point is that probability distributions have not been established for the bulk of measures. This inhibits confirmatory analyses but is less important where hypothesis generation is the objective, as in exploratory data analysis. (Mather and Doornkamp 1970, 168)
all attributes and can be typified as ratio measurement, i.e. there are no binary or multistate measurements:

ii) a predominant feature of this data set is the existence of extreme observations or outliers;

iii) attributes from specific dimensions have appreciably larger values than those from other dimensions and so have a scope for larger ranges which may introduce unwarranted weights;

iv) differences are not only of degree but also of kind between growth and no growth/decline situations.

Several measures could be used to portray different facets of the data set under review. However, it would be more desirable to identify a family of measures or, even better, one measure which does this best. To this end, the major alternatives which are least suitable must be discounted. Association measures have been excluded because the interest here is in dissimilarities between observational units\(^7\) rather than strict types of relationship between them. Euclidean type measures are unsuitable because they are unduly sensitive to extreme observations. A major alternative is the manhattan class of distance measures. The difference between euclidean and manhattan measures is illustrated graphically in Figure 5.6 where it can be seen that the manhattan is the distance \((A,B + B,C)\) as opposed to \((A,C)\) for euclidean (the term manhattan arises from this "around the block" method of calculation (Williams, 1976, 41)).

![Figure 5-6: Euclidean and Manhattan Variants of the Minkowski Metric.](after Williams, 1976)

One of the most commonly encountered forms of manhattan measure is the gower metric (1971):

\(^7\)Also, the various correlation coefficients are of limited use because they are only sensitive to linear coincidence or highly select forms of nonlinear coincidence.
The gower metric can cope with numeric data. Difficulties arise with the remaining three features discussed above. Firstly, standardisation is by the range of values in the population for each attribute (global standardisation). As the data used in this Study are influenced by outliers, it would be preferable if standardisation were based solely on the two individuals being compared (pairwise standardisation) because attributes effected by outliers are unintentionally given lower weights where global standardisations are used. Secondly, differences of kind cannot be represented so it would not be possible to apply discriminatory weights to selected comparisons. Thirdly, this measure is sensitive to absolute differences so there is a tendency to weight large value attributes with greater variation more highly than lower value attributes with smaller variation. In spite of these drawbacks, the gower metric has been used for comparative purposes because its manhattan format is more akin to the measure eventually chosen for general use.

The dissimilarity measure, which was selected, is a version of the canberra metric most frequently encountered as:

$$G = \frac{1}{s} \sum_{k=1}^{s} \left( \frac{|x_{ik} - x_{jk}|}{W_k} \right)$$

$x_{ik}, x_{jk}$ values taken by individuals or groups i and j for the kth of s attributes

$W_k$ range of attribute values for the population

Lance and Williams, 1967

This version of the canberra metric is broadly suited to the data set being used because it is not greatly influenced by outliers, is sensitive to differences of kind, and is responsive to proportionate differences as opposed to absolute differences. An additional advantage is its restriction to the range $C_1 \geq 0 \leq 1$ which assists interpretation. The canberra metric, unlike euclidean distance, but on the same principle as the gower metric, is not greatly influenced by extreme observations (outliers) on particular attributes. This form of the metric allows each attribute to contribute $\frac{1}{s}$ to the total dissimilarity calculated for all attributes. The canberra metric has a major advantage over the gower metric as its standardisation is based only on the individuals being compared $(x_{ik} + x_{jk})$, as opposed to a population parameter ($W_k$). This prevents the unintentional introduction of lower weights for attributes effected by extreme observations and is responsible for the measure’s sensitivity to proportional differences. There is also scope for weighting differences of kind as comparisons between observational units default to maximum dissimilarity.
for attributes where one of the values compared is zero. This is useful where it is
considered a static situation as qualitatively different from one showing change or
absence is qualitatively different from presence. The problem is that the capacity of
this version of the canberra metric is limited because it does not extend to
situations where change may be negative without the index becoming unbounded
(Lance and Williams, 1966:1967(a)), a situation which Clifford and Stephenson
(1975,55) warn against.

The mixed sign problem can be overcome by carrying out a transformation to
eliminate sign differences. Two transformations of the attribute matrix \( A_1 \) can be
employed. The first ‘powers’ all elements of the \( A_1 \) matrix such that \( z_{ns} \) becomes
\( z_{ns}^2 \) and the second carries out a ‘selective difference adjustment’ so that where
negatives exist for particular attributes the absolute difference between the minimum
attribute value and zero is added to all values for that attribute. These solutions
change the nature of the data set by removing valuable information and, in the case
of the ‘powering’ solution, actually exaggerate the effect of extremes. The only
alternative is to use a modification of the canberra metric.

Sneath and Sokal (1973,126) point out that Hodson (1969(a)) has used a
euclidean form of the canberra metric suggested by Hartzig:

\[
C_{II} = \frac{1}{n^2} \sum_{k=1}^{n^2} \left( \frac{(x_{ik} - x_{jk})^2}{(x_{ik})^2 + (x_{jk})^2} \right)
\]

(after Hodson, 1969(a))

Preliminary investigation showed the measure to be bounded so that \( C_{III} \) adapted
values \( C_{III} \geq 0, \leq 1 \) for like signs and \( C_{III} > 0, \leq 2 \) for unlike signs, progressing from
2.0 to 1.0 as differences increase. Where there are small differences in large values
the measure loses resolution. In addition to these technical drawbacks \( C_{II} \) squares
differences, introducing undesirable elements similar to those influencing euclidean
distance. These results are only tentative but a more intelligible measure would be
superior. A third version of the canberra metric, credited to Gower by Sneath and
Sokal (1973,126) and to Adkins by Lance and Williams (1967(a),17) has been
suggested:

\[
C_{III} = \frac{1}{n^2} \sum_{k=1}^{n^2} \frac{(|x_{ik} - x_{jk}|)}{(|x_{ik}| + |x_{jk}|)}
\]

(after Lance and Williams, 1967)
This modulus standardisation is useful because it retains all of the desirable features of the original metric and adds the unusual property of defaulting to unity where sign differences arise. As a result, two effects, one for differences of degree and the other for differences of kind, can be embodied in this measure.

It could be argued desirable to introduce sign differentiation by degree so that more subtle weights could be used. It should be recognised that the more extreme effects of these weights are mollified by the previously discussed feature of individual attribute contributions which are limited to \( \frac{1}{n} \) of the total. As a result, large numbers of sign differences are required before the final distance between any two observational units can be appreciably influenced. This is justifiable as the likelihood of process differentiation also increases.

The problem of moving from an established matrix of attributes for observational units \( (A_1) \) to one which represents differences between these units \( (D_1) \) has been examined thus far. This is the most complex problem in selecting taxonomic procedures because of diversity in measures and their representation of differences. The manhattan family of dissimilarities offer an extremely robust representation of differences given Berry’s (op.cit) concern with euclidean problems. In particular, the \( C_{III} \) version of the canberra metric is of most use in this analysis because its features permit a powerful portrayal of differences which is sensitive to major features of the data.

5.1.3 Classification Procedures - Searching for Multidimensional Structure I

The second stage of Sokal’s two stage procedure requires the selection of classification procedures which assist in reducing information in the dissimilarity matrix to manageable proportions. This could be attempted manually but as Hills explains, with reference to large correlation matrices:

The first and sometimes only impression gained from looking at a large correlation matrix is largeness. (1969, 249)

Classification procedures provide one method for reducing the complexity of large matrices by numerically categorising observational units into groups according to their similarities and dissimilarities, as portrayed by the characteristics selected. A multitude of techniques have been developed for solving the classification problem (but not all operate directly on dissimilarity matrices such as \( D_1 \)). Though much pioneering work in this field was done by geographers (Berry,1960; Smith,1965; Berry and Wrobel,1968; Johnston,1968) advances in geography have been overtaken by work in other fields where taxonomic problems assumed greater importance. Johnston recognised the need to look further afield for new techniques with the major reason being that:
A number of recent studies have presented classifications of geographical data using numerical methods which have been adopted from other scientific disciplines. (1968, 575)

This philosophy of multidisciplinary selection seems the most useful given the state of development within geography.

Rational selection of classification procedures is much easier than for dissimilarity measures. Although there are a large number of techniques these are of distinct types so that general criteria can be used to make selections. Two decisions must be made. First, which type of classification procedures is most useful and second which techniques from each type best satisfy research requirements.

Three factors were considered in selecting the most useful type of classification procedures (Appendix II). The first factor taken into account was the distinction between monothetic and polythetic procedures. Monothetic procedures operate by sequentially dichotomising observations using individual attributes, while polythetic procedures consider each distinction according to all of the available information. The polythetic procedures are more realistic as all attributes are treated simultaneously and not in a contrived, sequential manner. Further, they use higher level information more effectively because there is no reliance on simple dichotomisation.

The second factor was the difference between hierarchical and nonhierarchical procedures. In the former, classes or groups of observational units are related to one another so that all individuals can be viewed as members of the same population while in the latter groups are not related. Hierarchical type procedures were preferred for three reasons: i) they attempt to demonstrate links between individuals and the groups of individuals under study (Johnston, 1968, 580); ii) hierarchical procedures are the most developed (Clifford and Stephenson, 1975, 104) and therefore present a wide range of analytical options; iii) they do not require a prior knowledge of group structure whereas nonhierarchical techniques often require judgements concerning the number of groups or designation of ‘seed points’ for group formation. As a result, hierarchical classification procedures provide what Webster (1977, 215) describes as a good “starting point” for analysis.

The third factor is the difference between divisive hierarchical procedures, which successively partition the population, and agglomerative procedures which fuse individuals and groups to form a population. Divisive techniques are superior where there is an interest in upper level groups as there is less distortion since little manipulation is required to identify these. Agglomerative procedures are superior
for identification of lower level clusters. Since little is known of even basic areal differences the agglomerative type of procedure is preferred. As a result of these three considerations, only techniques which are polythetic, hierarchical and agglomerative are of immediate interest.

The second step is to select suitable classification techniques from the nominated type of procedure. There are two conflicting schools of thought as to how technique selections should be made. The first, termed the ‘theoretical school’, is based on the work of Jardine and Sibson (1968). The theoretical school argues that techniques should be selected on the basis of established mathematical properties. The second, termed the ‘pragmatic school’, arises from the work of Williams (Williams, Lance, Dale and Clifford, 1971) and adheres to the notion that techniques, providing the best empirical results, should be used. William’s view results from the observation that techniques selected according to mathematical properties often produce very poor classifications. In the light of work conducted using Jardine and Sibson’s recommendations, the pragmatic view has been adopted. The main consequence is that technique suitability should be assessed from outcomes and not just prerequisites.

The major factor taken into account in selecting classification techniques has been distortion of the taxonomic space produced in fusing individuals to form groups. Distortion results as individuals are fused since dissimilarities are recalculated to reflect differences between new groups and those already existing. Depending on the way this is done, systematic departures from original interindivdual dissimilarities can result. Re-evaluation may distort the original taxonomic space in one of two ways (Clifford and Stephenson, 1975, 106). Firstly, dilation can result where dissimilarities between individuals are increased. This is usually group size dependent so that as individuals are added to groups, the dissimilarity between them and the rest of the population increases. Secondly, space contraction results where the addition of individuals to groups increases resemblance to the rest of the population. Dilation is often characterised by regular size groups with small dissimilarities between elements but large differences between groups, while contraction usually results in ‘chaining’ or the failure of clear groups to emerge. Techniques which neither dilate nor contract the taxonomic space are referred to as space conserving. As the objective of this Study is to investigate dissimilarities in their most original format, space conserving classification techniques are preferable.

Two guidelines have been used in identifying classification techniques which conserve the taxonomic space. The first utilises findings accumulated from
Figure 5-7: Operation of UPGMA Fusion*

developmental research being carried out at the C.S.I.R.O.'s Division of Water and Land Research (D.W.A.L.R.). The D.W.A.L.R. experience has developed through a number of stages with the most recent suggesting that the Unweighted Pair Group Arithmetic Average technique (UPGMA) produces very little\(^8\) distortion and can be described as space conserving. UPGMA is an agglomerative, polythetic fusion technique, i.e. groups are formed by fusing individual observational units according to general similarities (i.e. minimum dissimilarity). This procedure classifies individuals (as shown in Figure 5.7) by fusing the two most similar individuals to form a group. Subsequently, dissimilarities between the new group and the remainder of the population are calculated as the average distance between its members and all other elements of the population. The technique is described as unweighted because all individuals have equal weights. It would be described as weighted were groups to be equally weighted such that individuals had weights inversely proportional to group size. The unweighted technique produces a heuristically better classification because individuals retain constant weights\(^9\).

\(^8\)Reported in an informal workshop at D.W.A.L.R. by Belbin (1983). It was pointed out that developmental work was continuing in this area.

\(^9\)Weighting would be useful where a particular group of individuals was under represented in a sample and weighting was desired to produce a representation of the distance between major groups.
Attention therefore remains firmly with the original distribution of observational units, as it should in an analysis of this type.

The second guideline takes advantage of the finding by Lance and Williams (1969(b)) that many hierarchical-agglomerative fusion techniques are variants of a single linear system. Briefly Lance and Williams show that the distance measures calculated between groups in many fusion techniques satisfy a recurrence formula, such that the distance between a group \((z)\) and a group \((ij)\) formed by the fusion of \(i\) and \(j\) is as follows:

\[
d_{z(ii)} = \alpha_i d_{zi} + \alpha_j d_{zj} + \beta d_{ij} + \gamma d_{zi} - d_{zj}
\]

where \(d_{ij}\) is the dissimilarity between groups \(i\) and \(j\)
\(\alpha, \beta, \gamma\) are parameters, set to simulate intergroup dissimilarities produced by different fusion techniques (following Everitt, 1974:17)

This simulation scheme is the basis for a fusion technique referred to as the generalised fusion procedure. This technique is not of direct interest but rather one which is a derivative of it and referred to as the flexible fusion technique. Flexible fusion is obtained when the parameters of generalised fusion satisfy the constraint:

\[
\alpha_i + \alpha_j + \beta = 1 \quad \text{where} \quad \alpha_i = \alpha_j \quad \text{and} \quad \beta \geq 1, \gamma = 0.
\]

Under this constraint the \(\beta\) coefficient can be manipulated, the effect being to alter distortion of the taxonomic space. This provided valuable insights into the effects of contraction and dilation so that conserving strategies (\(\beta = 0\) in this case, if groups are considered to be of equal weight) could be contrasted with various distortions.

The space conserving behaviour of UPGMA (not directly simulable using flexible fusion) in these, and other empirical, trials is noteworthy.

The end result, where space conserving strategies are sought, is a preference for UPGMA or flexible (\(\beta = 0\)) fusion. Others, such as nearest neighbour, Ward's incremental sums of squares and weighted pair group arithmetic average reveal marked tendencies towards distortion of the taxonomic space through either space contraction or dilation. This is not to argue general unsuitability of these procedures, which work well with specific configurations of observational units or can be used to deliberately highlight specific elements of a data set. However, it is a recognition of the need to consider use of classification with regard to purpose. This requires a series of decisions at several levels relating purpose to technique rather than simply accepting that classification may be useful and any technique can be used for this purpose without great difference in consequence.
Sokal's two stage strategy can also be implemented by substituting ordination for classification in the second stage. A large number of techniques have been developed for ordination. Summaries of these can be found in Everitt (1978); Dale (1975) and Spence and Taylor (1970). Many, such as factor analysis and multidimensional scaling, are special purpose and of little interest here. If Gittin's view that:

Ordination is an exploratory technique of greatest value in the initial stages of a study. (1969,37)

is to be accepted, techniques suited to more general forms of analysis will be required. That most commonly encountered by geographers is principal components analysis (PCA). It has been applied widely with great flexibility and has received wide exposure (King,1969; Harbough and Merriam,1968; Rummel,1967; Cooley and Lohnes,1967). Unfortunately this technique cannot be used in this Study as the dissimilarity measure of greatest interest is noneuclidean.

Another principle axis method developed by Gower (1966) to replace PCA where dissimilarity is noneuclidean or nonmetric, is principle coordinates analysis (PCO). This procedure is analogous to PCA except that an adjustment is carried out which Webster (1977, 15) describes as "euclidating" the taxonomic space. This adjustment transforms the original dissimilarity matrix $D_1$ to a form more suitable for manipulation by conventional principal axes techniques. The latent roots and vectors of are then extracted in the usual manner (Everitt,1978,18). This approach's main limitations, when compared with conventional PCA, (Webster,1977,156) are not relevant in this Study.

As taxonomists are primarily interested in the affiliation of observational units, the benefit of PCA and related techniques is their capacity to reveal these affinities at higher levels of conceptualisation. The drawback with application of such techniques is that they involve complex transformations of original data and disassociate the analyst from the raw data set. For this reason, ordination has been used here as an adjunct to classification since it provides an alternative view of interarea differences.
5.1.5 Diagnostic Procedures - Searching for the Sources of Structure

Acceptance of diagnosis as a legitimate component of numerical taxonomic analysis is the most important development in recent work because it introduces a capacity to formally examine taxonomic relationships. This has been crucial in the development of exploratory capacity because views of pattern are opened to inspection. As pointed out earlier, diagnosis can be simplified by decomposition into types, the first contrasting results from high level processing such as classification and ordination, and the second applying techniques developed for diagnosis. The former approach is useful where different versions of strategy can be reasonably proposed. As the techniques involved have already been examined these need no further discussion. The latter, which have received little attention, are of two types: those oriented towards extended investigation of interentity dissimilarities and others designed to facilitate search of attribute sets for systematic sources of differentiation. Only the six diagnostic routines used in this Study will be discussed in detail, five being concerned with interentity dissimilarities and one with attribute contribution patterns. The apparent bias is due to the expressed emphasis on form in the first case and the complexities of discerning pattern in the latter. Interentity diagnostic routines are again of two types, the first providing direct insights into classification and the second, pairwise views of interentity affinities. Two of the former have been used in this Study:

i) Dendogram Production (numerous sources) - This diagnostic produces a two dimensional hierarchical representation of the fusion procedure showing interentity affinities according to dissimilarity measures. Whilst comparatively common this procedure is one of the most important in numerical taxonomy because it allows group formation, with all necessary information, to be represented visually. As such, it conveys a very clear impression of class formation. The major limitations of the dendogram are that it produces only a two dimensional representation of multidimensional relationships and it does not focus on the particular level of pattern desired. The first of these can be offset by manipulating the dendogram, pivoting individual fusions, or larger groups, on their axes to obtain better representations of pattern. The second can be overcome by avoiding the distractive influence of the lowest dissimilarity groupings and concentrating attention at higher levels.

ii) Dendogram Comparison (CMPD) (Belbin,1982) - CMPD is an experimental program which extracts three summary measurements from hierarchical fusion procedures. These are: level of first fusion for each individual; order of each individual's first fusion; and level of every fusion. Collectively, these summarise major facets of fusion. The object of this procedure is to produce attributes from each classification so that they can in turn, be classified or ordinated. This type of procedure is especially important where data sets consist of several dimensions because classifications from each dimension can be produced and compared. This is potentially useful because formal impressions of internal diversity can be gained.
Three pairwise interentity diagnostics have been used in this Study. These shift attention to the relationships which exist between individuals without classifying or ordinating. As a result, they present an unequaled opportunity to manipulate the dissimilarity matrix in search of sources for higher level pattern. The procedures chosen were:

i) **Minimum Spanning Tree (MST)** (numerous sources) - This procedure searches the original dissimilarity matrix and constructs networks from original differences which show affinities between observational units by satisfying global minima. Four criteria are imposed for identification of minima:

a) each observational unit is contacted by at least one link;

b) links do not form closed loops;

c) all elements form one structure, i.e. no isolated groups;

d) the sum of links (measured by dissimilarities) is a minima (note - solution may not be unique).

The power of this procedure is that it demonstrates affinities from original dissimilarities so there is no recalculation of differences through fusion or changes due to transformation (as in PCO). Consequently, a clear overview of original dissimilarities can be obtained. Though there is some confusion as to whether MSTs constitute classification, ordination or diagnosis, application here is intentionally diagnostic because it is used as a selective reference to original dissimilarities to check on the distortions of classification and ordination. This is done in the first case by direct comparison of graphically scaled MST links with classification results (MST proximity should translate into group membership). In the second, interpretation of PCO plots is improved by overlaying MST links (but not actual dissimilarities) because this allows a contrast between original associations and those portrayed by principle axes.

ii) **Nearest Neighbour (NN)** (Belbin, 1982) - This routine searches dissimilarity matrices and identifies nominated numbers (n) of observational units most like specified individuals in terms of original dissimilarities. The difference between this and other nearest neighbour routines is that system wide constraints do not restrain the definition of dissimilarities. Nearest neighbours selected in this way are best typified as local by contrast to global minima. These shift attention from system wide considerations to the particular affinities of one observational unit with others. The procedure is extremely useful for gaining insights into the networks associated with individual areas and so the affinities responsible for group composition.

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10Gower and Ross (1969) have established a relationship between single linkage (nearest neighbour) clustering and MST procedures, leading Webster (1977,176) to conclude that the two are analogous. Conceptually, however, it can be thought of as an ordination device because it represents multidimensional differences in reduced format without resort to grouping. This parallel can be extended when it is realised that lower order MSTs can be extracted from dissimilarity matrices, controlling for those dissimilarities already chosen.
iii) Bond (Belbin,1982) - As with NN, bond is a procedure which searches original dissimilarity matrices but, in this case, it seeks to qualitatively categorise the strength of links between observational units and their neighbours. This categorisation is based on the concept of a bond, that the affinity between observational units is reflexive and strength of affinities is directionally variable. For example, the bond between two observational units A and B depends on the relative strength of A's link to B and B's to A. Hypothetical bond situations between A and B can be annotated as follows, depending on the relative strength of affinities:

<table>
<thead>
<tr>
<th>Bond</th>
<th>Situation</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A_1 - B_1)</td>
<td>A and B are mutual nearest neighbours;</td>
</tr>
<tr>
<td>(A_1 - B_2)</td>
<td>A's nearest neighbour is B but B is only A's second nearest neighbour;</td>
</tr>
<tr>
<td>(A_2 - B_1)</td>
<td>A's second nearest neighbour is B but A is B's nearest neighbour;</td>
</tr>
<tr>
<td>(A_2 - B_2)</td>
<td>A and B are mutual second nearest neighbours (both have a higher affinity with some other observational unit)</td>
</tr>
</tbody>
</table>

Obviously large numbers of bond situations can be envisaged from even small data sets. Many observational units will only be represented in some bond categories. Like NN, bond concentrates attention on individual networks but provides a more structured view of group composition and its sources.

Individually, each of these diagnostics is powerful but collectively, they add a new dimension to exploration because they increase capacities to search the sources of interentity affinity. All are characterised by simplicity and seek to reduce the obscurity of higher level analyses. This field is advancing rapidly, with three of the procedures being experimental when used and not formally published. It is these developments which sustain numerical taxonomy as a highly useful strategy for geographical exploration.

**Attribute diagnostics** are oriented towards the presentation of information on attribute associations with taxonomic pattern. Those chosen for use are exclusively applicable to classification because, at the risk of pre-empting later findings, this approach proves to be the more useful in this analysis. The most frequently encountered procedures available for attribute diagnosis involve: use of summary statistics for groups (centroid and dispersion measures for each attribute and group); and attribute contribution indices which reveal association between multiple group differences and those occurring naturally in each attribute. (Dale et.al.,1981; Lance and Williams, 1977; Lance, Milne and Williams,1968; Stimson,1972).

Derivation of summary statistics for various group configurations is the most commonly encountered method of investigating attribute patterns. This is only
useful where the number of attributes is small or can be restricted in some way. Routines used to produce summary statistics are similar in concept, but there are notable differences which distinguish some as more useful for exploratory data analysis. These use robust measures which are less distribution dependent and can be found in routines applying median and various ranging measures, e.g. the interquartile range (McNeil, 1977). This approach to diagnosis has not been chosen for use here because: the number of attributes is so large as to prohibit detailed assessment whilst maintaining an orientation towards place; and interest does not lie in conventional documentation of differences between individual groups but in the more general problem of place and its role in labour exchange.

The use of attribute contribution indices has developed because of the diagnostic and interpretative limitations of simple summary statistics. Attribute contribution indices, as used in conjunction with classification procedures, are designed to individually provide an indication of attributes which contribute most to multiple group differences and collectively suggest more general sources of distinction. Strictly, the term contribution index is a misnomer when used with polythetic classification because group patterns are the result of combined attribute effects. Individual attribute associations with group differences are therefore only indirectly indicative of attribute contributions because specific attributes are not directly responsible for group differences. This compromise must be accepted however, as alternative solutions present other problems.

The choices involved in selection and use of attribute contribution indices are much more complex than for group statistics. Many indices could be used in this role. The index chosen is that developed by Lance and Williams (1977) which was derived from Cramer’s (1949) constrained $\chi^2$ test ($\chi^2 \geq 0, \chi^2 < 1$). For numerical data Cramer’s test may be generalised to the one-way analysis of variance (ANOVA) equivalent:

$$S = \frac{1}{T}P$$

$B =$ between group variation  
$T =$ total variation of nominated population.
(high $S$ ratios indicate stronger associations with nominated intergroup differences and lower $S$ ratios indicate weaker associations).

The index patterns provide a basis for interpreting the meaning of interarea differences when produced for all attributes and spatial partitions of interest since broad patterns of attribute contribution can be discerned.

The $S$ coefficient was selected because it has three features which are of use in
exploratory analysis where classificatory strategies are being applied. The first is that as a simple variance ratio\(^{11}\) (with numerical data) it is suited to the needs of the exploratory data analyst. Since it is not an established probability statistic it cannot be easily abused to test statistical significance of group differences, a course not recommended with most clustering procedures as groups are derived without recourse to the underlying statistical distribution of data. Those indices used should therefore require minimal assumptions of this type\(^{12}\). The second feature is that it can be applied to attributes regardless of data type, even though there are reservations about its direct comparability in such situations because of differences embedded in types of measurement. Although this facility is not required with the current data set, it may be of use in any extension work. Finally, the S coefficient can be used to compare more than two groups at a time, a limitation of the C.S.I.R.O.’s GROUPER routine and many of the non parametric tests for differences between group centroids. As classifications may consist of numerous groupings, it is important that there be a facility for multiple group comparisons. Added to these features is the advantage that this index has been applied and tested with classificatory problems, by Lance and Williams (1977) in the first instance and by Belbin in development of the NUMERICAL TAXONOMY PACKAGE (NTP).

Simpler diagnostics will be encountered elsewhere in this Study but as these are primarily graphical they are best dealt with as encountered.

