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**AN EXPLORATORY CLASSIFICATION OF "ECOLOGICAL
INCUBATOR" ENVIRONMENTS IN WALES**

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ABSTRACT

Previous research has shown that there are spatial differences in new manufacturing firm formation rates from place to place which encourages an 'environmental' argument. The contemporary new firm literature fails to include a detailed study of both new manufacturing firms and new firm founders together in a variety of contrasting 'ecological incubator' environments. This researcher decided to undertake a field survey of new firms and new firm founders in a variety of environments in Wales. However, in order to allow a micro-level survey to be undertaken a classification of the space economy of Wales into a series of 'ecological incubator' environments was constructed. The classification was based on Revised (1978) Travel-To-Work Areas (TTWAs) which represent reasonable labour markets or environments. Eighteen 'surrogate variables' were derived from the contemporary new firm literature covering a range of themes which have been shown to be either promoting or impeding new firm formation. The decision as to which independent variables to include was based upon logical and well-argued lines as well as statistical association with the new firm formation process. Consequently, in order to identify general classes and relationships among the forty TTWAs and the eighteen surrogate variables, synthesising statistical procedures such as Principal Components Analysis and Cluster Analysis were used to identify five 'ecological incubator' environments in Wales. The innovative and detailed classification of environments enabled a survey of new founders in demonstrably different sub-areas in Wales to be undertaken on an objective basis rather than solely based upon intuition.

1. INTRODUCTION

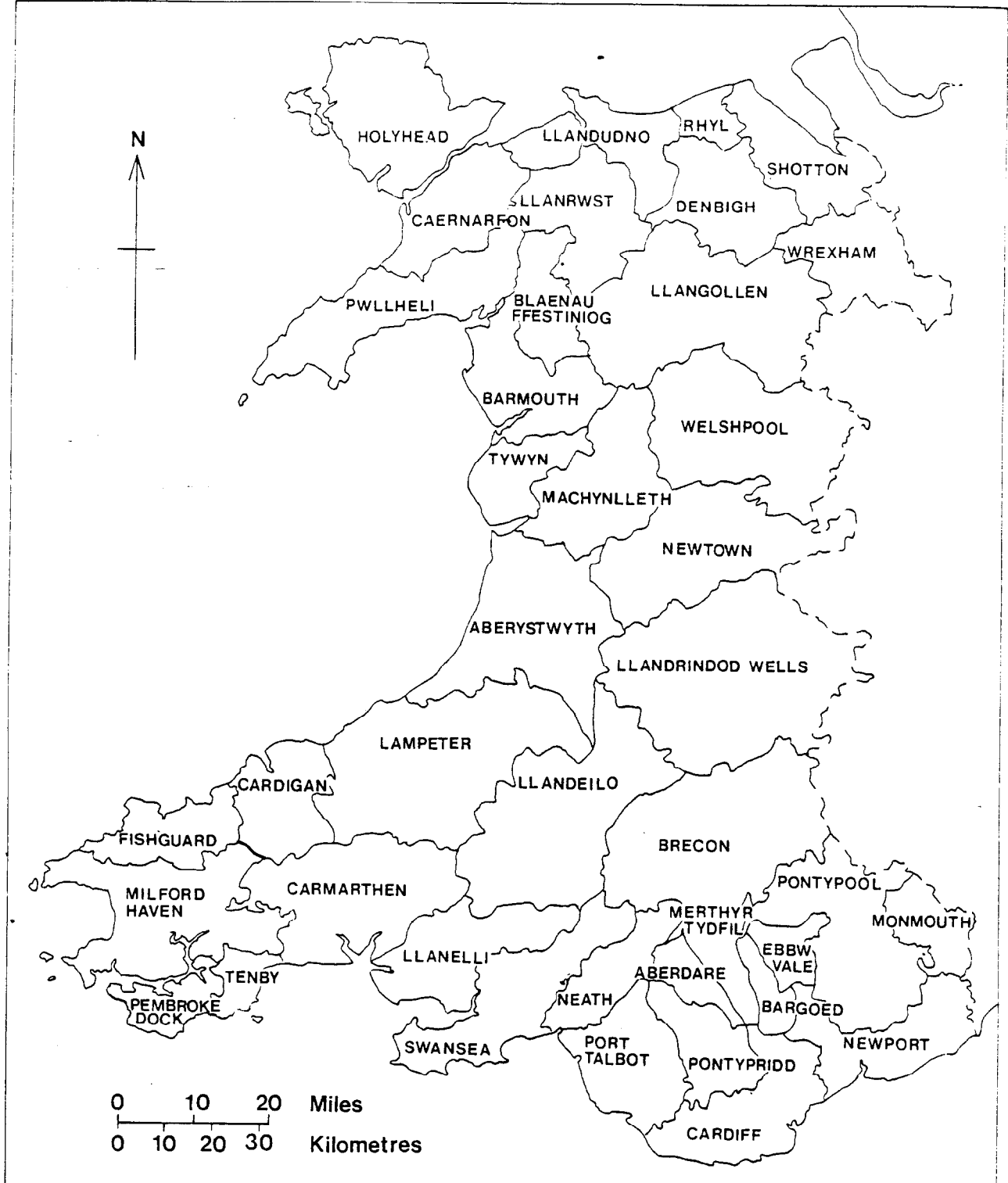
New and small manufacturing firms have played a key part in regional economic development. In recent years there has been a growing awareness of the need for, and importance of, new employment creation. In fact, one of the present Conservative government's objectives is to improve the climate for entrepreneurship and to foster more positive attitudes towards it (Frank et al, 1984). As noted by Mason and Harrison (1985) a number of studies have investigated new and small firms in specific regional and subregional environments. However, despite this considerable interest by geographers and others in recent years, there is still the need for greater research into the nature and consequences of spatial variations in new firm formation rates and small firm performance and growth; not least because such information is an essential prerequisite in justifying the case for a spatially selective small firms policy (Storey, 1982) and in order that the argument for the channelling of greater resources to help new firms in specific parts of the country to be more fully informed.

Previous studies have accepted that the founders of new firms are ultimately individuals but past studies do point to variation from place to place which encourages an 'environmental' argument. It could be claimed that some 'environments' may be more fruitful in generating and supporting new firms. Consequently, it could be argued that environments could be manipulated or, alternatively, targetted in order to generate successful new manufacturing firms. Unfortunately, the contemporary new firm literature fails to include a detailed study of both new manufacturing firms and new firm founders together in a variety of contrasting 'ecological incubator' environments. Such research is urgently needed as indicated by the calls for further research by Frank et al (1984). In fact, it could be argued that previous research has often been too specific both in place and in time. It is the intention of this study to provide more generally applicable conclusions which would, at least, add to the general case law of previously reported work. Therefore, the objective of this paper is to describe the development of a taxonomy of 'ecological incubator' environments in Wales. The resulting classification would form the basis for a survey of new firm founders over the 1979 to 1985 period.

