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A SHIFT-SHARE ANALYSIS OF EMPLOYMENT CHANGE
IN WEST YORKSHIRE, 1971-1981.

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Acknowledgements

Abstract

The structure of employment in West Yorkshire changed dramatically between 1971 and 1981. Employment in the manufacturing sector decined by almost one-third, whilst service sector employment grew by less than one-sixth. This paper uses the shift-share technique to compare changes in the industrial employment structure of West Yorkshire and Great Britain, and identifies several industrial orders in which employment change in West Yorkshire has not accorded with expectations. It also investigates the structural and differential components of employment change in sub-regions of West Yorkshire, and emphasises industrial orders in which employment changes have had a positive differential component. Analysis is preceded by a definition of the components of shift-share, and a critical evaluation of the shift-share approach.

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1. INTRODUCTION

The shift-share technique is generally used to analyse how employment in a particular sub-region of the economy has performed over a specified time period in comparison with the regional or national economy within which it is situated. The main advantage of the technique is that it standardises for industrial structure and thus helps to explain variations in the employment performance of regions.

The technique is used in this paper to provide a framework within which to further investigate the structural characteristics of employment change in West Yorkshire. Initially it is used to compare the employment performance of the West Yorkshire economy with the national economy between 1971 and 1981, and to assess how individual industrial orders within West Yorkshire have contributed to this performance. Shift-share components computed for three different time periods between 1971 and 1981 are then analysed in order to assess the stability of the trends observed. Finally, variations in the employment performance of Employment Office Areas within the county between 1971 and 1981 are examined and particular attention is paid to those areas of the county in which employment has performed better than one would expect on the basis of both national and county comparisons.

Firstly however, it is necessary to outline how the components of shift-share analysis are derived, and to acknowledge some of the technique's limitations.

2. THE ANALYSIS OF EMPLOYMENT CHANGE USING THE SHIFT-SHARE TECHNIQUE: DEFINITIONS, LIMITATIONS AND DATA SOURCES.

2.1 The shift-share components of employment change.

The shift-share technique disaggregates employment change into three components. Firstly, the national component is defined as that employment change which would have occurred in a sub-national region if total employment in that region had grown at the same rate as total employment in the national economy. Secondly, the structural component is defined as that employment change which would have occurred in a sub-national region if each industry in that region had grown at the national rate for that industry, less the national component. The sum of the structural and national components is equal to the 'expected' employment change. Finally, the differential component is defined as the difference between the actual change in employment and the sum of the national and structural components. The differential component thus refers to the difference between the actual and the expected employment change (Fothergill and Gudgin, 1982).

The first two components therefore, identify the proportion of employment change in a sub-national region which can be attributed to national economic trends in employment acting on the industrial structure of the region, whilst the differential component, captures the remaining variation; that is, the peculiarities or anomalies in employment change which cannot be explained either in terms of national trends or regional industrial composition. Interpretation of the differential component thus directs attention to industries or areas in the economy where the characteristics of employment change require further explanation. Most of the analyses

reported in this paper deal with the identification, description and explanation of change in the differential component, although the importance of the national and structural components in West Yorkshire is also investigated.

Before any results are presented however, it is important to mention some limitations of shift-share analysis, and to indicate the problems likely to be associated with the technique when analysing employment change in West Yorkshire between 1971 and 1981.

2.2 Criticisms of shift-share analysis.

A general criticism of shift-share analysis is that the technique fails to separate employment change into compartments which accurately represent national, structural and differential changes (Mackay 1968, Richardson 1978). The following discussion highlights four aspects of this general criticism, which, although they are inter-related, have been separated for clarity.

Firstly, it has been argued that the value of the technique is impaired because it is "highly sensitive to the degree of industrial disaggregation" (Richardson, 1978, p.205). Fothergill and Gudgin (1979a) however, have produced regional shift-share analyses at both SIC industrial order and MLH levels for total employment and manufacturing employment change between 1952 and 1975, and found that, with the exception of employment in the textile industry, different parts of which have strong regional associations, the level of industrial disaggregation makes only marginal difference to the results. Fothergill and Gudgin however, do emphasise the importance of comparing 'like with like', and of using disaggregated data wherever possible. This requirement becomes more pertinent as the area under investigation is refined because smaller areas tend

to be more sensitive to variations in specific industries which are not clearly identified in broad systems of classification. In this study, as the spatial framework is changed from the county to the Employment Office Area, the level of industrial disaggregation has been refined.

A second, and perhaps more important criticism, first advanced by Mackay (1968) and reported by Richardson (1978), is that the technique under-estimates the influence of industrial structure, because it fails to incorporate the effects which secondary 'multipliers' have on consumer activities in the economy. This omission is likely to be more serious in areas where regional multipliers are high, as the performance of one or two sectors in the economy will have a dominant influence on the pattern of regional change, although the shift-share technique treats each group as equally important (Randall, 1973). Potential under-estimation therefore depends on the size of the structural component and multiplier in each region, so it is important for these to be carefully estimated.

Evidence based on regional and sub-regional analysis of employment change between 1959 and 1975 (Fothergill and Gudgin, 1979b, 1982) suggests that the impact of the structural component, particularly for manufacturing employment, has declined in most areas of the county, and that even in areas with declining coal and textile industries, the structural handicap has not been too severe. Fothergill and Gudgin (1979a) have also found that when a long-run multiplier on manufacturing employment of 1.4, was used to estimate the impact on the differential component of multiplier effects from the structural component for each region of Great Britain, only the South East, Northern Ireland and the North West had an appreciably

modified differential component.

Calculations by Fothergill and Gudgin for West Yorkshire are reproduced in Table 1, indicating the absolute changes in total and manufacturing employment attributable to the structural and differential components computed on a per annum basis. Between 1959 and 1975, the structural component for total employment in West Yorkshire was -5.3 p.a. having become slightly worse during each of the time periods shown, whilst the differential component was +1.3 p.a. having shown some improvement from one time period to the next. The relationship between the size of the two components suggests that factors other than industrial structure have become more important in explaining the overall employment fortunes of the county between 1959 and 1975. The structural component for manufacturing employment has changed from -4.8 p.a. between 1959-1966, to -2.8 p.a. between 1971-1975, and the differential component has strengthened from -2.0 p.a. between 1959 and 1966 to +2.5 p.a. between 1971 and 1975. This evidence suggests that the influence of industrial structure on manufacturing employment change in the county has diminished and thus the liklihood of under-estimating the true impact of the multiplier on industrial structure is reduced.

Evidence of change over the period 1971 to 1981 in West Yorkshire (Table 2), based on Department of Employment (DOE) statistics (NOMIS), suggests, that in contrast to earlier time periods the importance of the structural component vis a vis the differential component has increased. The structural component for total employment was -4.7 thousand jobs p.a. between 1971 and 1981. It improved from -5.2 p.a. in the first period (1971-1975) to -2.7 p.a. in the middle period (1975-1978) but worsened to -6.4 p.a. between 1978 and 1981. Moreover, the structural component for

Table 1

Change in the Structural and Differential Components of Total
and Manufacturing Employment in West Yorkshire, 1959 - 1975

	STRUCTURAL COMPONENT		DIFFERENTIAL COMPONENT	
PERIOD	TOTAL EMPLOYMENT	MANUFACTURING EMPLOYMENT	TOTAL EMPLOYMENT	MANUFACTURING EMPLOYMENT
		'000's	per annum	
1959–1966	-3.0	-4.8	-2.3	-2.0
1966–1971	-6.8	-7.6	+2.6	+2.8
1971–1975	-7.7	-2.8	+5.4	+2.5
1959–1975	-5.3	-5.2	+1.3	+0.6

Source: Fothergill and Gudgin (1979b, Appendix 3 and 4)
The method used by Fothergill and Gudgin to obtain
industrial and employment information on a comparable
basis between 1959 and 1975 is described in Fothergill
and Gudgin (1978a).

Table 2

Change in the Structural and Differential Components for
Total and Manufacturing Employment in West Yorkshire, 1971-1981

PERIOD	STRUCTURAL COMPONENT				DIFFERENTIAL COMPONENT			
	TOTAL EMPLOYMENT		MANUFACTURING EMPLOYMENT		TOTAL EMPLOYMENT		MANUFACTURING EMPLOYMENT	
	'000's pa	Ab-solute	'000's pa	Ab-solute	'000's pa	Ab-solute	'000's pa	Ab-solute
1971-1975	-5.2	-20,863	-11.6	-46,700	+5.5	+21,848	+1.4	+5442
1975-1978	-2.7	- 8,229	- 5.1	-13,922	-1.5	- 4,425	-1.3	-3820
1978-1981	-6.4	-19,235	-15.6	-43,506	-2.8	- 8,533	-0.4	-3528
1971-1981	4.7	-47,354	-10.7	-106,775	+0.9	+ 8,513	-0.05	- 460

Source: DOE Statistics (NOMIS).

manufacturing employment was more negative in 1978-1981 (-15.6 p.a.) than it was in 1971-1975 (-11.6 p.a), although it did improve slightly in the middle period. According to these results therefore, the influence of the structural component for manufacturing employment change, relative to the differential component, increased over the decade.

Reversals in the strength of the structural component are not unusual, indeed its volatility has been well documented (Fothergill and Gudgin 1979b). What may be more significant however, is the effect that a structural component larger (albeit negatively) than that found by Fothergill and Gudgin, has on the multiplier operating in the economy. The estimation of regional multipliers is complicated by difficulties in quantifying the movement of commodities across regional 'boundaries', but they are generally assumed to be low, particularly for manufacturing industries. The multiplier is however related to the degree of linkage between firms in the economy. The extent of industrial linkage in the West Yorkshire economy is estimated later in the section, as it is important to first discuss why the structural and differential components calculated for the period 1971 to 1975, and presented in Tables 1 and 2, have different values.

Fothergill and Gudgin's calculations in Table 1 were based on industrial employment statistics which are comparable between 1959 and 1975. Within their data set, allowances were made for changes in the Standard Industrial Classification (SIC) system, and for alterations in the boundaries to which the official statistics referred. They developed a Composite Industrial Classification, containing 26 industrial orders, 16 of which were in the manufacturing sector, and ameliorated spatial discontinuities by

adjusting the data at employment exchange level, so that all data related to the boundaries in effect between 1965 and 1975. In contrast, the NOMIS data, presented in Table 2, is based on the 1968 SIC, and relates to post 1974 boundaries.

The employment data used by Fothergill and Gudgin (1978a, 1979b) can be compared with the NOMIS data at the regional level only (Table 3). This indicates that in Yorkshire and Humberside, total employment differed between the two data sets by 17,100 in 1971 and 3,900 in 1981. Given this inconsistency at the regional scale, it is likely that there will also be some variation when structural and differential components for total employment change are calculated for West Yorkshire. Larger discrepencies in regional employment components occur in the manufacturing sector, particularly in those manufacturing industries which are spatially concentrated in West Yorkshire, with employment in mechanical engineering in Yorkshire and Humberside varying by 22,900 in 1971 and 19,300 in 1975 between the two classification systems, and employment in clothing varying by 10,000 in 1971 and 9,300 in 1975.

Discrepencies of this order of magnitude, in conjunction with differences in the definition of West Yorkshire's boundary (pre and post 1974) are likely to account for the differences in the structural and differential components recorded in Table 1 and 2. It should be noted however, that Fothergill and Gudgin do stress that their adjusted figures are not comparable with the regional employment figures published by the Department of Employment (Fothergill and Gudgin, 1978a).

Finally, we can estimate the extent to which industrial linkage affects the ability of shift-share analysis to distinguish between structural component and differential component employment changes.

Table 3

Total Sectoral Employment according to the Composite and Standard Industrial Classification in Yorkshire and Humberside, 1971 and 1975.