A useful range of diagnostic routines have, in recent times, been associated with numerical taxonomic techniques so that acceptance of high level results as

\[ (A_i - \bar{A}_T) = (A_i - \bar{A}_G) + (\bar{A}_G - \bar{A}_T) \quad \bar{A}_G \text{ group attribute mean} \]

The sum of this term squared produces a version applicable to all observations:

\[ \sum_{i=1}^{N} (A_i - \bar{A}_T)^2 = \sum_{i=1}^{N} (A_i - \bar{A}_G)^2 + \sum_{i=1}^{N} (A_i - \bar{A}_G)(\bar{A}_G - \bar{A}_T) + \sum_{i=1}^{N} (\bar{A}_G - \bar{A}_T)^2 \]

Since \( \sum_{i=1}^{N} (A_i - \bar{A}_T)^2 \) the second term is zero by definition the reduced form is:

\[ \sum_{i=1}^{N} (A_i - \bar{A}_T)^2 = \sum_{i=1}^{N} (A_i - \bar{A}_G)^2 + \sum_{i=1}^{N} (\bar{A}_G - \bar{A}_T)^2 \]

The first term is within group variation and the second between group variation. The greater the ratio between these two components:

\[ F = \frac{\sum_{i=1}^{N} (A_i - \bar{A}_G)^2}{\sum_{i=1}^{N} (\bar{A}_G - \bar{A}_T)^2} \]

the more likely a significant group structure. Since group membership is the independent variable the ratio:

\[ S^2 = \frac{\sum_{i=1}^{N} (\bar{A}_G - \bar{A}_T)^2}{\sum_{i=1}^{N} (A_i - \bar{A}_T)^2} \]

expresses the explained variation as a ratio of the total variation. (following Johnston, 1978).

\(^{11}\) As a simple variance ratio the S coefficient provides an indication of the proportion of variance accounted for by the partition of observational units when the assumptions of the ANOVA model are satisfied. Since variation can be decomposed into two components, within group (unexplained) and between group (explained), it follows for any attribute observation \( A_i \) that deviations from the population mean \( \bar{A}_T \) can be expressed as:

\[^{12}\] Developmental work is currently under way to produce better contribution indices based on more robust identification of centroid and dispersion, in particular, derived from medians and with more flexible treatments of dispersion.
'black box', definitive solutions is no longer acceptable. Diagnosis is becoming an integral part of numerical taxonomy because it provides a basis for assessment, independent of classification or ordination, and a scope for extended understanding of results from taxonomic studies of form. This is especially important with geographical analysis because the observational units, and relationships between them, are inherently complex.

5.1.6 An Overview of the Numerical Taxonomic Strategy

This combination of techniques results in a very complex analytical strategy which, though based on Sokal's two stage construction, is better described as a three stage strategy because of the heavy emphasis on diagnosis (Figure 5.8). In reconsidering the techniques combined to form this strategy, it is well to recall the view of Williams and Lance regarding technique selection and the objectives to be achieved:

The user requirement, which can be seldom stated precisely, is to find some pattern, order or structure in the system which will permit either the economical description of the system or the generation of fruitful hypotheses concerning its origin. (1968, 31)

The techniques used in this Study have been chosen to enhance the scope for analysis in conditions of uncertainty.

Exploration is often thought inferior to analyses which purport definitive treatments because it is mistakenly ascribed a lack of rigour and thoroughness. As can be seen from Figure 5.8, exploration actually extends the analytical framework embraced in more conventional analysis. This is only possible because of technical developments in numerical taxonomy, but is underlain by two factors which contribute more specifically to superiority. First, the logic of analysis is comprehensive and iterative, seeking to examine and re-examine propositions in order to ascertain their robustness. This is important because it involves additional syntheses of information rather than 'matter of course' tests resulting in per se judgements which may ignore important detail or be otherwise inadequate due to inflexibility. Second, there is an explicit recognition of complexity in problems being addressed rather than a naive assumption of simplicity. Since inadequacy stems from analytical factors including theory, concept and technique, rather than the problems being investigated, it is rationally inconsistent to distort the character of problems to satisfy procedure. The reverse must be done by adjusting analytical procedure to problems.
An MATRIX content; 117 attributes for 150 areas In non-metropolitan N S.W.

MST output:
- ordered lengths for minimum spanning tree

VECTOR PLOTS output:
- three-dimensional plots
- eigen vectors and MST

On MATRIX output:
- similarities and dissimilarities between local areas in terms of nominated distance measures

ORDINATION PCO output:
- eigen vectors, eigen values, and trace
- two-dimensional vector plots

CLASSIFICATION UPGMA FLEXIBLE (γ = 0) output:
- fusion table showing order and level of area fusions

DEND output:
- two-dimensional dendrogram

NN output:
- specified nearest neighbours
- raw distance scores
- mean distances

ATT CONT output:
- contribution coefficients

CMPD output:
- information on content differences

BOND output:
- strength of entity associations

a Two Stage Serial Type Strategy

Miscellaneous Algorithms in Operational Use

Figure 58: Options chosen using XTP and
5.2 Data Extensive Analysis - Constraining the Taxonomic Space

Data selection and use are amongst the most important tasks in exploration because the first defines the taxonomic space which is the subject of analysis and the second, determines how resultant patterns will be treated. These two tasks are also amongst the most difficult because they are restrained by available information and the absence of comprehensive theory concept and empirical work to guide selection and use. This problem is further compounded because it has been decided to restrict selection and interpretation to outcomes from the labour exchange process and to extensively disaggregate dimensions for which attributes are selected to increase the role of nature in differentiation. Consequently, selection is pragmatic, a common result in the majority of data extensive analyses, as can be seen from the work of Walmsley (1980), Knox (1978), Webber and Craig (1978), Vinson and Homel (1977), Logan (1970), Lewis (1968) and Berry (1965). Selections could be justified, according to some of the obtuse theoretical work, to emerge on establishment of extensive social research data sets such as that of Cuyler, Lavers and Williams (1972), Land and Seymour (1975), Bebbington and Davies (1980(a); 1980(b)), Clayton (1983) and Cutter (1985). These are of little direct use however as they are not theories in the formal sense. Further, they are conceptually insular, as with the preceding empirical work, and only marginally applicable to labour exchange. This problem is aggravated with much of the pragmatic work which has been completed because many, e.g. Sorensen and Weinand (1983) and Grove and Roberts (1980), all but fail to discuss their selection procedures. The dominance of pragmatic responses to the selection problem is indicative of the stage to which data extensive analyses have developed and the subsequent need for a recognition of their exploratory basis.

Discussion of data specification will be in three parts. The first will examine the criteria for selection of data and the actual results of selection. The second and third will illustrate the kinds of problems which can be expected from the data selected and the difficulties which arise when attempts are made to ascribe indicator status in a data extensive environment. In many studies, these subjects are given low priority but they are crucial in exploratory data analysis because uncertainty concerning application is a major consideration. The grounds for uncertainty must as a result be established if an exploratory stance is to be fully justified.
5.2.1 Data Selection

The selection procedure should be treated at two levels, one for dimensions and the other for attributes. Three criteria have been important in the selection of dimensions. The most restrictive has been the availability of data at spatially local scales. In a confirmatory analysis, this limitation can be disastrous especially if surrogates are not available. However, restriction of scope in this way is not such a problem in exploratory studies because the investigative orientation is towards what can be learned from available data rather than what might be learned from theoretically desirable data. The next criterion is that sufficient information must be available on any dimension to permit disaggregation. This is essential if the variation within a particular dimension is to be appreciated. The final criterion differs from the first two as it imposes a conceptual, rather than operational limitation, i.e. that all dimensions selected closely reflect some aspect of localised labour exchange process. Strict application of this criterion is the only way to 'filter' data considered for use. Selection of dimensions is, consequently, pragmatically reductionist testing possibilities against availability, scope for detailed disaggregation and relationship to labour exchange.

Application of these criteria resulted in a set of six dimensions specified by 117 attributes. The resulting dimensions, and actual attributes constituting them, are shown in Table 5.1. The sources for each were the censuses taken between 1966 and 1976. Although this configuration of attributes and dimensions is clearly a compromise, forced by availability constraints and manageability, its coverage is fortuitously comprehensive, providing information on key elements of labour exchange. These can be related at a dimensional level, as in Figure 5.9, where it can be seen that four dimensions refer directly to different facets of involvement in formal labour exchange. These could be seen as initially pivoting on the participation dimension, the quantity of work dimension focusing on degrees of participation with the unemployment and employment dimensions partitioning participation into its two key components. The income and migration dimensions extend this subject by introducing remuneration for involvement and spatial mobility of those eligible for formal participation.

Selection of attributes to represent each of these dimensions at a detailed level of internal disaggregation is extremely difficult because the definitional character of dimensions can be subjugated by treatments which are too complex. The simplest representation of each dimension could be attained by choosing one commonly available source of differentiation, e.g. demographic factors such as sex and age. Even this solution is not possible as there are dimensions to which this
direct involvement in formal labour exchange

E  employment
I  income
QW quantity of work
U  unemployment
P  participation
M  migration
Table 5-1: Localised Labour Area Characteristics Organised in Dimension and Attribute Format.

<table>
<thead>
<tr>
<th>Labor Market Performance Attributes (129) Organised by Dimensions (6)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LABOUR FORCE PARTICIPATION (LFP) DIMENSION</strong></td>
</tr>
<tr>
<td><strong>UNEMPLOYMENT DIMENSION</strong></td>
</tr>
<tr>
<td><strong>EMPLOYMENT DIMENSION</strong></td>
</tr>
<tr>
<td><strong>INCOME DIMENSION</strong></td>
</tr>
<tr>
<td><strong>QUANTITY OF WORK DIMENSION</strong></td>
</tr>
<tr>
<td><strong>MIGRATION DIMENSION</strong></td>
</tr>
</tbody>
</table>

**Labor Force Participation (LFP) Dimension**

1. All unemployment %'s expressed as a proportion of the relevant wage and salary earners category (that in the previous period for changes over time).
2. % difference for unemployment change is expressed as a proportion of the nominated attribute for t-1.
3. % in any category is shown as a proportion of total families.
4. Expressed as a proportion of the working age population (15 years and over).
5. Absolute differences between participation rates.
6. Migration is expressed as a proportion of the number of individuals in the specified age group for 1976.
7. Original definitions of characteristic components are available from ABS census documents.

Source: ABS.
disaggregation does not apply, such as family income. The result is a less systematic decomposition of dimensions than would be desirable to simplify interpretation. Offsetting this is an increased diversity in dimensional composition (Table 5.1) which is more sensitive to major themes of dimensionally important variation.

Acceptance of a need to recognise dimensional diversity in this analysis created one major problem, an initial data set of unmanageable proportions (over 800 attributes per observational unit). The selection used here is a subset of these. Unlike the dimensional selection, however, criteria could not be universally applied with each set of attributes being evaluated according to less general criteria. The most complete representation of each dimension can be obtained by including characteristics which deal with incident and proportionate representations whilst referring to situations at each point in time as well as changes over time. However, it was decided to use only proportionate representations as relative differences are of more general interest than absolute. This left only proportionate information on cross sectional patterns for each year of interest and proportionate changes between these. The result was a smaller set of attributes than at first appears because attributes for many dimensions can only be derived cross sectionally as suitable information is not available for all years. Where this occurs, attributes for the 1976 period were used due to diversity with onset of the recession (Chapter 3). Data for income, quantity of work and migration dimensions have been circumscribed in this way. Of the remaining dimensions, it was decided that cross sectional views for each would be used unless they were not particularly revealing of areal differences. This qualification applied to the participation dimension and, to a lesser extent, the employment dimension where data reflecting shifts over time were selected to highlight areal differences. This left only the unemployment dimension where a composite of cross sectional and longitudinal attributes were used for each area because of severity at each point in time and changes between them were notably different (Chapter 4).

The dimensions and attributes of labour exchange in place selected for use in this Study have been described (Appendix 1). Collectively they reflect a diversity of coverage, the elements of which are definitionally associable. Specification, however, involves an appreciation of limitations, for it is these which control usage and inhibit development of faithful confirmatory models with overtly normative

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13 Income data are available at a spatially disaggregated scale from taxation records but the areal breakdown is not at the local scale. Also, migration data are not readily available at the local scale prior to 1976, but by definition migration deals with changes over time, the 1976 record being based on personal recollection. This dimension is longitudinal in concept but cross sectional in measurement.
applications. These issues must now be examined if specification is not to be a qualified recantation of available material.

5.2.2 Observational Distortion: An Illustration

Though the shortcomings of these sources were discussed in Chapter 2, few have been illustrated at the attribute scale and this is necessary as a prelude to data extensive analysis, so the need for care is understood. The more general problems of enumeration, local area boundary changes and the sampling base of the 1976 census were adequately treated in Chapter 2. The point made in earlier discussions of this issue, that the effects of a data problem can vary between places and social characteristics, is equally applicable to the difficulties raised below. Not all of the problems listed in the second chapter are illustrated, e.g. intercultural differences in response to questions, but this should not be taken to mean that they do not exist or are unimportant. It simply means that obvious examples were not apparent from the data set. Six illustrations have been chosen:

i) differences over time due to changing social values. The recorded change in female participation rates between 1971 and 1976 has been high in some rural areas. Others, such as Cunningham (1979) and Moir (1980) have also observed this phenomenon. The general opinion seems to be that a change in response has occurred without any change in actual activity. The explanations for this vary from the income sharing view (spread of tax burden) to the notion that female values have changed so that previously unrecognised work is now being recorded. As yet, there is no conclusive diagnosis of the problem and some, such as Clark\(^{14}\), suggest that it may, in fact, reflect a real shift in participation.

ii) High nonresponse to some census questions. This particular problem is most obvious with income data from the 1976 census where the nonresponse category often exceeds 10%. The seriousness of this problem arises from the fact that many of the income categories used contain much smaller proportions of the population than does the nonresponse category.

iii) Recollection inaccuracies and interperative licence. The migration question, which requires individuals to recall their place of residence in 1971 (for the data being used here), appears subject to this problem. Comparisons with demographic information taken from the 1971 census revealed only crude associations with those derived from 1976.

\(^{14}\)Pers Comm (1981)
recollections. In some cases, extremely high outmigration results were obtained. Differences between 1971 and 1976 data were aggravated as the 1971 records used for checking were defacto counts while those used for 1976 matrix tapes were de jure estimates. Nevertheless, questions as to the accuracy of these data remain.

iv) Inadequacies in the conceptualisation of social characteristics. The clearest examples of this problem are with the unemployment and migration data. As unemployment has already received considerable discussion, attention will be limited to the migration data. A properly conceived measure of migration should record all permanent movements by members of the population. The current measure records only differences in place of residence as at June 30th 1971, as opposed to the same data for 1976. There is no complete record of moves between these dates nor where back migration has occurred before 1976.

v) Changes to questions used in collecting information and its categorisation. This has occurred with the employment questions where minor changes in the format of questions can be found. Also, in the 1976 census, occupational status data on the labour force was classified differently from the earlier censuses such that self employed and employers became one category. The precise reasons for these changes cannot be determined but they serve to inhibit longitudinal comparison.

vi) Variations between different secondary sources. This is best exemplified with the unemployment data which was extracted from the Commonwealth Employment Service records and used in the previous chapter. To maintain some consistency, only census data have been chosen for use in the following chapters.

These problems are of such magnitude that they can only be eliminated in the precollection and collection stages of data compilation. This should not be interpreted as criticism of the Australian Bureau of Statistics or its efforts in this field. Rather, it points towards the inevitable defects of data which can be expected when presented with a collection problem of this magnitude over both time and space.

Recognition of these limitations is important in establishing the need for exploratory data analysis because they reveal the scant opportunity for true confirmation in spatial analyses. The sources of inadequacy are widespread, poorly documented and all but impossible to control. Yet, these data are the best available for investigation of spatial form and provide the only avenue for empirical

15As a result of this there were serious reservations as to the accuracy of these data. However, preliminary tests did not produce sufficient grounds for abandoning their use. As a precaution, net migration data originally produced for use in this Study were excluded from the data set so as not to overweight this dimension.

16D.T. Rowland, of the ANU’s Department of Demography, and J. Mackay of Monash University’s Department of Geography, provided data to verify results.

17A supplementary question referring to 1975 was asked but this by no means completes the record.
research. Exploratory data analysis does not control these problems but offers an alternative treatment of data whereby findings are qualified in the necessary way as stimulants to formally generated questions and hypotheses.

5.2.3 Data Interpretation: Characteristic vs Indicator Modes.

There is a preoccupation in social research with ascription of normative values to findings, regardless of appropriateness. General objectives were discussed in Chapter 2 and these can now be illustrated with reference to the current data set in spite of comfortable precedent. (Australia-Department of Home Affairs and Environment, 1983; Armstrong and Taylor, 1978; Brown and Burrows, 1977; Canada-Economic Council of Canada, 1977; Stilwell, 1974; Logan, 1970; Pullen, 1966; Rawstron and Coates, 1966). It is important that this problem be addressed because, even where it is possible to ascribe such values, the task is complex, laborious and can have an indefinite result.

Inappropriate imposition of indicator status can be demonstrated for this data set by ascribing the most obvious normative meaning to observations. This has been done in Figure 5.9 where stylised response continua have been established for each dimension. These continua, hypothetically relate attribute states for each dimension to performance levels (desirable or undersirable). The earlier discussion of justifications for using unemployment as an indicator of performance was informally based on a similar continuum. Figure 5.10 reveals the great potential for interpretative difficulties where an indicator mode is adopted.

These will be either conceptual or operational. Conceptual obstacles are of two types. Firstly, it is necessary to identify an association between variation in any attribute to be used as an indicator and a normative performance schedule which distinguishes between universally ‘good’ and ‘bad’ situations. Specification of such an association is usually contingent upon assumptions, such as those shown in Figure 5.10. These are often difficult or impossible to substantiate and can be challenged on one or more grounds. Examples from this data set include:

i) Large increases in participation or employment need not indicate good performance as they can result from: the volatility of small local populations; low values in earlier periods so that large increases only constitute a ‘catch up’; or the provision of low quality work with poor incomes or exploitative practices.

ii) High concentrations of families in low income categories need not be ‘bad’ e.g. retired people with low income commitments but high asset stocks would appear poor whilst not suffering undue hardship.

iii) High concentrations of individuals in part time work categories (<35 hours) indicates good performance only if members of this group do not
Figure 5-10: Stylised Continua Illustrating Potential Normative Interpretations at the Dimensional Level.

<table>
<thead>
<tr>
<th>DIMENSIONS</th>
<th>STYLISED PERFORMANCE SCALES</th>
<th>ASSUMPTIONS AND JUSTIFICATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SMALLER CHANGES OVER TIME</td>
<td>A positive association between employment changes and differentials in economic opportunity between areas results from increased access to pecuniary benefits of employment.</td>
</tr>
<tr>
<td></td>
<td>LARGER CHANGES OVER TIME</td>
<td></td>
</tr>
<tr>
<td></td>
<td>UNDESIRABLE PERFORMANCE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DESIRABLE PERFORMANCE</td>
<td></td>
</tr>
<tr>
<td>EMPLOYMENT</td>
<td>Indicator condition</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PERFORMANCE SCALE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ASSUMPTIONS AND JUSTIFICATIONS</td>
<td></td>
</tr>
<tr>
<td>INCOME</td>
<td>Indicator condition</td>
<td>A positive association between income levels and material well being of one local area relative to another. A larger proportion of families in higher or better income brackets means fewer people with a poor control of material resources.</td>
</tr>
<tr>
<td></td>
<td>PERFORMANCE SCALE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ASSUMPTIONS AND JUSTIFICATIONS</td>
<td></td>
</tr>
<tr>
<td>QUANTITY OF WORK*</td>
<td>Indicator condition</td>
<td>A positive association between differentials in the quantity of work and material well being between areas results from greater access to pecuniary benefits of employment.</td>
</tr>
<tr>
<td></td>
<td>PERFORMANCE SCALE</td>
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<td></td>
<td>ASSUMPTIONS AND JUSTIFICATIONS</td>
<td></td>
</tr>
<tr>
<td>UNEMPLOYMENT</td>
<td>Indicator condition</td>
<td>A negative association between unemployment and material well being of one local economy relative to another. Fewer unemployed results in a greater proportion of the population having access to the pecuniary benefits of employment.</td>
</tr>
<tr>
<td></td>
<td>PERFORMANCE SCALE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ASSUMPTIONS AND JUSTIFICATIONS</td>
<td></td>
</tr>
<tr>
<td>PARTICIPATION</td>
<td>Indicator condition</td>
<td>A positive association between changes in participation and differentials in material well being between areas results from notion that areas of highest activity are areas of highest opportunity.</td>
</tr>
<tr>
<td></td>
<td>PERFORMANCE SCALE</td>
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</tr>
<tr>
<td></td>
<td>ASSUMPTIONS AND JUSTIFICATIONS</td>
<td></td>
</tr>
<tr>
<td>MIGRATION</td>
<td>Indicator condition</td>
<td>A positive association between in migration and economic opportunity and a negative association between out migration and economic opportunity is a function of opportunity perception differences between areas.</td>
</tr>
<tr>
<td></td>
<td>PERFORMANCE SCALE</td>
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<tr>
<td></td>
<td>ASSUMPTIONS AND JUSTIFICATIONS</td>
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</tbody>
</table>
desire to work full time or overtime. The same applies to those working hours in excess of the norm.

iv) Directional migration flows, when used as indicators of variations in labour area opportunity, could be misleading because many movements are motivated by other factors, e.g. environmental and lifestyle preferences.

From this, it should be clear that association of attribute variations with performance criteria is a difficult matter under many circumstances.

The second factor is that each attribute must have a ‘stand alone’ capacity for normative interpretation if meaning is not to be contingent on other factors. That is, the association between variations in attribute values and its performance continuum must not be conditional on observations for other attributes or dimensions. This is very difficult to sustain because even accepted interpretations such as the association between unemployment and labour market performance is dependent on a knowledge of mobility in spatial situations. For example, areas of low unemployment and so ‘good’ performance may have simply been ‘abandoned’ by unemployed labour because employment opportunity is minimal. This problem is compounded in analyses such as this one where information for key dimensions has been highly disaggregated to provide a better impression of dimensional variations. For example, the ‘stand alone’ meaning of variations in concentration of people in middle income categories is very difficult to discern because its normative significance is almost completely dependent on concentrations in other categories. Conceptually, normative interpretation is not so easily attainable as is widely assumed.

Two operational problems arise as a direct consequence of these conceptual obstacles. The first is that many social and economic measurements do not have ‘stand alone’ normative interpretations. Undoubtedly, composite indices could be derived which increase the normative utility of many attributes, but this defeats the purpose of a simple system of indicators and would be very difficult to develop in a data extensive environment. Even then, it would not be feasible for information associated with many dimensions, such as quantity of work, where there is no information on preferences for quantities of work. The second is that simple performance continua are often difficult to derive at a dimensional level which reflect attribute variations because complex reversals occur where detailed attribute disaggregations are used. One of the more complex examples in Figure 5.9 is for the income dimension where a gradient from lowest to highest categories has been assigned reverse meanings with the effect that, at some intermediate point, normative interpretation is indefinite.
A reasonable conclusion from these observations is that the conventional indicator mode of interpretation is not generally justifiable in this analysis. The characteristic mode of interpretation (discussed in Chapter 2) is more appropriate because it does not 'stress' conceptually and operationally fragile information by placing unsatisfiable demands on it. Application of this interpretative stance stems not from the value of a priori judgements which ascribe general meaning, as with conventional indicators, but their ex-post capacity to provide unanticipated insights into the nature of differentiation. The justification for such an interpretative stance stems solely from the relationship of observations to specified social and economic processes, in this case, the labour exchange process. Interpretation follows on the basis of observed pattern, developing an inductive and inherently exploratory view of areal differentiation. The philosophy of exploratory data analysis is critical in this situation because its inherent flexibility removes constraints which would otherwise inhibit adoption of characteristic mode interpretation.

5.2.4 An Overview of Data Selection and Interpretation

Selection of dimensions and attributes is pragmatic and interpretation search oriented. This stance has developed as a response to the perceived limitations of data available for analysis of nature in differentiation. These difficulties have been discussed at length and it has been argued that their ramifications are most debilitating for confirmatory or definitive types of analysis which rely on desired data rather than available data with all its deficiencies. It is possible to develop theories to support the former type of approach, where problem identification restricts concern to a small number of areal attributes, for which sound information is available. This becomes increasingly difficult as the scope of identified problems expands since testable theory must be constructed around the deficiencies of data. This is not theoretical development but a post hoc manipulation of concept to circumvent the inadequacies of information. As such, it is inductively pragmatic but couched in terms of widely acclaimed deductivism, regardless of applicability. This illusion, with its consequences for selection and interpretation of data, has been dispensed with here because it can only serve to mislead with a problem of this magnitude.

5.3 Conclusion

A multidimensional exploration of local labour area patterns using an extensive data set is tenable in terms of strategy, technique and data availability. The purpose is to apply technique to data which will enable a thorough search for
structure in labour area differences. This is very different from conventional analyses which seeks to group the known, because there is a strong emphasis on searching for the unknown. The difficulty with place in labour exchange is that many of the phenomena being analysed are not directly observable and may be exceedingly complex. Hence, particular views of differentiation may be difficult to interpret as they can relate to unobserved or unobservable factors. Such views of differentiation must be regarded with scepticism and explored in great detail to elucidate varying patterns which may reflect thematic differences. This involves exhaustive manipulation of observations which is more comprehensive in intent than many confirmatory alternatives. The end result is an analysis which is sensitive to the limitations of knowledge and seeks to advance its bounds by use of the available rather than maintaining a preoccupation with the desirable but often unattainable.
APPENDIX H
Figure H-1: Options in Selection of Classification Procedures.

Source: After Clifford and Stephenson, (1975)
APPENDIX I
FURTHER NOTES ON ATTRIBUTE SELECTION

Special features of this selection warrant further discussion if the reasons for choices are to be understood (the quantity of work dimension is excepted from this discussion as attribute selection is determined wholly by availability). Firstly, the employment and unemployment attributes were selected to complement one another because they show both sides of the employment situation over the period 1966-76. A more detailed disaggregation of the unemployment data was not undertaken because of the small magnitudes involved and the problems this creates due to the sampling base of the 1976 census. There was scope to extract information from the census matrix tapes on special interest groups (i.e. other than decomposition by sex) and this was done\(^1\). The disaggregation of employment change data was used because it was the only relatively consistent disaggregation back to 1966, other than age. As age was used with the participation dimension, duplication would have resulted had it also been used with employment. Secondly, family income was used in preference to individual or household income because the latter two can be influenced by a variety of factors which confuse impressions of the remuneration situation. For example, individual incomes might appear quite low because of concentrations in part time work but where this kind of activity provides additional sources of income, the overall remuneration position at the family scale may be quite high. Equally, distortions may arise with household data where relatively independent individuals cohabit and produce an impression of high household income when individual incomes are moderate or even low. The family unit has been chosen as it is likely to constitute the least trivial\(^2\) source of variation. Thirdly, the use of participation data for only the period 1971-76 was determined by the quantity of data available. Had the data for 1966-71 and 1966-76 been used, this dimension would have received an unduly high weight in any subsequent analysis.

\(^1\)Unemployed seeking first job or a job other than first job should also be treated as special interest with the fortunate proviso that information on this subject was released for 1971.

\(^2\)Investigations for the South East Region of N.S.W. have shown a high degree of association between the three income series.
where dimensions were combined. The most critical period is that for 1971-76 and was used in preference to the others. Finally, the nonstandard age categories used in conjunction with the migration data were adopted to reflect movement in only major groups of the population, i.e. the young, middle aged and old, again so as not to over weight this dimension.