This paper adopts a well established methodology and the theoretical ideas are not new (Spence, 1968). The use of mathematical statistical methods (grouping and components analysis) will be used to define contrasting uniform regional types. The problem is essentially one of efficient multivariate classification. A set of areas (n), characterised by certain variables (m), has to be reduced into a smaller number of regional types with maximum uniformity or homogeneity. In this example the areas are Travel-to Work Areas (TTWAs) defined and revised by the Department of Employment (1978) (Figure 1), while the variables are surrogate variables associated with the new firm formation process. The criterion adopted for grouping

Figure 1

REVISED (1978) TRAVEL-TO-WORK AREAS FOR WALES



is that regional types will have maximum between-group variance and minimum within-group variance.

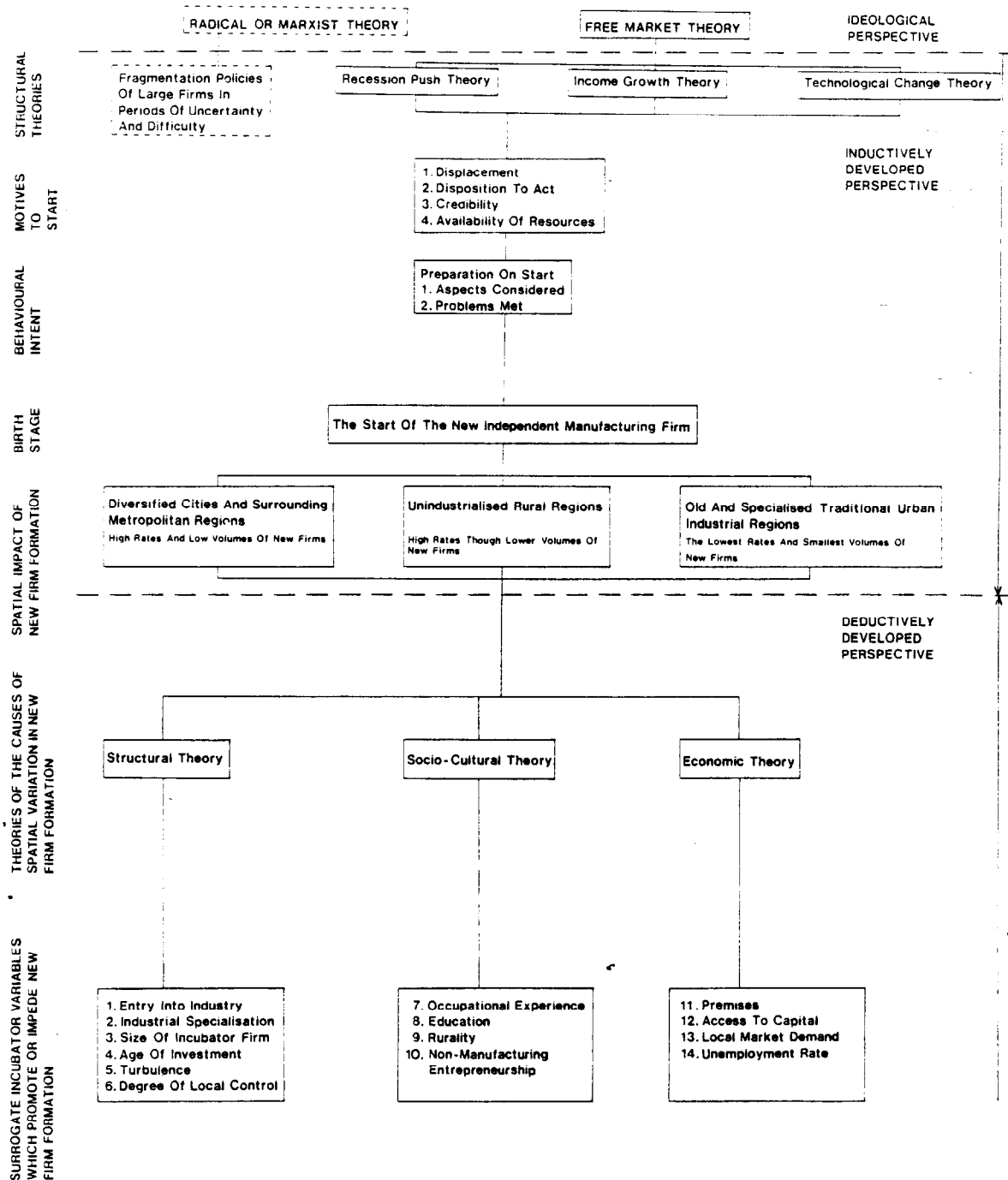
2. CHOICE OF SPATIAL SCALE AND SURROGATE 'ECOLOGICAL INCUBATOR' VARIABLES

In recent years there has been a debate as how to conceptualise the fluid 'plastic' space of an environment. Unfortunately, the spatial definition of local labour market areas (LLMAs) is 'fraught with the problems associated with simplifying a complex situation and imposing an artificial set of boundaries on an indeterminate and enormously variable set of individual workplace-residence relationships' (Ball, 1980). Consequently, there has been considerable work on the definition and construction of functional regions (Coombes et al, 1982), based on the intuitively important criterion of self-containment along with the incorporation of a hierarchical element in the regionalisation procedure. In essence, the spatial manifestation of the LLMA might be seen as a geographical area which is common to a number of employers and employees, the area within which the working population habitually seeks employment and where local employers recruit most of their labour. A number of researchers have assumed that a TTWA can be regarded as representing a LLMA, and they have been treated as such. For a number of years TTWAs have provided the areal base for the calculation of local unemployment rates and they have been used as building blocks for defining the regional policy Assisted Areas. The use of TTWAs for research is not without some problems (see Ball, 1980; Coombes and Openshaw, 1985). For example, TTWAs are only approximations to LLMAs and it is accepted that LLMAs overlap. There is evidence that people in certain socio-economic and occupational groupings seek work over wider areas than those in other groups (Goodman, 1970). Moreover, at any one time, the area over which the residents of a locality seek work will depend on the local mobility system and the existing spatial pattern of employment opportunities. LLMAs are therefore likely to be neither discrete nor constant over time (Department of Trade and Industry, 1983). Despite these limitations it can be argued that the Revised (1978) TTWAs represent reasonable LLMAs (Smart, 1974). Consequently, these defined TTWAs were regarded as reasonable building blocks for 'environments' in Wales. The choice of Revised (1978) TTWAs rather than Revised (1984) TTWAs (Coombes et al, 1985) was largely based on the fact that a variety of previously published and unpublished information was available at the Revised (1978) TTWA scale for Wales, but not at this newer scale.

The decision as to which independent variables to collect and build up to a TTWA scale was obviously difficult but the chosen variables reflect the domain of interest in the contemporary new firm literature as indicated in Figure 2. Perhaps the most important safeguard was that the independent variables were constructed upon well-argued lines.