COMPOSITE INDUSTRIAL CLASSIFICATION	1968 SIC (NOMIS)	1971 COMPOSITE	'000's SIC	Difference in '000's	1975 COMPOSITE	'000's SIC	Difference in '000's
A AGRICULTURE	1	26.8	36.1	9.3	26.0	34.5	8.5
B MINING	2	89.3	89.1	-0.2	84.5	82.9	-1.6
SUB-TOTAL		116.1	125.2	9.1	110.5	117.4	6.9
C FOOD	3	79.1	78.2	-0.9	81.9	81.4	-0.5
D CHEMICALS	4,5	46.3	41.2	-5.1	46.0	40.7	-5.3
E METAL MANUF.	6	100.0	103.7	3.7	91.7	94.0	2.3
F MECH. ENG.	7	126.1	103.2	-22.9	112.2	92.9	-19.3
G INSTRUM. ENG.	8	5.5	5.6	0.1	5.3	5.4	0.1
H ELEC. ENG.	9	29.6	27.0	-2.6	30.8	28.7	-2.1
I SHIPBUILDING	10	7.6	6.8	-0.8	8.8	7.3	-1.5
J VEHICLES	11	44.7	42.2	-2.5	46.2	43.3	-2.9
K METAL NES.	12	64.9	76.2	11.3	65.8	73.9	8.1
L TEXTILES	13	136.1	130.7	-5.4	110.7	107.4	-3.3
M LEATHER	14	5.5	5.4	-0.1	5.0	4.9	-0.1
N CLOTHING	15	58.5	48.5	-10.0	52.3	43.0	-9.3
O BRICKS	16	34.9	32.4	-2.5	31.6	29.6	-2.0
P TIMBER	17	28.4	24.5	-3.9	30.1	26.0	-4.1
Q PAPER	18	36.6	35.1	-1.5	35.0	34.5	-0.5
R OTHER	19	16.8	15.6	-1.2	23.2	19.6	-3.6
SUB-TOTAL		820.6	776.3	-44.3	7776.6	732.6	-44.0
S CONSTRUCTION	20	105.5	104.3	-1.2	110.6	110.2	-0.4
T GAS, ELEC.	21	33.1	34.6	1.5	33.2	34.8	1.6
U TRANSPORT	22	117.5	117.0	-0.5	113.9	113.9	0.0
V DISTRIBUTION	23	218.5	208.7	-9.8	238.9	228.6	-10.3
W INSURANCE	24	39.1	52.9	13.8	42.8	59.3	16.5
X PROFESSIONAL	25	233.0	248.9	15.9	272.4	292.8	20.4
Y MISCELL.	26	162.3	153.3	-9.0	169.7	174.8	5.1
Z PUBLIC	27	87.7	95.1	7.4	112.7	120.8	8.1
SUB-TOTAL		891.2	910.5	+19.3	983.6	1025.0	41.4
TOTAL		1993.4	1916.3	-17.1	1981.3	1985.2	-3.9

Sources: (1) Composite Industrial Classification, Fothergill and Gudgin (1978).

(2) SIC (1968), Department of Employment Statistics (NOMIS).

It is possible to estimate how employment in one industry is influenced by changes in employmemt in another through the analysis of inter-industry commodity flows, based on national input-output tables.

Evidence of commodity flows, at the national level in 1979, between four industries prominent in West Yorkshire (the woollen and worsted, hoisery and knitted, carpet, and clothing and fur industries) which together accounted for 15% of employment in the county in 1971 and 7% in 1981, are detailed in Table 4. Total intermediate demand for goods produced by the woollen and worsted industry equalled £722 million, of which 33% was purchased by other woollen and worsted producing industries, 17% by hoisery and knitted industries, 17% by the carpet industry, and 28% by the clothing and fur industry. Therefore 95% of the intermediate demand for woollen and worsted goods was bought by four industries, three of which are regionally concentrated in West Yorkshire. This implies that links between textile firms in West Yorkshire are well developed. The clothing and fur industry also purchased 64% of the intermediate demand for goods produced by hoisery and knitted industries, indicating inter-industry linkages, and 21% of other clothing and fur producers sales. Thus firms producing in the textiles and clothing industries are inter-dependent, and it is likely that employment change in one firm or industry will affect employment in the others.

These conclusions lend some support to the objections raised by Mackay (1968), and we should therefore recognise that when the shift-share technique is used in the analysis of employment change in West Yorkshire, the secondary effects of industrial structure may be under-estimated. Whilst this limitation is recognised, the

Table 4

National Industrial Input-Output Table for Selected Textile Industries, 1979.

Purchases by: / Sales by:	MLH	1	2	3	4	Intermediate demand	Total demand
1. Woollen and Worsted	414	239 (33%)	123 (17%)	122 (17%)	203 (28%)	722	1011
2. Hosiery and knitted	417	-	51 (13%)	1	249 (64%)	391	1236
3. Carpets	419	-	-	4 (2%)	-	245	691
4. Clothing and fur	443, 441-446 449	-	4 (1%)	-	92 (21%)	432	2904

Source: Business Statistics Office (1983)

Notes: (1) Figures are in £ million

(2) Intermediate demand represents purchases by industrial commodity groups 1-100, and also intra-industry demand

(3) Total demand includes purchases by Government, imports, exports, taxes and stock appreciation.

technique can still be used to identify industries or regions which have not performed as expected and so require more detailed explanation. The value of the shift-share technique only diminishes if it is used to infer causal relationships on the basis of a poorly identified industrial structure, rather than being used to indicate where one should look for explanation of a regions industrial performance.

2.3 Employment data from NOMIS.

The Department of Employment's National On-Line Manpower Information System (NOMIS) has been developed at the University of Durham, to provide a comprehensive source of information on the structure of employment at the local level (Gillespie and Owen, 1983). The procedure used to up-date the information for West Yorkshire, as new data becomes available or boundary re-defintion occurs, is described in Palmer (1986).

The employment data used in this paper was compiled when the Annual Censuses of Employment (ACE) were conducted in 1971, 1975, 1978 and 1981, and relate to total, male and female employment in surveyed establishments. All establishments enumerated during the Censuses were required to provide details of the businesses which their companies conduct. This was then used to code employees in accordance with the 1968 Standard Industrial Classification (SIC), which distinguishes 28 Industrial Orders and 181 Minimum List Headings (HMSO, 1968). Accessing the ACE data using NOMIS enables a high level of consistency to be maintained when comparing employment between different time periods, however, it should be noted that of the years covered in this paper, only the 1981 Census enumerated establishments with less than three employees, although in 1975 and

1978, employment in such establishments was represented by
re-entering the details obtained about them during the 1973 and 1976
Censuses repectively (Palmer, 1986).

ACE data is only available in aggregated form as
confidentiality restrictions prevent it being used to identify
individual establishments. However, other supplementary sources of
information, which are not encumbered with confidentiality
restrictions are available, such as Trade Directories, and West
Yorkshire Metropolitan County Council (WYMCC) Economic Trend
publications. These have been used in the paper to augment the
analysis of employment change by adding some establishment level
information.

3. THE EMPLOYMENT PERFORMANCE OF WEST YORKSHIRE IN COMPARISON WITH
   THE NATIONAL ECONOMY, 1971 TO 1981

3.1 The components of shift-share analysis for West Yorkshire:
   definition and aggregate results.

Shift-share analysis can be used at a variety of different
spatial scales, and the definition of individual components will
vary according to the scale which is used. In this section the
national component ($NCOM_r^k$) represents the employment change which
would occur in West Yorkshire if the multiplier of employment change
across all industrial orders in Great Britain was applied to the
employment total in the initial time period in each of the
industrial orders in West Yorkshire. This can be formally defined
as:

$$NCOM_r^k (t,t+T) = E_r^k(t)[E_n^*(t+T)/E_n^*(t)] - E_r^k(t) \qquad (1)$$

where E = employment: total, male or female

   En = employment at the national level

   Er = employment at the regional level i.e. West Yorkshire county

   t = initial time period

   t+t = end time period

   k = industrial order i.e. twenty-seven industrial orders in
       1968 SIC

   * = summation across industrial orders

The multiplier of employment change in each industrial order at the
national level, is then applied to the initial employment total in

each industrial order in West Yorkshire. The national component is subtracted, in order to derive a stanardised measure of the structural component. Formally the structural component ($SCOM_r^k$) can be defined as:

$$SCOM_r^k (t, t+T) = [E_r^k(t) [E_n^k(t+t)E_n^k(t)] - E_r^k(t)] - NCOM_r^k (t,t+T) \quad (2)$$

The residual differential component ($DCOM_r^k$) is then defined as the difference between actual employment change, and the change in employment which one would expect given the level of employment across all industrial orders at the national level, and the structure of employment by industrial order in West Yorkshire:

$$DCOM_r^k (t,t+T) = (E_r^k (t+T) - E_r^k(t)) - (NCOM_r^k (t,t+T) + SCOM_r^k (t,t+T)) \quad (3)$$

If it is assumed that there is no disaggregation into industrial orders, aggregate components of employment change can be computed for West Yorkshire (Table 5). The national component, or total employment decline, between 1971 and 1981 was -2.5%, in comparison total employment in West Yorkshire declined by 7% or 60,511. Male employment declined by 9.8% nationally, but in West Yorkshire the decline was 12.4%, whilst female employment which grew by 9.3% in the nation as a whole, increased by only 1.4% in West Yorkshire. Analysis of the structural component of employment change demonstrates that the industrial structure of the West

Table 5

Aggregate National, Structural and Differential Components of Employment Change in West Yorkshire, 1971-1981.

	TOTAL		MALE		FEMALE	
	Absolute	%	Absolute	%	Absolute	%
NATIONAL COMPONENT	−21,670	−2.5	−51,423	−9.8	+30,930	9.3
STRUCTURAL COMPONENT	−47,354	−5.5	−23,238	−4.4	−25,442	−7.7
DIFFERENTIAL COMPONENT	+ 8,513	+1.0	+ 9,393	+1.8	−731	−0.2
ACTUAL CHANGE	−60,511	−7.0	−65,268	−12.4	4,757	+1.4

Source: DOE Statistics (NOMIS)

Note: % figures are a % of employment in West Yorkshire in 1971.

Yorkshire economy had a negative influence on both male and female

employment change between 1971 and 1981, and that the effects were

stronger for female employment. The differential component is

positive for male employment, indicating that the observed decline

in male employment was less severe than we would expect on the basis

of industrial structure only. For female employment however, the

differential component is negative, despite the fact that female

employment in the county increased over the decade. This implies

that the level of female employment growth was less than could be

expected.

3.2 Structural and differential components in West Yorkshire by industrial order between 1971 and 1981.

Percentage changes in employment in each industrial order in

Great Britain and West Yorkshire between 1971 and 1981 are presented

in Table 6, illustrating the decline in manufacturing sector

employment and rise in service sector employment, which has been a

feature of post-war employment change. Total employment in the

manufacturing sector declined more dramatically in West Yorkshire

than in Great Britain as eight manufacturing industrial orders,

three of which had accounted for 21% of total employment in the

county in 1971 (mechanical engineering, order 7; textiles, order 13;

and clothing, order 15), suffered substantial employment declines.

In a few manufacturing industries however total percentage

employment declined less in West Yorkshire than in Great Britain.

In the metal manufacturing industry (order 6) for example, total

employment decline in West Yorkshire (-24.7%), was less severe than

in Great Britain (-42.9%). In the food industry (order 3) however,

total employment declined by 15% in Great Britain between 1971 and

Table 6

Employment Change by Industrial Order, 1971-1981: Great Britain and West Yorkshire; total, male and female.