As with so many of the conventions adopted, a range of possibilities exist for the expression of attributes in proportionate form. The pros and cons of those chosen (see Table 5.1) could be argued *ad infinitum* because comparatively little work has been done in Australia with local data. Only in the more extreme cases, where some departure from the common expression has taken place, is discussion needed. Apart from the unemployment case (discussed in Chapter 4), there are two other instances where significant departures have occurred. Firstly, the quantity of work attributes have been expressed as a proportion of the working age population rather than the labour force. This was done in an attempt to embody differences between areas in the total number who did work as a proportion of those eligible to work. Secondly, the age specific migration attributes were expressed as a proportion of the relevant age cohorts for individuals residing in each area at the census date in 1976. The usual expression for outmigration would have used the relevant age cohort data for 1971. This procedure was not adopted in order to retain a more direct comparability in the magnitude of directional flows. Also, there were reservations concerning the 1976 estimates of local populations for 1971. These variant forms of expression should not be attributed any definitive value, but merely treated as options in selecting a starting point for the exploratory process.
Multidimensional specification of spatial form offers a capacity for greatly enhanced insight into the role of place in labour exchange as it introduces considerations of nature into differentiation. The major concern of this analysis is with distinctions between place as opposed to the status of places on nominated ‘social variables’. This involves a significant departure from analyses of extent in differentiation where there is little need to distinguish the spatial and social as the nexus between them is unitary and nomination of either as being the subject of interest is a perceptual, rather than analytical, matter. This is not the case in multidimensional analysis where a unitary nexus no longer exists and outcomes from social process are commonly perceived as variables with place as an attribute of these. This position is reversed here, with place being designated as the variable of interest and social phenomena as the attributes of place. As such, they are simply a means of observing a complex multidimensional variable. It is the distinctions or qualitative states of this variable which must be evaluated to ascertain its role in social process. The primary concern of this analysis is, therefore, identification of robust impressions of place where nature has been incorporated into differentiation.

A ‘shorthand’ method of interpreting distinctions in place has been adopted to maintain an emphasis with place rather than the detail of social process. This method proceeds by using the smallest number of highly general extrinsic attributes (external to the attribute set) possible for ascription of labels to particular types of place. This is unnecessary in pure research which seeks to manipulate place in order to identify different states but is interpretatively useful as general meanings can be assigned to these. The extrinsic attributes must be simple, of obvious meaning and preferably qualitative, to highlight major differences in variable state. More detailed consideration, using intrinsic attributes, is prohibitive where emphasis is on iterative investigations of form. It is neither possible to treat place and social process simply, nor is it necessary, where place is the factor of major concern.

Given the conceptual structure of dimensions specified through attribute
selection and the diversity of factors which constitute place, there is little to suggest
the features of spatial form which may emerge from analysis. This creates one
major difficulty, differentiation of meaningful structure from pattern where a labour
exchange perspective has been adopted. Apart from an extraordinarily general
literature, which has little relevance to nonmetropolitan N.S.W., the only
counterveiling factor is the findings of data intensive analysis of place using
unemployment differences. From this, three alternatives might be expected: the
first, and simplest, is a spatially contiguous regional structure resulting from the
influence of locationally proximate stimuli which dominate local economies; the
second is an urban hierarchic structure where systematic differences in the collective
functions of place override spatially contiguous stimuli; and the third is structures
deriving exclusively from labour exchange phenomena. The first and second are
comparatively simple to identify because they contrast markedly and reflect on overt
correspondence between labour exchange manifestations of place and more general
structures. Applicability of these views must be called into question as it may be
unreasonable to expect such correspondence where only the labour exchange
perspective is adopted and a very high level of dimensional disaggregation is used.
This leaves the third alternative where it may be almost impossible to distinguish
structure from pattern because so little is known of place where circumstances relate
exclusively to labour exchange. As there was evidence of all these phenomena in
the data intensive analysis (see unidimensional maps in Chapter 4), it would not be
unreasonable to further increase the complexity of this problem by proposing that
any identifiable structure may be some combination of these, confounding any simple
scenario. Recognition of nature in differentiation involves a step towards empirical
reality but, as can be seen, empirical synthesis is another problem entirely as
discernable structure is not a foregone conclusion.

The task of this analysis is to investigate differences for one hundred and fifty
places documented according to one hundred and seventeen labour exchange
attributes in search of robust structural distinctions between places. Analysis is
conducted in four stages with the bulk of reported findings referring to dimension
implicit manipulations where dimensional patterns are subsumed into one
dissimilarity matrix (as opposed to dimension explicit analysis where dimensional
patterns are analysed individually in separate dissimilarity matrices). This is done
because of notable affinities with dimension explicit manipulations. These are used
to qualify dimension implicit impressions of form where necessary, thus simplifying
the argument. The first stage of this analysis examines the preferred classificatory
view (see Chapter 5) of interarea differentiation. The second opens this view to
question by investigating alternatives resulting from different
dissimilarity/classification combinations and dimension explicit respecifications of the
attribute set. The third subjects the preferred classification to a diagnostic review,
seeking the sources of structure in original dissimilarities. The fourth adopts a
diametrically opposed treatment of dissimilarities by seeking syntheses through
ordination. In combination, these four stages of analysis provide grounds for well
developed impressions of interarea form and so, the role of place in labour exchange.

6.1 Classification and Dimension Implicit Analysis of Localised Labour
Area Differentials

Classification and ordination are both used in this analysis as there are no
strong preconceived notions as to the type of areal differences constituting the
taxonomic space. The classification option was used in a dominant role for two
reasons, both of which support the view that classification is a very powerful
exploratory technique. First, classification is technically simpler than ordination,
constituting a more direct numerical manipulation of dissimilarities in contrast to
complex mathematical transformation. In addition, there is a developing literature
(Norris, 1971; Austin and Noy-Meir, 1971; Austin, 1976(a), 1976(b); Pielou, 1977)
indicating ordination is, in many cases, effected by nonlinearity problems which are
difficult to identify and overcome. Second, a well developed bank of diagnostic
routines are now available for use with classification methodologies and are highly
suited to exploration as they operate directly on dissimilarity matrices. Initially,
classification offers the most direct and least complicated approach to the
exploration of interarea differentiation.

As discussed in Chapter 5, the C_{II} version of the canberra metric was chosen
to represent interarea dissimilarities. The resulting dissimilarity matrix consisted of
over 22,000 elements, too large for any direct examination to retain a balanced
appreciation. The UPGMA fusion strategy was chosen to group places according to
their differences because of its space conserving properties. Whilst hierarchical
techniques such as this have advantages, especially in terms of representation, their
use is qualified by the assumption that original dissimilarities are naturally
hierarchical. Whilst no definite 'goodness of fit' measure has been developed to test
this assumption (Rohlf, 1974), Belbin has incorporated three indices into his set of
routines. These are the cophenetic correlation coefficient, the Bray-Curtis
dissimilarity measure and the space distortion coefficient. The respective coefficient
values are shown in Figure 6.1 and all are within acceptable bounds\(^1\), showing no need for qualification to the use of UPGMA as it is reasonable to accept assumptions of a naturally hierarchical structure.

Initial efforts to identify a useful categorisation of areal differences using the $C_{II}$-UPGMA combination resulted in confusion because a proliferation of very small (tertiary) groups in conjunction with one very large (primary) group. This obscured any substantial classification of areas into major groups. Inspection of the dendogram for this classification (Figure 6.1) revealed that it was dominated by a comparatively large proportion of outliers which failed to integrate with other groups of areas in nonmetropolitan N.S.W. Only when an eighteen group level of categorisation was accepted (shown in Figure 6.1) did substantial differentiation of areas, within the previously amorphous primary group, emerge.

It is very difficult to determine the level of categorisation which should be accepted from areal classification, this usually being done intuitively. The three main groups, to be known as secondary because of their role in partitioning the primary group, appear from the dendogram to constitute one of the clearest partitions of nonmetropolitan N.S.W., with more detailed partitions generating outliers within the primary group. The resulting categorisation of areas is shown in Table 6.1. As a point of departure, this suggests a pattern of areal differentiation characterised by fifteen tertiary groups, each containing less than 2% of all areas and three secondary groups, respectively containing 41%, 32% and 15% of areas. For convenience, the tertiary groups containing outliers will be referred to collectively as the nonconformist group because they have one feature in common, dissimilarity from the remainder of areas and one another.

Whilst the nonconformist group results in an ‘untidy’\(^2\) classification it must be

\(^{1}\)The hierarchical assumption means that individuals from two separate groups should have similar individual dissimilarities to those of the complete groups to which they belong. The cophenetic correlation coefficient is simply a Pearson’s Product moment correlation coefficient calculated for observed levels of $C_{II}$ dissimilarity after fusion against those from the raw dissimilarity matrix. It ranges in value from -1.00 to +1.00 and is interpreted with stronger positive associations indicating the presence of a natural hierarchy amongst observational units. The Bray-Curtis coefficient is a nonmetric dissimilarity measure where differences (as for cophenetic correlation) are scaled by the summation of all attribute values for the two individuals being compared. Low values for this coefficient indicate little difference between original dissimilarities and those produced by hierarchical fusion. The main benefit of this index is in monitoring differences between various fusions. The final index is the space distortion coefficient which is the ratio of maximum dissimilarity from final fusion and the maximum dissimilarity value in the dissimilarity matrix. While interpretation must be loose, Belbin (pers comm,1982) claims that empirical tests show values of less than 0.4 to indicate space contraction while those above 0.9 indicate space dilation. This index, though exceedingly crude, can be used to tentatively diagnose distortion resulting from application of hierarchical classification procedures. None of the indices are definitive and at best they can be regarded as providing only crude guidance as to distortion.

\(^{2}\)This untidiness can be eliminated by application of space dilating strategies which ‘regularise’ group patterns by reducing the tendency for outliers to emerge and increasing a tendency for more uniformly sized groups to develop. Though more amenable to simple conceptualisation, this is a less realistic portrayal of original differences.
Figure 6-1: Dendogram for Hierarchical Classification of Local Areas for Nonmetropolitan N.S.W. Using $C_{III}$ and UPGMA.

Cophenetic correlation coefficient 0.706
Bray & Curtis coefficient 0.067
Space distortion coefficient 0.823
recognised that natural differences between areas need not be so highly regular as geographers have come to accept from other classification methods and conceptual models of areal differentiation (Losch, 1952; Christaller, 1966; Thunen, 1966). An advantage of empirical analysis in this field is that it does not over simplify pattern and retains the enigmatic which may otherwise be inconceivable as it is simply absorbed by more general considerations. The most dramatic increase in utility from the eighteen group pattern arises from identification of the three secondary groups without which it would be impossible to gain insights into content of the primary group. This constitutes a marked reduction in the complexity of areal differences and suggests the possibility of structure, without which application of numerical taxonomic strategies would be difficult as interpretation would be highly prescribed.

There are two options at this point: the first is to use this pattern of areal differences as a basis for comparison and proceed to refinement by examination and re-examination of differences in search of consistencies in form; and the second is to attempt a ‘shorthand’ interpretation to find if the pattern of areal differences has any apparent social meaning. The second alternative has been chosen because further manipulation of interarea differences would be pointless if an apparent meaning is not identifiable, suggesting a need for detailed examination of attributes to ‘guarantee’ the benefits of continuing. If, however, a ‘shorthand’ meaning is identifiable, this strengthens subsequent analytical efforts by providing a tentative theme of differentiation which can be monitored for recurrence from different perspectives. This is also important because intelligibility is one of the few criteria which can be used to assess the merits of suggested patterns of differentiation.

Considering group content from Table 6.1, where the detail of individual fusions shown in the dendogram is excluded, there is evidence, from a number of sources, that the pattern is, indeed, meaningful and, therefore, suggestive of local structure. This is important because it dispels earlier concerns that pattern might be reflective of obscure labour exchange factors. The three secondary groups which partition the bulk of areas can be qualitatively described as follows: the smallest of these draws its membership exclusively from coast or near coastal areas; the next group has a strong bias towards more highly urbanised areas; whilst the final group seems to comprise areally more expansive inland locations associated with shires\(^3\) which are less urban, mainly rural areas (termed nonurban group). These

\(^3\) Local government areas in N.S.W. have three main distinctions: shires, which are usually areally large and encompass rural locations; municipalities, which are areally small and usually refer to small urban centres; and cities, which are also areally small but refer to large urban centres, commonly in excess of 20,000 people.
Table 6-1: Eighteen Group Pattern Using C_{III} and UPGMA for Nonmetropolitan N.S.W.

<table>
<thead>
<tr>
<th>GROUP SIZE</th>
<th>GROUP MEMBERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>48</td>
<td>32.00%</td>
</tr>
<tr>
<td>32.00%</td>
<td></td>
</tr>
<tr>
<td>62</td>
<td>41.33%</td>
</tr>
<tr>
<td>62</td>
<td>41.33%</td>
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<tr>
<td>23</td>
<td>15.33%</td>
</tr>
<tr>
<td>15.33%</td>
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</tbody>
</table>

propositions can be combined to attain a higher level of generality indicating existence of a tripartite typology of interarea differences. Such a typology is conceptually significant as it may provide a basis for integrating individual propositions.

Shorthand characteristics, substantiating elements of the tripartite typology, must now be examined in more detail. Coastal areas constitute the most obvious distinction in the population under study as they can be separated simply using spatial location as a highly qualitative, extrinsic attribute of place. This distinction can be most clearly observed by transferring the classifactory content of Table 6.1 to a spatial framework, as done in Figure 6.2, where all members of the population...
have been mapped. From this it can be seen that, with few exceptions, coastal locations belong to one group and, though smaller in membership than other groups, there is minimal evidence of disruption. The only exceptions are Mullumbimby, which is an outlier to the population, and Bega, Wingham and Taree, which have municipal status and, therefore, an affinity with the urban group. This group is remarkable for its spatial contiguity which is so resilient as to withstand interspersion by a large tract of metropolitan N.S.W., with the diversity of influence this entails. By virtue of spatial simplicity, this group is the clearest manifestation of place as a labour exchange structure.

The urban group is more subtle in its manifestations than the coastal group because of an inherent complexity arising from a greater diversity of places. It is, nevertheless, a well defined component of the population, being quite distinct and overriding influences of the coastal group in cases identified above. The major features of this group, and that to follow, can be highlighted by differences in local government status and population size. The most immediate characteristic is a preponderance of spatially less expansive areas - cities and municipalities (Figure 6.2), and a notable trend towards larger population nonmetropolitan cities, such as Dubbo-Talbragar (pop 23,246)\(^4\) and Tamworth-Parry (pop 38,425), and intermediate town or service centres, such as Cowra and Forbes (in the 7,000-8,000 pop range). With few exceptions, the municipal-city status of this group's membership is shown in Figure 6.2 by proportional circles as distinct from the shire boundaries of more expansive nonurban areas. The only exceptions are Temora, which finds its way into the rural group, and others such as Lithgow, and again Mullumbimby, which appear as outliers. Of the remainder, areas such as Wagga Wagga-Mitchell, Tamworth-Parry, Narrabri-Namoi, Armidale-Dumaresq, Muswellbrook-Denman and Inverell-Macintyre are amalgamations, incorporating a municipality or city within a rural shire. Others not represented by proportional circles naturally incorporate urban areas of various sizes which have not been assigned municipal or city status although their populations are as large as others which have, e.g. Wade Shire (Griffith, pop 11,930), Leeton Shire (Leeton, pop 6,631), Cootamundra Shire (Cootamundra, pop 6,384), Mudgee-Turon (Mudgee, pop 5,724), Tumut Shire (Tumut, pop 5,569) and Bourke Shire (Bourke, pop 3,534) to mention but a few. In addition, particular influences may be at work in other areas, such as the military base at Singleton or the impact of metropolitan influences on proximate

\(^4\)Populations for 1976 will be selectively referenced for illustration only as the interpretation is not one of population size. A great deal of care has been taken to remove the direct effects of size through standardisation because of crude associations found in the unemployment analysis and preprocessing of this data set.
Circles indicate towns
O 2,500
O 2,500-5,000
O 5,000-10,000
Diameters indicate total numbers of wage & salary earners.

Figure 6.2: Spatial Distribution of Non-conformist
areas such as Gloucester or Mittagong. This group is spatially less obvious than the coastal element of the population because it is not distributionally continuous. It is therefore aspatial in the first degree but does have spatial connotations at a higher level, as it overlays the next group which has been typified as nonurban. As a consequence it reflects a second manifestation of place in labour exchange structure.

The nonurban group is clearly discernable in Figure 6.2 as a residue of the coastal and urban groups, accounting for the spatially continuous elements of nonmetropolitan N.S.W. which are not coastal and the spatially expansive areas of low population which do not fit the urban scenario. Conforming to these limitations, the nonurban group forms a spatially continuous region bounded by the coastal areas and punctuated by spatially disjunct members of the urban group. The only exceptions to this are the remaining outliers, e.g. Windouran, Bingara and Barraba. The residue view of this group is, however, only adequate for introductory purposes. Since it contains the largest proportion of places, the other groups could be better portrayed as residuals of nonurban place in a nonmetropolitan situation. As such, it can be cast as the analytical context for these groups and a benchmark for distinction. The only qualification to this view is the lower populations of these areas which reduce their social significance. As a distinct type of place in its own right, this group could be described as rural in context but for its widely ranging economic base which includes pursuits such as mining. The nonurban description is best retained under these circumstances for its generality. The representative integrity of this group strongly suggests a third place manifestation in labour exchange structure.

The coastal group is easily distinguishable from the remainder of places in nonmetropolitan N.S.W. because the qualitative location attribute is particularly effective in this case. The urban-nonurban distinction is less definite because the two groups are spatially coincident. The qualitative attributes of areal size and local government status are only of use in highlighting differences but remain unreliable for thorough documentation, as location has done for the coastal group, and, likewise, for the quantitative population attribute.

This situation has been rectified for the urban group in Table 6.2 where the Australian Municipal Information System index of urbanisation is shown for all areas (see Table 6.1 for group membership). This index shows the proportion of each area's population living in urban areas for the 1976 period. Where amalgamations

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5 This distinction is blurred in Figure 6.2 by the need to amalgamate areas and the resultant departure from standard local government areas.
have taken place, a population weighted average of the original indices has been used. Even a cursory examination of Table 6.2 shows how noncoastal areas, with high index values, have been differentiated from those with low values. The urbanisation distinction is, however, not absolute and reversals or exceptions can be found. For example, less urban areas such as Lyndhurst (41%) are included in the urban group while others which are more urban, such as Warren (53%), are in the nonurban group. This Table adequately demonstrates the existence of a ‘grey zone’ where the urban and nonurban groups intersect and factors specific to the labour exchange situations can be hypothesised as overriding the urban-nonurban distinction. It is recognition of these factors which indicates the need to qualify the urban-nonurban element of the typology and propose a distinction between ‘urban like’ and ‘nonurban like’ area types. This could be extended to the coastal group at this point to suggest a ‘coast like’ group, emphasising the view that neither groups, nor their labels, should be thought of as definitive.

There is evidence that the limits of structure may extend well below this level, each secondary group containing its own substructure. The dendogram in Figure 6.1 provides the best avenue for establishing the existence of a substructure. Closer examination of secondary groups reveals a tendency in each for this to occur. Essentially, each consists of two components, one being selectively high resolution with key areas fusing at lower levels of dissimilarity while the rest of the group has a lower resolution with areas appending to the high resolution element in small groups. These two phenomena can be portrayed as core and peripheral elements within each secondary group. This is not unusual and is characteristic of hyperspherical clusters which commonly have elements more intensely indicative of group content, with others appending at higher levels of dissimilarity.

As an extension of the subgroup observation, it is not difficult to hypothesise distinct entities within the core identities of each main group. In the urban case, for example, Table 6.2 shows a distinction between ‘more urban’ (e.g. Dubbo-Talbragar) and less urban core elements (e.g. Scone, Lyndhurst and Uralla). This supports the earlier notion that members of the urban group are not simply ‘urban’ but urban by degrees, thus showing the limitations of the labels being used to indicate group composition.

Substructure potential can also be seen in the coastal group where there is scope for distinction between urban coast (including areas such as Coff’s Harbour and Port Macquarie) and nonurban coast (including areas such as Bellingen and

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6This is an advantage of UPGMA and other space conserving classification procedures because they represent clusters in this ‘untidy’ but natural form.
<table>
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<th>Rank</th>
<th>Place</th>
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</table>

Table 6.2: Indices of Urbanization for Local Areas (% population in urban areas).
Ulmarra). This shows that the urban-nonurban factor, which distinguishes the two major components of this population, may be important within the coastal group even though the group as a whole is an exception to the urban-nonurban rule.

The nonurban group does not have this potential to the same degree. Although distinctions can be proposed, these are not clear as 'chaining' (tendency for individuals to fuse in singular sequence) is more apparent in this group. Core group substructures, such as those discussed for the urban and coastal groups, could only be generated with great loss of simplicity because of the 'classificatory noise' resulting from proliferation of tertiary subgroups.

This problem is exacerbated by the different levels of dissimilarity at which subgroup distinctions occur within each secondary group. In accepting the lowest meaningful subgroup distinction it is also necessary to accept a group level which breaks higher level substructure groups into less meaningful components. This makes consistent interpretation extremely difficult and, for this reason, the eighteen group representation is preferred.

Functional organisation of the three major groups which house these substructures is important because it suggests the relationships between major elements of the typology. This is evident from the dendogram in Figure 6.1 where main group fusions are identifiable sequentially as urban and coast, followed by nonurban at a higher level of dissimilarity. Association of the first two groups is plausible because the coastal group contains a strong urban subgroup, so an affinity is to be expected. However, it could be argued on similar grounds that since the coastal group contains a less urban component, an affinity with the nonurban group is not unlikely. Similar links can be envisaged between the urban-nonurban groups because of the 'less urban' and 'less nonurban' elements in each of the respective groups. As the functional relationships observed here could have been influenced by such factors as the impact of extreme observations in peripheral subgroups, it is difficult to discount other possibilities which might be indicative of a highly fluid situation.

The most important outcome from this classification is the identification of a pattern which tentatively summarises the effects of nature in interarea differentiation. In attempting a synthesis of the tripartite typology (Figure 6.3), it seems that a combination of regional and urban hierarchic influences dominate. The regional effect is clearest for coastal and nonurban groups where the members of each form continuous spatial partitions of the State. Tests on similar data sets to that being used here, but incorporating a contiguity constraint (King, 1969) permitting fusion of only locationally adjacent areas, produced a highly stressed
classification, i.e. one where dissimilarities were much higher than would otherwise have been the case. These observations suggest that regional continuity, as a description of areal similarity, must be qualified since it is only apparent at more general levels of differentiation where large groups are being used. An urban hierarchic effect is arguably operative through the distinction between urban and nonurban groups and within the urban group between the ‘more urban’ and ‘less urban’ subgroups. Crude as the hierarchic influence is, it relates the spatially continuous regional component of the pattern and its spatially disjunct component, the former providing a context for the latter and integrating all elements of the tripartite typology.

Figure 6-3: Key Elements of the Tripartite Typology in its Spatial Context.

It appears from this classification that in spite of earlier doubts as to the likelihood of identifying intelligible spatial pattern that one can be proposed. The C_{III}-UPGMA classification revealed a pattern of areal differences dominated at upper dissimilarity levels by a nonconformist group, ostensibly consisting of outliers, and three areally substantial groups which embraced all remaining areas of nonmetropolitan N.S.W. The nature of these differences was ascribed meaning by reference to four ordering factors. Location and urbanisation were the most important, with local government status and population proving useful in selection of these keys. A tripartite typology of secondary group differences, reflecting coast-urban-nonurban differences, was evident from these factors. This interpretation provided a context for identification of a less important substructure of areal differences which served to highlight the main elements of differentiation through a core-periphery distinction within groups. Though the C_{III}-UPGMA classification is
technically preferred (Chapter 5), questions as to the pervasiveness of this structure from different perspectives remain. This issue must be canvassed because of an unremitting concern as to the prematurely definitive manner with which such results are accepted in human geography without due regard for alternatives.

6.2 Alternative Classificatory Treatments of Interarea Differentiation.

The combination of $C_{III}$ dissimilarity and UPGMA fusion as the principle mode of classification was chosen because it portrayed specific features of the data set in a space conserving manner. The structure revealed represents only one of many which could have been identified. Limited validation can be obtained through manipulation and comparison of results to create an empirical context within which preferred outcomes can be assessed. This approach has a definite advantage over isolated intuitive assessment because it provides substantive insights into pattern variants. Awareness of these is one of the more powerful instruments for prevention of abuses, such as assignation of definitive status. Alternatives will be considered in two stages, the first examining technically different views of dimension implicit pattern and the second, dimension explicit variants.

6.2.1 Alternative Dimension Implicit Views of Pattern.

Of the many dissimilarity-fusion combinations used results for two are reported, one holding dissimilarity constant and the other, fusion. The first combined $C_{III}$ dissimilarity with the flexible fusion technique where the cluster intensity coefficient ($\beta$) was set to 0.0. Empirical trials have shown that where $\beta=0.0$ fusion is maximally space conserving (though slightly dilating). Comparison of UPGMA with flexible ($\beta=0.0$) therefore provides the basis for a comparison between two space conserving strategies. The second combination related gower dissimilarity to UPGMA. Gower differs from $C_{III}$ in that it does not treat differences of sign (+,−) as differences of kind but rather, differences of degree. Gower's mode of standardisation is global, de-emphasising individual differences by standardising uniformly\(^7\) and introducing the effects of global characteristics, such as the presence of outliers. Gower, therefore, offers a contrast in representation to the $C_{III}$ measure by emphasising different features of the data. Consideration of these two alternatives should assist in assessing the durability of the tripartite typology.

The $C_{III}$-flexible classification bears an unmistakable resemblance to the $C_{III}$-UPGMA classification at both the individual fusion level and, more importantly, in the consistency of major group content (see Figure 6.4). The exceptions which

\(^7\)By comparison to standardisations which use information from only the two areas being compared.
Figure 6-4: Dendogram for Hierarchical Classification of Local Areas for Nonmetropolitan N.S.W. Using \( C_{III} \) and Flexible Fusion (\( \beta = 0.0 \)).

Dissimilarity \( C_{IJ} \)
differentiate the pattern from that previously discussed are likely to result from this technique’s tendency to dilate the taxonomic space. The most numerous exceptions result from minor differences in individual fusions and are of little significance. Dilation does, however, result in three more important departures from the previous pattern. The first of these is that the nonconformist group has been largely dissipated, necessitating only a seven group partition to expose pattern instead of eighteen groups. Dissipation has occurred in one of two ways with outliers either appending to main groups, becoming their more extreme members, or going to an embryonic nonurban group which has developed (Group 3 in Figure 6.4). The second is development of the embryonic nonurban group which does not fuse with the main nonurban group until after the coastal group. While ‘breakaways’ such as this are common (Clifford and Stephenson, 1975, 106) with space dilating techniques the possibility of an affinity between the coast and nonurban groups must not be excluded. The third is that a small number of ‘less urban’ areas, such as Lyndhurst, Scone and Wade, have broken away from the urban group and reformed within the nonurban group. Without exception, these are either shire type areas with rural bases or amalgamations of rural and urban type areas so they could be seen as transitional between the two groups.

These results could obviously be interpreted in two ways, one suggesting alternative group affinities to those in the C$_{III}$-UPGMA classification and the other, distortions due to space dilation. The latter is plausible because two of the test coefficients$^8$ in Figure 6.4 indicate a poorer hierarchical representation of differences than in the C$_{III}$-UPGMA case, as would be so where dilation occurs. This does not deny the possibility that outliers may be more closely associated with some elements of the population than others, or that the transitory elements of the population are more unstable. However, these features have been revealed here by a distortion which allows them to be observed.