Figure 2

A FLOW DIAGRAM ILLUSTRATING THE PROCESSES AND FACTORS ASSOCIATED WITH SPATIAL VARIATIONS IN THE NEW FIRM RESURGENCE PHENOMENON



Factors widely associated with the new firm formation process - either promoting or impeding it - are illustrated in Table 1. Unfortunately, a number of the the 'surrogate' variables identified in Table 1 were not available. However, ninety-seven variables of which the majority were concerned with local employment characteristics were obtained, these variables have been also previously identified in the contemporary new firm literature. At this stage, exploratory correlation analysis was used as a means of guidance to seek measurable important factors in the new firm formation process. Eighteen surrogate variables with a statistical association with the new firm formation process, covering a range of themes associated with 'incubator environments' were identified and selected from the ninety-seven for the classification procedure. These eighteen surrogate variables are defined in Appendix 1.

However, carefully the eighteen surrogate variables were selected, they cannot represent the only possible combination which potentially could have been used. Some observers might quarrel with choice of individual variables, and others with the general conception of the local environment which they imply. But within the limitations imposed by the availability of data they appear to provide a sensible framework for the identification of 'ecological incubator' environments defined on a fairly broad basis. Therefore, the presumption that different 'ecological incubator' environments exist can be tested in this way and if they do exist will provide an essential prelude to research in order to sample different regional types.

3. RESULTS OF A PCA ON EIGHTEEN 'SURROGATE INCUBATOR' VARIABLES

The theory surrounding the use of Principal Components Analysis (PCA) has already been discussed in detail by Davies (1984). A matrix of intercorrelations of variables (18 by 18) is presented in Table 2 and it appears that the variables are associated with each other and it is likely that they will share common components. On the basis of this an R-Mode PCA was performed and the component model's key assumptions (Norusis, 1985) were not violated. In the unrotated solution, 69% of the total variance was explained by the first four components. The selection of variables was so diverse and interpretation was difficult, if not impossible. The unrotated direct extraction of orthogonal reference axes by PCA did not adequately illuminate the interrelationships between the collection of variables. As a consequence the reference axes (components) were manipulated by a process of rotation in order to isolate more meaningful (i.e. interpretable) dimensions.

After a varimax rotation the first four components (out of eighteen) exhausted 69.7% of the initial total variance. Table 3 shows the variance was more evenly distributed after rotation with the first component accounting for 21.7%; the second 21.6%; the third 14.9%; and the fourth 11.6%. The sum of squares of all the component loadings was greater than one and the

TABLE 1: FACTORS IDENTIFIED BY THE NEW FIRM RESEARCH LITERATURE WHICH ARE ASSOCIATED WITH EITHER PROMOTING OR IMPEDING NEW FIRM FORMATION IN LABOUR MARKETS

Factors	Surrogate Variables	Promoting/ Impeding
1. Size of 'incubator' firm	High % of total manufacturing employment in plants employing fewer than 25 persons.	Promoting
	High % of total manufacturing employment in plants employing 500 or more persons.	Impeding
2. Occupational experience	High % of population in managerial and professional groupings.	Promoting
	High % of population in manual groupings.	Impeding
3. Education	High % of population with higher degrees.	Promoting
4. Access to capital	High savings per head of population.	Promoting
	High house-owning population.	Promoting
5. Entry into industry	High % of population in low entry barrier industries.	Promoting
	High % of population in heavy industries.	Impeding
6. Market demand	High regional income distribution.	Promoting
	High rate of change in manufacturing employment growth.	Promoting
	High rate of change in total employment growth.	Promoting
7. Degree of local autonomy	High % of total manufacturing employment in indigenous plants.	Promoting
8. Age of investment	High % of total manufacturing employment in 'young' plants.	Promoting
9. Turbulence	High employment loss rate in manufacturing plant closures.	Promoting
10. Industrial specialisation	High Tress specialisation statistic.	Promoting
11. Premises	Availability and low cost of premises.	Promoting
12. Non-Manufacturing entrepreneurship	High % of total employment in commerce, retailing and wholesaling.	Promoting
13. Unemployment	High % change in the rate of unemployment.	Promoting
14. Rurality	High % of population living in towns of over 5,000 population.	Impeding

TABLE 2: CORRELATION MATRIX OF VARIABLES

VARIABLE	RURality	POPCHANGE	MFRPC	TOTDIS	TOTSTSHPC	MININGPC	HEAVYINDPC	EASYENTRYPC	MFRCHPC	TOTCHPC	FOREIGNPC	P25PC	P500PC	CLOSRATE	ELCLOSRATE	MANPROFPC	MANUALPC	SELFEMPLOYPC
RURality	1.00																	
POPCHANGE	0.14	1.00																
MFRPC	-0.48	-0.14	1.00															
TOTDIS	-0.40	-0.05	0.87	1.00														
TOTSTSHPC	0.18	0.25	-0.74	-0.68	1.00													
MININGPC	-0.40	-0.50	0.58	0.43	-0.53	1.00												
HEAVYINDPC	-0.46	-0.11	0.48	0.56	-0.42	0.22	1.00											
EASYENTRYPC	0.22	0.03	-0.32	-0.33	0.23	-0.21	-0.30	1.00										
MFRCHPC	0.39	0.40	-0.32	-0.31	0.46	-0.40	-0.36	0.00	1.00									
TOTCHPC	0.28	0.41	-0.17	-0.01	0.33	-0.39	-0.14	0.14	0.44	1.00								
FOREIGNPC	-0.22	-0.10	0.37	0.37	-0.40	0.31	0.47	-0.04	-0.08	0.28	1.00							
P25PC	0.31	0.24	-0.61	-0.64	0.65	-0.42	-0.36	0.20	0.45	0.20	-0.34	1.00						
P500PC	-0.67	-0.37	0.68	0.59	-0.52	0.55	0.50	-0.33	-0.53	-0.28	0.26	-0.56	1.00					
CLOSRATE	0.61	0.25	-0.59	-0.59	0.42	-0.43	-0.41	0.03	0.24	0.11	-0.38	0.61	-0.56	1.00				
ELCLOSRATE	-0.02	0.17	0.25	0.30	-0.18	0.11	0.10	-0.24	-0.13	0.19	0.10	-0.10	0.05	0.16	1.00			
MANPROFPC	0.40	0.02	-0.53	-0.49	0.37	-0.41	-0.38	0.25	0.25	0.12	-0.33	0.26	-0.54	0.24	-0.31	1.00		
MANUALPC	-0.63	-0.26	0.79	0.66	-0.60	0.71	0.52	-0.33	-0.38	-0.26	0.48	-0.47	0.75	-0.54	0.26	-0.80	1.00	
SELFEMPLOYPC	0.78	0.38	-0.67	-0.58	0.47	-0.59	-0.56	0.30	0.55	0.22	-0.42	0.52	-0.81	0.71	-0.25	0.45	-0.75	1.00