INDUSTRIAL ORDERS .(1968 SIC)		1971-1981 Change in employment as a % of 1971 employment					
		TOTAL		MALE		FEMALE	
		GB.	W. YORKS	GB.	W.YORKS	GB.	W.YORKS
1	Agriculture	-18.4	-15.2	-18.9	-16.5	-17	-11.7
2	Mining	-14.7	-10.7	-16.3	-11.9	+24.5	+58.8
	PRIMARY	-17	-11	-18	-12.5	+ 6	+ 6.4
3	Food	-15.0	+14.9	-16.3	+ 2.4	-13.2	+29.3
4	Coal	-17.6	-31.9	-18.2	-38.6	-13.0	- 1.2
5	Chemicals	-10.5	-11.7	-10.7	-16.8	-10.1	+ 2.8
6	Metal Manuf.	-42.9	-24.7	-43.0	-23.0	-41.7	-36.9
7	Mech. Eng.	-21.7	-28.7	-21.8	-29.7	-20.9	-21.5
8	Instrum. Eng	-17.8	+ 9.5	-15.1	+ 0.9	-22.7	+32.8
9	Elec. Eng	-15.4	-21.2	8.5	- 5.5	26.7	-49.8
10	Shipbuilding	-23.5	-31.6	-24.7	-34.3	- 5.5	- 6.7
11	Vehicles	-25.0	-20.9	-23.8	-24.1	-32.5	+ 2.1
12	Metal NES	-26.4	-22.4	-22.6	-18.5	-35.5	-35.3
13	Textiles	-44.7	-51.3	-44.7	-47.4	-44.7	-56.8
14	Leather	-31.9	-51.2	-35.6	-38.5	-26.9	-65.0
15	Clothing	-37.0	-49.2	-37.9	-54.1	-36.7	-47.2
16	Bricks	-29.5	-17.5	-30.2	-17.3	-26.9	-18.1
17	Timber	-19.2	- 5.1	-20.8	- 7.1	-12.4	+ 2.6
18	Paper	-15.3	- 6.6	-15.6	- 4.8	-14.8	- 9.6
19	Other NES	-23.7	-10.5	-21.5	- 4.8	-27.4	-18.3
MANUFACTURING		-24	-30	-21	-27.6	-27	-35.5
20	Construction	- 8.0	- 0.3	-11.9	- 3.9	+45.5	+44.9
21	Utilities	- 8.3	- 6.5	-12.9	-11.7	+15.5	+22.5
22	Transport	- 8.6	- 4.9	-12.1	- 9.6	+ 8.9	+21.8
23	Distribution	+ 5.1	+ 7.3	+ 3.5	+ 3.7	+ 6.3	+10.5
24	Insurance	+34.9	+46.5	+29.3	+32.5	+40.2	+60.2
25	Professional	+26.0	+18.7	+19.7	+13.3	+29.2	+21.3
26	Miscellaneous	+31.0	+26.5	+17.2	+14.0	+42.7	+37.0
27	Public	- 5.0	+14.9	-11.6	+ 3.2	+ 7.5	+40.7
SERVICES		+14	+15	+ 3	+ 5.0	+23.6	+25.3
TOTAL		- 2.5	- 7.0	- 9.8	-12.4	+ 9.3	1.4

Source: DOE Statistics (NOMIS)

1981, yet in West Yorkshire total employment increased by 15%, and female employment by 29.3%.

Total service sector employment changed by relatively equal proportions in Great Britain and West Yorkshire. Employment growth in the professional and miscellaneous industries (orders 25 and 26), was greater in the nation as a whole than in the county, however the insurance industry (order 24) expanded employment more rapidy in Great Britain, especially for female employment.

The structural component of employment change in each industrial order in West Yorkshire is calculated by applying the national, industry-specific, employment change multiplier to the initial employment in each inustrial order in West Yorkshire, and then subtracting the national component. It therefore reflects both the combination of industries in the county and their national rates of growth or decline. Fothergill and Gudgin (1978b) found that variations in national rates of growth between industries had a stronger influence on a regions structural component than the mix of industries in a region, but that this influence was diminishing. During the 1970's and 1980's structural factors explained only a small proportion of change in regional manufacturing employment as manufacturing industries experienced similar rates of decline at the national level, causing differences between growing and declining industries to lessen (Keeble, 1981). In West Yorkshire however the strength of the structural component has increased (Table 2), primarily because the county has a high proportion of manufacturing industries which are experiencing rapid decline.

Analysis of change in total employment in West Yorkshire between 1971 and 1981 indicates that the West Yorkshire economy had an unfavourable industrial structure in comparison with the national

economy, as all the industrial orders in the primary, manufacturing

and construction sectors had negative structural components, (Figure 1),

whilst only four industrial orders in the service sector had

positive structural components (distribution, order 23; insurance,

24; professional services, 25; and miscellaneous, 26).

The comparison of structural components by sex (Figures 2 and 3),

shows that the structural component for female employment change was

worse than the component for male employment change in 22 of the 27

industrial orders represented, 16 of which were in the manufacturing

sector. The structural components for male and female employment

change were particularly weak in the metal manufacturing industry,

order 6 (male -33%, female -51%) the textile industry, order 13,

(male -35%, female -54%), the leather and fur industry, order 14

(male 26%, female -36) and the clothing industry, order 15 (male

-28%, female -46%). Applying sex-disaggregated and industry

specific employment changes to the mix of industries in the West

Yorkshire region therefore, demonstrates that the industrial

structure had a worse effect on female employment change than male

employment change.

The size of the differential component can be used to identify

industries in which factors other than industrial structure have

influenced change; this directs attention to those industrial orders

in which the form of employment change requires further explanation.

A negative differential component indicates that the employment

performance of a particular industry has been below its expected

level, whilst a positive differential component indicates that

employment change has been better than one might expect.

Both primary sector industries had positive differential

components for total employment change, but only nine industrial
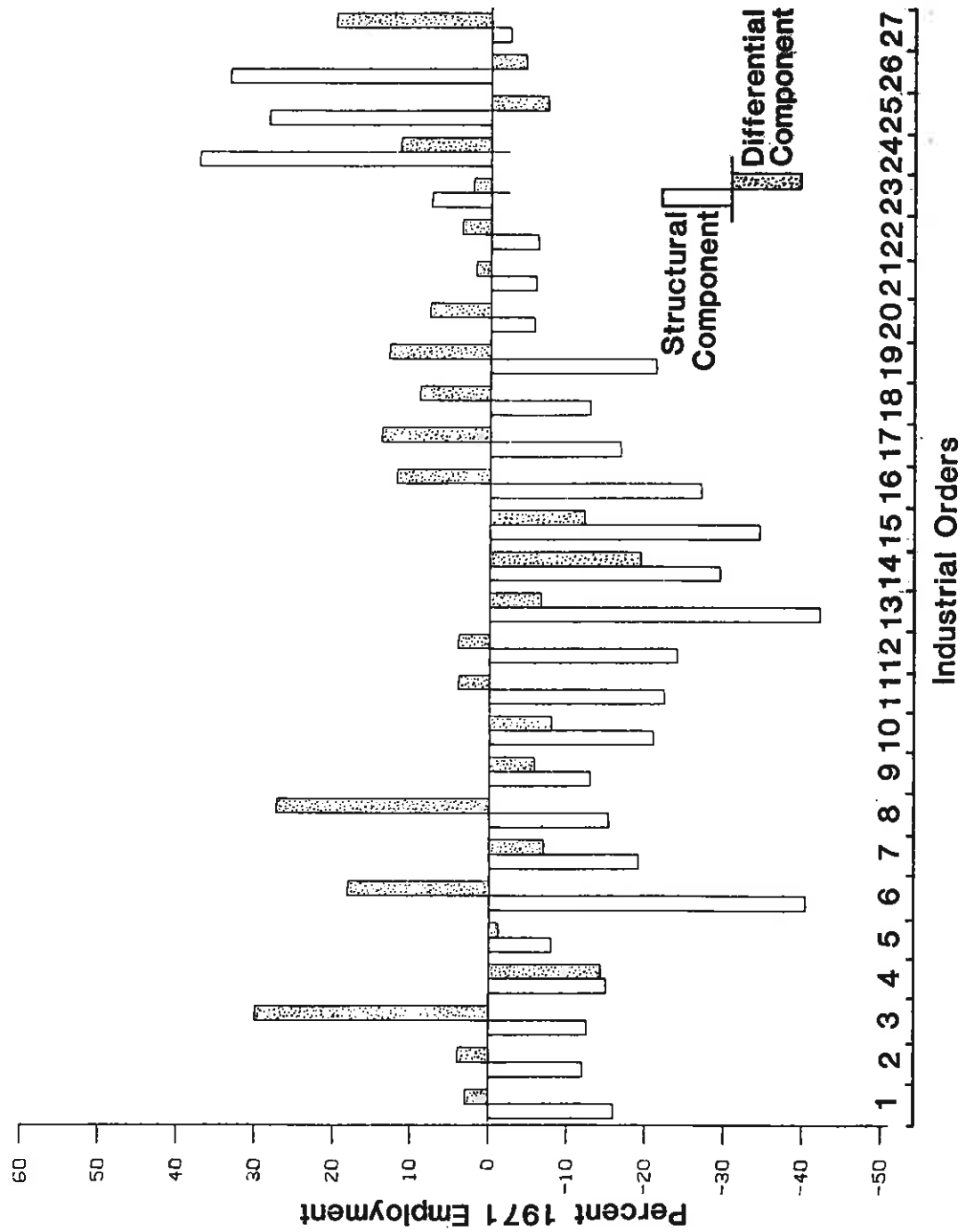
Figure 1
Structural and Differential Components for Total Employment Change by Industrial Order in West Yorkshire, 1971-1981.
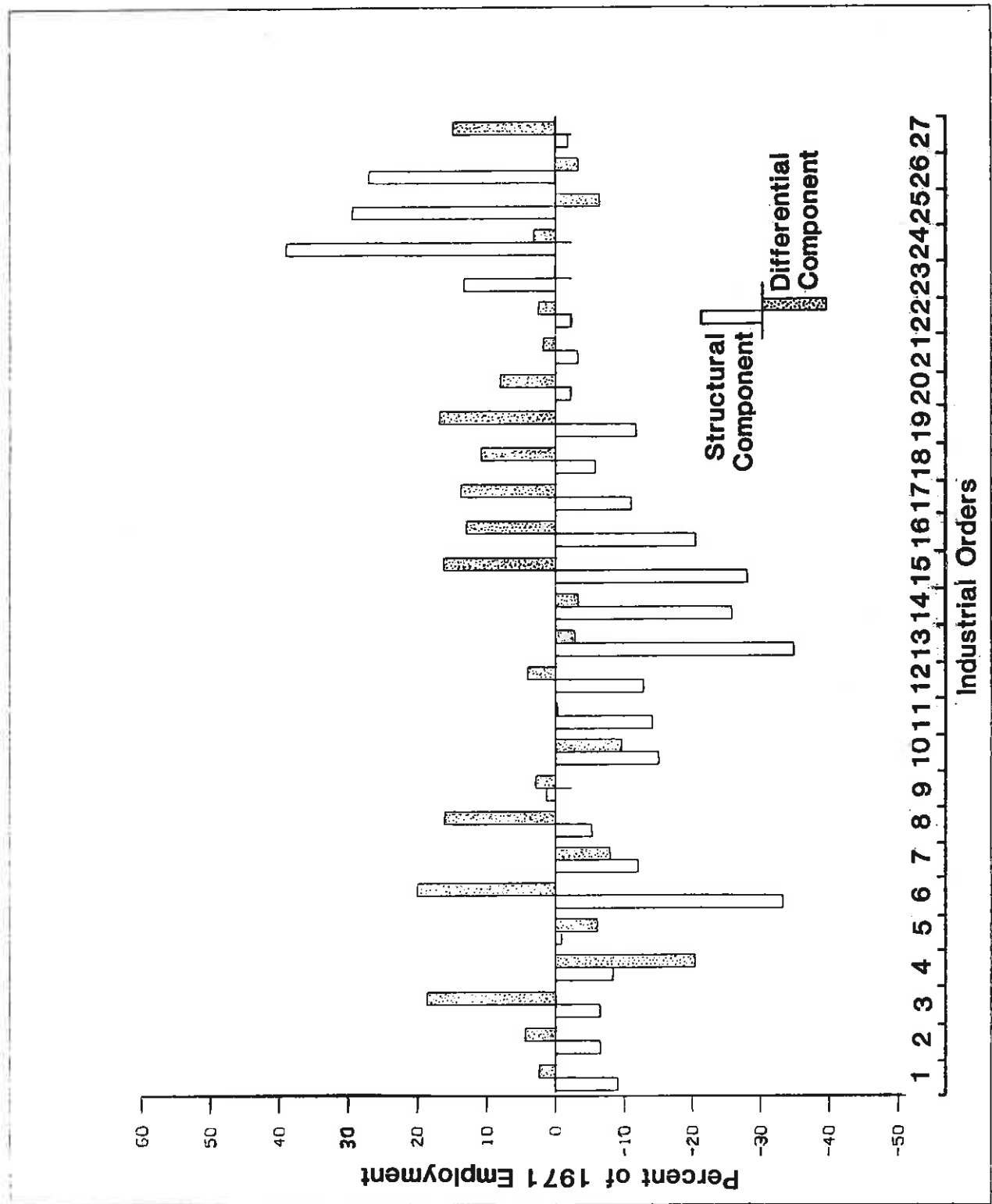
Figure 2
Structural and Differential Components for Male Employment Change by Industrail Order in West Yorkshire, 1971–1981.