Unlike the situation where flexible fusion has been used with relatively predictable consequences the effects of changing dissimilarity measures is less certain as it deals with the representation of complex interarea differences. For example, with elimination of the capacity to make distinctions of kind, similar elements from different groups might have a greater tendency to fuse. It has been decided to examine the effects of substituting gower for C$_{III}$ by reference to the classification

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$^8$The cophenetic correlation coefficient fell markedly to 0.57 and the Bray-Curtis dissimilarity increased noticeably. One obvious cause of this, as can be seen by a comparison of the dendograms in Figures 6.1 and 6.4, is the incorporation of outliers into main groups. This increases intergroup fusion levels which hierarchically must be representative of individual dissimilarities between groups. The space distortion coefficient was within acceptable bounds but it does not make use of the available information so extensively as its alternatives.
resulting from application of the UPGMA fusion. This facilitates comparison with the \( C_{III} \)-UPGMA structure as differences between the two can be ascribed to representation. As seen from Figure 6.5, components of the tripartite typology are clearly visible, but departures from the \( C_{III} \)-UPGMA classification are more obvious than for the \( C_{III} \)-flexible classification. This is most apparent from the problems in identifying a group level to reveal key elements of the tripartite typology since large numbers of tertiary groups are generated by gower. The group referencing system has been changed in response with amalgams of tertiary groups being appended to secondary groups or forming nonconformist groups within the classification. Strict adherence to the sequence of hierarchical distinctions produces an unwieldy pattern with over thirty groups as opposed to the current five. The degree of generality which results at the five group level can be interpreted as consisting of two nonurban groups (1 and 3) an urban group (2), a coastal group (4) and, from past experience, a nonconformist group (5).

Interarea differences, as portrayed by Gower's coefficient, are obviously less satisfactory than for \( C_{III} \) because, while the elements of the original pattern are apparent their representation is far from concise. Figure 6.5 shows numerous examples of this poor representation. Three of the more obvious are:

i) the split between nonurban local areas, resulting in an unnecessarily complex representation of differentiation and blurring distinction between nonurban and other groups;

ii) elements of the coastal group (Nambucca, Hastings etc.) are classified into the first group, this being intuitively less satisfactory by comparison with both of the earlier classifications;

iii) clarity of classification is lost because of the large number of outliers generated and their interspersal between and within more broadly based groups.

The gower representation of interarea dissimilarity is insufficiently clear for an initial exploration because it emphasises different qualities of the data to those previously discussed. Given this situation, the poorer quality resolution of interarea differences provides an empirical vindication of the \( C_{III} \) choice which produces a simple and very clear representation of structure.9

The alternative dimension implicit patterns of local differentiation clearly reflect elements of the tripartite typology but without replicating its precise form. Departures from the \( C_{III} \)-UPGMA classification are of two types. The first is

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9As an aside, the hierarchical structure of the gower-UPGMA classification is sound and on a par with that of the \( C_{III} \)-UPGMA classification. This has only been achieved at considerable cost to the intelligibility of group pattern. However, it does reinforce the suitability of the UPGMA fusion procedure for use where space conservation is desired.
Figure 6-5: Dendogram for Hierarchical Classification of Local Areas for Nonmetropolitan N.S.W. Using Gower’s Coefficient of Dissimilarity with UPGMA.

Dissimilarity Cm

0.0585 0.0848 0.1111 0.1373 0.1636 0.1899 0.2162 0.2424 0.2687 0.2950

Group

1

2

3

4

5

Cophenetic correlation coefficient 0.789
Bray & Curtis coefficient 0.058
Space distortion coefficient 0.777
reconfiguration of elements from major groups in the tripartite typology to functionally different sequences. Reconfiguration is to be expected as the criteria for fusing individuals and representing multidimensional differences between areas have been changed. The reassuring aspect of this is that even though reconfiguration takes place, the elements of structure upon which the typology is predicated remain intact. The second is redistribution of outliers, so prominent in the $C_{III}$-UPGMA classification, to parent groups. This could be taken to suggest that outliers have affiliations with the population which are observable under conditions of mild space dilation. This review of alternative dimension implicit patterns has proven invaluable in demonstrating the analytical differences resulting from different technical perspectives. The $C_{III}$-UPGMA view of structure is clearly superior to the two alternatives because of its inherent simplicity, by comparison to the gower representation, and minimal distortion of the kind associated with flexible fusion.

6.2.2 Dimension Explicit Views of Pattern

Dimension explicit analyses provide a capacity to thematically decompose data sets and so provide further alternative views of pattern. The dimension explicit views of pattern will not be treated in the same detail as dimension implicit alternatives for two reasons. First, dimension explicit patterns are likely to be more disparate than those for various dimension implicit analyses and therefore more difficult, if not impossible, to resolve. Resolution does not receive a high priority because of the earlier decision to concentrate on dimension implicit analyses due to their generality. Second, it is not possible to examine each of the dimension explicit alternatives in the same detail because of the task's magnitude.

Each dimension was used to produce a $C_{III}$ dissimilarity matrix (of the same proportions as that used in the dimension implicit analyses) and subjected to classification using UPGMA. To simplify treatment, all comparisons were made with only the dimension implicit $C_{III}$-UPGMA classification.

With the number of classifications to be examined here there is a need for systematic comparison if scope of the problem is to be controlled. Developmental work on techniques for formally decomposing classifications (Rohlf, 1974) is still rudimentary. Formal comparisons can be made according to many criteria but all depend on summarising features of individual classifications. Unfortunately this offsets the main advantage of deriving alternative viewpoints as the substance of...
each configuration is largely ignored. It has been decided to use a less formal approach where specific features of the dimension implicit structure are sought in each of the dimension explicit patterns to ascertain relationships between the two.

This was done systematically by searching for elements of the tripartite typology in each of the dimension explicit classifications and qualitatively rating occurrences of individual groups as: HIGH - where the majority of members from original groups reform into one similar group; MODERATE - where the group is partially formed or split into more than one recognisable component; and LOW - where original groups have been diffused into other groups or are in such small clusters as to be only vaguely recognisable. Also the presence or absence of established outliers has been noted as LARGE, approaching or exceeding that found in the CIII-UPGMA dimension implicit classification, or SMALL. As this assessment is qualitative it will be supported by descriptive comments and the dendograms (Appendix J) for each of the dimension explicit classification so that the rationale for judgements can be ascertained and alternatives considered.

The result of comparisons between dendograms for the dimension implicit and explicit classifications is shown in Table 6.3 where there is ample evidence of departures, though limited in degree, from the original pattern because the moderate categorisation is predominant. This indicates variability between group patterns where, for example, the coastal group might be present, as in the migration dimension but in two components instead of the original one. In a smaller number of cases (e.g. the coastal group for the family income dimension), departures from the dominant structure are highlighted as key group presences are not easily identified since their elements have been thoroughly dispersed. By contrast, other departures are negligible. This tendency is especially prevalent for the rural group because of its size so that dilution by smaller groups is less likely. This does not constitute a bias in categorisation but is an expected outcome because of the data set's nonmetropolitan character. Collectively, predominance of the MODERATE categorisation can only be interpreted as showing that dimension explicit departures from the dimension implicit structure are not sufficient to seriously detract from the utility of the tripartite typology.

This finding is not surprising because attributes from each of these dimensions were instrumental in development of the dimension implicit structure. Whilst it must be remembered that nondimensional combinations of attributes are operative with polythetic procedures, the information in Table 6.3 is indicative of possible sources of structure because of obvious dimensional affinities. For example, the coastal group is most clearly apparent from the unemployment dimension where the
<table>
<thead>
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<th>RURAL</th>
<th>OUTLIERS</th>
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<td>MODERATE mixed coast and urban 'like' group (clear subgroups for each)</td>
<td>MODERATE mixed coast and urban 'like' group (clear subgroups for each)</td>
<td>HIGH one clear rural 'like' group</td>
<td>SMALL</td>
</tr>
<tr>
<td>QUANTITY OF WORK</td>
<td>LOW relatively dispersed into main rural and urban 'like' groups</td>
<td>HIGH elements of coast 'like' groups too diluted to decrease clarity</td>
<td>MODERATE two rural groups but elements of coast 'like' group too diluted to decrease clarity</td>
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</tr>
<tr>
<td>FAMILY INCOME</td>
<td>LOW as above</td>
<td>HIGH as above</td>
<td>HIGH one major rural 'like' group</td>
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<td>UNEMPLOYMENT</td>
<td>HIGH one very clear coast 'like' group</td>
<td>MODERATE two small urban 'like' groups-each appended to a rural 'like' group.</td>
<td>MODERATE two rural 'like' groups each with urban appendages.</td>
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<td>LABOUR FORCE PARTICIPATION CHANGE</td>
<td>MODERATE two amalgams of urban and coast 'like' elements</td>
<td>MODERATE two amalgams of urban and coast 'like' elements</td>
<td>HIGH one large rural 'like' group</td>
<td>SMALL</td>
</tr>
<tr>
<td>MIGRATION</td>
<td>MODERATE two clear coast 'like' groups</td>
<td>MODERATE one small but clear urban 'like' group</td>
<td>MODERATE two large rural 'like' groups</td>
<td>SMALL</td>
</tr>
</tbody>
</table>
urban-nonurban distinctions blur, while it is not clear from the family income or quantity of work dimensions. The comments in Table 6.3 reinforce this point, showing that partial development of groups can result in simplified views of differentiation. As a final point, these affinities can be seen amongst the outliers where, although the dimension explicit attributes have smaller complements of outliers, the most extreme observations in dimension implicit classification are well represented amongst these. The dimension implicit structure can therefore be seen as having a dimension explicit context with each dimension emphasising specific features of differentiation.^

The variant forms of areal pattern in this and the previous subsection are related by their apparent similarities to the dimension implicit C_{I}UPGMA classification. Were this evidence of similarity not apparent, the adequacy of the tripartite typology as a summary of differences may have been called into question. These variant views of form have revealed different features of the interarea distribution and shown that definitive treatments are philosophically unjustifiable in exploratory data analysis. It could be argued that consideration of such alternatives is wasteful because it introduces extraneous material and thereby unnecessarily complicates an otherwise direct exposition. However, only through a comparative exposition can the adequacy of a preferred representation be assessed. The dimension implicit C_{I}UPGMA classification is clearly superior because it attains a higher degree of generality than any of its competitors. It appears well founded in its component dimensions and retains the simplest standard of exposition.

6.3 Spatial Structure - A Diagnostic Reconstruction from Original Dissimilarities

The C_{I}UPGMA classification appears to be highly utilitarian by comparison to dimension implicit and explicit alternatives. However, very little is known of its foundation in the actual dissimilarities from which it derives. In simplifying areal

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11 A more formal method of comparison was attempted, though with minimal success. Belbin’s CMPD routine, which summarises hierarchical classifications by using three features as a basis for comparison (see previous chapter), was adopted for this purpose. These features of each dimension explicit classification can then be used to form the basis of a 6x6 dissimilarity matrix representing differences between classifications. This dissimilarity matrix can be used as the basis for classifying the dimension explicit classifications or, if desired, an ordination of classifications. Applied usefulness was not great for three reasons. The first is that, in focussing on the three nominated features of each classification, the vital link with group formats was lost. As a result, there was only minimal justification for use of this formal method in studies such as this one. The second is that the features nominated concentrate on similar phenomena and, therefore, ignore other kinds of features. The third is that traumatic redefinition of data sets, as opposed to minor changes where only a small number of attributes are altered, presents problems in reconciling narrowly based impressions. These problems underline the need for development of more robust techniques for formally comparing differences in dissimilarity patterns and preferably making reference to original dissimilarity matrices rather than classifications derived from them. Until such developments are advanced there is no substitute for direct inspection of classification results.
differences to obtain an impression of areal form it must be asked whether the
essential character of areal differences has been preserved or lost because valuable
information has been foregone in the process of simplification. As there are no tests
similar to those used in confirmatory analyses, a course of diagnosis is necessary to
ascertain the representational quality of the areal structure identified.

Individual dissimilarities can be examined globally, where system wide
constraints on selection of dissimilarities are imposed, so all members of the
population are included in any diagnosis. Also, dissimilarities may be considered
from a pairwise perspective where individual differences are selected according to
need. Global examinations are restrictive since dissimilarities cannot be investigated
as interest dictates. Pairwise selection circumvents this problem by allowing themes
of interest, or illustration of particular points, to be pursued without restraint.
Unfortunately, these can become directionless or facile because the range of ad-hoc
themes and illustrations which might be pursued is large. Great care must be
taken with pairwise examinations to ensure they are incisive and highly directed.

The minimum spanning tree (MST) was used to gain an impression of global
minima from the $C_{III}$ dissimilarity matrix. The diagnostic benefit of comparing
MST results with those obtained from classification is that the former relates all
individuals in the population according to original dissimilarities without
classificatory distortion or reliance on the creation of composite individuals (groups).
Diagnostic application of the MST requires a collective rather than an individual
perspective on differences as the purpose is to search for general patterns which are
evident from individual affinities. These do not parallel fusions from classification
techniques which operate on group centroids because individuals join collective sets
after the initial fusions which form the basis of groups. The collective pattern of
individual affinities in the MST indicate the strength of groups by showing whether
they consist of individuals which are naturally similar (minimally dissimilar). The
MST results have been presented graphically in Figure 6.6 where pairwise
dissimilarities have been scaled as link lengths and plotted in tree format. The
difficulty with graphical representation is that the only true differentiation is
through the links of the tree, the positional disposition of nodes being otherwise
immaterial. This difficulty can be used to advantage because trees can be

\[12\text{There are three reasons for this limitation. The first is that, in a taxonomic analysis of this size, the abundance of individual comparisons is so formidable as to make systematic and rational comprehension impossible. The second is that, in an environment where exploratory data analysis is necessary, group patterns are more easily appreciated and of greater interest because of their generality. The third is that individual comparisons may be influenced by particularities which cannot be appreciated in an aggregate analysis of areal form. This difficulty is aggravated by the 'noise' generated by conceptualisation and measurement problems.}\]
Figure 6-6: Minimum Spanning Tree of Interarea Differences from the $C_{III}$ Dissimilarity Matrix.

Note:
1) Link lengths scale by dissimilarity coefficients ($C_{ij}$) for each interval on the tree.
2) Points can be represented directionally as desired.
3) Member of nonconformist group in $C_{ij}$-UPGMA classification.
meaningfully configured where familiarity has been established using alternative techniques.

Collectively, the tripartite typology of interarea differences is readily apparent from the pattern of single linkage dissimilarities represented as MST minima in Figure 6.6. This is extremely important because it reaffirms the internal consistency of groups derived using C_{III}-UPGMA. Indeed, these consistencies are so strong that the group structure can be easily transposed onto the MST, as shown by the schematic representation in Figure 6.6. Little more can be said on this, simply because the pattern is so clear.

However, two other features of original dissimilarity are evident from the MST. The first is that affinities between groups superimposed on the MST have been reconfigured with the urban-coast amalgam being supplanted by one where the urban and coastal groups are separated by the nonurban group. This result is not surprising because both the urban and coastal groups contain 'peripheral' elements which tend towards 'nonurban' character. Great care must be taken when assessing group associations from MST's because they rely on the association between only two areas, one from each of the transposed groups. As a consequence, group configuration is narrowly based by comparison to centroid methods used with most classification techniques and subject to the effects of extreme observations or individual nuances. The second feature of the MST is that evidence of transition between the urban and nonurban groups emerge when single linkages are examined. The Namoi-Narrabri and Mudgee-Turon nodes act as foci for areas from both groups. This is not surprising because peripheral subgroups have already been identified which 'blur' group distinctions but do not, as a glance at Figure 6.6 shows, devalue the tripartite typology. Recognition of 'blurring' is significant because it explains the structure's susceptibility to reconfiguration, noted in this and the previous section. The MST has shown that the pattern of interarea differences is strong and replicable from the interarea dissimilarity matrix.\(^{13}\)

The base of the tripartite typology is more widely founded than the single linkage analysis indicates. It is, in reality, the outcome of extensive networks of interarea affinities which can best be illustrated by reference to bonds which prioritise linkages according to reflexivity. The extent of these interrelationships,

\footnote{Classification procedures (apart from nearest and furthest neighbour techniques) use more general methods for determining the functional relationship between groups such as average minimum dissimilarities or intercentroid distances. Not all MST interpretations are as restrictive. A common feature of MSTs is the emergence of nodes which directly interlink several observational units. These nodes indicate the presence of groups or subgroups which can be stereotyped by the node because it is common to all of them. Unfortunately, the subgroups identifiable from Figure 6.7 are well below the level of resolution being contemplated at the eighteen group level and therefore of minimal conceptual value.}
which are confined to specific groups for most substantive bonds, can be shown by reference to the proportion of bonds in different categories\textsuperscript{14}. The scope of such networks is extensive with only 7.4\% being of the perfectly reflexive 1-1 type, the remainder being 7.0\% (1-2), 2.7\% (2-2), 36.7\% (1-3+) and 46.1\% (2-3+). The large proportion of bonds which are of the (1-3+) and (2-3+) types shows that strong one way links are often not matched reflexively with the effect that three or more intermediate areas can be 'pulled' into a more extensive set of affinities. The type of networking which results is illustrated by reference to areas from the coastal group in Table 6.4. (illustration extended in Appendix K). As can be seen, bonding within the coastal group shows an internal cohesiveness which does not rely on simple 1-1 reflexive bonds but which are, nevertheless, consistent with group composition. These simply show a clearly bounded network which is most characteristic of core elements in the group substructure and decays to varying degrees where peripheral elements are concerned. Though too extensive for detailed reference, it is these networks which are ultimately the source of the tripartite typology.

\begin{center}
\begin{tabular}{|c|c|c|c|c|}
\hline
 & 1-1 & 1-2 & 2-2 & 1-3+ & 2-3+ \\
\hline
Coffs Harbour & 0.190 & 0.199 & & & \\
Shoalhaven & & & & & \\
Port Macquarie & & 0.205 & & & \\
Coffs Harbour & 0.208 & & & & \\
Great Lakes & & & 0.210 & & \\
Tintenbar & & & & & \\
Copmanhurst & & & & 0.294 & \\
Great Lakes & & & & & \\
Eurobodalla & & & & & \\
Shoalhaven & & & & & \\
 & & & & & \\
\hline
\end{tabular}
\end{center}

\textbf{Table 6-4: Specimen Table Of Bond Interconnections From }C_{III}\textbf{ Dissimilarity Matrix.}

The MST provides a further insight into the status of outliers as it is concerned with a notion suggested from the space dilating $C_{III}$-flexible fusion, that extreme observations may have affinities with particular groups in the population. To examine this proposition more closely extremes in the MST were identified.

\textsuperscript{14}Five categories of bond are recognised from original dissimilarities. These can be interpreted as follows (also shown in Chapter 5): 1-1, mutual nearest neighbours; 1-2, area one's nearest neighbour is area two but area one is area two's second neighbour; 2-2, mutual second neighbour; 1-3+, area one's nearest neighbour is area two but area one is area two's third or more neighbour; and 2-3+, area one is area two's second neighbour but area one is two's third or more neighbour.
according to degrees of dissimilarity from other members of the population. The criterion used was that system minima had to satisfy the condition: \( C_{II} \geq 0.30 \). This was chosen because only a small proportion of areas had global minima which exceeded it. Those areas identified in this manner are shown symbolically in Figure 6.6 and belong, without fail, to the nonconformist group from the \( C_{II} \)-UPGMA classification. This is important because it shows that the classification’s outliers are extreme in terms of original dissimilarities and not classificatory aberrations. More importantly, they are associated with either the urban or nonurban groups, the most likely division to arise (considering location and values on the index of urbanisation) if they are related to elements of the population in a consistent manner. The existence of these affinities in the original dissimilarity matrix strengthens the hypothesis that, whilst these areas may be extreme, they relate to specific elements of the population instead of being detached from it.

Care must be taken in advancing this hypothesis because extremes may default to individuals within the population as no suitable alternatives exist\(^{15}\). For example, this may be the case where extremes represent latent groups which do not have sufficient membership to emerge in this Study. This proposition can be better elucidated by reference to interarea dissimilarities where there is a greater flexibility for examination of individual affinities. It could be expected that if extremes are unrelated to elements within the population that their nearest neighbour patterns would be disparate. Alternatively, if links were likely, extremes would consistently link to one or other of the coast, urban or nonurban groups. To examine this proposition, extremes (conservatively nominated in this case as those belonging to the \( C_{II} \)-UPGMA nonconformist group and satisfying the \( C_{II} \geq 0.30 \) constraint were cross classified with their first three nearest neighbours in Table 6.5\(^{16}\). With one exception (Mullumbimby), the first three nearest neighbours for each extreme consistently derive from the same group in the population, identifying all as having either urban or nonurban affinities. Mullumbimby is an unusual case and could be expected to fit the coastal (see map) or urban (100% score on index of urbanisation) elements of the typology, though it has a tendency towards the urban

\(^{15}\)There being an assumption in the approach to analysis that all areas being examined are members of the same population, there is no provision for non membership.

\(^{16}\)The extreme status of these individuals has been re-emphasised by some of the material emerging from application of minor simplification techniques. These are threefold. Firstly, mean dissimilarities from the population (arithmetic mean of dissimilarities to all other individuals) are usually amongst the highest recorded. Secondly, the first three nearest neighbours of the outliers rarely include that area amongst their first three nearest neighbours. Thirdly, bonds to individual members of the population are at best highly nonreflexive and at worst not classified. Relationships to other members of the population are therefore very weak. The usual situation then is one where the outlier’s priority fusions go to other individuals or groups because links are weak and one way.
<table>
<thead>
<tr>
<th>AREA</th>
<th>NN1</th>
<th>NN2</th>
<th>NN3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lithgow</td>
<td>Goulburn</td>
<td>Cootamundra</td>
<td>Broken Hill</td>
</tr>
<tr>
<td>Cooma</td>
<td>Wagga-Mitchell</td>
<td>Yass</td>
<td>Goulburn</td>
</tr>
<tr>
<td>Bombala</td>
<td>Namoi-Narrabri</td>
<td>Crookwell</td>
<td>Tumut</td>
</tr>
<tr>
<td>Mullumbimby</td>
<td>Gloucester</td>
<td>Bellingen</td>
<td>Lismore</td>
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<tr>
<td>Nymboida</td>
<td>Goodradigbee</td>
<td>Tamarang</td>
<td>Merriwa</td>
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<tr>
<td>Conargo</td>
<td>Illabo</td>
<td>Jemalong</td>
<td>Tamarang</td>
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<tr>
<td>Barraba</td>
<td>Coonabarabran</td>
<td>Ashford</td>
<td>Holbrook</td>
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<tr>
<td>Jerilderie</td>
<td>Waugoola</td>
<td>Jemalong</td>
<td>Wakool</td>
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<tr>
<td>Murrumbidgee</td>
<td>Wakool</td>
<td>Tamarang</td>
<td>Mulwaree</td>
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<td>Nundle</td>
<td>Murray</td>
<td>Tamarang</td>
<td>Boolooroo</td>
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<tr>
<td>Unincorporated</td>
<td>Carrathool</td>
<td>Abercrombie</td>
<td>Lachlan</td>
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<tr>
<td>Monaro</td>
<td>Lockhart</td>
<td>Wakool</td>
<td>Carrathool</td>
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<tr>
<td>Windouran</td>
<td>Lockhart</td>
<td>Narraburra</td>
<td>Jemalong</td>
</tr>
<tr>
<td>Manilla</td>
<td>Wellington</td>
<td>Balranald</td>
<td>Uralla</td>
</tr>
</tbody>
</table>
group with two of its neighbours deriving from that source. It does seem from these affinities that nonconformist elements of the population could be satisfactorily typified as outliers from elements within the population and that, if they belong to latent groups (with insufficient mass to form), these may have similar affiliations.

In this diagnostic review of the $C_{III}$-UPGMA classification, global and pairwise techniques have been combined. The global view of original dissimilarities obtained through development of an MST has indicated a high level of support for the tripartite typology which is most clearly revealed by the $C_{III}$-UPGMA classification. The pairwise BOND routine was used to expand on the source of this strength by illustrating the kinds of networks which support the tripartite typology showing that localised labour area associations are in many cases broadly based. The MST proved useful in corroborating an earlier notion that outliers may have affiliations with groups in the population. Added support for this proposition was found from a review of selected nearest neighbours which showed consistent links to specific groups. This examination of individual dissimilarities has reaffirmed the tripartite typology as an adequate index for the nature of interarea differences and has added valuable depth to understanding.

6.4 Ordination and Localised Labour Area Differentials

Classification has provided a powerful insight into the previously unexplored structure of labour exchange differences where nature has been introduced to the specification of areal form. Refinement of these insights can be achieved by reconstructing impressions of form in more conventional terms which simplify relative differences between areas. Ordination of dissimilarities provides one method of attaining this goal. The characteristics of ordination are two fold. Firstly, it reverses the primary contention of classification that there are meaningful discontinuities in the distribution to be analysed and assumes meaningful continuities. Secondly, it attempts to separate these and dispose variation to a series of independent continua representing higher levels of dimensionality than for originals. The first characteristic is important because it constitutes a radically different technical approach to investigation of areal differences and offers the scope for a further affirmation of structure. It is not unusual for an ordination to highlight facets of form undetectable from classification because of difference in rationale. The second is conceptually important because the continua, axes or gradients identified, can reflect intelligible themes of differentiation which represent key features of structure. These are of critical interpretative importance because they provide a highly refined view of areal differentiation.
Principal Coordinate Analysis (PCO) was selected and applied to this task. The initial problem encountered in using any of the principle axes ordination techniques is selection of the appropriate axes to represent interindividual differences most effectively. Pielou (1977, 338) states that such decisions are largely subjective and reflect the need to choose between demands for simplicity and precision. Responses to the problem vary, some being made in accordance with significance tests, others monitoring proportions of the variance explained in search of natural ‘cut off’ points and yet more accepting criteria related to cumulative percentage of the variance explained. The stance adopted here was to inspect the distribution of observational units on individual axes and combinations of axes until the most effective representation of differences was achieved. This labourious method was adopted because it is the information represented by the axes which is critical. From this inspection, the first three axes (I, II, III) offered the greatest interpretative promise. Axes I and II were of most value because they concisely represented elements of interarea differentiation, III being included for use with three dimensional scattergrams which give scope for a more comprehensive examination of interarea differences. From classification results and association with ‘shorthand’ attributes, the first axis was found to represent urban-nonurban differences (from Table 6.2) but with the coast group indistinguishable as a separate entity. By similar means, the second axis was found to separate coastal from noncoastal areas (Figure 6.2) but with loss of the urban-nonurban distinction. While each is individually inadequate, they have an obvious potential when combined to effectively represent the major elements of structure.

Combination of these two axes is shown in Figure 6.7 where it has been represented in two parts. The first incorporates group symbols from the tripartite typology with place names and the second overlays the full set of MST links on the symbol pattern. The former is designed to enable assessment of congruence between the C_{III} UPGMA classification and ordination outputs, facilitating the identification of gradients (meaningful distribution of places on axes of variation) by using a powerful summary of differences. The latter overlays MST links between areas.

\[1^7\] These were selected with the knowledge that cumulative percentage of variance explained would be small (total: 15.5%; I = 7.4%; II = 3.1%; III = 3.0%). This is not surprising in social analyses such as this because of the large number of latent vectors which can be extracted from matrices of such size and the inherent complexity of social data. Usefulness does not depend on explained variation which may be of little conceptual merit, but information content. Good empirical results can be obtained in taxonomic studies with use of relatively few, though carefully chosen principle axes. Those axes not used deal with lesser facets of differentiation which elucidate elements of the subgroup structure.

\[1^8\] Only MST links are used, differences are those on the principal axes which have been adopted, not link lengths.
and provides a contrast with the ordination representation. This is useful in identifying distortions and assessing consistency of representation on selected axes by reference to original dissimilarities.