TABLE 3: VARIMAX ROTATED COMPONENT MATRIX - PRINCIPAL COMPONENT ANALYSIS

VARIABLE	<u>Components</u>				<u>Communality (h²)</u>
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	
RURALITY	0.895	-0.032	0.198	-0.084	0.850
POPCHANGE	0.123	-0.148	0.702	0.234	0.585
MFRPC	-0.414	0.693	-0.183	0.357	0.812
TOTDI5	-0.361	0.739	-0.027	0.354	0.802
TOTSTSHPC	0.047	-0.795	0.385	-0.249	0.845
MININGPC	-0.317	0.411	-0.548	0.184	0.604
HEAVYINDPC	-0.558	0.362	-0.022	0.194	0.480
EASYENTRYPC	0.222	-0.004	0.102	-0.615	0.439
MFRCHPC	0.224	-0.259	0.645	-0.092	0.541
TOTCHPC	0.087	0.113	0.851	-0.065	0.749
FOREIGNPC	-0.340	0.622	0.286	-0.044	0.586
P25PC	0.196	-0.756	0.290	-0.011	0.694
P500PC	-0.675	0.353	-0.397	0.209	0.782
CLOSRATE	0.648	-0.546	0.102	0.287	0.811
ELCLOSRATE	0.118	0.185	0.148	0.751	0.635
MANPROFPC	0.468	-0.231	0.060	-0.586	0.619
MANUALPC	-0.629	0.455	-0.254	0.437	0.858
SELFEMPLOYPC	0.778	-0.382	0.307	-0.126	0.862
Eigenvalue	3.903	3.884	2.684	2.082	
% of Variance	21.680	21.580	14.910	11.570	
Cumulative % of Variance	21.680	43.260	58.170	69.740	

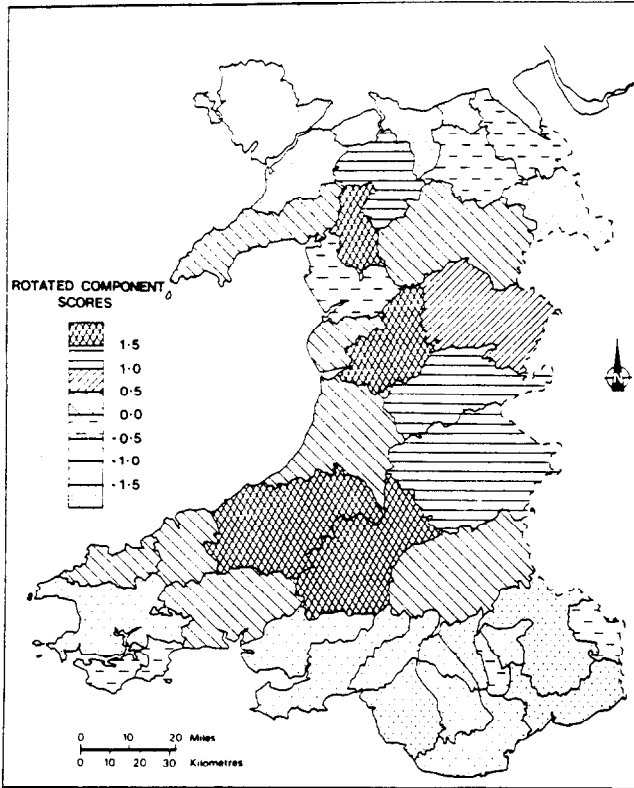
relative amounts of variance of each original 'surrogate' variable is indicated by the communality (h^2) in Table 3. The rotated components analysis concentrates on maximum interpretability between common components, and so the communalities are less than 100%. Most of the variables are well explained by the first four components and this shows that the main variance in the study data has been included in the analysis. Some variables, however, are not so well represented and these include HEAVYINDPC (0.480) and EASYENTRYPC (0.439)

On the basis of the component loadings the four components have been given descriptive labels. The first component is clearly a 'rural self-employment component' with high positive loadings on rurality and self-employment and medium negative loadings on manufacturing employment in large plants and heavy industry, as well as manual employees. Component 2 is termed a 'diversified externally influenced traditional industrial component', as indicated by a high positive loading on diversification, medium loadings on percentage in manufacturing and foreign owned plants, and high negative loadings on total structural shift and small plants. In contrast, component 3 is clearly a 'favourable growth component' with high positive loadings on population and total change and medium positive loading on manufacturing change. Finally, component 4 can be characterised by 'employment loss in closures where manual employment predominated'. This component is associated with a high positive loading on employment loss in closures, medium positive loadings on manual and manufacturing employment and the level of diversification and finally, medium negative loadings on easy entry industries and managers and professional workers. It is worth emphasising that it would be dangerous to attach too much to the above interpretations. They are merely trends (Spence, 1968).

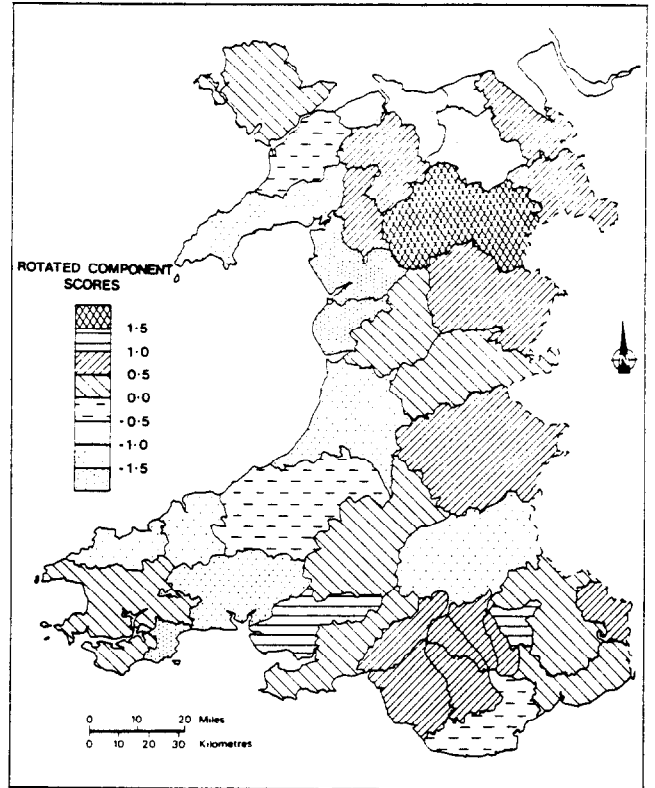
A 4 by 40 matrix of component scores, which evaluate the original observation's score on the four basic patterns in terms of a standard unit of measure has been produced by the varimax rotated PCA. By selecting the most important of these scores, interpreted in relation to the component structure, basic patterns of geographic variation of each component can be determined. These are illustrated in Figure 3a to 3d. The high scores on component 1 in Figure 3a show a basic rural character with very high positive scores in, for example, Machynlleth and Llandeilo. Certainly, Figure 3b brings out the diversified externally influenced traditional industrial TTWAs of north-east Wales and south-east Wales. The most notable exception being metropolitan Cardiff which has a low negative score. Figure 3c illustrating 'favourable growth' is apparent in the less industrialised TTWAs along the Anglo-Welsh border, the northern coast of Wales (excluding Shotton) and the western TTWAs of Milford Haven and Pembroke Dock. Finally, for component 4 it is significant that all the traditional urban areas in north-east Wales and south Wales (with the exception of Merthyr Tydfil) have high positive