24
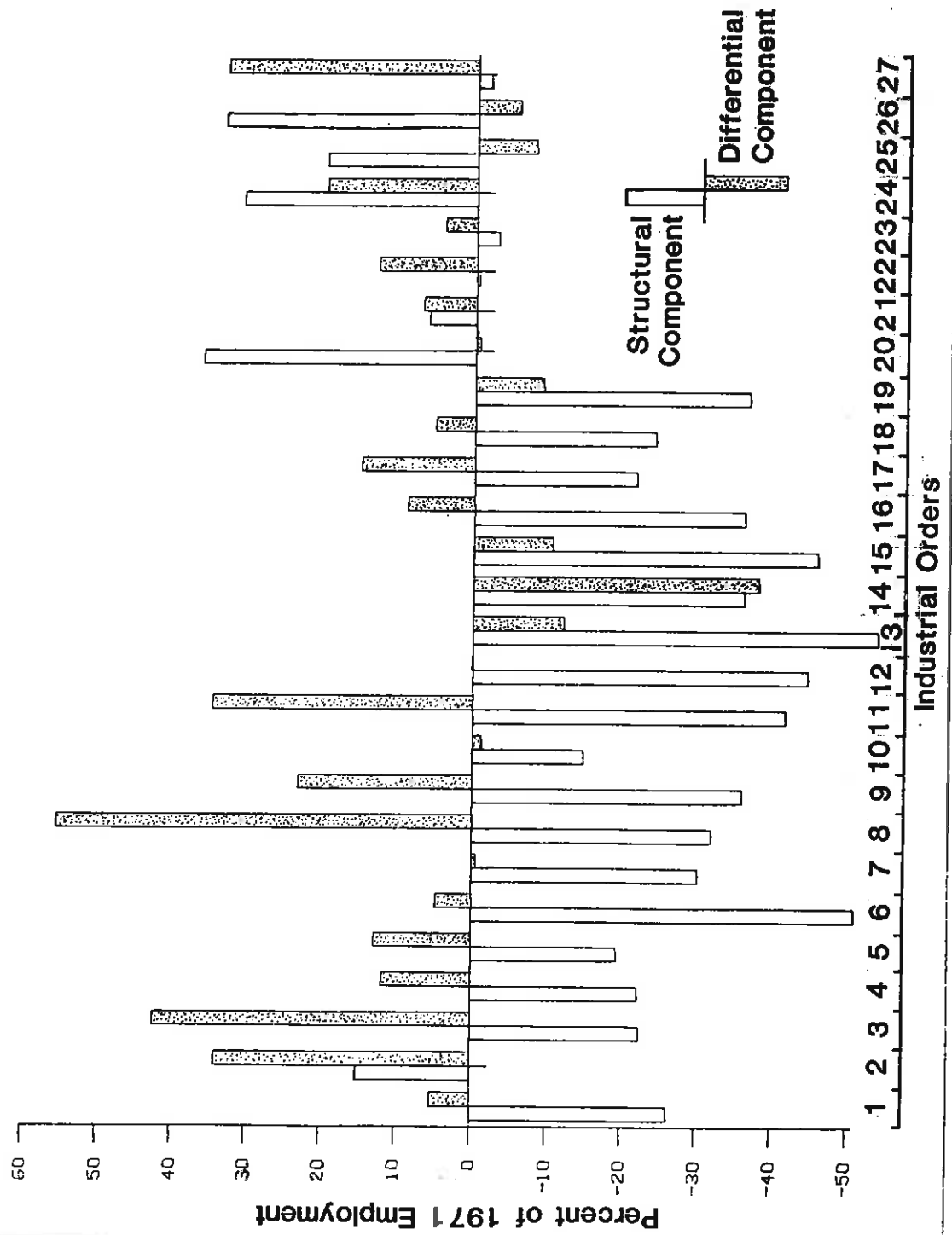
Figure 3
Structural and Differential Components for Female Employment Change by Industrial Order in West Yorkshire, 1971-1981.

orders were positive in the manufacturing sector (Figure 1); in particular, the coal and petroleum products industry, order 4 (-14.3%), the leather goods industry, order 14 (-19.3%), and the clothing industry, order 15 (-12.1%) fared worse than one might expect. In contrast, in the service sector, the professional and scientific services, order 25 (-7.3%), and miscellaneous services, order 26 (-4.5%) were the only orders with negative differential components. Male structural components were positive in 17 industrial orders, although employment change was always less than 20%, whereas for females the differential component was positive for 18 industrial orders, being particularly significant in the food industry, order 3 (+43%), and the instrument engineering industry, order 8 (+55%) in the manufacturing sector, and in public administration, order 27 (+33%) in the service sector.

Computed structural and differential components are used as the basis for classifying industrial orders in West Yorkshire (Table 7). In eight of the industrial orders which lost total employment, declines attributable to the structural component were exaggerated by losses in the differential component, whilst in the remaining twelve, structural losses were offset by differential gains. Total employment increased in only seven industrial orders; three of which combined negative structural components with positive differential components, two exhibited positive structural change and negative differential change, and two gained employment with both a positive structural and differential component. Employment losses are associated with negative structural and positive differential components of employment change in thirteen industrial orders for male employment, but only eight for female employment. Negative structural and positive differential components are associated with

Table 7

The Classification of Industrial Orders in West Yorkshire, 1971-1981, based on Structural and Differential Component Comparisons

	Industrial Orders		
	Total Employment	Male Employment	Female Employment
EMPLOYMENT LOSS			
Neg. Struct. Comp. and Neg. Diff. Comp.	Coal (4) Chemicals (5) Mech. Eng. (7) Elec. Eng. (9) Shipbuilding (10) Textiles (13) Leather (14) Clothing (15)	Coal (4) Chemicals (5) Mech. Eng. (7) Shipbuilding (10) Vehicles (11) Textiles (13) Leather (14)	Mech. Eng. (7) Shipbuilding (10) Textiles (13) Leather (14) Clothing (15)
Neg. Struct. Com. and Pos. Diff. Comp.	Agriculture (1) Mining (2) Metal Manuf. (6) Vehicles (11) Metal NES (12) Bricks (16) Timber (17) Paper (18) Other NES (19) Construction (20) Utilities (21) Transport (22)	Agriculture (1) Mining (2) Metal Manuf. (6) Metal NES (12) Clothing (15) Bricks (16) Timber (17) Paper (18) Other NES (19) Construction (20) Utilities (21) Transport (22)	Agriculture (1) Coal (4) Metal Manuf. (6) Elec. Eng. (9) Metal NES. (12) Bricks (16) Paper (18) Other NES (19)
Pos. Struct. Comp. and Pos. Diff. Comp.		Elec. Eng. (9)	
EMPLOYMENT GAIN			
Neg. Struct. Comp. and Pos. Diff. Comp.	Food (3) Instrum. Eng. (8) Public Admin (27)	Food (3) Instrum. Eng. (8) Public Admin (27)	Food (3) Chemical (5) Instrum. Eng. (8) Vehicles (11) Timber (17) Transport (22) Distribution (23) Public Admin (27)
Pos. Struct. Comp. and Neg. Diff. Comp	Professional (25) Miscellaneous (26)	Professional (25) Miscellaneous (26)	Construction (20) Professional (25) Miscellaneous (26)
Pos. Struct. Comp. and Pos. Diff. Comp.	Insurance (24) Distribution (23)	Insurance (24) Distribution (23)	Mining (2) Utilities (21) Insurance (24)

employment gain however in only three industrial orders for male
employment, but in eight for female employment.

Various suggestions to explain some of these employment changes
are offered below, drawing on data obtained at Minimum List Heading
level from NOMIS, and using information from published studies, and
other sources.

3.2.1 Primary and Manufacturing Industries

Male employment declined in the coal and petroleum products
industry (order 4), which employed 957 people in 1971 and 652 in
1981, because of the closure of the coke ovens and manufactured fuel
industry (MLH 261), which had a workforce of 327 in West Yorkshire
in 1971. This employment change was a combination of negative
structural and differential components. However, in the mining
industry (order 2), which supplied the coke foundries, employment
loss due to structural decline was less severe than expected, which
is reflected by a positive differential component of +4.0%,
primarily because the investment and productivity decisions made by
the NCB favoured the collieries in West Yorkshire in comparison
with other areas of Great Britain, particularly during the earlier
years of the decade. Between 1971 and 1981 the Coal Board invested
£48 million in the Prince of Wales colliery near Pontefract, securing
800 jobs; £46 million in Kellingley colliery north of Castleford,
and a further £7.5 million at nearby Allerton-Bywater, which was
then able to absorb many of the jobs lost at Walton colliery near
Wakefield. In addition, new engineering and training centres were
financed at Kellingley and Allerton-Bywater (NCB, 1980).

The mechanical engineering industry (order 7) experienced
employment loss associated with both negative structural and

differential components for males and females. The industry as a whole is very diverse, with some employment occurring in each of fourteen Minimum List Headings (331-349). Two of the largest employers are the metal-working machine tools industry (MLH 332), which in 1971 employed almost 14% of the total mechanical engineering workforce, and the textile machinery industry (MLH 335), which employed 10% of the workforce; their employment declined by 59% and 55% respectively between 1971 and 1981.

The metal working machine-tools industry has been severely affected by changes in the international characteristics of demand for machine tools. Many UK firms producing for large domestic customers, produced high quality, specialised products which were less subject to price competition, and these firms were slow to adapt to more price competetive, general purpose, computer-numerically controlled machine tools, under development in the USA, Japan and the rest of Europe. They also began to experience cost competition from newly industrialising countries in the production of conventional machinery. These factors caused the UK's share of international trade to decline by one-third, whilst Japan's quadrupled. The machine-tools industry also declined because of its failure to attract sufficient skilled engineers, its poor research and development effort, particularly in overcoming production problems, and its weak marketing and after-sales service (Jones 1978).

In West Yorkshire, the machine tools industry is concentrated mainly in the Halifax, Shipley and Keighley areas, where plant size tends to be larger than the national average. A study of the industry undertaken by the County Council in 1977 found that during the previous five years, profitability and returns on capital in the

industry were very low (WYMCC, 1977). Consequently, the level of redundancy and plant closure in the industry was high. Employment losses were exacerbated in West Yorkshire because local raw material and component linkages were well formed, especially in casting and steel fabrication operations, as few firms own foundries.

Structural declines in the textile machinery industry reflect both the problems of the UK textile industry, and increasing competition from new industrial nations (Senker and Swords-Isherwood, 1980). Rothwell (1976) demonstrates how firms producing textile machinery in Britain have failed to keep pace with changes in the production process of the textile industry, and to maintain the standards of reliability and efficiency required, with the effect that textile producers have purchased machinery from abroad. Job loss in textile-related machinery firms occurred throughout West Yorkshire between 1971 and 1981, and affected a whole range of establishment sizes. The Crossrol textile machinery company was one of the largest firms to be affected, as since 1977, over 650 people have been made redundant at its Halifax plant, which closed in 1981, despite the fact that some production was transferred to Holmfield. The company blamed the recession for depleting demand, and the failure of export markets as the level of foreign competition increased (WYMCC, 1981). Decline in textile-related machinery industries emphasises the inter-dependence of industrial change in the West Yorkshire economy.