The three main elements of the tripartite typology are clearly segregated by combination of the first two axes (see symbol patterns in Figure 6.7(a)). Elements of the substructure are also discernable, i.e. the core elements which highlight the content of each group, their less specifiable peripheries and the urban-nonurban distinction between coastal areas. The clarity of this segregation is such that at the main group level the plot plane can be partitioned without difficulty so that closed boundaries incorporate complete groups in mutually exclusive sets (Figure 6.7(b)). The only exceptions come from the original nonconformist group. This does not compromise the ordination’s utility since one of its purposes is to simplify, the outlier distribution being perfectly consistent with expectations from the earlier affinities argument.

The clarity of this simplified representation can be seen from superimposition of MST links on the ordination plot (as a substitute for absent lower axes) because the majority of links are contained within the overlain group boundaries. Below the main group level, there is evidence that acceptance of this simplification results in distortion of individual dissimilarities as many MST linkages by-pass areas portrayed as being nearer in the coordinate space. This illustrates the limitations of the PCO simplification and suggests which elements constitute the greatest departure from original perspectives on structure. The clarity of the bivariate representation was again emphasised when a third dimension was introduced and three dimensional plotting routines were used to represent the resultant pattern. While the third dimension contributed little to conceptual refinement the facility to plot in three dimensions was extremely useful as it provided a capacity to examine the point pattern from different physical viewpoints. Manipulations of this kind permitted the distribution to be searched more thoroughly. The result (see Appendix L) is refinements which represent features of the structure more powerfully but all of these are essentially present in bivariate plots (so the simpler representation was retained). These diverse sources reaffirm congruence between the classification and

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19 There are few graphics routines capable of simulating the projection of three dimensional scatter plots in a two dimensional space. Two routines have been used in this Study, the first, a heavily modified version of Gallant's (1976) "3-D with Perspective" routine (marketed through Tektronix) and the second, a more sophisticated routine, referred to here as PRESPLOT and written especially for this Study by G. Preston of the ANU Computer Services Centre. All 3-D output presented is from PRESPLOT. PRESPLOT has a number of advantages in that; the 3-D cluster of points can be 'orbited' and continuous views presented; the clusters can be investigated from within, i.e. views need not be external; and it includes an angular transformation so that the broadest two dimensional face of symbols representing each point are presented for view. PRESPLOT has not yet been released as development for other applications is incomplete.
Figure 6-7: Ordination Plots of Principal Axes I and II Showing
(a) Area Labels, Group Membership and
(b) MST Relationships.
Figure 6-7: Ordination Plots of Principal Axes I and II Showing (a) Area Labels, Group Membership and (b) MST Relationships.

- Urban
- Nonurban
- Coast
- Transition zone
ordination results even though both procedures are sensitive to different features of the structure.

Having re-established the tripartite typology according to its fundamentals, this view of interarea differentiation proposes four key features of the configuration in what is perhaps their simplest format. These rely on classification of group definition which is described by either zones of transition, where group peripheries overlap when axes are interpreted literally (as opposed to specification by imposition of conceptualised group boundaries), or absolute distinction, where there is no transition. The latter is easily recognised from Figure 6.7, the former being defined, in the broad sense, by value ranges occupied by members of two or more groups with the limits being defined according to extremities reached by members of opposing groups. Two zones of transition and one of absolute distinction are apparent. The resulting impression of configuration is as follows:

i) the coast and urban groups are absolutely distinct with no transition zone between them indicating minimal peripheral interaction;

ii) the coastal and nonurban groups share a small zone of transition, suggesting that the nonurban component of the coastal group is capable of forging a link with the main nonurban group;

iii) the urban and nonurban groups share a larger zone of transition due to the nature of some urban and nonurban areas, e.g. those containing small urban centres, indicating a stronger peripheral interaction on the main axes of differentiation than for either of the other two comparisons;

iv) the distribution of coastal areas parallels that of the urban-nonurban distribution with least distinction at the nonurban extreme and most at the urban, suggesting pervasiveness of an urban-nonurban distinction.

Collectively, these features constitute a hypothesis as to the form of interarea differences according to dimensions of variation. They are, at the most rudimentary level, associated with the axes produced by ordination. However, interpretation can be far more difficult where non linearities exist because axes are functionally related (see literature referenced earlier) and not individually interpretable. These problems do not seem to be important here as simple tests of extremes, by reference to core groups of the classification (as in Figure 6.7(a)) and 'shorthand' information, indicate existence discernable conceptual gradients.

From this, it is possible to generate a highly stylised model of interarea

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20. Expansive as this delimitation is, only small proportions of the population are taxonomically indeterminant and this falls even further when less expansive definitions are used. For example, midpoints were defined in Figure 6.8(a) as partitioning equal numbers of overlapping from elements alternative groups so that there is an indication of tendencies towards membership of groups other than those suggested by the tripartite typology. This reveals only six transitory elements, four across the urban-nonurban distinction and two across the coast-noncoast distinction.
differentiation which embraces only the fundamental elements of form. This model of differentiation is a direct extension of the MST overlay on the PCO plot and identifies the major elements of interarea variation which are represented as a conceptual composite of the two axes identified\(^{21}\). The result is simultaneous portrayal of urban-nonurban and coast-noncoast differences on integrated continua (Figure 6.8), emphasising differences of degree which in turn become differences of kind. That is, at any point on the continua, differences are comparatively minor and can be seen as shifts of degree between areas such as more urban or less nonurban. When the continua are considered as a whole, they reflect differences of kind such as that between urban and nonurban types of place. The classification constitutes an empirical simplification of this proposition emphasising qualitative differences of kind with an empirical allocation of transitory elements to preferred groups. Where there is an absolute distinction, as between urban and coastal areas with urban tendencies, there is no reason to assume that groups might not expand to engulf differences as other areas are introduced to such analyses. The stylised representation of interarea differences provides a basis for reconciling empirical observation with conceptual possibility without tedious reference to extraneous detail.

![Stylised Conceptual Gradient of Interarea Differences](image)

Note: A similar gradient can be detected from the gower dissimilarity matrix which was also subjected to a PCO

**Figure 6-8:** Stylised Conceptual Gradient of Interarea Differences.

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\(^{21}\)Conceptual gradients of this type are difficult to identify if ordination is beset by nonlinearities resulting in functionally related axes which are not individually interpretable. As pointed out above, this does not appear to be a problem here, their combination being for purely conceptual purposes.
6.5 Areal Form as a Conceptual Index of Nature in Differentiation

Isolation of spatial form constitutes one empirical synthesis of place in labour exchange. Spatial form, as identified in this instance, elucidates the states of place which result from incorporation of nature into differentiation. The most immediate task is to articulate the states of place in a high level manner to show their role in labour exchange. Substantial resources have been devoted to the specification of areal form and translation of pattern into propositions suggestive of structure. A two part question arises as a logical extension of this analysis if it is not to be justified for its own sake. The first asks what is revealed about the nature of areal differences and the second, what is the significance of form specification where nature has been introduced? The notion of structure assumes areal differences are not ad hoc and that they derive from spatial differences in socio-economic processes associated with place. As a consequence, spatial form is an index of nature in differentiation for outcomes which result from these processes. The significance of such an index is that, where identifiable, it offers a higher degree of generality than obtainable through analyses of extent in differentiation. In addressing this question, the task is to produce a synthesis indicating the source of widely based areal differences and demonstrate the significance of findings.

Higher level synthesis is not difficult because the elements of form, which result from incorporation of nature into differentiation, are surprisingly recognisable given the complexity of source in highly disaggregated spatio social observation. The tripartite typology bears the unmistakable signature of popularly perceived differences in regional economic structure (most familiar to settlement geographers) with its urban-nonurban and coast-noncoast differences, suggesting a conceptual integration of the typology’s elements. These themes, or elements of them, are recurrent in several works on the subject, just as the typology has been recurrent from different analytical perspectives. The urban-nonurban element of the typology is firmly ensconsed in Australian and overseas settlement theory (Jefferson, 1939; Ziph, 1949; Losch, 1952; Christaller, 1966; Lloyd and Dicken, 1972). Aspects of the Australian urban-nonurban structure have been empirically examined in numerous studies, the cruder type concentrating on population size differences (Scott, 1964; Rose, 1966; Bourne, 1975; Cloher, 1975; Lonsdale and Holmes, 1981) with more sophisticated studies examining differences in function (King, 1954; Daly and Brown, 1964; Ryan, 1965; Smith, 1965(a);(b); Linge, Rimmer and Lance, 1976; Australia-Department of Home Affairs and Environment, 1983; Sorenson and Weinand, 1983).

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22This is not an invalid exploratory objective because the purpose is to search observations which are potentially, but poorly, understood.
Whilst only two categories, 'urban like' and 'nonurban like', have been suggested here this is to be expected given Rose's (1967,149) view that elements of the Australian urban system are not highly specialised, with "a tendency for all functions to be reasonably well represented". Presumably those which do not satisfy this view are peripheral to any categorisation or fall into nonconformist groups. The major objection to these studies is they fail to recognise other important distinctions, in this case one inherent to the Australian situation, i.e. coast-noncoast. This is less frequently recognised but has been empirically identified by Rowland (1975,65) using a crude population density model and proposed conceptually in regional development literature as an adjunct to core-periphery models where it is shown as an extension of extractive relationships (Vance,1970; Weinäld,1972; Rimmer,1975). Incomplete as each of these treatments may be, they sustain the general proposition that labour exchange corresponds very strongly to conceptual and empirical settlement models.

Were this analysis an investigation of conventional differences in areal function through industry or occupational mix, this finding would not be surprising because activity differences due to function could be expected as a manifestation of settlement characteristics. However, since this data set has not been structured to elicit such a result, it can only be concluded that these aspects of differentiation are so strong as to permeate the form of diverse outcomes from the labour exchange process. From this it can be proposed that classification and ordination articulate an unexpected activity gradient of unprecedented generality as the underlying source of labour exchange differentiation.

As form is not a simple function of industry/occupational mix, the concept of activity responsible for labour exchange differences must be generalised if prescriptive deficiencies are to be eliminated in future research. This can be done by considering five issues in two groups on the theme of spatial differences in human activity. The first three concern the fundamentals of activity:

i) What people do.

ii) How they do it.

iii) Why they do it.

The final two relate activity to location:

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22These types of analysis have a strong basis in labour exchange and could have been adopted as an alternative but they are narrowly conceived, have predictable results and have been executed extensively in Australia and overseas. As a result, they provide a poor subject for exploration.
iv) Where the activity is being carried out.

iiiv) Why is it being carried out at those locations

The concept of activity derives from the subject matter of these issues which, in turn, target: the objectives of action; the way objectives are achieved; the motivations for achievement; the place where actions are taken; and the characteristics of place which enable activity of varying kinds. From this, activity can be tentatively defined as:

The efforts of people to achieve private and social objectives by available means, the attainment of which involves reconciliation of alternatives as constrained by resource endowments and governed by aspirations, commitments and ethical considerations.

The ramifications of activity differentiation between areas have scope to be far more complex than suggested by analyses of elemental settlement function, embracing not only the tangibles of industry/occupational mix approaches but also intangibles, such as aspirations and ethical considerations. The full extent of activity influences can only be established by continued exploration of diverse data sets.

Theory, concept and empirical analyses have proven more useful in retrospect than in establishment of this Study. There was little, at the outset, to indicate an affiliation between detailed labour exchange differences and general findings from settlement related research. Research has, therefore, been inductive and search oriented. Were more conventional approaches to analysis adopted, it is likely that this finding would have gone unobserved as preoccupation with detail would have mitigated against high level generalisation. It remains, however, to establish whether this finding is significant and if so, why?

Significance can be established in accordance with two criteria. The first is conceptual generality of findings. In short, this refers to breadth of applicability which, in this case, has been markedly increased by introduction of nature into differentiation. The resulting impression of areal form has encapsulated diverse sources of variation and summarised them in a highly simplified way. The readily interpretable character of areal difference is analytically important because form has become a 'shorthand' index of nature in differentiation. Unlike the analysis of areal unemployment differences, where findings were restricted to one dimension and gained merit by association with performance assessment, analysis of nature in differentiation has a far wider ambit so it is possible to hypothesise more general sources of differentiation. This has been done and removes the restrictions inherent in data intensive analyses.
The second source of significance is a direct outcome of this because, contrary to earlier expectations, the analysis has important policy ramifications. Correspondence of widely based labour exchange differences with areal activity dramatically simplifies a complex problem and integrates these considerations into a wider research frame (Jeffrey and Webb, 1972, 159). This contrasts sharply with original concerns that no intelligible pattern of differences would be identifiable because of idiosyncratic labour exchange differences and exceeds any expectation of interpretability. The policy relevance of this is that it provides a context, based on 'natural' or popularly perceived differences, which can be used as a reference point to integrate programmes or, as an initial guide for implementation where necessary information sources are underdeveloped. This is important because, until now, there has been little to suggest the existence of such an organisational structure for labour exchange.

Form has proven a powerful index of nature in areal differentiation through what can be loosely termed the 'settlement surrogate'. It simplifies an extremely complex problem by identification of general dimensions which have important ramifications for labour exchange analysis and policy formulation. These findings have resulted largely from the inductive character of this analysis which is not constrained by the tenets of a priori theories derived from informal observation. These have a penchant for premature simplification which pre-empts alternatives before they have been adequately considered. It is likely that the generality of labour exchange differences would go unrecognised in narrower analyses, perpetuating an already secular research trend. By contrast, there is strong evidence to suggest a relationship between areal labour exchange differences and more general characteristics of the space economy, indicating a need to break with idiosyncratic treatments in spatial analysis.

6.6 Conclusion

This analysis has sought to determine whether intelligible interarea differences can be identified from extensively specified labour exchange outcomes and, if so, what they indicate about the previously unexplored nature of labour exchange differentiation. A great deal of effort has gone into pattern manipulation to develop familiarity, assess consistency and dispel views that one pattern is in some way definitive. Empirical manipulation of this pattern involved the introduction of alternative patterns to that preferred by use of different dissimilarity/classification combinations, redefinition of the data set, diagnostic examination using global and pairwise techniques and finally, application of ordination as an alternative to classification.
A very clear and empirically consistent structure was identified which, in its simplest form, embodied three principal groups with a nonconformist group of outliers appended. The 'shorthand' method of interpretation established that at the highest level of generalisation these groups represented a 'natural' distinction between coastal, urban and nonurban communities. These group content hypotheses were integrated at a higher level to constitute a tripartite typology of interarea differences which embraced both regional and urban hierarchic themes, synthesising general structure of labour exchange in the space economy.

Ordination isolated the fundamentals of interarea differentiation with these themes recurring in a format which enabled the formulation of a simplified model suggesting a conceptually integrated gradient of areal differentiation. This model acted as a focus for higher level synthesis, leaving little doubt that the main elements of labour exchange differentiation corresponded in form to key elements of the space economy, embracing such diverse factors as location, population size, expansiveness of areas, local government status and, more generally, critical elements of the space economy. Fundamental distinctions of place in labour exchange have been described as reflecting an activity gradient which incorporates all of these lower level factors. As a tentative summary of place in labour exchange, this gradient documents the crucial geographic variable with marked qualitative differences for nonmetropolitan N.S.W. The different states of this place variable are of empirically unsuspected and unprecedented generality because of the overt concern in social studies with detailed labour exchange attributes from widely ranging dimensions in the first instance and the paucity of similar exploratory work in the second. It is this generality which indicates emergence of a very powerful synthesis with an exceedingly complex problem which is otherwise obscured in data intensive analyses of extent in differentiation.
APPENDIX J
a. Employment Change
b. Quantity of Work
c. Family Income
d. Unemployment
e. Labour Force Participation Change
f. Migration
Figure J-1: Employment Change
Figure J-2: Quantity of Work

- CORRELATION COEFFICIENT 0.847
- BEST AND WORST COEFFICIENT 0.178
- SPACE ELLIPSE COEFFICIENT 0.204
Figure J-3: Family Income
Figure J-4: Unemployment

[Diagram showing a tree structure with various nodes labeled with place names, likely representing a correlation or classification diagram.]

*GENEIC CORRELATION COEFFICIENT -0.78
*SPACI DISTORTION COEFFICIENT 0.98
Figure J-5: Labour Force Participation Change
Table K-1: Illustration of Interaction Within the Coastal Group for Specimen Areas Using Nearest Neighbour Patterns.

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Routines for simulating three dimensions in two, were developed so that higher level plots could be reviewed and greater flexibility introduced into inspection procedures. Inclusion of the third dimension added little to the two dimensional patterns in this case because the third principal axis was not critical to exposure of the tripartite structure’s main features. As a result, the simpler, two dimensional representation was retained, but this situation need not prevail with other data sets so that three dimensional plotting is an important adjunct to exploration. Three dimensional representation was not superfluous, however, as it served to highlight specific features of the distribution being examined, though sometimes at the cost of others. Highlighting by manipulation of viewpoint\textsuperscript{1} serves to reinforce impressions of the distribution’s form and, for this reason, three plot sets have been chosen and are presented below. Presentation results in a number of problems\textsuperscript{2} and requires the use of overlays because unscaled titles distort depth perception. MST’s were also overlain to facilitate interpretation, these being drawn in two dimensions and automatically reorientated in accordance with different viewpoints.

The three illustrations are shown in Figures L.1 to L.3 and highlight the following features:

- L.1 - Coast as distinct from urban-nonurban amalgam;
- L.2 - Urban-nonurban distinction regardless of coastal status;
- L.3 - Full tripartite structure;

\textsuperscript{1}Complex graphical transformations are possible so that, for example, it is even feasible to observe the point pattern as it would appear from one area. While this would be of relevance were this research being done for a particular local government interested in its position relative to others, this facility produces views which are insufficiently general for this Study but it does serve to illustrate the power of the routine.

\textsuperscript{2}Squares were used as opposed to circles or cubes because of the inordinately large number of calculations required with the former and the plot cluttering which was produced by the additional lines needed to represent the latter. Hidden line removal has the disadvantage of eliminating symbols of areas which fall into the background as they are shielded from view by symbols closer to the viewport.
Figure L-1:
Figure L-1:
Figure L-2:
Figure L-2:
Figure L-3:
Figure L-3:
Poor integration of place into social process has resulted in spatial analysis being assigned the status of an addendum to serious social research. Consequently it is often of only casual interest, appearing *ad hoc* and inessential. The problem of place in social process has, thus far, only been addressed by those with a penchant for grand theory. These arguments have minimal foundation in empirical observation and it is doubtful as to whether they constitute theory in its logical sense. Such problems can be addressed by expanding on the ‘shorthand’ treatment of place in labour exchange. This can be done by searching for evidence of critical regularities in attribute affinities with spatial structure which are indicative of association with social process.

Though the shorthand treatment has proven extremely useful, because it has maintained an emphasis on place, it can be criticised on two grounds. These arise from its reliance on extrinsic attributes of place and subsequent ignorance of intrinsic attributes which result directly from the element of social process under study, i.e. labour exchange. First, associations of place with social process are extremely broad as highly qualitative attributes are used. Whilst these may be intelligible and, therefore, suggestive of structure, this may not be true of the extensive array of intrinsic attributes, raising doubts as to the meaningfulness of ‘structure’. Second, this method artificially distinguishes between place and social process to emphasise the former. Social process is therefore treated as an analytical convenience in the identification of place\(^1\). These problems combine to impair specification of an integrated model relating place to social process since there is an analytical disjunction between conceptions of place and immediate sources of observation in outcomes from social process. These must be associated with spatial structure if such a model is to be developed from an empirical basis.

Extension of the shorthand treatment is very complex since the number of

\(^{1}\text{This is of no less consequence than the widely encountered alternative where place is used as an analytical convenience for disaggregation of social process. The only difference is that it reverses this tendency by using social process to distinguish place.}\)
attributes involved is so large that consideration of outcomes from social process may overshadow those of place. This cannot be allowed, in what is essentially a spatial analysis, if emphasis on the role of place in labour exchange is to be maintained. This problem can be overcome by taking the structure of place, previously identified as the tripartite typology, and using it to document regularity in outcomes from social process. Identification of such regularities involves collective examination of attribute associations with this particular distinction of place. Though it is known associations of this type are collectively responsible for what has been observed and digested using the shorthand method, it is not known which attributes have influence nor whether they have collective themes. The empirical task is therefore to search for conceptually meaningful themes amongst regularities in association.

The terms association and regularity are used advisedly in this Study. In the first case, care must be taken in ascribing causality to attributes which are highly associated with spatial structure since pervasive elements of place may in turn be responsible for attribute states in localised social process. There is ample evidence from the 'shorthand' perspective that this may be the case. Given this, illusory gains from statements of naive causality should be avoided and association used as a method of exploration to generate plausible hypotheses with potentially far greater ramifications. Here this will take the form of a model which fits place and process and in doing so reduces the ad hoc character of spatial analyses by integrating it with social process. Developments of this type are necessary if spatial analyses are to be established as elemental to social process.

In the case of regularity identification, caution must be exercised if attribute combinations are not to be ascribed simplistic meanings. Regularity is identifiable in two stages: the first being numerical, which refers to concentrations of association indices within defined ranges; and the second, conceptual, which seeks social meaning in numerical regularity. Numerical regularity is obviously a prerequisite for conceptual regularity but is of negligible value where the latter is not discernable. Numerical regularities may indicate existence of either coincident or divergent influences amongst attributes. Coincident regularities include all attribute effects which are highly associated with identified spatial structure because their individual distributions coincide with that of the dominant spatial structure. Attributes which are poorly associated with this structure are divergent because it can be reasonably proposed that they would reveal different spatial patterns.

Whilst the nature of conceptual regularities cannot be speculated upon from what is known, four limiting cases can be envisaged upon the assumption that numerical regularities can be identified:
i) coincident influences concentrated within a small proportion of dimensions but conceptually unintelligible;

ii) as above but conceptually intelligible;

iii) coincident influences spread across a large proportion of dimensions but conceptually unintelligible;

iv) as above but conceptually intelligible.

Of these, only the fourth is capable of sustaining the level of hypothesis generation necessary for development of a broad spectrum model of place in labour exchange. This type of result is necessary since spatial structure must have a demonstrable intrinsic generality if it is to be widely applicable in labour exchange.

7.1 Patterns of Attribute Affinity with Spatial Structure

The ensuing argument can be construed in several ways. A two part exposition has been chosen for clarity, the first seeking attribute associations with spatial structure and the second attempting a synthesis resulting in an integral model of place in labour exchange. The first part uses Cramer contribution coefficients (S.) to examine multiplace associations, derived from a streamlined version of the tripartite typology, which excludes outliers to emphasise differences between major groups. Cramer coefficients are organised and reorganised within Bertin's (1981) reorderable matrix framework. This involves physical manipulation of complex contingencies in search of 'like' elements embedded in the initial matrix which are representative of thematic differences or conceptual axes. This has been done here by taking the initial matrix of attribute associations for the tripartite typology, ordered by magnitude of contribution scores, reorganised by dimensions and then partitioned according to major dimensional themes. These are qualified where necessary by noting lesser themes within those identified. Whilst these may appear extraneous their exclusion would result in simplistic treatment of thematic hypotheses which is unjustifiable in exploratory research. Superimposition of dimensional categories on the initial representation of scores is necessary due to the impracticality of relating highly disaggregate attributes from conceptually disparate dimensions. The second part is largely self explanatory. It commences with an attempt to relate dimensional themes of differentiation which leads to far reaching hypotheses concerning place and social process.

2A great deal of work was done with the Cramer coefficient to establish its empirical properties using a large number of actual and simulated distributions. It was found, in this instance, that contribution patterns were similar between original and modified distributions but that scores for the latter were higher. Interpretation is therefore relative between extremes of 0.0 and 1.0, being distribution dependent. This was found to hold in a variety of simulations. An important technical finding of this work was that classificatory signatures could be identified from regression residuals of ordered coefficients. This concept has great potential in taxonomic work as it provides a basis for differentiation of classifications.
Each dimension of areal variation used in this Study has the potential to attain high levels of interpretative significance if it is assumed that labour exchange processes have highly spatial manifestations due to associations with place. This assumption is of fundamental interest because it is paramount to all considerations of place in social process. If a case for acceptance of this assumption cannot be established empirically there is no point in model development and the grand theory of recent times must be abandoned as there is no reason to believe place has a meaningful role in social process. The results of this first stage analysis are therefore important not only to the second stage of model development but more generally in spatial research.

In adopting Bertin's (op.cit.) reorderable matrix framework the initial exposition of attributes ordered solely by $S_i$ scores has been dispensed with since it proved to be of little analytical value, combining conceptually disparate attributes into indecipherable combinations. These were reordered by superimposition of a dimensional framework on attributes which produced a cross classification by magnitude of $(S)$ scores and original dimensions. The objective of this manipulation is to reorder attributes into a simpler format where dimensional themes may be discernable. This dimensional mode of interpretation is similar to that used with principle axes methods of ordination. The main difference is that axes are predefined and identified conceptually rather than technically. Contribution coefficients serve a similar role to axis loadings except they indicate multigroup discrimination for a given spatial structure as opposed to positive or negative correlation with axes responsible for spatial differentiation. The obvious advantage of Bertin's method is that technical assumptions are reduced to a minimum.

This matrix will, for practical purposes, be regarded as the original for subsequent analysis. As analysis of dimensional contribution patterns can be complicated, a consistent format will be used in this search for dimensional themes. This is outlined in Figure 7.1 which shows that each dimension will be treated in three phases, the first searching original patterns for numerical regularities, the second examining these for conceptual themes and the third relating any findings as synthetic hypotheses in model format. Before this can be done however, a general treatment of dimensional differences is necessary to put individual patterns into context. This will be largely restricted to an examination of numerical regularities because of difficulties in relating conceptually disparate sources of variation. As

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3 Unlike the principle axes methods maps for each dimension are not required since the purpose is to identify associations with the one multigroup spatial structure, mapped previously. This approach therefore offers valuable economies for hypothesis generation and development of a higher level model of place in labour exchange.
such, it will provide a starting point for the identification of dimension specific numerical regularities, recording original sequences from which subsequent interpretation.

![Table of Dimensions and Regularities]

**Figure 7-1**: Format for Identification of Dimensional Themes.

Table 7.1 shows score values graded into mutually exclusive categories commencing at $s_i=0.00$ and progressing through intervals of 0.09 index units. Though the starting point and intervals have been chosen for convenience they are sufficiently comprehensive to highlight key elements of pattern. Categorisation according to explicit dimensions is arbitrary in that other conceptual divisions, common amongst attributes, could be envisaged. In this particular case, these could not be applied because none are common to all dimensions. It is only within dimensions that such commonalities can be identified. Dimensionality offers the advantage of a relatively disaggregated view which, as with the score gradation, will not obscure important detail.

In addition, three summary indices are presented for each dimension and their various categorisations in Table 7.1. The purpose of these indices is to facilitate identification of numerical regularities by revealing attribute concentrations from different perspectives. The first, and simplest, is a column concentration index (C) showing the percentage of attributes in each score/dimension category of Table 7.1 as a ratio of the total number of attributes used. Application of this simple index is constrained to comparisons across the full array of attributes. It cannot be used independently to represent concentrations within particular dimensions because each is represented by different numbers of attributes so that identical numerical concentrations in different dimensions represent different proportions.