Figure 3a to 3d

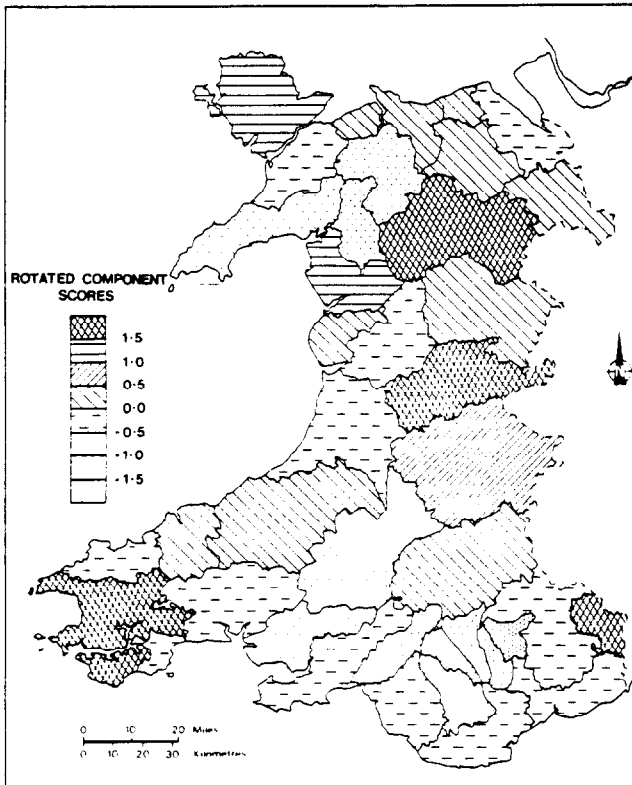
COMPONENT 1 RURAL SELF-EMPLOYMENT



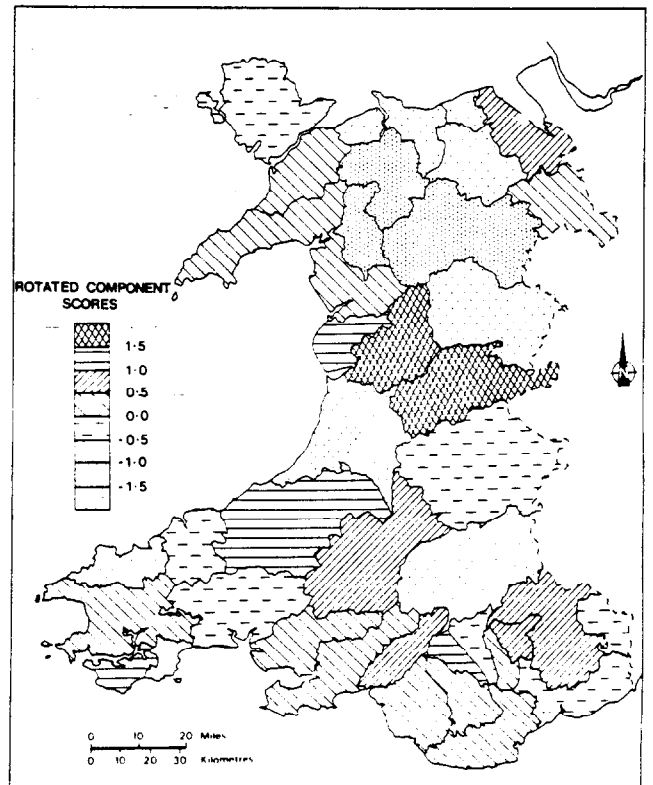
COMPONENT 2 DIVERSIFIED EXTERNALLY INFLUENCED TRADITIONAL INDUSTRIAL AREAS



COMPONENT 3 FAVOURABLE GROWTH AREAS



COMPONENT 4 AREAS WITH RELATIVELY HIGH EMPLOYMENT LOSS IN CLOSURES & WHERE EMPLOYMENT IN MANUAL OCCUPATIONS PREDOMINATE



scores (Figure 3d). However, a number of ostensibly rural TTWAs also have high scores on this component, most notably Newtown, Lampeter and Pembroke Dock. Although caution must be taken when interpreting component score maps, it does seem that linked trends which have been isolated in the component structure do have a geographic expression in terms of spatial pattern.

This simple mapping of component scores is useful in that it describes the labour market pattern of each single basic component, but nothing other than intuitive classification can be attempted. However, to obtain the type of classification required for a survey of new firm founders in contrasting 'ecological incubator' environments in Wales a cluster method (i.e. Ward's method (1963)) was used to group similar TTWAs on the basis of the above mentioned component scores. In this study no contiguity constraint was built in, and what is produced by Ward's method is a grouping of relatively homogeneous TTWAs which have maximum between-group variance and minimum within-group variance. A dendrogram (Figure 4) has been drawn to display each stage in the grouping analysis, together with the make-up of the groups in terms of the original observations. It should be noted that the loss of detail (as measured by the within-group D^2) has been plotted on a logarithmic scale, emphasising the very small loss of detail in the initial grouping steps. A measure of efficiency in grouping, i.e. of explanation with respect to the objective function was calculated at each stage, on the lines used by Spence (1968). Figure 5 illustrates the relative efficiencies and shows the progress from complete detail to total generality as measured by within-group variance. Sharp breaks in the line may be regarded as a significant level of classification. In Figure 5 a sharp break in slope arises at step thirty-five when a five cluster solution is the result. With regard to the objectives of the study and the level of homogeneity and generality of the groups produced, it appears reasonable to stop the method at stage thirty-five. Consequently, a five cluster solution has been arrived at producing meaningful contrasting 'ecological incubator' environments in Wales.