In the leather goods (order 4) and clothing (order 15) industries, employment losses attributable to the structural component have been amplified by losses in the differential component for females, although for males a negative structural component in the clothing industry has been offset by gains in the

differential component. These changes reflect the forms of spatial re-structuring adopted in these industries in recent years. Massey and Meegan (1982) have demonstrated that intensification processes which involved increasing labour productivity through the introduction of small, low cost labour saving techniques, were the dominant form of production re-organisation through which job loss occurred in the mens outwear and footwear industries during the 1960's and 1970's. They argued that, faced with a situation in which world demand was either stable, as in the case of outwear, or increasing slightly, as the case of footwear, static domestic demand, and increasing competition from Third World countries, industrialists were under very strong pressure to cut costs. As the main labour processes in the industry were relatively old-fashioned, "a unitized single person craft operation based on the sewing machine" (Massey and Meegan, 1982 p.41), the potential for intensification was high. The level of intensification adopted in each region varied as other forms of production re-organisation were tried. However, for the majority of firms, labour costs and labour availability governed the magnitude of intensfication, and the direction of any industrial relocation which took place. As Yorkshire and Humberside had above average levels of wages and salaries per worker it was heavily inflenced by intensification in the industry. Moreover as the labour was heavily unionised, it was less attractive to the few expanding firms which were seeking to relocate (Massey and Meegan, 1982).

A variety of reasons have been given by clothing firms in West Yorkshire to explain changing levels of employment. The John Collier clothing firm for example, reduced its workforce in Leeds by 120 in 1977, as demand for made to measure clothing fell. Subsequently

plans to reduce the workforce by a further 100 were announced as production was concentrated in the North East, in order to lower the companies operating costs (WYMCC, 1977, 1979). Other clothing firms opted to relocate their operations within West Yorkshire when their production processes were re-organised. Sumrie Clothing of Leeds for example, moved to a smaller factory a few miles from its previous location in an effort to reduce costs and borrowing requirements. In other instances, re-locations were associated with expansion, and the need for better equipped factories to enable unit cost reductions (WYMCC, 1981). Thus a variety of different forms of re-organisation were adopted in West Yorkshire, with the overall effect of reducing employment in the clothing industry by more than one would expect on the basis of industrial structure alone.

The performance of the clothing industry in West Yorkshire is related to the textile industry, in which a structural component of -42% was exaggerated by a total differential component of -6.6%. The woollen and worsted industry (MLH 414), accounted for 67% of the employment in textiles in West Yorkshire in 1971 and 58% in 1981. Several reasons have been advanced to explain the textile industry's poor performance, for instance, lower demand in the clothing industries, as fewer suits are purchased and proportionately less consumer expenditure is devoted to clothing, has affected the demand for cloth, whilst import penetration in the home market has accelerated, reaching almost one-third by 1979, and the export market has contracted (Hardhill, 1982). Industry-wide decline has also been related to poor management, and Hardhill's evidence suggests that this has been a particular problem for companies indigenous to West Yorkshire, as they have failed to maintain employment levels comparable with those of external companies.

However the wider scope for funding available to external companies, which tend to be much larger concerns, may also be an explanatory factor.

As a whole the woollen industry has been criticised for its failure to successfully restructure and modernise. Many firms in West Yorkshire restructured through acquisition, which as a form of take-over is argued to be a preferred form of investment during recession because it reduces the level of competition. But, Hardhill found that acquisition, "had a long term negative effect upon employment" as 83% of the firms acquired in West Yorkshire between 1960 and 1972, and 65% of those acquired between 1972 and 1976, shed labour, whilst of the plants in which no ownership change occurred, only 59% reduced employment (Hardhill, 1982, p.33). Evidence of structural change in the textile industry compiled by WYMCC, demonstrates the importance of acquisition in the overall restructuring process. For example the decision by Hoescht UK Ltd. to invest £3 million in a yarn producing plant in Calderdale creating 200 new jobs, actually followed an earlier decision to close the recently acquired John Shaw and Son Ltd., which had operated at the same site, and which caused the loss of 350 jobs. The workforce of Hoescht UK Ltd. was therefore slimmed by 150, following acquisition and an investment of £3 million. Furthermore, as the John Shaw division of Hoescht UK was to be used as the companies northern Headquarters, the new operation was associated with a different occupational and skill mix (WYMCC, 1977).

Hardhill emphasises how large firms in West Yorkshire have had a significant influence on the form of restructuring, as company acquisition and/or closure is often a means of concentrating production. For instance the decision of the Illingworth Morris

group of companies to close Trafalgar Mills in Huddersfield, with
the loss of 350 jobs, reflected a wider decision to concentrate
production in existing mills at Kirkheaton, transferring (and
modernising) some of the firms operations at Trafalgar Mills (WYMCC,
1979).

In contrast to industrial orders which experienced negative
structural and differential components, structural component
declines in several industrial orders were tempered by gains in the
differential component for both male and female employment. In the
metal manufacturing industry for example (order 6) which employed
17,500 people in West Yorkshire in 1971, the structural component
for employment decline was -40%, which implied an expected job loss
of over 7,000 between 1971 and 1981. Infact only 4,300 jobs were
shed, as the industry performed better than expected. Positive
differential components in the Brick industry (order 16) reflect the
relative bouyancy of the glass (MLH 463) and cement (MLH 464)
industries, particularly around Castleford and Wakefield, (see
section 4.4).

In the vehicles and timber industries (orders 11 and 17) male
employment losses were the result of a negative structural component
and a positive differential component, whilst for females,
employment increased in both industries. In the vehicle industry
favourable differential components reflect the diversity of firms
with vehicle industry links in West Yorkshire, because although some
large employers, such as David Brown Tractors and International
Harvesters, suffered serious trading difficulties and reduced their
workforce dramatically during the late 1970's, a large number remain
engaged in a range of vehicle, and vehicle component manufacturing
operations (WYMCC, 1982).

Gains in the differential component in the timber industry may
be a favourable omen for the West Yorkshire economy, as demand in
the industry is projected to expand, generating higher levels of
employment. This follows an acceleration in timber-framed
construction during the late 1970's, so that by 1982 almost 25% of
new housing completions in the UK were estimated to be timber-framed
(Institute for Employment Research, 1983). The impact on local
employment however will be complex, since between 1971 and 1981 both
male and female employment has · fallen by 40% in MLH 471 (which
covers establishments engaged in timber sawmilling and the
manufacture of wooden doors and window frames etc.) for which demand
is expected to rise, whilst employment has increased in industries
using timber products. Male employment rose by 10% in MLH 472
(wooden furniture and upholstery) for example, and female employment
almost doubled in MLH 479 (wood and cork manufactures). Employment
in these industries may begin to suffer as the demand for timber
increases, pushing up prices.

In contrast to industries in which employment has declined,
seven industrial orders registered growth in total employment; male
employment grew in all seven, whilst female employment increased in
fourteen orders. In the manufacturing sector, both male and female
employment increased in the food and instrument engineering
industries (orders 3 and 8), and in both cases growth was associated
with negative structural components, as employment in the industries
declined nationally, and positive differential components. Growth
in the food industry was the most significant as 3,423 jobs were
created, whilst instrument engineering gained 217 jobs. The food
industry also had the largest differential component for males
(+18.6%) and for females (+42.5%).

Much of the growth in food industry employment occurred in three sections of the industry; over 1000 jobs were created in biscuit manufacturing (MLH 213), over 1400 in the bacon-curing and meat industries (MLH 214) and more than 1800 in the cocoa, chocolate and sugar confectionery industry (MLH 217). Several large companies account for a substantial proportion of employment in these industries, for instance Fox's Biscuit Ltd, has factories near Halifax and Batley, and Rowntree Mackintosh has factories near Halifax and Castleford. Firms engaged in bacon and meat production are more dispersed, but employment growth in these firms is particularly significant because nationally the performance of this industry has been poor, partly because the home supply of pigmeat has been severely affected by Monetary Compensation Amount arrangements dictated in Brussels, but also because the meat products sector has been slow to expand investment (NEDO, 1978).

3.2.2. Service Industries

In contrast to employment losses in manufacturing sector industries, five industrial orders in the service sector gained both male and female employment. The performance of the professional and scientific services industry (order 25) is particularly important as it was the largest employer in West Yorkshire in 1981. Employment in the industry increased by 19% between 1971 and 1981 (Table 6). However, growth was less than one would expect on the basis of national rates of change, generating a negative differential component (-7.3%). Similarly, employment in miscellaneous services (order 26) increased in West Yorkshire, but this growth had a differential component of -4.5%.

The insurance and banking industry (order 24) grew faster than

any other industrial order in West Yorkshire, as male employment increased by 33% and female employment by 60%. Furthermore it was the only industry in which structural and differential components were positive for both male and female employment. The majority of employment growth has occurred in the Leeds and Bradford areas, as financial operations, originally developed to serve the textile industries, have been extended.

The level of service provision in three provincial regions of the UK, has been investigated in two studies conducted by Marshall (1982, 1983). The first investigated manufacturing firms demand for a range of business services, by a questionnaire survey of selected establishments in Yorkshire and Humberside, the North West, and the West Midlands. The second was concerned with the supply of services in the Local Authority districts of Leeds and Bradford, Manchester and Birmingham. The two studies therefore compared the demand for, and supply of, services in three provincial conurbations. Although this paper has a different orientation, that is, it compares West Yorkshire with the national economy, some of Marshall's findings help explain the performance of service employment in West Yorkshire. Marshall's studies do not define service industries according to MLH divisions of the Standard Industrial Classification, but in order to achieve some consistency with the analyses reported here, service activity categories have been combined into industrial orders. Of the 95 establisments surveyed in Leeds and Bradford, 39 operated in the insurance, banking, finance and business services (order 24), 48 in the professional services (order 25), and 8 were management consultancy firms, which could belong to either category. Within order 25 accountancy firms and solicitors were very poorly represented, showing only a 9% and

14% response rate. Both of these activities had negative
differential components in West Yorkshire at the MLH level. In
contrast, architects and consultant engineers were well represented,
with 35% and 48% response rates; these activities had positive
differential components in West Yorkshire at the MLH level. Because
of these differences, the conclusions drawn from Marshall's work can
only be tentatively applied to this study, particularly with regard
to changes in the professional services order.

The results of the first study (Marshall, 1982) indicate that
in Yorkshire and Humberside 56% of the 357 manufacturing
establishments surveyed, internalised their service provision.
Yorkshire and Humberside therefore had an 'intermediate' position in
relation to the other areas studied. But, when external services
were sought, establishments in Yorkshire and Humberside were more
likely to satisfy demand within their Local Authority district than
establishments in other areas studied. More detailed study of
establishments in the woollen and worsted industry (sample size 17),
found that about 48% of service provision was internalised, the
remainder was purchased externally, of which more than 90% was from
within the local area. Subsequent analysis of service supply in the
three conurbation centres (Marshall, 1983), revealed that 77% of the
income from industry and commerce was obtained from within 50 miles
of the offices surveyed, but that services such as solicitors,
finance companies and insurance brokers, which are well represented
in Leeds, obtained between 50% and 70% of their income from industry
and commerce in the local area (1-10 miles).

This evidence indicates that the supply of external services in
Yorkshire and Humberside is well geared to the needs, identified in
terms of demand, of establishments in the area. Further analysis

found that of the three conurbations studied, the fastest employment growth rate between 1976 and 1980, was achieved in Leeds and Bradford. Growth was attributed to the fact that computer services and advertising agents (part of order 24) and management consultants, the fastest growing services, grew more rapidly in Leeds and Bradford than in the other conurbations. These findings led Marshall to suggest that Leeds and Bradford rather than Manchester, which is constrained by the availability of staff and by problems of accessibility, is being selected more often as a key location from which to serve the North (Marshall, 1983).