There is, therefore, need of an index which will permit a direct assessment of
attribute concentration between dimensions. This can be done by adjusting the C index to a new form labelled C* which adjusts the original in relation to the number of attributes in each dimension:

\[ C_{ij}^* = C_{ij} \times 0 \]

where

- \( C_{ij}^* \) = adjusted column percentage
- \( C_{ij} \) = original column percentage
- \( 0 \) = adjustment factor \( \frac{a}{b} \) where
  - \( a \) is the number of attributes in the most heavily represented dimension and \( b \) is the number of attributes for the dimension being considered.
- \( i \) = nominated dimension
- \( j \) = nominated score range

This simple adjustment for each dimension results in interdimensional smoothing with the sum of scores for each dimension now being identical to that for the most heavily represented dimension. As a result attribute concentrations can be assessed on a dimensional basis.

A further refinement can be made by weighting the \( C^* \) values according to score magnitudes so that the importance of contribution effects is introduced into comparisons. This adjustment is based on a recognition that some concentrations are more important to the areal structure being investigated than others. An index \( |t| \) was created to emphasise this feature of concentration differences:

\[ t_{ij} = C_{ij}^* \text{ where } t = \text{the weighted concentration index.} \]

\[ K = \text{weight for each of } j \text{ score gradations.} \]

The weighting system used here was taken from the score gradation in Table 7.1 with lower category boundaries being accepted in each of the nine cases. These were chosen so that index values would be conservative but a number of other alternatives, including category centroids or upper values for each category, could have been used with the same result.

These indices are of particular value in formulating elementary impressions from Table 7.1. Firstly, at a dimensional level, attribute concentrations are clear from the C index. The unemployment dimension has the highest concentration at \( C=19.66 \) and income the lowest at \( C=11.97 \), with the others tending towards the higher of these two extremes. While this might lead to suspicions that the income dimension is poorly represented and susceptible to ‘swamping’ by the predominance of attributes from better represented dimensions, this concern is unfounded. The \( |t| \) value for income is second only to unemployment and in both cases high values are due to attribute concentrations in the upper score categories. More generally, contribution patterns for most dimensions are similarly concentrated in a very distinct manner (similar score gradations for each dimension). Whilst such
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concentrations are not necessarily indicative of conceptually significant structure, they do suggest numerical regularities supportive of efforts in this direction.

Attention will now be shifted to a dimensional scale, where conceptual regularities may be identified. Table 7.1 provides the starting point in each case where numerical regularities will be specified as a prerequisite for reordering elements of the matrix in search of thematic associations which can be proposed as relating attributes. Although contribution patterns for each dimension will be discussed separately, there are sometimes parallels between them and the possibility of links because of their common focus on labour exchange. These parallels will be pointed out where appropriate.

The unemployment dimension will be used to introduce this phase of investigation because it formed a basis for the preceding data intensive analysis. A glance at Table 7.1 shows that, while there are no unusually high concentrations of attributes in any of the score value categories for this dimension, there is a tendency for scores to concentrate towards the upper end of the continuum. This is highlighted by the dimension's dominance of $s_i \geq 0.80$ score category. This indicates that particular attributes from the unemployment dimension are relatively good areal discriminators within bounds of the structure being investigated. Unlike some of the other dimensional categories, the unemployment attributes are distributed across all score categories (with the exception of the 0.00-0.09 category), indicating no natural discontinuities upon which to distinguish between groups of attributes.

This poses an interpretative problem in distinguishing meaningful coincident and divergent effects because there is no obvious 'break' in contributions. This problem is heightened by the diversity of attributes in the upper and middle score gradations which could be identified as the source of coincident effects, as they seemingly defy thematic interpretation. For example, attributes in these ranges reflect changes over time for special interest unemployed (i.e. those other than the common male-female disaggregation and the unemployment situations at specific times for more general indices). There is some evidence of organisation amongst the more influential attributes, including the combined dominance of male unemployment change attributes for 1971-76 and 1966-76 in the $s_i \geq 0.80$ category. There is a similar association of female change attributes in the 0.50-0.59 value range indicating that male attributes discriminate between the places identified in the tripartite typology with more power than female attributes. Likewise, other associations can be proposed and speculated upon but there is still little scope for a generalisation which is applicable to the broader range of unemployment attributes.

On the premise that systematic absences from the high value contribution
Table 7-2: Unemployment Attributes Classified by Prercessionary or Recessionary Status and Cramer Coefficient Values.

<table>
<thead>
<tr>
<th>Coefficient Ranges</th>
<th>PRE RECESSION</th>
<th>POST RECESSION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SI</td>
<td>SI</td>
</tr>
<tr>
<td></td>
<td>seeking 1st job 1971-76</td>
<td>0.82</td>
</tr>
<tr>
<td></td>
<td>male 1971-76</td>
<td>0.82</td>
</tr>
<tr>
<td></td>
<td>male 1966-1976</td>
<td>0.81</td>
</tr>
<tr>
<td>0.70-0.79</td>
<td>married 1976</td>
<td>0.71</td>
</tr>
<tr>
<td>0.60-0.69</td>
<td>age ≤ 21 yrs 1976</td>
<td>0.68</td>
</tr>
<tr>
<td></td>
<td>seeking 1st job 1976</td>
<td>0.66</td>
</tr>
<tr>
<td></td>
<td>male 1976</td>
<td>0.65</td>
</tr>
<tr>
<td>0.50-0.59</td>
<td>female 1971-76</td>
<td>0.58</td>
</tr>
<tr>
<td></td>
<td>female 1966-76</td>
<td>0.58</td>
</tr>
<tr>
<td></td>
<td>married male ≥ 1 child 1976</td>
<td>0.55</td>
</tr>
<tr>
<td></td>
<td>seeking 1st job 1971-76</td>
<td>0.53</td>
</tr>
<tr>
<td></td>
<td>single 1976</td>
<td>0.53</td>
</tr>
<tr>
<td>0.40-0.49</td>
<td>female 1976</td>
<td>0.47</td>
</tr>
<tr>
<td></td>
<td>age ≤ 20 yrs 1976</td>
<td>0.46</td>
</tr>
<tr>
<td></td>
<td>seeking 1st job 1976</td>
<td>0.45</td>
</tr>
<tr>
<td>0.30-0.39</td>
<td>male 1971</td>
<td>0.36</td>
</tr>
<tr>
<td></td>
<td>seeking 1st job 1971</td>
<td>0.31</td>
</tr>
<tr>
<td>0.20-0.29</td>
<td>male 1966</td>
<td>0.27</td>
</tr>
<tr>
<td></td>
<td>female 1966-71</td>
<td>0.23</td>
</tr>
<tr>
<td></td>
<td>female 1971</td>
<td>0.22</td>
</tr>
<tr>
<td>0.10-0.19</td>
<td>male 1966-71</td>
<td>0.19</td>
</tr>
<tr>
<td></td>
<td>seeking 1st job 1971</td>
<td>0.18</td>
</tr>
</tbody>
</table>

categories may provide insight into the theme of this dimension, attention will now be turned to the lower scoring attribute combinations. Although fewer in number and therefore potentially less diffuse, the first impression is that they are as interpretatively amorphous as attributes from the higher scoring ranges. This dissipates when it is recognised that all of the lower scoring attributes contrast in one way with their higher scoring counterparts. They refer almost exclusively to conditions of the period 1971 and before, while, by contrast, those in the upper score categories refer to the 1976 period. Fundamentally, this represents a distinction between those attributes dealing with spatial differences before onset of the 1970’s recession, documented in Chapter 3, and those based on differences after onset of the recession. The clarity of this can be seen from Table 7.2 where the unemployment dimension of the original matrix has been reordered. There is negligible overlap between the two groups of attributes with even those referring to changes over time polarising sharply, depending upon whether the terminating year of temporal comparison is 1976 or 1971. This finding is in keeping with the earlier unemployment discussion where longitudinal consistency propositions were found to
be less durable than their cross sectional counterparts. The most plausible reason for this is a strong and relatively uniform recessionary effect on most unemployment attributes, changing their spatial manifestation over time. This involved a shift from some previous form to one more like that of the tripartite typology. Variations in the consistency of this effect, e.g. the propensity of male attributes to discriminate most powerfully, raise numerous issues and questions as to subthemes. However, these influences are piecemeal and below the level of pattern resolution being considered at this stage and are more suited by their detail to pursuance in dimension explicit analysis.

The nature of the unemployment dimension’s contribution to observed areal structure is best characterised as discriminating on the basis of a period specific shift associated with, if not directly caused by, the recession of the early 1970’s.

Since employment is the conceptual antithesis of unemployment, the employment change dimension will be examined next in search of attribute regularities which may expand the existing impression of place in labour exchange. As the predefined features of the employment change dimension are time period, sex and occupational status it is to be anticipated that different influences on area structure may be identified. The distribution of contribution coefficients is far more concentrated than for the unemployment dimension as the bulk of its attributes are continuously confined to only four of the available value categories in Table 7.1. There is no representation in the two upper value categories and only token representation in the third (C=0.85, C*=1.09 and t=0.65), indicating this dimension does not contain any especially powerful discriminators. This is not surprising in the context of the s_i >= 0.80 value range because the unemployment dimension is exceptional in its representation at this level, yet it becomes increasingly more unusual in the 0.70-0.79 and 0.60-0.69 categories. Token representation in the two lowest score categories is unusual by comparison with other dimensions, showing that whilst there are no high level concentrations there are equally none in the bottom two categories. This highlights the continuous four category block and firmly focuses attention on it. A glance at the [t] scores for each dimension shows this concentration is not sufficient to produce as strong a potential for collective influence as for many of the other dimensions.

Although having comparatively weak collective influence, this dimension may

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4 The end result is familiar from the unemployment chapter. Of more critical importance, this view of nature in differentiation raises two questions: first, is the spatial distribution of unemployment likely to remain comparatively stable for duration of the recession and if so how will it change in periods of higher growth which may terminate the current experience; and second, while the shift is associated with the recession, it might well be asked whether it is responsible for areal structure or some localised set of phenomena have an ordering influence? These issues can be investigated further in later studies.
yet embrace a strong thematic element. The key to identifying the prominent elements of pattern lies in the four categories which contain the bulk of attributes and occupy the value range 0.20 to 0.59. As with the unemployment dimension, the first impression from this set of observations is amorphous because they are so tightly clustered. Contrary to expectations raised by the unemployment dimension, there is no simple division of attributes which accords with Australia’s shift into recession nor is there evidence of organisation according to sexual division of labour. In contrast to the unemployment dimension, attribute combinations from the upper level score categories present the best starting point for any detailed examination of the employment change dimension by virtue of the fact that they are fewer in number. The most striking feature of these value categories is the predominance of attributes referencing change in the wage and salaried (W&S) component of the labour force as having greatest coincident influence. Extending the examination, it can be seen that all W&S attributes can be accounted for above the $s_i=0.40$ level of contribution. Utility of this observation is increased because only two attributes, from either of the other two occupational status types, penetrate this level.

This finding strongly suggests a division of employment change attributes according to the mode of labour exchange. These modes are of two types, one applying to wage and salary earners and the other to self employed and unpaid labour. The first mode of labour exchange can be described as direct because remuneration for labour is in the form of transfers from employers to employees as wages or salaries. The second mode can be described as indirect because remuneration derives from profit (which is contingent upon success) for the self employed and from something less tangible, though no less real, in the case of those providing unpaid labour. Mode of remuneration is simply a characteristic of more deep seated differences which extend into formal relationships of the individual with the economy. This aside, the clarity of distinction is shown in Table 7.3 where attribute scores are organised by the mode of labour exchange. There is an overlap between the two caused by the intrusion of two attributes, i.e. female self employment, representing a lesser theme based on the sexual division of labour. The existence of other lesser themes could also be speculated upon, for example, the predominance of attributes with the low scores which have 1966 as a base year or groupings according to specific features of occupational status. As with the unemployment dimension, these are insufficiently general compared to the major theme and do not warrant more than a mention at this stage. It is noteworthy that the upper boundary of the 0.30-0.39 category again accords closely with the distinction between attributes assigned to the coincident and divergent influence categories.
Table 7-3: Employment Change Attributes Classified by Modes of Labour Exchange and Cramer Coefficient Values.

<table>
<thead>
<tr>
<th>Coefficient ranges</th>
<th>DIRECT EXCHANGE LABOUR</th>
<th>INDIRECT EXCHANGE LABOUR</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.60-0.69</td>
<td>male W+S 1966-76</td>
<td>0.65</td>
</tr>
<tr>
<td>0.50-0.59</td>
<td>male W+S 1966-71</td>
<td>0.59</td>
</tr>
<tr>
<td></td>
<td>female W+S 1966-71</td>
<td>0.58</td>
</tr>
<tr>
<td></td>
<td>female W+S 1966-76</td>
<td>0.52</td>
</tr>
<tr>
<td>0.40-0.49</td>
<td>male W+S 1971-76</td>
<td>0.47</td>
</tr>
<tr>
<td></td>
<td>female self employed 1971-76</td>
<td>0.44</td>
</tr>
<tr>
<td></td>
<td>female unpaid 1966-71</td>
<td>0.38</td>
</tr>
<tr>
<td></td>
<td>male unpaid 1971-76</td>
<td>0.37</td>
</tr>
<tr>
<td></td>
<td>male unpaid 1966-71</td>
<td>0.32</td>
</tr>
<tr>
<td></td>
<td>female unpaid 1971-76</td>
<td>0.31</td>
</tr>
<tr>
<td>0.20-0.29</td>
<td>male self emp. 1971-76</td>
<td>0.28</td>
</tr>
<tr>
<td></td>
<td>female unpaid 1966-76</td>
<td>0.24</td>
</tr>
<tr>
<td></td>
<td>female self emp. 1966-76</td>
<td>0.23</td>
</tr>
<tr>
<td></td>
<td>male self emp. 1966-76</td>
<td>0.21</td>
</tr>
<tr>
<td>0.10-0.19</td>
<td>male unpaid 1966-76</td>
<td>0.18</td>
</tr>
<tr>
<td>0.00-0.09</td>
<td>male self emp. 1966-71</td>
<td>0.09</td>
</tr>
</tbody>
</table>

From these observations, the nature of the employment change dimension is best described as arising from modes of labour exchange. Changes in direct modes of exchange are most clearly responsible for areal discrimination on this dimension while attributes from the indirect modes show a tendency towards rapidly diminishing influence.

Continuing the direction introduced through employment change, the labour force participation dimension will now be examined as it expands on the employment theme by seeking regularities in participation change. The initial distribution of coefficients (Table 7.1) for this dimension results in its attributes having the lowest collective potential \( t \) to influence the observed three group structure. Paradoxically it also contains the score/dimension category (0.50-0.59) which has the highest individual potential to influence the classification. The low \( 1/t \) value for this dimension results from an absence of attributes in the range of \( s_i \geq 0.70 \) and only one in the range 0.60-0.69 in conjunction with a heavy concentration in the low score categories. Offsetting this, there is a very clear discontinuity in the distribution of coefficients with the 0.40-0.49 category being vacant. The distribution is clearly bi-modal and if attribute combinations are meaningful this factor offers the potential for great interpretative clarity.
The interpretative strength of this dimension only becomes clear when the types of attribute concentrated in each mode are inspected. This reveals a powerful conceptual distinction based on the sexual division of labour. This is better illustrated in Table 7.4 where membership of the first attribute group is exclusively restricted to female participation while the second group, i.e. below the vacant 0.40-0.49 category is, with two exceptions, male dominated. The power of this distinction is it operates over the bulk of attributes with little or no regard for age which could also be expected to have a strong organisational influence through the effect of life cycle factors, e.g. child rearing or abilities to participate. The ramification of this division is that change in male participation has little or no influence on the areal structure being investigated while the female attributes are relatively powerful discriminators and could therefore be expected to have considerable influence.

This result is not surprising, as male participation rates are relatively uniform between areas and constant over time while female rates have undergone considerable upheaval in the previous ten years (Moir, 1980 also found a trend
similar to that found in these data during preprocessing). Examination of the age characteristics for each of the two attribute sets shows little evidence of intelligible pattern at more detailed levels of comparison, there being a regular tendency for reversals in age and score sequences (see Table 7.4). At a crude level there is some indication of attribute ordering with older females having the highest contribution scores, middle age females having moderate scores and younger females having the lowest scores. The two youngest age categories are so low as to fall into the score ranges for male attributes. Interestingly the male pattern seems to be the reverse with older males having the lowest scores and younger males the highest.

Many possible explanations could be presented for elements of these two gradations such as the more uniform premarital work behaviour of females or the stable work habits of younger men. This however is the subject matter for future studies. It will only be treated as an addendum to the major theme of this dimension because credibility relies on the scores of the lower and higher extremes of age while ordering amongst the intermediate age groups is relatively indistinct. Since this lesser theme does not challenge the validity of the major theme it requires no further discussion.

The nature of areal differentiation on the labour force participation dimension can be most succinctly described as depending on changes in the sexual division of labour with female attributes being consistently better discriminators than those of the male population.

The quantity of work dimension is the last to be directly reflective of variations in work situation. Superficially, there are recognisable similarities between the numerical regularities of this distribution of contributions and those already discussed (Table 7.1). The first and most marked similarity is the distribution of contribution scores across all but the highest value categories, very much as with the unemployment dimension. The problems generated by this continuity across value categories are consequently identical because there are difficulties in grouping sets of attributes for interpretation. Unlike the participation situation, there are no natural discontinuities to assist in making judgements. A second similarity, arising from the continuous distribution of scores, is the denudation of individual score categories, with each having only a small number of observations. Interpretations

5The finding clearly provides a rich ground for hypothesis generation and question development. It should be remembered that in choosing attributes reflective of participation change (as opposed to participation levels), the possibility of difficulties being caused by changing female perceptions of labour force status was canvassed. Assuming that this has occurred, the participation change attributes embody two effects, i.e. that intended which reflects changes of degree and another which is unintended and reflects changes of kind (this has been discussed in the data presentation chapter). Given the importance of sexual division amongst these attributes and the discriminatory power of the female attributes, it can only be accepted that if, such an effect does exist, it is integral to the areal structure identified previously.
must rely on integrating information across a wide range of value category's to gain insights into thematic meaning. Finally, the lower aggregate \( t \) score for this dimension, as with the others, is due to the value characteristics of this distribution with no representation in the highest category and 50% of attributes attaining contribution scores with values below \( s_i=0.39 \). From these points, it is clear that the overall distribution of contribution scores has strong interpretative parallels with those already discussed. It remains to see whether these influence identification of conceptual regularities in the same way.

In ascribing a specific theme to the quantity of work dimension a number of patterns could be anticipated but, as with most unexplored attribute sets, these would be largely conjectural and of little empirical merit. With the quantity of work dimension for example, distinctions could be anticipated according to the sexual division of labour (because of postulated differences in the availability of work opportunities for males and females), or areal differences in work quantities (categorised into overtime, full time or part time activity levels, combinations of each portraying different areal work scenarios). In seeking a starting point for interpretation, equal score concentrations in the upper and lower value categories offer no interpretative advantage in commencing with either extreme so the upper score categories will be examined first by default.

First impressions from Table 7.1 dispel any notions of a simple interpretation along sexual or work quantity lines but elements of another pattern are clear with all the upper categories referring to the higher quantity of work attributes for both sexes. The consistency of this pattern is reinforced by attribute content in the lower score categories where reference is almost entirely restricted to lower working hour situations. This is highlighted in Table 7.5 where the distinction is formalised by separating all attributes according to whether they fall above or below a thirty five hour week, with those of thirty five hours or more being typified as ‘full time plus’ and those which are less, as part time work weeks. The need for a ‘full time plus’ category arises from the absence of any sequential progression from lower to higher working hours above the thirty five hour category. The forty hour week follows directly from the ‘forty nine or more’ hour week, totally interrupting any semblance of a sequence. The thirty five hour week delimitation was arrived at because of consistently low \( S \) values below this level, its affiliation with the more standard work week and the association of this division with the \( s_i=0.39 \) ‘cut off’, characteristic of each preceding dimension. The multiple job holding attributes were assigned to the ‘full time plus’ category. These were of minimal thematic value as one has a high contribution score and the other low, cancelling out any coordinated effect.
### Table 7-5: Quantity of Work Attributes Classified by Type of Work and Cramer Coefficients Values.

<table>
<thead>
<tr>
<th>Coefficient Ranges</th>
<th>Full Time Plus</th>
<th>$S_f$</th>
<th>Part Time</th>
<th>$S_f$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.70-0.79</td>
<td>female ≥ 49 hrs per week</td>
<td>0.75</td>
<td>male ≥ 49 hrs per week</td>
<td>0.74</td>
</tr>
<tr>
<td></td>
<td>male ≥ 40 hrs per week</td>
<td>0.71</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.60-0.69</td>
<td>female ≥ 40 hrs per week</td>
<td>0.60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.50-0.59</td>
<td>male 35-39 hrs per week</td>
<td>0.52</td>
<td>female ≥ 35 hrs per week</td>
<td>0.51</td>
</tr>
<tr>
<td></td>
<td>female ≥ 2 jobs</td>
<td>0.50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.40-0.49</td>
<td>male 35 hrs per week</td>
<td>0.48</td>
<td>male 41-48 hrs per week</td>
<td>0.46</td>
</tr>
<tr>
<td></td>
<td>female 41-48 hrs per week</td>
<td>0.42</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.30-0.39</td>
<td>female 36-39 hrs per week</td>
<td>0.39</td>
<td>male &lt; 15 hrs per week</td>
<td>0.36</td>
</tr>
<tr>
<td></td>
<td>female ≥ 2 jobs</td>
<td>0.33</td>
<td>male 20-29 hrs per week</td>
<td>0.34</td>
</tr>
<tr>
<td>0.20-0.29</td>
<td>female 30-34 hrs per week</td>
<td>0.29</td>
<td>male 15 hrs per week</td>
<td>0.23</td>
</tr>
<tr>
<td>0.10-0.19</td>
<td>male 30-34 hrs per week</td>
<td>0.15</td>
<td>female ≥ 20-29 hrs per week</td>
<td>0.12</td>
</tr>
<tr>
<td></td>
<td>female &lt; 15 hrs per week</td>
<td>0.12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.00-0.09</td>
<td>female 15-19 hrs per week</td>
<td>0.09</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Regardless of the actual category definitions used for high and low scoring attributes, or the allocation of individual attributes to specific categories, it is clear that structure is inextricably related to differences in ‘work week’ lengths, i.e. ‘full time plus’ and ‘part time’. The major implication of this for observed areal structure is that differences are due to intensity of commitment to formal work. The resulting hypothesis is that high intensity commitments systematically distinguish place because there is little scope for reconfiguration of work behaviour according to personal preferences. The likely reason for this is that behaviour is largely determined by the requisites of activity requiring such labour. Hence, similar local economies may generate correspondent profiles. This behavioural restriction is removed where intensity of commitment is weaker and therefore less likely to reflect main requirement differences in dominant modes of activity.

The theme of differentiation on the quantity of work dimension can be argued to reflect differences in intensity of commitment to formal work and so main labour requirements of dominant activities.

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*Formal work is that done for financial remuneration.*
The income dimension differs from those already discussed because it concentrates on remuneration for work and not the features of work, broadening the base of areal differentiation. Distribution of contribution coefficients for the income dimension has two major features. First, attributes are sparsely distributed across a wide range of score categories. The effect is that these will have to be considered collectively from the outset because no one category will contain sufficient information. Second, the distribution is discontinuous so there is the possibility of a simplified interpretation. The aggregate \( t \) score for the dimension is second only to that of the unemployed dimension. This occurs because, although the \( s_i \geq 0.80 \) category is vacant, the majority of attributes have high contribution scores while only three have values below \( s_i = 0.39 \). Even then, none fall in the lowest category. As a result, the income dimension has a high contribution potential in spite of the small number of attributes involved.

Any assessment of thematic influence is more constrained for the income dimension than the others because it only contains one axis of variation, i.e. income level, whereas the others all have two or more. Even a cursory examination of the attributes in Table 7.1 reveals no simple progression which might accord with preconceived notions of coincident influence. (e.g. low incomes are more influential than high incomes or vice versa. In considering the combined attribute content of the 0.70-0.79, 0.60-0.69 and 0.50-0.59 value categories, for example, there is a mixture of extreme income attributes, with levels respectively as low and high as the $3000-4000 and $12000-15000 income brackets. Extension of this examination to the 0.40-0.49 value category only succeeds in confusing the situation further with the $0 and $18000 brackets appearing in sequence.

As with earlier dimensions, it is only when the attributes which have least influence are considered that some semblance of meaning can be identified in the contribution pattern. In this case, the three attributes from the 0.20-0.29 and 0.10-0.19 categories have one feature in common. They are all from the middle categories of the income distribution and, when considered collectively, form a continuous group. These three attributes clearly represent middle income elements of the population and show that they have little or no discriminatory power. In the light of this finding, it is clear from Table 7.6 that attributes from the higher contribution categories are from the upper and lower income brackets. As such, they systematically tend towards either extreme of the income distribution, suggesting that observed areal structure is due to concentrations of high and low income groups as distinct from those of 'middle' Australia.

The theme of this dimension is very clear, being one of areal differences based
Table 7-6: Family Income Attributes Classified by Income Levels and Cramer Coefficient Values.

<table>
<thead>
<tr>
<th>Coefficient Ranges</th>
<th>Middle Incomes</th>
<th>$5,000-6,000</th>
<th>Upper and Lower Incomes</th>
<th>$10,000-15,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.70-0.79</td>
<td></td>
<td></td>
<td></td>
<td>0.70</td>
</tr>
<tr>
<td>0.60-0.69</td>
<td>$900-1200</td>
<td>0.64</td>
<td>$500-600</td>
<td>0.62</td>
</tr>
<tr>
<td></td>
<td>$600-800</td>
<td>0.62</td>
<td>$300-400</td>
<td>0.62</td>
</tr>
<tr>
<td>0.50-0.59</td>
<td>$1,500-2000</td>
<td>0.55</td>
<td>$1,500-1,800</td>
<td>0.53</td>
</tr>
<tr>
<td></td>
<td>$4,000-5,000</td>
<td>0.50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.40-0.49</td>
<td>$4,500</td>
<td>0.43</td>
<td>$2,000-3,000</td>
<td>0.42</td>
</tr>
<tr>
<td></td>
<td>50</td>
<td>0.42</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$1,800+</td>
<td>0.41</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.30-0.39</td>
<td>$8,000-9,000</td>
<td>0.25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.20-0.29</td>
<td>$6,000-7,000</td>
<td>0.16</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$7,000-8,000</td>
<td>0.10</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

in extremes of the income distribution. Middle income elements of the population are poor discriminators of place with tendencies towards wealth and poverty distinguishing place most effectively.

The migration dimension, like income, has been introduced to broaden conceptualisation of nature by reference to mobility. The main numerical regularities of this dimension's distribution are threefold. The most important is a marked tendency for the majority of attributes to concentrate in two adjacent middle range categories which have so far been used to distinguish between coincident and divergent influences on spatial structure. Any distinction on this basis will have the unavoidable effect of 'blurring' influences. The second is that the 0.60-0.69 category is vacant and produces a natural discontinuity, but as this occurs at an unusual point in the distribution and only separates two attributes from the remainder, it is unlikely to be of great interpretative value. The final feature is that the distribution of attributes, with equal concentrations in the upper and lower value categories, has resulted in the third highest value for any dimension, those surpassing this level having heavier proportionate concentrations in the upper categories.