The five regional types have a measure of efficiency of 57.7%. In other words the number of regional types has been reduced from forty to five with a loss of detail of 42.3% (bearing in mind that the inputted component scores were based on components explaining 69.7% of the original variance). The resultant classification is depicted in Figure 6. The characteristics of each of the clusters in terms of the mean change in the eighteen surrogate variables are shown in Table 4. The cluster mean for each of the variables is shown to provide a reference point for interpreting each of the clusters. Cases where cluster means for a variable deviate by more than one standard deviation from the respective global mean are underlined, and are used in the commentary below to highlight the distinguishing characteristics of each of the clusters (Openshaw, 1983). Again, the naming of the clusters for

Figure 4

LINKAGE TREE GROUPING OF REVISED (1978) WELSH TTWAs BY WARD'S GROUPING METHOD

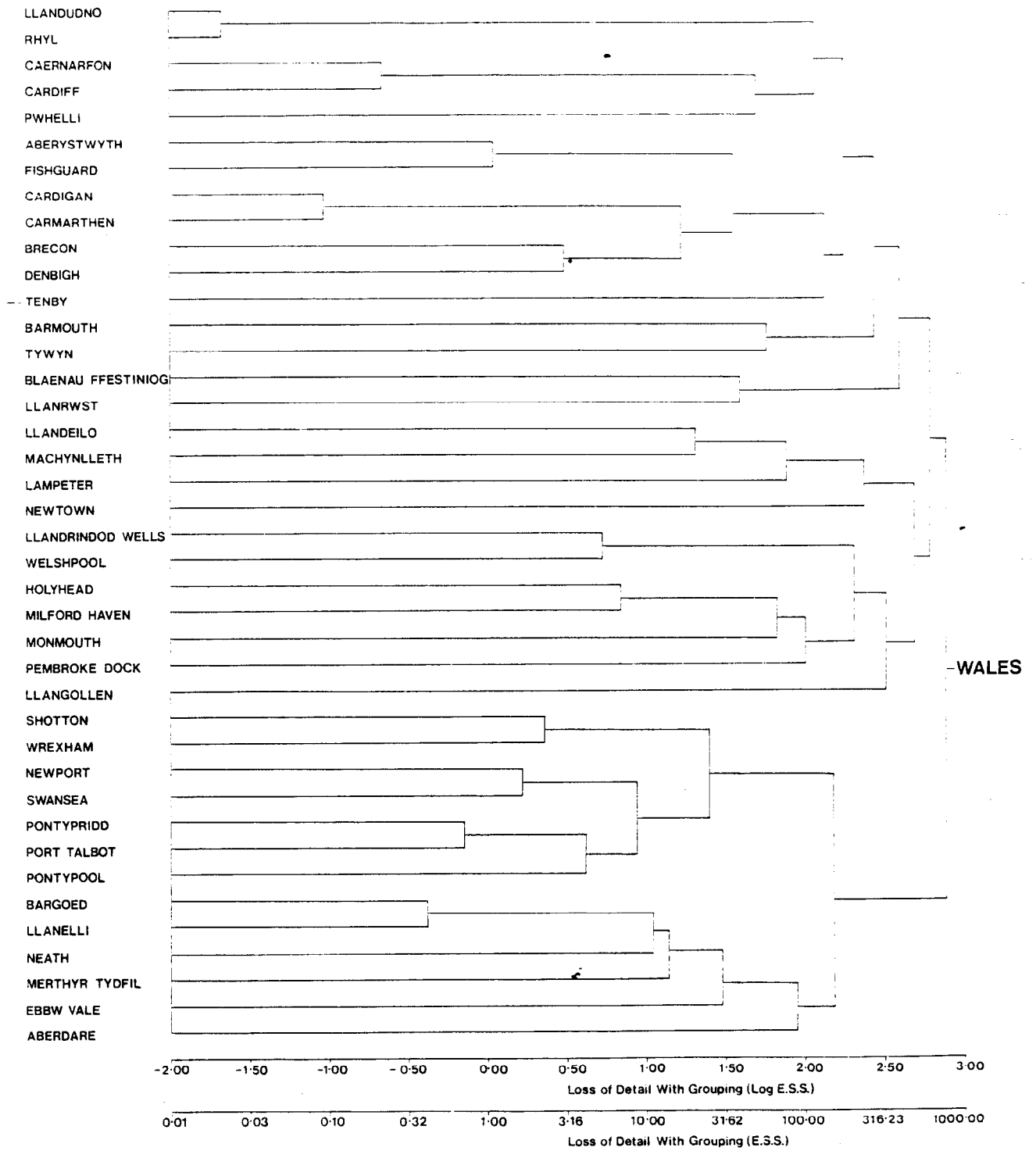
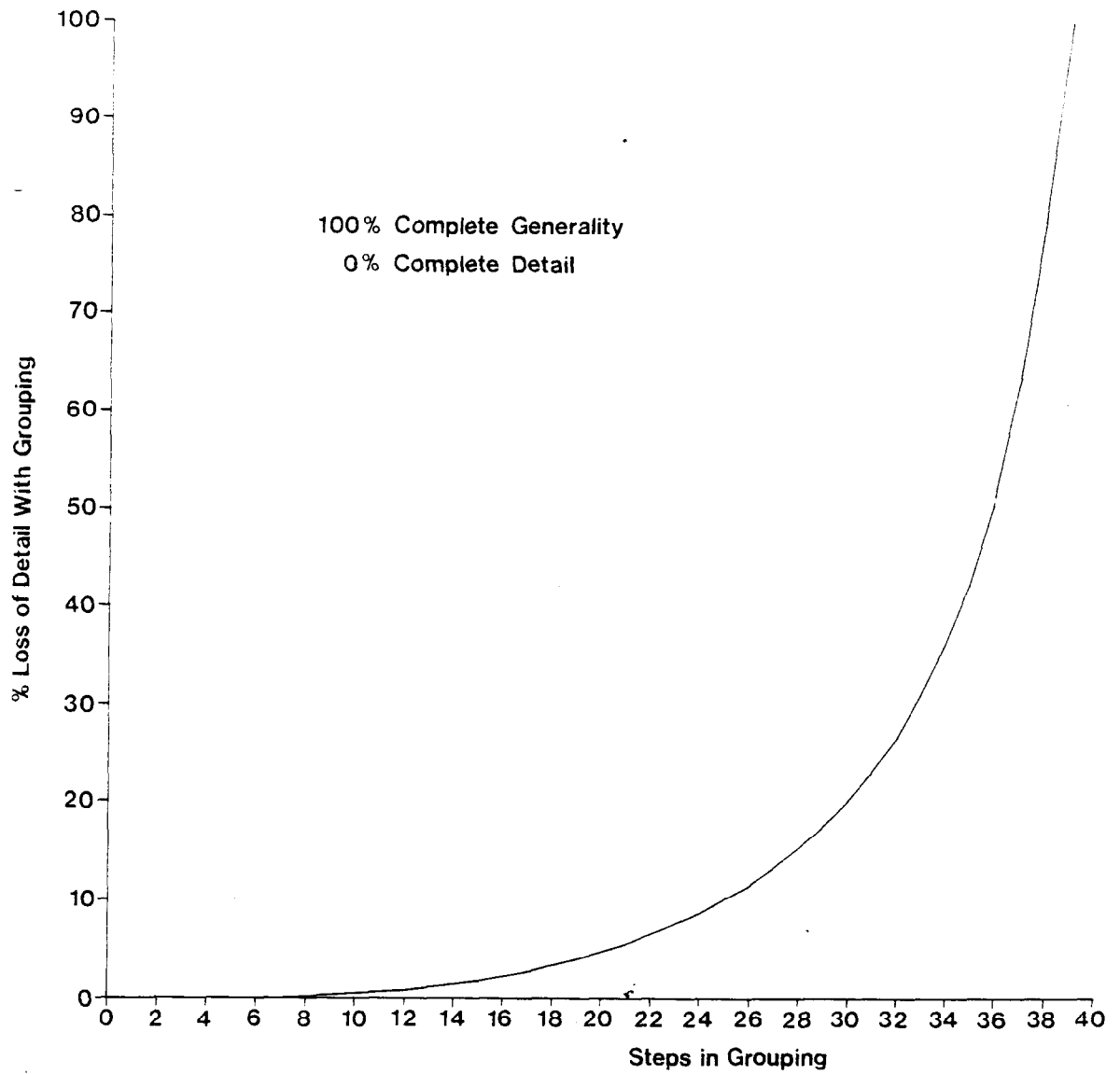
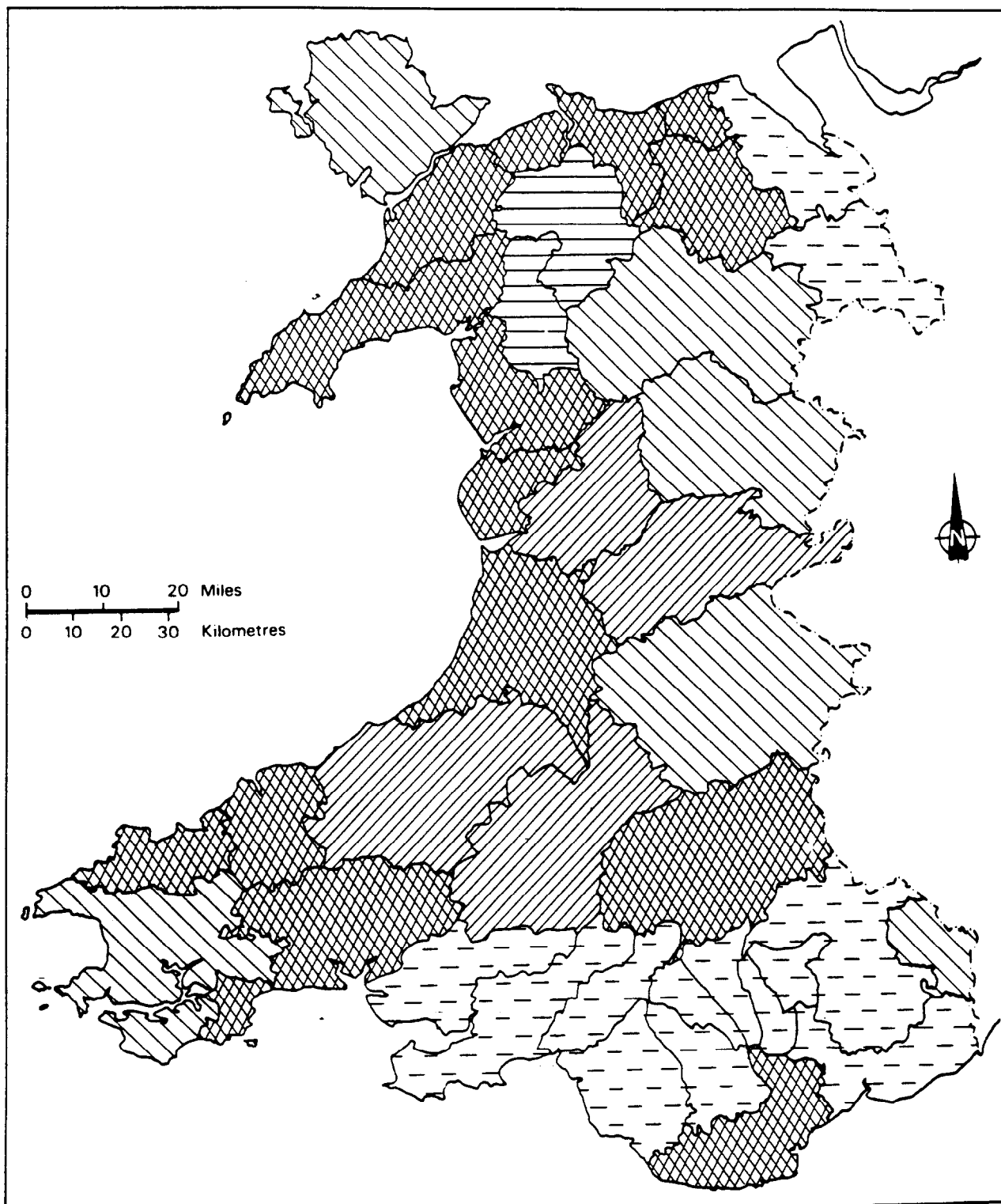