The implications for employment change in West Yorkshire could be significant, because although business service activities, such as insurance and banking, are thought to be demand led, that is they depend on demand generated within the local economy, their presence in an area can stimulate demand, and thereby generate growth (Marshall 1982,1983). These arguments can be connected to Fothergill and Gudgin's suggestion that differences in the growth rates of the insurance and banking industrial order largely determine variations in the growth of service employment between regions (Fothergill and Gudgin, 1978c). If these theories are correct then the Leeds and Bradford areas, as suppliers of business activities, can help to sustain, and possibly regenerate, future employment in West Yorkshire.

3.3 Changes in the Shift-Share Components between three time
        periods: 1971-1975, 1975-1978 and 1978-1981.

It is important to assess how stable trends in both the structural and differential components have been over time in order to identify how consistently the investment decisions of particular

industries have favoured or disfavoured the local economy in
comparison with the national economy. The time periods chosen have
regard for Randall's observation (1973) that time spans should be
long enough to allow trends to emerge, but not so long that trends
are obscured. They also reflect the years in which Censuses of
Employment were conducted.

Between 1971 and 1981 the total employment in West Yorkshire
fell by 7.0% (Table 8). Employment growth occurred between 1971 and
1975, but there was progressive decline in employment thereafter.
Manufacturing sector employment declined in each time period,
although the most dramatic declines occurred between 1978 and 1981
when the workforce was reduced by 20%, whilst in the service sector
employment grew between 1971-1975 and 1975-1978 by 13.6% and 13.2%
respectively, but then declined slightly between 1978-1981.

Within the manufacturing sector, the overall increase in
employment in the food industrial order over the decade reflects
growth between 1975 and 1981 only. Employment in the mechanical
engineering (order 7), textile (order 13) and leather (order 14)
industries declined in each time period, although the rate of
decline slowed between 1975 and 1978. Within the service sector
only the insurance industry (order 24) gained employment in each
time period, whilst the transport industry (order 22) consistently
lost employment. Employment in professional services (order 25),
which accounted for the largest proportion of the workforce in West
Yorkshire in 1981, increased by 20.0% between 1971 and 1975, and
0.4% between 1978 and 1981, but the number employed declined between
1975 and 1978.

The aggregate structural component for male employment change
was negative in all three periods (Table 9) although it did show

Table 8

Percentage Change in Total Employment by Industrial Order in West Yorkshire
for Three Time Periods between 1971 and 1981.

Industrial Order	1971-1975 %	1975-1978 %	1978-1981 %	1971-1981 %
Agric.	-15	- 1.0	- 7.2	-15.2
Mining	- 8.5	+ 1.0	- 3.5	-10.7
PRIMARY	- 8.3	+ 0.8	- 4.1	-11.4
Food	- 0.4	+ 7.6	+ 7.2	+14.9
Coal	- 8.8	- 2.5	+ 0.2	-31.9
Chemical	+ 6.8	+ 4.1	-20.6	-11.7
Metal Manuf.	- 8.2	+ 3.0	-20.5	-24.7
Mech. Eng	- 7.5	- 4.6	-19.2	-28.7
Instrum. Eng.	- 7.0	- 6.3	+25.8	- 9.5
Elec. Eng.	+10.0	-12.1	-18.6	-21.5
Shipbuilding	+19.7	+91.0	-53.4	-31.6
Vehicles	+14.6	- 4.0	-28.2	-20.9
Metal NES.	- 2.6	- 3.4	-17.4	-22.4
Textiles	-19.0	- 9.0	-33.9	-51.3
Leather	-20.0	+ 9.5	-44.3	-51.2
Clothing	-18.4	-18.6	-23.4	-49.2
Bricks	-16.2	+ 5.8	- 6.9	-17.5
Timber	+17.3	- 4.4	-15.4	- 5.0
Paper	+ 4.0	- 6.3	- 4.2	- 6.6
Other	- 2.3	+ 7.6	-14.9	-10.5
MANUFACTURING	- 8.0	- 5.2	-20.0	-30.3
Construction	+ 6.8	+10.0	- 7.6	- 0.25
Utilities	+ 3.3	-11.0	+ 1.4	- 6.5
Transport	- 2.4	- 1.0	- 1.5	- 4.9
Distribution	+ 8.6	- 0.25	- 1.5	+ 7.3
Insurance	+11.3	+15.0	+14.0	+46.0
Professional	+20.0	- 1.5	+ 0.4	+19.0
Miscellan.	+ 6.2	+21.0	- 1.6	+26.5
Public	+41.6	-14.5	- 5.1	+14.9
SERVICES	+13.6	+13.2	- 0.1	+15.0
TOTAL	+ 2.7	- 1.4	- 8.3	- 7.0

Source DOE Statistics (NOMIS).

Table 2

Percentage Change in the Structural Component for Male Employment Change for Three Time Periods between 1971 and 1981

RANK	1971-1975		1975-1978		1978-1981		1971-1981	
	Industry	Structural Component %	Industry	Structural Component %	Industry	Structural Component %	Industry	Structural Component %
1	Clothing	-13.1	Leather	- 9.2	Metal Manuf.	-30.5	Textiles	-34.9
2	Leather	-12.5	Clothing	- 6.7	Textiles	-23.8	Metal Manuf.	-33.3
3	Textiles	-11.7	Metal Manuf.	- 6.3	Clothing	-13.8	Clothing	-28.1
4	Bricks	-11.3	Textiles	- 6.2	Metal NES.	-12.3	Leather	-25.8
5	Mining	-10.0	Construction	- 4.1	Other	-12.2	Bricks	-20.5
6	Coal	- 9.4	Public	- 3.4	Shipbuilding	-11.7	Shipbuilding	-15.0
7	Utilities	- 9.3	Utilities	- 3.1	Vehicles	-11.2	Vehicles	-14.1
8	Metal Manuf.	- 8.6	Coal	- 2.8	Bricks	-10.1	Metal NES.	-12.8
9	Agriculture	- 8.1	Mech. Eng.	- 2.2	Leather	- 9.1	Mech. Eng.	-12.0
10	Mech. Eng.	- 7.1	Paper	- 2.1	Timber	- 8.4	Other	-11.7
11	Instrum. Eng.	- 6.8	Bricks	- 2.0	Mech. Eng.	- 4.2	Timber	-11.0
12	Vehicles	- 5.4	Timber	- 2.0	Chemicals	- 2.9	Agriculture	9.1
13	Food	- 5.1	Transport	- 2.0	Public	- 2.7	Coal	8.4
14	Shipbuilding	- 4.3	Food	- 1.9	Construction	- 2.2	Food	- 6.5
15	Paper	- 3.9	Vehicles	- 1.5	Agriculture	- 1.4	Mining	- 6.5
16	Transport	- 3.1	Instrum. Eng.	- 1.5	Paper	- 0.5	Paper	5.8
17	Metal NES.	- 2.5	Agriculture	- 0.6	Food	- 0.2	Instrum. Eng.	5.3
18	Elec. Eng.	- 2.3	Shipbuilding	- 0.2	Instrum. Eng	+ 2.4	Utilities	3.2
19	Timber	- 1.5	Mining	+ 0.3	Elec. Eng.	+ 2.4	Transport	2.3
20	Chemicals	- 1.2	Other	+ 0.9	Transport	+ 2.5	Construction	- 2.2
21	Other	- 0.7	Elec. Eng.	+ 1.2	Mining	+ 2.6	Public	- 1.8
22	Public	+ 4.5	Metal NES.	+ 1.5	Coal	+ 3.0	Chemicals	- 0.9
23	Construction	+ 4.6	Distribution	+ 2.8	Distribution	+ 5.5	Elec. Eng.	+ 1.3
24	Distribution	+ 5.3	Professional	+ 3.0	Utilities	+ 9.2	Distribution	+13.3
25	Miscellaneous	+ 7.6	Chemical	+ 3.4	Professional	+10.1	Miscellaneous	+27.0
26	Insurance	+13.3	Insurance	+ 7.5	Miscellaneous	+10.9	Professional	+29.4
27	Professional	+15.9	Miscellaneous	+ 7.9	Insurance	+16.0	Insurance	+39.1
TOTAL		- 1.8		- 0.8		- 2.2		- 4.4

Source: DOE Statistics (NOMIS).

slight improvement between 1975-1978. Twenty one industrial orders
had negative structural components between 1971-1975, whilst only 18
had negative components between 1975-1978, and 17 in the last time
period (1978-1981). Table 9 ranks industrial orders according to
their structural performance in each time period. This indicates
that the textiles and clothing industries (orders 13 and 15
respectively) consistently had the worst structural components and
the insurance, professional and miscellaneous services (orders 24,
25 and 26) consistently had the best.

Structural components for aggregate female employment change
were worse than the components for male employment change in all
three periods, although they also improved between the first and
second periods (Table 10). Twenty one industrial orders, including
all the manufacturing orders, had negative structural components
between 1971-1975. However, the number was reduced to nineteen
between 1975-1978, and to seventeen between 1978-1981. When the
industrial orders are ranked on the basis of their structural
component for female employment change, the textile industrial order
again features amongst those experiencing significant, structurally
related, employment declines. Within the service sector the
miscellaneous industry (order 26) had the most positive structural
component for female employment change over the three time periods,
but the mining and construction industrial orders also had good
structural components.

It is useful look at those industries whose structural
component has either improved or worsened over time, as this
emphasises industries which have consistently experienced either
favourable or adverse conditions for employment change. Between the
first and second time periods, the structural component for male and

Table 10

Percentage Change in the Structural Component for Female Employment Change for Three Time Periods between 1971 and 1981

RANK	1971–1975 Industry	Structural Component %	1975–1978 Industry	Structural Component %	1978–1981 Industry	Structural Component %	1971–1981 Industry	Structural Component %
1	Textiles	-24.4	Agriculture	-10.6	Metal Manuf.	-30.5	Textiles	-54.0
2	Coal	-23.9	Brick	-9.6	Textiles	-26.0	Metal Manuf.	-51.0
3	Vehicles	-21.1	Textiles	-9.5	Vehicles	-24.7	Clothing	-46.0
4	Metal Manuf.	-19.9	Leather	-8.5	Clothing	-24.1	Metal NES	-44.8
5	Clothing	-18.7	Elec. Eng.	-7.8	Other	-22.0	Vehicles	-41.8
6	Mech. Eng.	-18.6	Clothing	-7.6	Vehicles	-19.4	Other	-36.7
7	Metal NES.	-17.3	Instrum. Eng	-7.1	Bricks	-17.6	Leather	-36.2
8	Leather	-16.7	Paper	-6.6	Elec. Eng.	-16.8	Bricks	-36.2
9	Mining	-15.3	Metal NES.	-6.5	Instrum. Eng.	-14.3	Elec. Eng.	-36.0
10	Paper	-13.8	Metal Manuf.	-5.5	Leather	-13.7	Instrum. Eng.	-32.0
11	Food	-13.7	Public	-4.9	Chemicals	-11.4	Mech. Eng.	-30.2
12	Elec Eng.	-13.5	Vehicles	-4.7	Shipbuilding	-10.9	Agriculture	-26.3
13	Other	-12.2	Timber	-3.7	Timber	-10.7	Paper	-24.2
14	Instrum. Eng.	-12.0	Utilities	-3.7	Mech. Eng	-9.4	Food	-22.5
15	Agriculture	-11.9	Other	-3.7	Public	-7.8	Coal	-22.3
16	Bricks	-11.3	Food	-3.6	Food	-5.7	Timber	-21.7
17	Chemicals	-8.5	Mech. Eng.	-3.6	Agriculture	-4.8	Chemicals	-19.4
18	Timber	-7.3	Distribution	-2.8	Paper	-4.5	Shipbuilding	-14.8
19	Transport	-6.2	Transport	-1.5	Coal	-0.9	Distribution	-3.0
20	Shipbuilding	-3.3	Shipbuilding	+0.3	Distribution	+1.2	Public	-1.8
21	Distribution	-1.4	Chemicals	+3.0	Professional	+4.4	Transport	-0.4
22	Utilities	+3.1	Professional	+2.1	Utilities	+6.5	Utilities	+6.2
23	Insurance	+4.8	Coal	+3.0	Transport	+7.1	Mining	+15.2
24	Construction	+9.1	Construction	+8.3	Miscellaneous	+10.2	Professional	+19.9
25	Miscellaneous	+9.9	Miscellaneous	+8.6	Insurance	+12.4	Insurance	+30.9
26	Professional	+11.9	Insurance	+9.3	Construction	+13.4	Miscellaneous	+33.4
27	Public	+13.2	Mining	+15.5	Mining	+14.8	Construction	+36.2
TOTAL		-3.6		-1.1		-2.3		-7.7

Source: DOE Statistics (NOMIS).

female employment change improved in all the manufacturing industries, but worsened in the service industries of distribution, professional services and public administration, in insurance and banking for male employment only, and in the utilities for female employment. Between the 1975-1978 and 1978-1981 periods however, improvements in the structural component for males were reversed in 10 of the 17 manufacturing industries, and for females in all but one of the manufacturing industries. Structural components in the service sector improved for each industry, with the exception of public administration and defence whose structural component became more negative.