The nature of areal distinctions, caused by introduction of the migration dimension, is very complex with the attribute pattern conveying an image of conceptual disarray (Table 7.1). Each of the three major axes; migration type, sex
and age, all seem to play a part in development of an overall theme. As a result, there is no simple division of attributes, as found with the other dimensions. Closer examination of Table 7.1 suggests that the most complete interpretation involves one dominant theme qualified by two lesser or secondary themes. The dominant theme relies on separation of attributes by migration type to reveal a situation where immigration has tended to have a greater influence on observed areal differences whilst *inter-alia*, outmigration has had a far weaker effect. This pattern has been highlighted in Table 7.7 where attributes have been partitioned according to migration type. Immigration attributes prevail in the upper value categories, diminishing in frequency as contribution values decrease. A reverse pattern can be observed for outmigration attributes with a degree of overlap existing between the ‘in’ and ‘out’ migration categories. This overlap is more extensive than for any of the other dimensions discussed so far and it is in this that the two lesser themes are evident because consistencies are apparent amongst the affected attributes.

**Table 7-7**: Migration Attributes Classified by Direction of Movement (in-out) and Cramer Coefficient Values.

<table>
<thead>
<tr>
<th>Coefficient Ranges</th>
<th>In-Migration</th>
<th>S₁</th>
<th>Out-Migration</th>
<th>S₁</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.70-0.79</td>
<td>male 55-69 years in</td>
<td>0.75</td>
<td>female 55-69 years in</td>
<td>0.72</td>
</tr>
<tr>
<td>0.60-0.69</td>
<td>female 30-54 years in</td>
<td>0.56</td>
<td>male 30-54 years in</td>
<td>0.51</td>
</tr>
<tr>
<td>0.50-0.59</td>
<td>female 15-19 years out</td>
<td>0.48</td>
<td>female 30-54 years out</td>
<td>0.46</td>
</tr>
<tr>
<td>0.40-0.49</td>
<td>male 15-19 years out</td>
<td>0.45</td>
<td>female 55-69 years out</td>
<td>0.45</td>
</tr>
<tr>
<td>0.30-0.39</td>
<td>female 20-29 years in</td>
<td>0.36</td>
<td>male 15-19 years out</td>
<td>0.35</td>
</tr>
<tr>
<td>0.20-0.29</td>
<td>male 20-29 years in</td>
<td>0.33</td>
<td>male 20-29 years out</td>
<td>0.33</td>
</tr>
<tr>
<td>0.10-0.19</td>
<td>male 15-19 years in</td>
<td>0.12</td>
<td>female 55-69 years out</td>
<td>0.18</td>
</tr>
</tbody>
</table>

The first of these lesser themes applies to immigration attributes with low contribution values. Table 7.7 shows that collectively these have one feature in
common. They refer to the two youngest age groups of the population for both males and females. As a result, immigration attributes can be partitioned along a secondary axis, that of age, with older age mobility having a systematically greater influence than for younger age groups. The second applies to the outmigration attributes which have high contribution scores. With the exception of one, these attributes referred to female outmigration which dominated the higher value categories with male attributes being commonly relegated to the lowest value categories. The suggestion from this is that the lesser theme for outmigration attributes lies in a sexual partition, female attributes having more influence than male. All three of these themes raise a number of questions as to why such patterns emerge but, as with those from the other dimensions, these must await further exploration in a dimension explicit environment.

The nature of areal differentiation for this dimension then revolves around the dominant theme of influential immigration attributes against a background of lower influence outmigration attributes as qualified by lesser themes involving age and sex specific effects.

As a precursory note to the conclusion of this section, it should be pointed out that variants on the attribute contribution pattern for the modified three group structure can be expected. Approximately eighty separate contribution profiles were constructed for variants of the three group model to observe the effects of different representations. These included select group comparisons, group amalgamations, disaggregations and the comparison of core elements from groups. Contribution patterns either mirrored that of the modified three group structure or focussed attention on specific aspects of it. The significance of these wider observations is in the suggestion that sources of the tripartite typology may be even more pervasive than this examination indicates.

This analysis indicates the widespread occurrence of dimensional themes in spatial variation between places. This dispels earlier concerns that regularities may not be identifiable or occur in only a small number of dimensions. This is an extremely important result as it is indicative of a spatial structure founded in diverse elements of labour exchange. As such, it sustains the assumption that labour exchange has a strong affinity with place and that it is reasonable to incorporate the latter into models of social process. Indeed, the accumulated evidence suggests that it would be unrealistic not to include place in models of

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7 These results have not been presented because of concerns as to the adequacy of the Cramer coefficient for making direct comparisons between different group structures (see Chapter 5). Other coefficients, which facilitate direct comparisons, preferably based on medians and interquartile indicators of dispersion, must be developed if this direction is to be pursued in future studies.
social process as there are at least three types of place associated with its operation. Though clarity of dimensional themes is variant and subject to qualification by lesser thematic influences, the question remains as to how the two can be synthesised in a logically consistent manner.

7.2 Nature in Differentiation - A Synthesis

An imprint of the factors associated with multigroup differences, in what is apparently a highly structured space economy, has now been established. As such, there are two sets of finding, one spatial and the other social. This presents numerous options for a synthesis of the two. The implied, if not stated objective of most syntheses, is to search for a common factor in social process which relates its diverse elements in a spatial context. The conventional response of geographers at this point has been to continue on a reductionist path and adopt the encyclopaedic approach of the atlas tradition. Though useful in planning applications, this confuses means and ends as it is not conducive to higher level synthesis as place becomes entangled with the detail of social process. Two alternatives provide better scope for a synthesis. The first is pragmatic and seeks a synthesis through either an overview of dimensional regularities or identification of a common factor relating them. Unfortunately, as will be shown below, ‘the well of pragmatism is now dry’. The second is to adopt an abstractionist approach but with one major difference. Options for integration of place into social process are heavily constrained by formal bases in detailed spatial and social observation. As a consequence, abstraction is formal as opposed to that current amongst grand theorists in this field.

The bases for a first level of synthesis are shown in Table 7.8 and Figure 7.2. These have been constructed to provide an overview from which collective generalisations may be derived using keyword descriptions in the first instance and highly stylised graphical representations in the second. Jointly, these represent the simplest possible views of dimensional regularity. Even at this simple level of exposure, the collective complexity of labour exchange, as an element of social process, is apparent. The themes embraced vary widely, being so diverse as to encompass recessionary, sexual, behavioural, demographic and status related phenomenon. A wide variety of schema could be developed from these patterns to suggest a more comprehensive model of social process in a spatial environment.

8The essential thrust of the atlas tradition has been dispensed within the ‘shorthand’ treatment where spatial structure has been indexed socially at a highly synthetic level without encumbrance of the encyclopaedic legacy with which geography has become associated.
Table 7-8: Keyword Description of Dimensional Themes.

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Coincident Features</th>
<th>Divergent Features</th>
<th>c</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unemployment</td>
<td>- post recession employment attributes.</td>
<td>- pre recession employment attributes.</td>
<td>19.66</td>
<td>8.87</td>
</tr>
<tr>
<td>Employment Change</td>
<td>- changes in the wage and salaried component of the labour force.</td>
<td>- residual components consisting of self employed and unpaid occupational groups.</td>
<td>15.38</td>
<td>6.45</td>
</tr>
<tr>
<td>Participation Change</td>
<td>changes in female participation rates.</td>
<td>- changes in male participation rates.</td>
<td>18.80</td>
<td>6.02</td>
</tr>
<tr>
<td>Quantity of Work</td>
<td>- attributes from the full time plus quantity of work category (standard).</td>
<td>- attributes from the part quantity of work category.</td>
<td>17.09</td>
<td>7.16</td>
</tr>
<tr>
<td>Family Income</td>
<td>- high and low income attributes</td>
<td>- intermediate income attributes</td>
<td>11.97</td>
<td>8.39</td>
</tr>
<tr>
<td>Migration</td>
<td>- immigration attributes as qualified by age.</td>
<td>- outmigration attributes as qualified by sex.</td>
<td>17.09</td>
<td>7.26</td>
</tr>
</tbody>
</table>

Figure 7-2: Stylised Summary of Dimensional Themes.

The major problem is that dimensional diversity mitigates against identification of one such model so that none could be nominated as a preferred alternative. The overview approach is, therefore, not likely to produce a utilitarian model of place in labour exchange. The second level of synthesis however, does not appear to offer a marked improvement on the first. Examination of Table 7.8 and Figure 7.2 reveals little evidence of commonality extending beyond the dimensional level. The reason is ostensibly similar to that for the overview approach, i.e. conceptual diversity.
Simple solutions to an otherwise complex problem are therefore not readily apparent. It is these basic themes as qualified, extended or otherwise modified which can be said to constitute the elements of nature in differentiation. Disjoint as may be, these provide the only clues as to scope of nature in differentiation.

One solution to this impasse is to adopt a more detached view of regularities and seek a higher level framework for consideration. The theoretically abstract literature, rejected at the outset of this Study, offers several constructs which could be fitted to these observations to explain identified regularities. At their highest level of generality, these are invariably related to spatial division of labour (Massey, 1985; Urry, 1985; Walker, 1985; Warde, 1985). This concept expands the conventional view of labour division, which asserts that labour is partitioned in accordance with specialisations inherent in modes of production, by arguing that place imprints a compounding effect on this otherwise aspatial concept. Apart from the attendant theoretical levels of abstraction associated with this concept (concerning the nature of place and mode of production) which detract from generality, spatial division of labour is very attractive since it embraces major concerns of economic geographers. Walker demonstrates this in his summary:

The result of the location process is, at any time, a mosaic of workplaces and associated communities. This mosaic is literally a division of labour. The spatial division of labour is necessarily uneven in its development because of differences among labour processes and the idiosyncratic element in workplace employment relations (1985, 185).

This type of view is especially appealing in the current analysis because it offers sufficient scope to reconcile observational regularities derived from conceptually diverse sources. It not only emphasises links between them, through the labour exchange process, but apparently refutes claims such as that of Durkheim (in Warde, 1985, 192) that place has no role in social process and particularly labour exchange.

Spatial division of labour could be embraced incautiously under these circumstances as a basis for empirical integration. This would be ill advised because, although it is attractive to theoreticians in search of spatial legitimacy, its ontological utility is open to question on three grounds. First, although theoretical adherence to this concept may be a major development, it is inherent in empirical analyses of place because mere establishment of a data extensive observational base implies a spatial division of labour. Hence, the concept reverts in status to that of a label for the selection adopted. This is directly akin to the concept of nature in differentiation but with the disadvantage that its theoretical extension has a range
of implications which may be unestablishable. This leads to the second point which has been argued by Warde in his claim that:

No agreement exists as to the mechanisms which distribute significant social artefacts across space over time. Nor is there even a consensus about how to describe spatial patterns. (1985,191)

This point is clear from the literature, there being fundamental differences in development of theory, with disputes as to the foundations of process being paramount (Sayer, 1985,51). Concern with spatial division of labour is obsessive in some studies of place and social process (e.g. those referenced in introduction of this concept) whilst not rating a mention in others. From this it can only be concluded that the theoretical ‘pedigree’ of this concept is tentative and by no means central in theory development. The final concern is that this analysis has not been constructed as a test for existence of an abstract concept of spatial division of labour with its specific tenets and supporting theoretical infrastructure. Identification of spatial structure and widely ranging dimensional regularities do not therefore constitute support for a general proposition lacking the capacity to specify components of a labour division and the spatial outcomes which result. The disjunction between theory and observation is too great to be overcome without a conceptual leap which leaves much open to conjecture.

Abstract theory, for all its deficiencies, suggests one factor common to dimensionally disparate themes. This factor is place. In this Study, place has been assigned the status of a variable with attributes stemming from social process. It has been overlooked thus far as a unifying influence whilst other more obvious possibilities have been discounted because of adherence to the analytical distinction between place and social process. Whilst valuable in simplifying the analysis, relationship of the two is crucial to any synthesis. Unlike the abstract theorists, any synthesis must now reconcile two important findings:

I) evidence of definite SPATIAL STRUCTURE;

II) evidence of strongly ordered SOCIAL DIFFERENCES.

The problem is to formulate an integration which relates these findings in a logically consistent manner.

There are two ways of doing this but care must be taken to avoid confusion

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9Empirical work on recent conceptualisations of spatial division of labour is scarce. Earlier work on differences in industry composition between places can be confused with this development because they often relied on employment data in the absence of material concerning value added. There is no disputing that these analyses are founded in mode of production and relate to division of labour but the character of this relationship is unclear and definitely complex whilst the relevance of production mode, vis-à-vis other factors such as class and place, remains unclear (Walker, 1985).
of evidence concerning place and social process. The first is to embrace the atlas tradition in geography and map initial attribute values according to spatial structure. This approach links place and process in a mechanistic way but only succeeds in documenting outcomes from process in spatial context. The atlas tradition has not been particularly successful in revealing the role of place in social process because: it provides insight into what exists but not how place and social process relate (hence, the burgeoning of abstract theory); and it confuses place and process by representing them as one. Whilst this representation is perhaps accurate, it is analytically obstructionist since the problem is not reducable to fundamental elements because of premature integration. The second approach is to depart from the atlas tradition and use the empirical evidence of spatial and social regularity as a basis for conceptualising a model of place in social process. This relies on formal impressions of spatial structure and evidence that widely ranging social forces are operative. As both of these requirements have been satisfied, the second approach is preferred since it avoids replication of established treatments and is more directly related to the major objective of seeking place in labour exchange.

The obvious problem with proposition of place as the common factor relating dimensional regularities is that it involves an analytical reversal. This problem arises as the observed structure of place was determined from dimensional regularities and not vice-versa. The key to determining the role of place in labour exchange lies in the unravelling of this reversal since it is the obvious logical flaw. This problem is greatly simplified here because resolution is constrained by the need to integrate empirically observed phenomena. Consequently, only two models can be seriously proposed and it is these which must be investigated if the role of place in labour exchange is to be discerned.

The first model dispels analytical reversal by arguing that spatial and attributional analyses are interpretatively distinct. As a result, they provide two separate perspectives on the same problem and so offer scope for expansion of existing results. The type of integration used in this model parallels that of the underlying analytical structure and can be characterised as a ‘top down’ use of place as the common factor relating dimensionally disparate themes. Under this approach,

10 Although this approach has much in common with the rejected theoretical alternative the similarity is superficial as the intermediate stages rely on formal observation rather than conjecture as to the extent and nature of differences in place. Conceptual models in this situation rely on a reconciliation of observational regularities as opposed to manipulation of rather malleable theoretical constructs.

11 This would be very difficult in a purely theoretical environment since the problem may be subject to redefinition in the ‘shifting sands’ of the unobserved. The result could, in all likelihood, be a proliferation of models indistinguishable in their accuracy.
dimensional regularities are related through their common role in producing a given typology of places. Place, as the common factor, relates dimensional regularities as an end product of analysis not as a source of differences between dimensions. The resulting model relies on a specification of conceptual and empirical links which relate all elements of the analytical framework, even though distinctions have been made to separate evidence of the spatial and social (Figure 7.3). The empirical links in this model show that spatial differences in outcomes from the labour exchange process can be investigated by: specifying sets of spatially disaggregated outcomes as a basis for analysis (1); which can be used to segregate places (2); and, in turn, these may be used to examine spatial distributions of attributes (3). The spatial component of the analysis can be addressed separately by use of extrinsic attributes (as done here) to specify the character of place in a ‘shorthand’ manner (4). This is a substitute for the traditional atlas approach whereby very high level surrogates are used to emphasise the social meaning of place and so free this analysis to pursue the key elements of spatial structure in a social context. The conceptual paths parallel this but emphasise only the objectives of analysis: identification of spatial structure (5); distinctive features of social process (6); and the link between them (7). The final link (8) in this model shows the hypothetical role of spatial analysis in elucidating artificially aspatial treatments of the labour exchange process and the necessity for qualification since they ignore variant influences which have their foundation in place.

From a purely empirical perspective, this model can be typified as reificationist since the attributional treatment elucidates the ‘shorthand’ activity gradient concept developed in the spatial element of analysis. The activity gradient represents a general statement of spatial structure in nonmetropolitan N.S.W. whilst the identification of dimensional regularities specifies principle sources of labour exchange influence associated with this structure. As documented in Table 7.8 and Figure 7.2, these are general, dimensionally constrained and definitely thematic, indicating that place has an important role in social process. The significance of this finding is emphasised in the reification model because it indicates the futility of aspatial analyses which ignore a crucial component of social process.

Unfortunately this model is unsatisfactory in two ways. First, dismissal of the analytical reversal is tentative since the ‘top down’ representation of place, as the elusive common factor relating dimensional regularities, uses the general to relate the specific. Integration is only possible in this instance because an analytical structure has been adopted which seeks to separate place and process. This response to reversal is unique and necessitates an acceptance of analytical reversal under other
Figure 7-3: Framework of Integration for Spatial and Attributional Analyses.

circumstances which is indicative of a more general discordance between analytical and causal process. The need to take interpretative liberties of the type implied in this model is therefore troubling. Second, place is assigned a passive role, acting as an analytical convenience to explore labour exchange. Though analytically acceptable in the exploratory stage of analysis this is conceptually inadequate, given the apparent significance of place in social process. A response is needed which addresses both of these deficiencies.

The source of these difficulties lies in what can be described as the ‘traditional spatio analytical’ model (Figure 7.4 (a)) of social research. This underlies most spatial research conducted by geographers, including the empirical phases of this Study. It assumes two conditions which are not necessarily sustainable. First, the starting point for all such analysis is founded in aggregate specifications of social process, in this case, labour exchange. Though analytically convenient, the difficulty with this is that aggregates are founded in spatial particularities so that they are organically composed of place specific events. As such, aggregate specifications are synthetic in the extreme and conceptually ignore the particular in an effort to attain the general. In so doing, the first assumption becomes one of spatial homogeneity which is clearly unjustifiable from both spatial and social perspectives, given the results obtained here.

The second assumption is one of sequential extension from the aspatial,
through nomination of outcomes, to spatial representation. This is largely responsible for the criticism of the reification model that place is reduced to the status of an analytical convenience. The only compensation for this in the reification model was to introduce a hypothetical analytical link (8) to show the relevance of spatial research for exploration of social process. Hence, the analytical reversal was partially undone by introduction of a circularity, or feedback effect, into analysis, necessary if place is to be recognised as organically inherent to social process.

These criticisms concern configuration of the ‘traditional spatio analytical’ model and its reification derivative rather than the composition of either. Resolution of the problem with these models lies in reconfiguration of their principle tenets and not respecification of elements.

The revised model (Figure 7.4 (b)) proposes that spatial structure is not simply an analytical convenience but a key element of labour exchange and therefore necessary to appreciation of its operation. The labour exchange process is place dependent, each area having different work and labour requirements, reflecting the types of local economy that have developed overtime and been documented in the previous Chapter. In this particular case, observed areal structure is presented as underlying the outcomes from social process which are constrained according to the features of place. This use of empirical results is justifiable so long as it is accepted that the version of structure identified is suitably general to correspond with widely ranging regularities in the diverse features of labour exchange. This is sustainable on three grounds which establish ubiquity of the tripartite typology: its derivation from a wide array of labour exchange attributes; a widespread association with dimensional regularities, and correspondence with an extremely general and highly intelligible ‘shorthand’ interpretation of place. The analytical relevance of this is that, whilst differences in outcome from social process can be used to identify types of place, they are not their cause but a reflection of them. The analytical reversal needed to sustain this model is therefore caused by an inappropriate premise in the ‘traditional spatio analytical’ model.

The conceptual thrust of this revised model is that differences in place permeate labour exchange, indicating that place identities must be explored and established if perceptions of labour exchange process are to be contextually sound. This alters the reificationist argument substantially with differences in activity between place being hypothesised as the source of process regularities. This view is conceptually stronger than that proposed by the traditional alternative because it argues that people in different types of place, involved in a diversity of activities,
Figure 7-4: Roles of Place in Labour Exchange - Two Alternative Models.

(a) Traditional Spatio-Analytical Model

(b) Revised Spatio-Conceptual Model
have exchange characteristics reflective of this phenomenon. The empirical basis of
the activity gradient concept offers a high degree of robustness by comparison to a
priori alternatives. Definition under this circumstance is ascribed in a post hoc
manner and designed to fit findings as opposed to modifying them so that they
accord with concept. The most immediate consequences of this development is that
social regularities identified in accordance with multigroup spatial structures indicate
key differences in the parameters of process between places. These have been
isolated here and must be recognised in any aggregate treatments of labour exchange
if misspecification is to be avoided.

Though this establishes the importance of place in labour exchange, it ignores
the role of place in process. Whilst the revised model is geographically attractive
its exposition, thus far, is naive because place, regardless of its delimitation, is
partially defined in social terms. This deficiency of the model can only be revised,
given what is known, by altering the status of analytical feedback in the reification
model, so that it is a conceptual necessity rather than an analytical afterthought.
The essential proposition of this feedback is that place and social process can only
be partitioned in an analytical sense whereas, in practice, they are difficult to
distinguish because they are elements of an intricate symbiotic relationship. Place is
crucial to differentials in the operation of social process and these, in turn, are
partially responsible for the social definition of place through more general features
of social interaction which are generated exogenously to individual places. These
influences can be portrayed collectively as aggregates of varying strength with
foundations in other places. Strength varies according to generality of source.
Where the source is uniform in all other places, the aggregate is in fact aspatial.
Transmission, however, is not only dependent on strength of source but receptiveness
of individual communities. It is at this point that interarea research becomes
stalled since the factors involved in receptiveness are often intangible and impossible
to identify in all but the most demanding of inter-area studies. These, of course,
are of limited benefit as factors applicable in one place are redundant in others.
Despite these drawbacks, it must be concluded that place is not only generative of
aggregate influences but recipient of them.

The revised model reflects these arguments in its integration of the two sets of
empirical findings. The activity gradient concept, with its urban, coast and
nonurban elements, is portrayed as underlying the operation of social process.
Labour exchange, in this spatial environment, reflects the constraining and enabling
features of each place type and the widely ranging regularities which result, are
proposed as an indirect function of this. The critical role of place as a parameter
of social process is determined by the three issues, initially raised in the previous chapter, for specification of activity. It is the collective responses to these issues in individual places which are the primary determinant of outcomes from process. More conventional work, addressing such problems as industry/occupational mix, regional growth and plant location, indirectly address aspects of these issues. The advantage of this analysis is that they are explicitly nominated as underlying place in its role as a parameter of social process.

At the outset of this Study, place was defined for analytical purposes in purely pragmatic terms as being any discrete component of space. Though satisfactory for exploratory purposes, this definition is no longer adequate as the 'traditional spatio analytical' model has been rejected and place is now being proposed as inalienable from social process. It must satisfy two criteria before this is the case, being integral to the collective endeavour of human beings. Without the first, place would be a purely behavioural construct as reference is limited to the individual and, in the absence of the second, 'asocial' as it has no relevance to people. Examples of these situations can be easily envisaged as demonstrated through the humanistic and behavioural work of geographers (op.cit.) in the first case and undefined or unperceived specifications in the second. Place may therefore exist as a partition of space in a completely 'asocial' sense. From this analysis it can be observed that place, as a socially relevant phenomenon, serves two functions: imposing constraints on human endeavour through the assembled human and physical resources that any specification embraces (Pred, 1985); and presenting opportunities for activity which is different from that in other types of place through the same channels. The role of place in social process is therefore that of an enabling and constraining device for human endeavour. It is as conceptually and analytically indispensable to analysis of other levels and types of human organisation within which the individual operates.

The implications of this model for appreciation of place's role in labour exchange can be explored more formally by recasting it in theoretical terms which specify its major components according to definition, postulate and axiom. The value of this lies not in a belated attempt to emulate 'scientific method' but in using categorisation to identify sources of implicit assumption in the model. As with most socio-economic theories which are patently inadequate, it is these assumptions which are of greatest importance because they reveal deficiencies with the model where further research is required. Definition of the model is given by the concepts underlying its main elements. These are areal structure (AS), work requirements (WR), labour requirements (LR), allocation mechanism (AM) and
labour exchange outcomes (LEO). Each has been treated earlier in general
discussion and, in the case of AS and LEO, been ascribed tentative empirical
meaning from preceding analysis. The postulates of this model are proposed
relationships between its defined components. These can be summarised as:

\[
\begin{align*}
\text{AS} & \rightarrow \text{WR} \\
\text{AS} & \rightarrow \text{LR} \\
(\text{WR}, \text{LR}) & \text{ resolved by AM} \\
\text{AM} & \rightarrow \text{LEO} \\
\text{LEO} & \rightarrow \text{AS}
\end{align*}
\]

It is these postulates which constitute the hypothetical basis of the model. Axioms
are difficult to identify in social research because of the subject matter's complexity
and comparative primitiveness of knowledge. Only one axiom is identifiable for this
model and that is the social necessity of labour exchange in specialised societies,
whether it be direct in exchanging labour for remuneration or indirect in allocating
labour amongst alternative ends. These categories identify the main features of this
model at the fundamental level of individual statements. However, given the
limitations of observation with such a complex phenomenon as nature in areal
differentiation, much of this structure relies on assumption.

An examination of definition, postulate and axiom shows two sources of
assumption, one from postulate and the other operational limitations of observation.
Five major assumptions of these types are apparent and are outlined in sequence
from the model in Figure 7.4(a):

i) areal structure as reflected in place differences is ubiquitous, having a
tendency to permeate a wide array of elements within labour exchange
and possibly those from a broader spectrum of socio-economic processes;

ii) that resolution of work and labour requirements is attained through a
mechanism which is locationally invariant (treated as a ‘black box’ in
this analysis to avoid contemporary preoccupation with its format and
assumptions this involves);

iii) the selection of labour exchange outcomes is sufficiently general to be
reflective of pervasive differences in place (since specification of place here
is dependent on these surrogates);

iv) a feedback effect is operative, with labour exchange outcomes influencing
the character of place through changes to composition by the collective
effect of individual decisions (arrived at partially in response to labour
exchange);

v) labour exchange is independent of all other social processes which can be
ignored with minimal consequence for accuracy of empirical analysis.
A major objection to the 'so called' social and economic theories discussed in the early stages of this Study was that they provided little guidance for exploration. This resulted from their informal basis in observation and the failure to state assumptions. The major assumptions of this model have now been identified but the relevance of these assumptions to research development needs to be demonstrated.

Those underlying this model identify five related fields for empirical exploration. These may be undertaken in combination but in all likelihood, will require individual attention because of the problem's vast scale. As such, the model in Figure 7.4(a) acts as a repository for findings and additional hypotheses so these can be coordinated to provide better insights into nature in areal differentiation.

First, the ubiquity of place and its relationship to labour exchange must be examined in detail if this assumption, which is sustainable in this case, is to be elucidated. This requires extensive exploration of place identities which can only be achieved at the interarea scale by selection of different attribute sets. As the emphasis in this Study has been on outcomes from the labour exchange process, further selections might concentrate on either work/labour requirements or features of the allocation mechanism, with the objective of establishing general outcome associations. Investigation of place identities will invariably require intra-area analyses to uncover the deeper elements of composition. The empirical results obtained here provide guidance in selecting directions for both approaches. Any advances in appreciation of place will require an integration of results from both types of analysis. Given past performance in geography, the prognosis for this is poor with the result that findings are likely to remain obscure and 'piecemeal'.