Figure 5

**ACCUMULATION OF WITHIN-GROUP SUM OF SQUARES AT EACH STEP
OF CLUSTERING REVISED (1978) WELSH TTWAs**

5 CLUSTER SOLUTION OF WELSH ECOLOGICAL INCUBATOR ENVIRONMENTS








-  Cluster 1 TTWAs With Favourable Industrial Structures Associated With Relatively Small Manufacturing Bases, Low Foreign Ownership And Favourable Socio-Economic Mix.
-  Cluster 2 Specialised Easy Entry Declining Rural TTWAs.
-  Cluster 3 Turbulent Rural TTWAs With A Tradition of Self Employment.
-  Cluster 4 Growth In TTWAs With High Foreign Ownership.
-  Cluster 5 Traditional Diversified And Urban TTWAs With A Predominance of Manual Employees.

TABLE 4: CLUSTER CHARACTERISTICS IN TERMS OF MEAN CHANGE IN VARIABLES

VARIABLE	Cluster				
	1	2	3	4	5
RURALITY	2.126	<u>4.855</u>	<u>6.198</u>	3.094	0.281
POPCHANGE	4.751	-2.675	9.443	10.711	0.724
MFRPC	10.024	10.500	18.865	18.920	<u>33.883</u>
TOTDI5	2.176	2.130	2.410	2.479	2.670
TOTSTSHPC	<u>9.516</u>	-4.525	-2.243	1.687	-7.734
MININGPC	0.558	1.670	0.683	0.539	8.098
HEAVYINDPC	7.304	0.515	1.810	23.101	25.545
EASYENTRYPC	20.533	<u>37.515</u>	15.495	22.327	12.820
MFRCHPC	27.451	-51.275	29.398	48.133	-28.468
TOTCHPC	2.512	-12.690	8.400	<u>31.973</u>	-8.189
FOREIGNPC	2.150	11.875	2.408	<u>32.370</u>	22.161
P25PC	28.552	6.620	21.733	16.249	6.315
P500PC	12.764	0.000	0.000	6.497	51.708
CLOSRATE	20.484	7.785	<u>41.573</u>	12.399	4.855
ELCLOSRATE	15.009	5.025	<u>43.580</u>	22.140	22.811
MANPROFPC	14.906	12.070	13.925	13.800	9.246
MANUALPC	26.585	34.535	25.845	30.409	<u>45.027</u>
SELFEMPLOYPC	21.179	20.140	<u>31.233</u>	21.101	6.992

Note: Cluster mean marked in *italics* deviate by more than one standard deviation from the respective global mean

intelligibility purposes is inevitably a highly subjective process that may or may not be coloured by preconceived ideas about which groups should be present.