It was shown earlier that between 1971 and 1981, the differential component for male employment change in West Yorkshire between 1971 and 1981 was +1.8%, and the differential component for female employment change was -0.2% (Table 5). Analysis over three consecutive time periods however reveals that, for aggregate male employment (Table 11), the differential component was positive in the 1971-1975 period only, becoming slightly negative in the middle period, before reaching equilibrium with the nation during 1978-1981. For female employment (Table 12), the differential component was positive in the first time period only, becoming negative between 1975 and 1978, and worsening thereafter. A comparison of industry-specific differential components for male employment change for the three time periods reveals that between 1971-1975 and 1975-1978 only 6 manufacturing orders and two service orders improved their differential performance, whilst between the 1975-1978 and 1978-1981 periods the differential component was improved in 10 manufacturing orders, four of which had shown improvement between the earlier periods, (food, order 3; metal

Table 11

Percentage Change in the Differential Component for Male Employment Change for Three Time Periods, 1971 and 1981.

RANK	1971-1975 Industry	Differential Component %	1975-1978 Industry	Differential Component %	1978-1981 Industry	Differential Component %	1971-1981 Industry	Differential Component %
1	Shipbuilding	-13.3	Coal	-25.3	Chemicals	-12.9	Coal	-20.4
2	Clothing	- 9.0	Clothing	-19.7	Vehicles	-12.6	Clothing	-16.2
3	Leather	- 7.1	Utilities	- 6.8	Mech. Eng.	- 7.8	Shipbuilding	- 9.6
4	Insurance	- 6.0	Elec. Eng.	- 6.4	Leather	- 4.1	Mech. Eng.	- 7.9
5	Miscellaneous	- 5.9	Instrum. Eng.	- 6.3	Professional	- 2.8	Professional	- 6.4
6	Other	- 3.8	Professional	- 4.8	Miscellaneous	- 2.0	Chemicals	- 6.1
7	Textiles	- 3.4	Vehicles	- 3.4	Utilities	- 1.8	Miscellaneous	- 3.3
8	Agriculture	- 3.0	Public	- 3.0	Textiles	- 0.6	Leather	- 3.3
9	Bricks	- 2.3	Metal NES.	- 2.4	Timber	- 0.5	Textiles	- 2.8
10	Food	- 0.2	Mech. Eng	- 2.1	Coal	- 0.3	Vehicles	- 0.3
11	Transport	+ 0.4	Timber	- 1.6	Construction	+ 0.3	Distribution	+ 0.2
12	Distribution	+ 0.6	Paper	- 1.6	Agriculture	+ 0.8	Utilities	+ 1.8
13	Mech. Eng.	+ 0.6	Distribution	- 1.2	Distribution	+ 0.8	Agriculture	+ 2.3
14	Coal	+ 2.0	Chemicals	- 0.3	Mining	+ 0.9	Transport	+ 2.5
15	Instrum. Eng.	+ 2.2	Textiles	- 0.2	Elec. Eng.	+ 1.1	Elec. Eng.	+ 2.9
16	Metal Manuf.	+ 2.2	Transport	+ 0.2	Public	+ 1.2	Insurance	+ 3.2
17	Metal NES.	+ 2.3	Mining	+ 1.4	Transport	+ 2.0	Metal NES.	+ 4.1
18	Mining	+ 2.5	Insurance	+ 3.4	Clothing	+ 3.9	Mining	+ 4.4
19	Professional	+ 2.5	Construction	+ 4.9	Paper	+ 4.0	Construction	+ 8.1
20	Construction	+ 3.6	Professional	+ 5.3	Metal NES.	+ 4.3	Paper	+10.8
21	Elec. Eng.	+ 8.8	Agriculture	+ 5.4	Insurance	+ 5.4	Bricks	+12.9
22	Chemicals	+ 8.9	Food	+ 7.0	Bricks	+10.2	Timber	+13.7
23	Paper	+ 9.4	Leather	+ 8.0	Other	+11.5	Public	+14.8
24	Utilities	+10.6	Bricks	+ 8.0	Metal. Manuf.	+12.8	Instrum. Eng.	+16.0
25	Timber	+19.3	Metal Manuf.	+10.2	Food	+13.1	Other	+16.8
26	Public	+19.5	Other	+10.4	Instrum. Eng.	+22.9	Food	+18.6
27	Vehicles	+20.6	Shipbuilding	+60.0	Shipbuilding	+29.8	Metal. Manuf.	+20.0
TOTAL		+ 2.5		- 0.3		0.0		+ 1.8

Source: DOE Statistics (NOMIS)

Table 12

Percentage Change in the Differential Component for Female Employment Change for Three Time Periods Between 1971 and 1981.

RANK	1971-1975 Industrial Order	1971-1975 Differential Component %	1975-1978 Industrial Order	1975-1978 Differential Component %	1978-1981 Industrial Order	1978-1981 Differential Component %	1971-1981 Industrial Order	1971-1981 Differential Component %
1	Shipbuilding	-32.5	Public	-21.6	Shipbuilding	-57.5	Leather	-38.1
2	Bricks	-21.6	Elec. Eng.	-15.4	Leather	-49.2	Elec. Eng.	-23.1
3	Leather	-11.5	Clothing	- 9.7	Elec. Eng.	-28.0	Textiles	-12.1
4	Construction	-11.2	Vehicles	- 7.1	Miscellaneous	-12.0	Clothing	-10.5
5	Miscellaneous	- 7.8	Utilities	- 6.6	Textiles	- 9.4	Professional	- 7.9
6	Clothing	- 7.0	Professional	- 4.9	Mech. Eng.	- 7.2	Miscellaneous	- 5.7
7	Instrum. Eng.	- 7.0	Paper	- 4.0	Professional	- 2.0	Shipbuilding	- 1.0
8	Textiles	- 5.4	Other	- 3.8	Distribution	- 1.2	Construction	- 0.6
9	Metal. Manuf.	- 1.2	Textiles	- 3.6	Transport	- 0.8	Mech. Eng.	+ 0.2
10	Professional	+ 0.6	Coal	- 2.7	Chemicals	- 0.7	Metal NES.	+ 0.6
11	Vehicles	+ 2.2	Agriculture	+ 0.9	Metal Manuf.	- 0.6	Distribution	+ 4.2
12	Insurance	+ 2.5	Timber	+ 1.5	Mining	- 0.4	Metal Manuf.	+ 4.8
13	Transport	+ 3.5	Distribution	+ 2.5	Other	+ 0.1	Paper	+ 5.2
14	Distribution	+ 4.6	Mech. Eng.	+ 2.5	Timber	+ 0.5	Agriculture	+ 5.3
15	Mech. Eng.	+ 4.8	Instrum. Eng.	+ 6.2	Clothing	+ 0.6	Utilities	+ 7.0
16	Other	+ 5.3	Other	+ 6.4	Agriculture	+ 1.3	Bricks	+ 8.8
17	Coal	+ 6.1	Chemicals	+ 7.7	Other	+ 1.5	Other	+ 9.1
18	Chemicals	+ 7.3	Construction	+ 8.1	Paper	+ 1.6	Coal	+11.8
19	Agriculture	+ 7.7	Transport	+ 9.1	Construction	+ 2.8	Transport	+12.9
20	Paper	+ 8.5	Insurance	+ 9.3	Insurance	+ 3.5	Chemicals	+12.9
21	Utilities	+11.1	Metal Manuf.	+10.2	Utilities	+ 3.6	Timber	+15.0
22	Food	+11.3	Mining	+10.6	Public	+11.4	Insurance	+19.9
23	Mining	+16.2	Food	+13.0	Bricks	+14.5	Public	+33.2
24	Timber	+18.6	Miscellaneous	+17.1	Vehicles	+16.0	Mining	+34.2
25	Elec. Eng.	+23.8	Bricks	+20.2	Food	+16.3	Vehicles	+34.6
26	Vehicles	+31.4	Leather	+29.0	Coal	+20.0	Food	+42.5
27	Public	+60.7	Shipbuilding	+325.0	Instrum. Eng.	+61.9	Instrum. Eng.	+55.5
TOTAL		+ 2.7		- 0.7		- 2.3		- 0.2

Source: DOE Statistics (NOMIS)

manufacture, order 6; bricks, order 17; other manufactring, order
19) and three service industries, only one of which had also improved
between the earlier periods (insurance, order 24).

In general, changes in the pattern of differential components
were more diverse for males than females. Between the first two
time periods differential components for female employment change
improved in seven manufacturing industrial orders, and three service
sector industrial orders. However, improvements were sustained in
only two manufacturing orders (food, order 3 and instrument
engineering, order 8), both of which increased employment.

In certain industrial orders the differential component has
consistently weakened over the three time periods, as investment
decisions have favoured West Yorkshire less over the decade. This
has affected male employment in the mining industry (order 2),
although its differential component remained positive until the
1978-1981 time period, and in the chemical (order 5), mechanical
engineering (order 7) and vehicle (order 11) industries.
Differential components of female employment change also worsened in
the mining industry, and in the electrical engineering (order 9),
and distribution industries.

4.   SPATIAL ANALYSIS OF SHIFT-SHARE COMPONENTS IN WEST YORKSHIRE,
     1971 TO 1981.

4.1 Shift-share components for AOA's in West Yorkshire: spatial
     framework and component definition.

Shift-share analysis has been used in the previous section to
examine how different industrial orders within West Yorkshire fared,
in comparison with the national economy over the period 1971 to
1981. The technique is used in this section to investigate how
individual sub-regions, in this case Amalgamated Employment Office
Areas (AOA's) within West Yorkshire have performed relative to the
performance of the County as a whole. AOA's are the smallest
spatial units for which consistent runs of employment data are
available, and there were 28 in West Yorkshire in 1981 (Figure 4 and
Table 13). They can be combined to form Travel-to-Work-Areas
(TTWA's), which represent local labour market areas (Palmer, 1986).