Second, the assumption that labour allocation mechanisms can be treated as areal constants is inadequate because it implies an independence from place. It is unlikely that labour allocation mechanisms are invariant because labour composition changes markedly with place. As a result the role of labour allocation mechanisms could also be expected to vary and have a direct impact on outcomes. The simple market model, commonly encountered in the literature, would seem to be inadequate when the bases for labour exchange are considered which include factors such as the role of prejudice, industry requirements, necessity for queueing and the formality of information flows. There is very little information to provide insights into spatial differences in labour exchange mechanisms. This has been partially done here by examining outcome patterns from labour exchange, but, as shown by sequencing of elements in the model, it would be difficult to separate these from the more general features of place.
The third expands on these directions, assuming that choice of exchange outcomes is adequate to provide a facsimile of nature in labour exchange differentiation, and extending the argument, the character of places. Whilst this may be the case, selection has been dependent on availability of information which imposes a severe constraint on the capacity to choose data with effective representation as a primary objective. Even now, there is no theoretical guidance as to what characteristics should be selected or how these should be weighted in subsequent analyses. There is however limited empirical guidance as to the relationship between attributes in each dimensional context. This provides preliminary guidance as to the attribute combinations which may prove capable of providing insight into the role of place in labour exchange.

The fourth assumption directs attention towards the existence of conceptual feedback effects which are practically ignored in most applied geographical research. Work in diffusion and innovation is the possible exception, however this remains elementary in labour exchange where transmission of unemployment impulses has been the major focus of research (Vining, 1945; Brechling, 1967; Cassetti, King and Jeffrey, 1971; Jeffrey and Webb, 1972; Clark, 1975). This examines a relatively simple phenomenon and relies on association of aggregates to imply process rather than an explicit knowledge of it. The paucity of work in this field of labour exchange is not surprising as many critical factors, such as community values, are intangible. The effect is concepts of dubious merit, such as community indifference curves (Smith, 1977) which are difficult to manipulate in an empirical environment. This situation is compounded when the hypothesised character of spatio social relations is considered as the subsequent ramifications for highly aggregate operations of social process are very difficult to discern. The feedback theme has been adopted elsewhere as in Myrdal’s (1957) model of growth/decline process and, more recently, in the theoretical literature through arguments concerning the reflexiveness of space (Badcock, 1984, 52) and the operation of a socio-spatial dialectic (Soja, 1980). Unfortunately, the first of these is derived from observation of gross macroeconomic phenomena which ignore the problems of small scale place. This type of deficiency has come to be expected and prompted Harvey (1973, 26) to observe a predilection amongst regional economists “for understanding economies and misunderstanding space”. This problem has been partly offset in the theoretical literature but it lacks the formal empirical support necessary to substantiate much argument and has become detached in the extreme (Badcock, 1984, 53). Such considerations can only be ignored in the rarefied environment of theory as they become substantial obstacles in empirical analysis.
The final assumption raises the most difficult issue of all because, in assuming independence of labour exchange from all other aspects of social and economic process, the partial character of models such as this, is exposed. The inadequacy of artificial partitions of otherwise integrated phenomena is highlighted by the diversity of interests in the chosen attribute set, few of which are solely related to labour exchange. Resultant deficiency in the model could be overcome by inclusion of an exogenous element, but this would be of little practical value since the concept of nature in differentiation is exceedingly complex and there is little formal basis for a specification. An awareness of exogenous influences is best encouraged in models of process relating specific variables, noted as a limitation in more general studies or treated according to individual circumstances.

These assumptions identify the major aspects of spatio social relationships in labour exchange which must be investigated further if a comprehensive empirical model is to be developed. Though related through their common foundations is the revised model and drawing in work from other fields, this provides grounds for trepidation if empirical comprehensiveness is expected in the short term. This stems from two sources: first, the assumptions of this model are diverse in terms of current interest fields; and second, they provide conceptually significant research problems in their own right. A comprehensive empirical model can only be established once these fields have been more fully explored. In the interim, sound short term gains will be restricted to these and narrowly based partial integrations, with a heavy reliance on theoretical abstraction from the little that is known or can be established.

This model of place in labour exchange is important for four reasons. First, whilst it does not eliminate the analytical reversal identified initially as a major weakness of reificationist approaches, it is based on a recognition of problems in the 'traditional spatio analytical' model. It could be claimed that the initial reversal is a result of analytical exigencies but this would be misleadingly simple. The necessity to incorporate a circularity into the model reveals its true complexity and the cause-effect dilemma this creates. The reality of place in process is more complex than widely recognised, with one being integral to the other. Second, the solution adopted with the revised model is not unique, as with the reification model, since it departs in rationale from the traditional alternative. Where a ubiquitous spatial structure is not evident to support such action, exploration is necessary to search subsets of attribute combination since more than one spatial structure may be inherent in social process. Third, the model is constrained by reference to conventional analysis so options are limited to the observable and attainable. The
excesses of abstract theorisation are therefore minimised. Fourth, place is assigned a positive role in labour exchange and no longer the analytical convenience assumed in so many treatments. Models of labour exchange, be they theoretical or empirical, which choose to ignore place are conceptually barren.

7.3 Conclusion

Place is an integral component of labour exchange. Unfortunately, appreciation of place’s role in labour exchange is a highly speculative venture since the phenomena being related are both subtle and extremely complex. Traditional approaches to spatial analysis have underrated the significance of place in social process whilst theoretical abstraction has produced a profusion of competing alternatives. The model developed here compensates for these deficiencies by revising the former to emphasise the significance of place, constraining the range of alternatives which can be formulated by reference to empirical benchmarks. The fundamental bases for this model lie in the identification of a spatial structure which is widely based in dimensional regularities. These are indicative of social affinities with place which are sufficiently general to justify the description of spatial structure as ubiquitous. The resultant model reverses the principle tenet of its predecessor, arguing that place is an organic component of social process and that the two are therefore not independent but conceptually instrumental in definition of one another. In so doing, claims that place is an analytical convenience are dismissed and a positive role for place in development of social research is proposed. In concluding, it is contended that social process cannot be realistically modelled without incorporation of the spatial differences inherent in place since these are, in effect, parameters of social process.
The fundamental source of spatial variation in social process is human beings in specific places. As the source of variation is highly sophisticated its manifestations can be expected to attain high levels of complexity. This empirical analysis has sought to control for complexity by targetting research in accordance with five parameters:

i) restriction of attention to the labour exchange process;

ii) an empirical focus on the extent and nature of differentiation;

iii) analysis of areal form as opposed to process;

iv) use of small scale spatial units (local) for investigation of areal differences;

v) a highly disaggregated social treatment of dimensional variation.

Each of these issues has been widely addressed in the geographical literature but comparatively little has been done to integrate them and shift attention from the conceptual to empirical realm. The purpose of this discussion is to review the overall development of preceding analyses. This will be done in two parts, one dealing with exploratory data analysis as an adjustment to the difficulties of spatial research and the other, substantive findings from empirical manipulation of outcomes from the labour exchange process.

8.1 Exploratory Data Analysis: A Model for Investigation of Spatial Differentiation

Conventional philosophies of numerical analysis in geographic research are defective because they do not reconcile desirable goals with those which are attainable in specific situations. There is need for a framework which will assist in overcoming this problem. Where the desirable and attainable diverge pragmatic solutions are required if empirical analyses are to provide a starting point for
research. It is in this context that the philosophy of exploratory data analysis is useful because it provides a framework and justification for research in the most difficult of circumstances.

The major contention of this philosophy is that structured exploration provides a substitute for inadequate theory until sufficient is known of the phenomena being examined. The purpose of exploration in this situation is to assist in developing a research environment capable of sustaining theory formulation. Pragmatic analyses have been criticised as unsystematic and uncoordinated. Exploratory data analysis creates a framework which offsets these criticisms by imposition of structure on search procedures which necessitate evaluation of alternatives at subsequent stages of analysis. From the experience of this Study, a model for analysis of spatial data can be proposed.

The main features of this model are shown in Figure 8.1 where the critical stages of exploration have been presented. The first task in this framework is problem identification and justification for assignment of priority. All subsequent stages of the model involve internally exclusive decisions which direct the analyst towards designated choices. The first choice is that between exploratory and confirmatory modes of analysis which is necessary to minimise distortion in findings. The fundamental question is: can analysis confirm results in environments of general uncertainty? A bank of tests is used to guide this decision. Results must be positive for all categories if confirmatory analysis is to be preferred. Violation of one or more criteria substantially increases the difficulty of maintaining a definitive control of the research problem. Since a high level of control over concept and measurement is not easily attainable in complex applied research, exploratory philosophies must be accepted as a 'matter of course' alternative to confirmatory solutions.

If exploration is not to be given positive direction in the absence of sound theory, search priorities must be established to facilitate systematic disaggregation of the research problem into manageable components. Establishment of search priorities is governed by the three factors shown in Figure 8.1. Two analytical options follow with scope for data intensive and data extensive analyses. The primary consideration in any choice between the two depends on the objectives of analysis. If analysis of extent in differentiation is the objective, data intensive analysis is appropriate whereas the reverse holds for analysis of nature in differentiation. Investigations of nature in differentiation are extraordinarily complex to formulate and previous conceptualisations are often inappropriate or defective. Increasing uncertainty of this kind further legitimises the need for development of exploratory philosophies.
Figure 8-1: Exploratory Data Analysis, Spatial Research and Critical Decision Points.

- **Problem Identification** 
  - What is to be investigated
  - Why it is to be investigated

- **Adequacy for Theory Formulation** 
  - Proceed to confirmation
  - Additional round of exploration

- **Analytical Framework**

- **Adequacy of Confirmation** 
  - Continue confirmatory analysis
  - Revert to exploration

- **Exploratory Data Analysis**
  - Search related procedures necessary to specify features of problem (inductive)

- **Confirmatory Data Analysis**
  - Conditions for hypothesis testing and proof satisfied (deductive)

- **Establishment of Search Priorities** 
  - What issues are important
  - What numerical information is available
  - What techniques and procedures are available

- **Data Intensive Search**
  - Investigations of extent in areal differentiation

- **Data Extensive Search**
  - Investigations of nature in areal differentiation

- **Synthesis of Areal Form**

- **Questions and Hypothesis Generation**
Exploration of areal form, be it data intensive or extensive, is valuable because the resulting empirical syntheses facilitate formal conceptualisation where none was previously possible. This is an interactive procedure where findings have the status of hypotheses or questions until sufficient formal information has been accumulated to legitimately support confirmatory analysis.

The goal of exploratory data analysis is to minimise the distortions of empirical research which result from acceptance of inappropriate or inadequate theory and research objectives. It has developed as a pragmatic response to these problems and embraces a recognition of the need to reconcile desirable and attainable objectives in empirical studies. Interarea problems are especially prone to the difficulties which inhibit confirmatory or definitive analyses and for this reason exploratory data analysis is more appropriate here than in other fields of geographic endeavour.

8.2 Areal Segregation and Localised Differences in Outcomes from the Labour Exchange Process

Local labour exchange differentials are poorly understood in Australia, yet they are a fundamental expression of socio-economic process. The empirical element of this Study has been designed to provide insights into the spatial character of labour exchange differentiation and so the role of place in social process. This analysis consists of three components:

i) substantive material necessary to sustain informed empirical manipulation of spatial data;

ii) data intensive analyses of extent in spatial differentiation of outcomes from the labour exchange process;

iii) data extensive analyses of nature in spatial differentiation of outcomes from the labour exchange process.

The substantive material in this Study has been of two types. The first established necessary background for informed analysis by identifying the prevalent macroeconomic trends operative over the period of interest and establishing the effectiveness of locationally discriminant policy on structure of the space economy. Review of macroeconomic conditions was considered necessary to establish the significance of a labour exchange analysis for the period of study. This documented the onset of a widespread recession, paying attention to the timing and severity of crisis which partitions the period of interest and had a marked effect on some sources of observation. Examination of locationally discriminant policy was undertaken to determine whether exploration should be concerned with the effects of policy because of recent influences on spatial structure. It was found that successive
State and Federal governments had imaginative public commitments to restructuring the space economy of N.S.W. The effectiveness of these policies was eroded by short term changes in objective, poor resource support and, particularly in the Federal case, a shortlived commitment. As a result, redistribution of activity was negligible, mitigating against detailed consideration of policy initiatives and their effects in local analysis of spatial structure.

The second type of substantive material referred to the 'strategy/technique/data' combination used to explore nature in areal differentiation. Treatment of this was necessary for two reasons: exposition of a philosophy espousing exploratory data analysis without operationalising it under complex analytical circumstances is meaningless; and exploration of nature in areal differentiation offers scope for innovative responses. The strategy used was taxonomic and the techniques applied, numerical. These two aspects of the framework have been combined in ways not commonly encountered in human geography. The data to be explored using this combination were purposefully selected at high levels of spatial and social disaggregation to dispel notions of definitive theoretical control and avoid replication of the indicators approach. Data selection highlighted the need for an exploratory stance in research of this type as it emphasised the limitations imposed by availability and quality of information.

Empirical investigation of local differences in labour exchange revealed marked patterns of spatial segregation. This phase of analysis was developed in two parts with one focussing on differences of extent and the other, by contrast, differences in nature between places.

Unemployment was used as the sole basis for analysis of extent in spatial differentiation because of its widespread application as a surrogate for performance of the labour exchange process. This aspect of investigation was specified by two issues. The first was oriented towards the concept of unemployment and its utility as a performance surrogate\(^1\). It was found that conventional views of the concept ignored important elements of unemployment. Traditional justifications for its use as an index of performance were found wanting because of interpretative ambiguity in spatial circumstances. A more robust alternative was found in the welfare justification which adopted the view that concentrations of unemployment are only indicative of areas with unemployment induced welfare problems.

The second issue, specifying direction in the analysis of spatial unemployment patterns, concentrated on the durability of observed differences through examination

\(^1\)Detailed consideration of indices used in differentiation is only possible in data intensive analyses because few dimensions of differentiation are used.
of cross sectional and longitudinal outcomes from exchange. Conventional analyses of pattern are weak because the views of form they convey make no reference to consistency. Patterns may then be ephemeral and not truly indicative of a consistent role for place in labour exchange. For this reason, the analysis emphasised identification of form constants through comparison of spatial patterns. This analysis revealed a very complex pattern of areal differentiation, characterised by high degrees of cross sectional and longitudinal instability. The search for form constants simplified these patterns and enabled the identification of core areas which were of unconditional welfare concern. This is analytically important as it highlights those places where cross sectional, longitudinal or cross sectional/longitudinal problems can be consistently observed. These are areas where the labour exchange process has proven to be consistently incapable of removing unemployment induced welfare problems and remedial public action is warranted. There is clearly a strong basis for believing that place has a role in labour exchange since spatial analysis permits diagnosis of socially significant differences in the space economy. These results however only establish a prima facie case and must be expanded if grounds are to be established for a synthesis of place and social process.

The problem with analyses of extent is that conclusions, questions and hypotheses as to the significance of place in labour exchange are strictly limited in application to only one dimension of spatial differentiation. Investigations of nature in differentiation offer an increased scope for generalisation. This component of the analysis was specified in two parts, one dealing exclusively with areal form and the other, attribute contribution patterns from social process.

Extensive manipulation and diagnosis of spatial dissimilarities revealed a remarkably consistent and intuitively intelligible pattern of spatial segregation. As a first stage of analysis, this is extremely important from both conceptual and analytical viewpoints. Conceptual significance arises from the initial possibility that no structure would be identifiable. Here, a robust structure of differences has been identified from several analytical perspectives on the basis of labour exchange outcomes. This suggests a highly ubiquitous taxonomy of place which is hardly surprising, in retrospect, given the subsequently proposed model of place and its role in labour exchange.

Analytically, classification enabled the identification of a tripartite typology of areal differences, the character of which was specified using the "shorthand method". The spatial structure indexed by this typology represented differences between

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2 As a corollary, areas of unconditionally low and conditional welfare concern were also identified.
coastal, urban and inland nonurban place. These differences transcend two dichotomous themes, the first being regional (coast-inland) and the second urban hierarchic (urban-nonurban). Extensive diagnosis revealed that this structure was replicable from numerous perspectives and well founded in original dissimilarities. Ordination reaffirmed these themes and suggested a powerful integration which synthesised differences through the widely ranging activity gradient concept. Though an inductively derived proposition, this conceptualisation of activity is important because of its widely ranging basis in outcomes from the labour exchange process. This offers one major advantage over conventional treatments, such as the industry/occupational mix alternative. This view of activity is not prescribed by narrowly preconceived theory that restricts the type of tangible result which can be obtained when so little is actually known of place in labour exchange. The final product, therefore, 'fits' the manifestations of social process in place rather than forcing place to 'fit' one specification of the problem. The end result is a concept of activity which is capable of supporting expansive hypotheses concerning place since it is both more general and flexible than prescribed definition.

The analysis of nature in differentiation through areal form was expanded by searching for regularities in the immediate source of social variation. This was done through examination of attribute contribution patterns. Identification of such regularities in attribute contribution is important because it provides insights into the nature of variation and determines the empirical significance of patterns in spatial differentiation. This proved to be a very difficult phase of analysis because of the diversity in dimensions and their extensive disaggregation through attributional specification. These difficulties did not obscure the evidence of widespread, clearly discernable and highly intelligible regularities at the dimensional scale which were indicative of strongly thematic associations between place and operation of the labour exchange process. As such, they were regarded as indicating spatial parameters in operation of the labour exchange process. From this it was argued that social process could not be specified in isolation from place. The two sets of multidimensional observations could be easily related in an analytical sense. However, they had a more valuable function where the role of place in labour exchange was concerned. Firstly, they established the preconditions for a far reaching conceptual synthesis of place and labour exchange and secondly, observational limitations to constrain such a development, and so avoid the excesses of abstract theorisation.

The result was a model of place in labour exchange which reverses the principal tenets of the 'traditional spatio analytical' model that underlies a large
proportion of applied spatial research. The fundamental proposition of this model is that differences in place were not caused by the social regularities, identified subsequently, but that operation of process is place specific. This is the source of regularities which emerge from aggregate (collectively based in other places) social processes, such as labour exchange. Exogenous factors can only be incorporated into this model by proposition of feedback effects from operation of aggregate social process to individual places, developing an interaction so that place is inextricably related to social process. Little is known of the ‘filtering’ mechanisms which influence the strength of these feedbacks other than elementary work in diffusion and innovation. Redefinition of place in these terms is inseparable from a conceptual and analytical role in social process.

It has been possible in the first empirical component of this analysis to provide a view of areal differentiation according to differences of extent. The second component presented an extension of this by incorporating diverse elements of labour exchange to present a treatment of nature in differentiation. The importance of this is that unlike previous studies with labour exchange, it concentrates on outcomes rather than supposed determinants and is inherently empirical to provide observational insights into differentiation and does not rely on theory but attempts to show directions for development. Exploration of this type is essential if challenging respecifications of place in labour exchange, and less directly social process, are to be undertaken.

Directions for further development of this work have been specified in the discussion of assumptions in the previous Chapter. More direct extensions of this particular work, however, can be attained by expanding analytical coverage to include other states in Australia and a wider array of attributes and dimensions. Given the significance of place in social process, it would also appear fruitful to use the tripartite typology as a basis for selecting places where extensive intra-area studies of social process could be conducted to gain an understanding of causes for differentiation. Such work, though constrained to very few places, provides the only path to a refined understanding of social process and its operation in place.

8.3 Conclusion

Applicability of exploratory data analysis to interarea investigation takes place within a much wider debate as to the suitability of philosophies, methodologies and techniques for acquiring knowledge. This Study has dealt with only one facet of this, the use of imperfect observation and its role in theory development. The significance of this Study lies in neither its exposition of exploratory data analysis
nor its empirical treatment of place in labour exchange, but rather in its integration of the two. It not only transfers and develops a much needed philosophy to geographical research but demonstrates its suitability in the most arduous of applied research environments. Interim results, which elucidate the nexus between structure in place and social process, have several applications which have not been pursued here. This is the work of subsequent studies which may choose to accept this argument. However, this work on the role of place in social process is a starting point for extended empirical work of this type. The role of place in social process cannot be accepted as an analytical convenience but equally its legitimacy as an element of social process must be refined if these gains are to be consolidated.
This Study emerged from an original fascination with spatial disparities in the social characteristics of people. It developed through four stages, the initial point of departure being social indicators. After extensive work, culminating in a study of south east N.S.W., it was found that outcomes from social process could not be systematically reconciled with place. The more serious difficulties of this approach could be eliminated by accepting highly aggregated partitions of space and social process where both lost definition. Even then, problems persisted with outcomes from process, such as spatial concentrations of unemployment, indicating reversals in performance according to accepted models. This position was regarded as untenable.

The second stage of development involved a response to these difficulties by seeking to reconcile models of social process and spatial observation by empirically modelling social relationships in a spatial environment. It was hoped that this would account for at least some of the observed inconsistencies. Three problems obstructed all efforts in this direction. First, available information was so limited that only highly prescribed aspects of labour exchange could be examined. Second, data were of dubious reliability for modelling in a purportedly confirmatory manner. Third, the models which could be ‘pieced’ together with foundations in established theory were fragmented and naive by comparison to the complexity of actual problems. The result was entirely unsatisfactory with inadequately conceived models relying on association of spatially decomposed aggregates to imply causality.

The disturbing feature of this approach is that elementary and imprecise theoretical constructs can be proposed and are often well received where high levels of association can be demonstrated between aggregates. Residuals for such models are often supportively random indicating, at first sight, adequate specification. The question is: how can this be where vital factors are not included in numerical models? For example, proposed relationships between wealth and spatial disparities in labour force opportunity do not and cannot include such factors as control of resources and purpose of work which are as too ‘soft’ for inclusion. The obvious reason is that several factors may be confused in residual patterns, unless of course labour force opportunity is a perfect surrogate for all absent factors. Under these
circumstances, models with lesser claims to explanatory power and highly structured residuals indicative of specification problems would be superior as difficulties are obvious and comparatively minor. Unfortunately, this is not usually the case and problems are more insidious. Whilst such constructs are indisputably useful in suggesting some causal possibilities, they do not qualify as definitive models of complex social process.

The third stage of development sought to combine the best features of both preceding stages. A first draft was completed using this strategy four and a half years after commencement. This involved an attempt to document major disparities in the spatial distribution of highly disaggregate social variables in combination with a causal model of spatial differentiation. Though an improvement over the earlier strategies, this result was unsatisfying as it did not resolve concerns from the two earlier formulations. The worst excesses of this could be alleviated by excluding the unpalatable and accepting higher level social aggregates. Irrespective, the fundamental problem remained the same, a general failure of all three approaches to reconcile place with social process in anything other than an analytical way.

This left three options, superficial refinement of the unrefineable, abandonment of the Study or reformulation to address the problem of place and its role in labour exchange. The final option was adopted within the context of Tukey’s exploratory data analysis as an adjustment to the technical obstacles which combined to impede progress. The format of this Study and the techniques applied have been carefully chosen as a result of experiences in the earlier stages of development. It contains some features thought undesirable in reporting research. In some cases, the obvious has been stated, the tedious retained and negative perspectives emphasised. Decisions to do so have been made with great care as the obvious is often elusive until stated, the tedious necessary where fields are replete with difficulties and the negative justifiable where understatement is misleading. This has been necessary due to the numerous stages required in formulating this Study with the hope that it will minimise difficulties for those who follow. As a final comment, there is a bias in much of the empirical literature towards positive research results and ‘clean’ argument which treat obstacles with abandon. This cannot continue if social research is to develop in a balanced manner.
Bibliography


Australia-Australian Bureau of Statistics. (undated) "Sampling Error Associated with the Census (revised)", Australia.


of the Committee of Commonwealth/State Officials on Decentralisation", A.G.P.S., Australia.


Australia-Commonwealth Bureau of Census and Statistics, (various years) "Australian Labour Reports", Australia.


Economic and Social Research Regional Paper 1, Cambridge University Press, Great Britain.

Chorley, R.J. and Haggett, P. 1969 "Integrated Models in Geography", Methuen, Great Britain.
Daly, M.T. 1964. "Urban Settlement in Central Western N.S.W.", Department of Geography, Sydney University and N.S.W. Geography Society, Australia.
Daly, M.T. 1968. "Report to the Department of Decentralisation and Development on Some Aspects of Life in N.S.W. Country Towns", Macquarie University, Australia.
Daly, M. and Brown, J. 1964. "Urban Settlement in Central Western N.S.W.", Department of Geography, Sydney University and Geography Society of N.S.W., Australia.
Donnison, D. 1981. "Local Responses to Unemployment in Britain", Seminar - Urban Research Unit, Australian National University, Australia.


Friedmann, J. "Regional Development Policy", MIT Press, U.S.A.


Pullen, G. 1975. "Internal Migration Survey (Kempsey)", N.S.W. Department of Decentralisation and Development, Occasional Paper No.1, Australia.


Stohr, W. and Taylor, D.R.F. 1981. "Development from Above or Below? The Dialectics of Regional Planning in Developing Countries", Chichester, U.S.A.


### GLOSSARY OF TERMS USED IN THIS THESIS

**PLACE**
- locational segregation of social and physical environments.

**LABOUR EXCHANGE PROCESS**
- process resolving work and labour requirements.

**SPATIAL PROCESS**
- disaggregation of social process according to place.

**SPATIAL FORM**
- outcomes from spatial process according to place.

**EXTENT IN DIFFERENTIATION**
- distinction by degree differences in status between places.

**NATURE IN DIFFERENTIATION**
- distinction by qualitative differences in status between places.

**VARIABLE**
- phenomenon of varying states - observational units used to monitor these, with emphasis remaining on initial phenomenon.

**CHARACTERISTIC**
- feature of observational unit - features used to monitor observational unit with emphasis remaining on observational unit.

**DIMENSION**
- collective reference to characteristics of common definitional origin.

**ATTRIBUTE**
- unique reference to characteristics below dimensional level.

**DATA INTENSIVE ANALYSIS**
- analyses using one dimension of variation between places.

**DATA EXTENSIVE ANALYSIS**
- analyses using more than one dimension of variation between places.

**LOCAL SCALE**
- level of observation identified with small communities.

**EXPLORATORY DATA ANALYSIS**
- search for structure in data as a response to theoretical, conceptual and observational uncertainty.

**INCIDENT DATA**
- measurement expressed in absolute terms.

**PROPORTIONATE DATA**
- measurement transformed to reflect relative incidence.

**STRATEGY**
- integrating framework for solution of research problem.

**NUMERICAL TAXONOMY**
- numerical search for consistencies in populations or samples.

**DISSIMILARITY MEASURE**
- index of dissimilarity between observational unity.

**CLASSIFICATION**
- simplification of dissimilarity patterns according to discontinuities.

**ORDINATION**
- simplification of dissimilarity patterns according to continuities.

**DIAGNOSIS**
- analysis of empirical simplifications in search of observational foundations.

**PATTERN**
- any set of distinctions between observational units.

**STRUCTURE**
- set of distinctions from which high level synthesis can be obtained.

**DIMENSION IMPLICIT**
- dimensional patterns subsumed into one dissimilarity matrix.

**DIMENSION EXPLICIT**
- dimensional patterns retained in separate dissimilarity matrices.

**EXTRINSIC ATTRIBUTES**
- attributes exclusive to set directly analysed.

**INTRINSIC ATTRIBUTES**
- attributes inclusive of set directly analysed.

**COINCIDENT INFLUENCE**
- spatial coincidence of dimensional or attributational patterns.

**DIVERGENT INFLUENCE**
- spatial divergence of dimensional or attributational patterns.