Cluster 1 has fourteen members and its variable characteristics deviate most strongly from the global means on six variables. This cluster is associated with TTWAs with 'favourable industrial structures for employment growth, small manufacturing bases with low proportions of foreign ownership and favourable socio-economic mixes' as illustrated by above-average proportions of professional and managerial workers compared to relatively low levels of manual workers. The most notable and perhaps surprising member of this cluster is the metropolitan and commercial capital city labour market - Cardiff. The raw data, and the results of the PCA show that on the presented variables Cardiff has a completely different character from the rest of urban and industrial south Wales. Consequently, Cardiff has been allowed to remain within this cluster but its inclusion must be viewed with caution. The smallest group is cluster 2 which has only two members. It is apparent that this cluster is a 'specialised easy entry industry declining rural cluster'. In contrast, cluster 3 can be labelled 'turbulent rural TTWAs with a tradition of self-employment' cluster. In this cluster, four variables deviate by more than one standard deviation from the respective global means. Cluster four has two variables which deviate by more than one standard deviation and it may be called 'growth in TTWAs with high foreign ownership'. Finally, cluster 5 is clearly a 'traditional, diversified and urban TTWAs with a predominance of manual employees' cluster. In fact, this cluster of thirteen members has the following variables, MFRPC, MININGPC, HEAVYINDPC and MANUALPC - deviating by more than one standard deviation from the respective global means.

The above analysis has classified Wales into five sub-areas based on the characteristics of the eighteen surrogate variables. As was expected, with the notable exception of Cardiff, all the urban and traditional industrial TTWAs in south and north-east Wales have been grouped into a single homogeneous cluster. However, the rural remainder of Wales has been shown to contain a variety of heterogeneous TTWAs, with specific factors leading to marked differences in classification between one TTWA and another.

4. SUMMARY AND CONCLUSION

An established methodology has proved useful in specifying on a consistent basis the interlocking elements of 'ecological incubator' environmental characteristics. It must be stated that the methodology adopted in this paper has some similarity to that which Davies (1983) termed a 'multivariate structural approach' to ecology and it has proved an "important methodological key to unlocking some of the secrets of the complex areal human mosaic that

is the subject matter of human geography and ecology. It has been and will continue to be useful in abstracting generalizations from appropriate data sets" (Davies, 1984).

The classification adopted enabled the objective of surveying new firm founders in contrasting environments to go ahead on an objectives basis and not solely based on intuition. However, that is not to say that the solution presented is the only one possible. At each stage of the analysis a number of subjective decisions were made and they have had a bearing on the final solution. Also, when the focus is on an aggregate spatial unit such as a TTWA, it must be realised that decisions are made by individuals rather than by the more abstract (and aggregated) concepts. Even given this the researcher is reasonably satisfied (and we have to recognise that we can never be perfectly satisfied) regarding data, assumptions and procedure. The interpretation of the results of the solution do appear to be valid with regard to the stated goal of the analysis in mind. This paper was concerned to find general classes and relationships among the forty TTWAs and the eighteen surrogate variables to provide a structure on the basis of established theory for a survey of firm founders in contrasting new firm environments.

A traditional concern of human geographers has been to synthesise the spatial characteristics and distributions of human phenomena to produce generalisations of the differentiation of earth space (Davies, 1985). Using synthesising statistical procedures such as PCA and Cluster Analysis, a classification of 'ecological incubator' environments in Wales has been constructed from variables consistent with existing environmental theories. This innovative and detailed classification was used to survey new manufacturing businesses and new firm founders in sub-areas of Wales. This second stage survey tested the applicability of the the eighteen surrogate variables and the presented classification. The new firm survey also provided detailed information on, for example, why more new firms have been generated in certain environments in Wales rather than others. Moreover, the questionnaire used in the survey was largely designed along the lines of the Gibb and Ritchie (1982) social development model and the survey results enabled the two levels of explanation into new firm formation listed in Figure 2 to be more satisfactorily interpreted. The answers to the above mentioned issues will be further explored in a number of reports currently being prepared.

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APPENDIX 1: DEFINITION OF VARIABLES

VARIABLE

RURALITY	- Area of TTWA (h.a.) / Usually Resident Population, 1981
POPCHANGE	- Percentage of Change of Population Present on Census Night, 1971-1981
MFRPC	- Percentage of Total Employment in Manufacturing, 1981
TOTDI5	- Endogenous Diversification Entropy Statistic for Total Employment, 1981
TOTSTSHPC	- Percentage Total Employment Structural Shift, 1971-1981
MININGPC	- Percentage of Total Employment in Mining and Quarrying (SIC 2), 1981
HEAVYINDPC	- Percentage of Total Manufacturing Employment in Heavy Industries (SICs 4, 5, 6 and 10), 1981
EASYENTRYPC	- Percentage of Total Manufacturing Employment in Easy Entry Industries (SICs 17, 18 and 19), 1981
MFRCHPC	- Change in Absolute Manufacturing Employment 1971-1981 as a Percentage of Absolute 1971 Absolute Employment
TOTCHPC	- Change in Absolute Total Employment, 1971-1981 as a Percentage of Absolute 1971 Total Employment
FOREIGNPC	- Percentage of Total Manufacturing Employment in Foreign Owned Manufacturing Establishments, 1983
P25PC	- Percentage of Total Manufacturing Employment in Establishments Less Than 25 Employees, 1985
P500PC	- Percentage of Total Manufacturing Employment in Establishments Greater Than 500 employees, 1985
CLOSRATE	- Number of Manufacturing Establishment Closures, 1980-1984 Divided by 1978 Manufacturing Employment Stock and then Multiplied by a Thousand
ELCLOSRATE	- Employment Loss in Manufacturing Establishment Closures, 1980-1984 as a Percentage of the 1978 Manufacturing Employment Stock
MANPROFPC	- Percentage of Persons in Employment Being Managers and Professionals (SEGs 1, 2 and 13), 1981
MANUALPC	- Percentage of Persons in Employment Being Manual Workers (SEGs 9, 10 and 11), 1981
SELFEMPLOYPC	- Percentage of Persons in Employment Being Self-Employed, 1981