The structual component within each AOA, is calculated by
applying the proportional change in employment in each industrial
order in West Yorkshire to the initial employment in each AOA, and
then subtracting the national component, which in this case
standardises for the West Yorkshire economy. Formally, the
component is defined as:

$$\text{SCOM}_i^k (t, t+T) = (E_i^k(t) [E_r^k (t+T)/E_r^k(t)] - E_i^k (t)) - \text{NCOM}_i^k (t, t+T) \qquad (4)$$

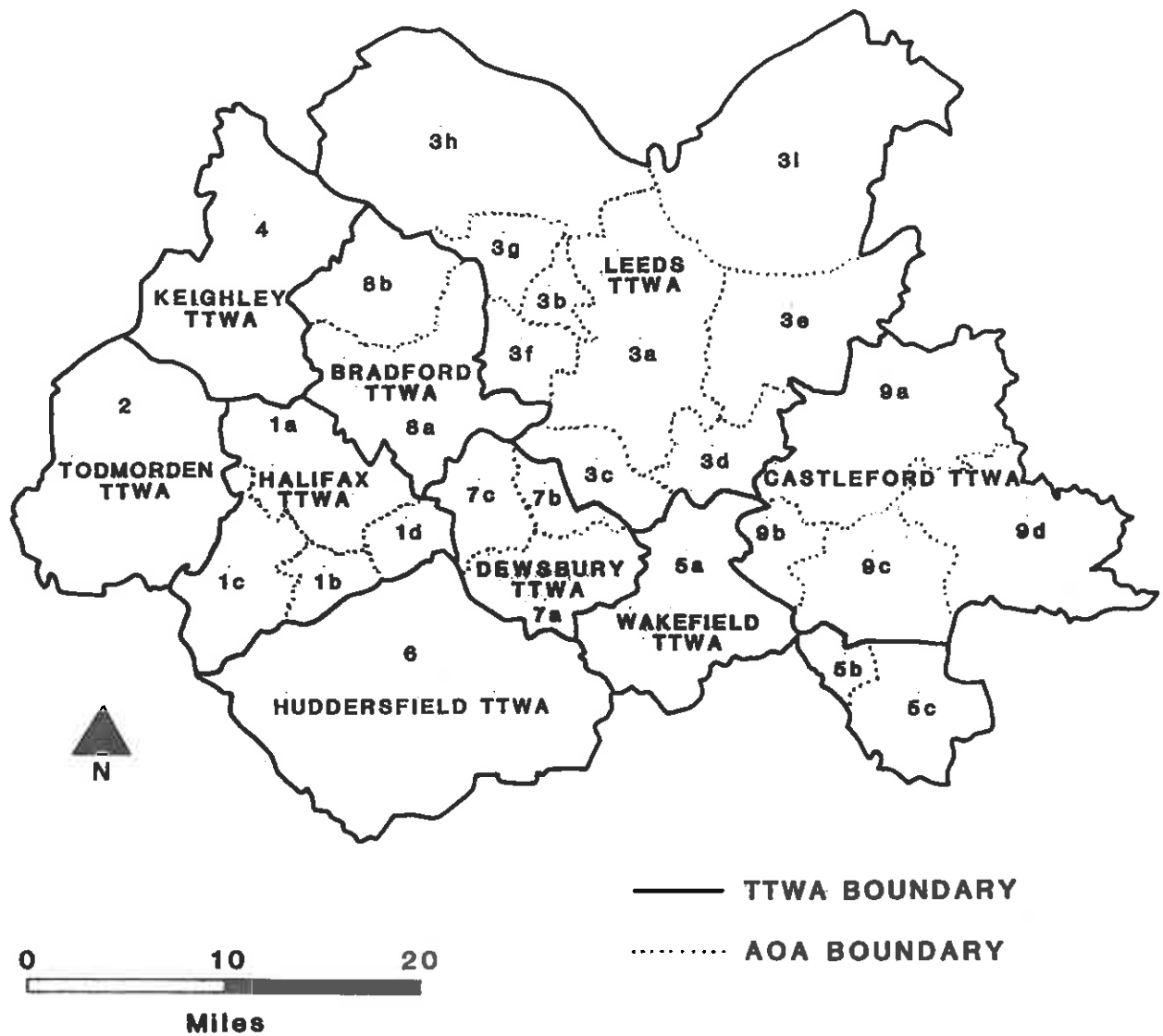where i represents the AOA and varies from 1 to 28.

Figure 4

The Spatial Configuration of AOA's and TTWA's in West Yorkshire, 1981.

TABLE 13   AMALGAMATED OFFICE AREAS IN WEST YORKSHIRE. 1981.

HALIFAX TTWA
      containing: Halifax AOA   1a
                      Elland AOA   1b
                      Sowerby Bridge AOA   1c
                      Brighouse AOA   1d

TODMORDEN TTWA
      containing: Todmorden AOA   2

LEEDS TTWA
      containing: Leeds and Hunslet AOA   3a
                      Horsforth AOA   3b
                      Morley AOA   3c
                      Rothwell AOA   3d
                      Seacroft and Crossgates AOA   3e
                      Bramley AOA   3f
                      Yeadon AOA   3g
                      Otley AOA   3h
                      Wetherby AOA   3i

KEIGHLEY TTWA
      containing: Keighley AOA   4

WAKEFILED TTWA
      containing: Wakefield AOA   5a
                      Hemsworth AOA   5b
                      South Elmsall AOA   5c

HUDDERSFIELD TTWA
      contianing: Huddersfield AOA   6

DEWSBURY TTWA
      containing: Dewsbury AOA   7a
                      Batley AOA   7b
                      Spen Valley AOA   7c

BRADFORD TTWA
      containing: Bradford AOA   8a
                      Shipley   8b

CASTLEFORD TTWA
      containing: Castleford AOA   9a
                      Normanton AOA   9b
                      Pontefract AOA   9c
                      Knottingley AOA   9d

The residual differential component then indicates the difference between the actual employment change and the expected employment change in each AOA, that is the change which would have occurred if each industry in the AOA had grown or declined at the same rate as that industry in West Yorkshire.

$$DCOM_i^k (t,t+T) = (E_i^k(t+T) - E_i^k (t)) - (NCOM_i^k (t,t+T) + SCOM_i^k (t,t+T)) \quad (5)$$

The calculations reported in sections 4.2 and 4.3 assume no disaggregation by industrial order or sex.

4.2   Variations in the structural component between AOA's

Two broad zones can be identified in West Yorkshire which differ according to the nature of their structural components (Figure 5). Firstly, there is a zone in the West of the county containing the TTWA's of Keighley, Todmorden, Bradford, Halifax, Dewsbury and Huddersfield, where all AOA's, apart from Halifax, have negative structural components. They were most significant in the Brighouse (-13.9%), Spen Valley (-16.6%), Elland (-21.1%), Sowerby Bridge (-19.0%) and Todmorden (-14.5%) AOA's, the first four of which have strong textile industry associations, whilst Todmorden TTWA (-14.5%), and Keighley TTWA (-9.8%), have strong ties with the declining clothing and leather industrial orders. The spatial concentration of firms with poor industrial structures emphasises the existence of inter-industry associations in the textile producing areas of the economy.

A second zone to the East of the county contains TTWA's in which AOA's generally had positive structural components,

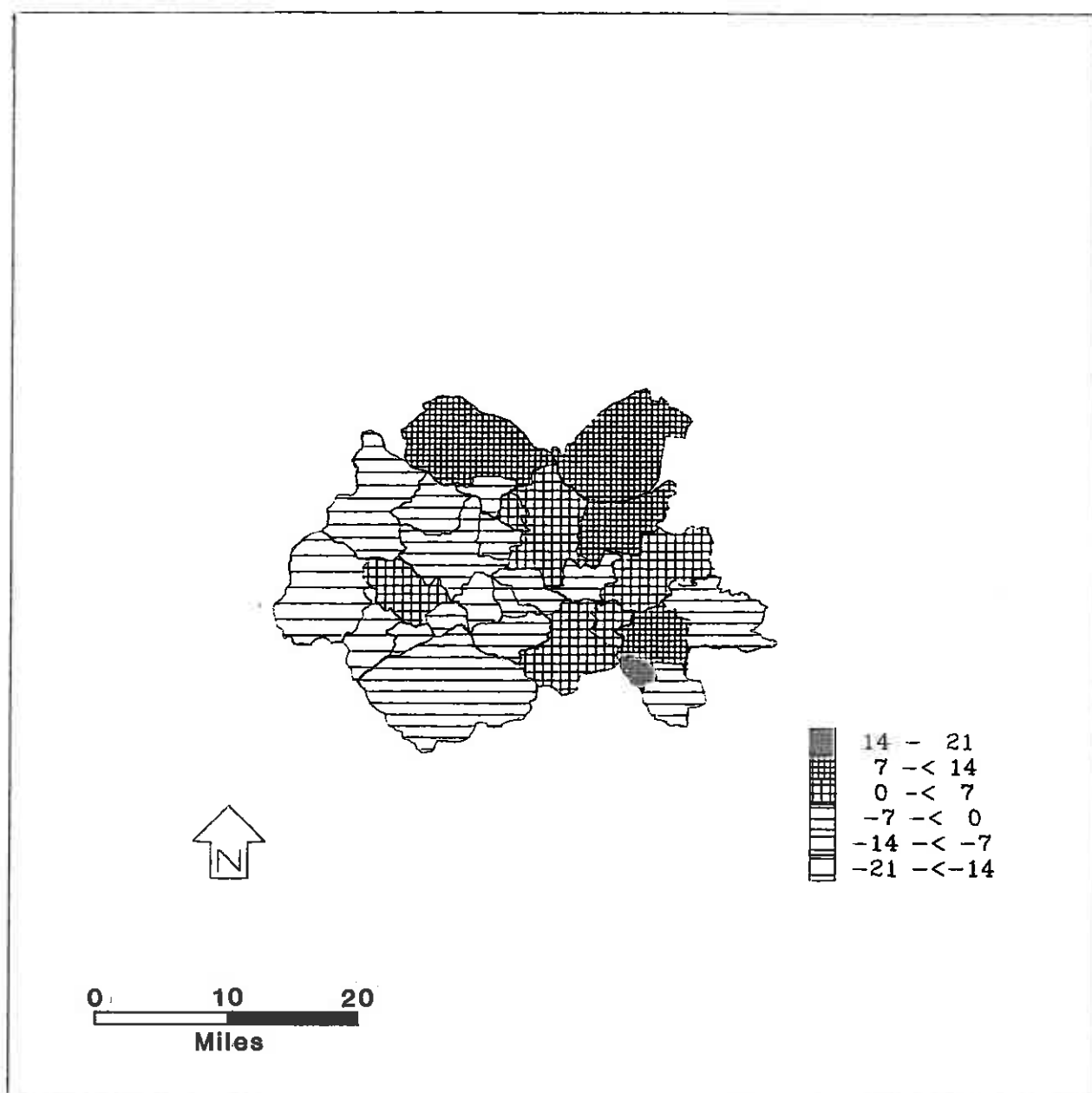| | 14 — 21 |
	7 —< 14
	0 —< 7
	—7 —< 0
	—14 —< —7
	—21 —<—14

N

| 0 | 10 | 20 |

Miles

Figure 5

Change in the Structural Component of Total Employment Change for AOA's in West Yorkshire, 1971-1981.

particularly the rural areas such as Otley (+13.1%) and Wetherby

(+12.7%), but also Seacroft (+6.8%). Within this area however, the

AOA's of Knottingley (-3.3%) and South Elmsall (-1.0%) both had

relatively poor industrial structures.

4.3 Variations in the differential component by AOA

Spatial variation in the differential component across the

county provides evidence of a centre-periphery dichotomy in the

pattern of employment change, which earlier work (Palmer, 1986)

identified (Figure 6). A clear division exists between the city

based AOA's of Leeds and Bradford and the adjacent AOA's of Yeadon,

Rothwell and Normanton, which all experienced negative differential

change in total employment, and the surrounding AOA's, the majority

of which have positive differential components.

Earlier work at the travel-to-work-area (TTWA) level found that

the TTWA's of Wakefield and Castleford experienced less employment

decline than other TTWA's in the county, as the proportion of

employment in the county located within the Wakefield and Castleford

TTWA's, increased between 1971 and 1981. They were the only AOA's

to register growth in both female full-time and part-time employment

and also an increase in male part-time employment over the decade.

As the differential components for total employment change in the

AOA's which formed the Wakefield and Castleford TTWA's between 1971

and 1981 were positive, execept for Normanton, the relative

employment performance of these areas can be related to factors

other than industrial structure. In other words any investment

decisions that have affected employment in the area, which may

have involved the comparison of alternative modes of investment, and

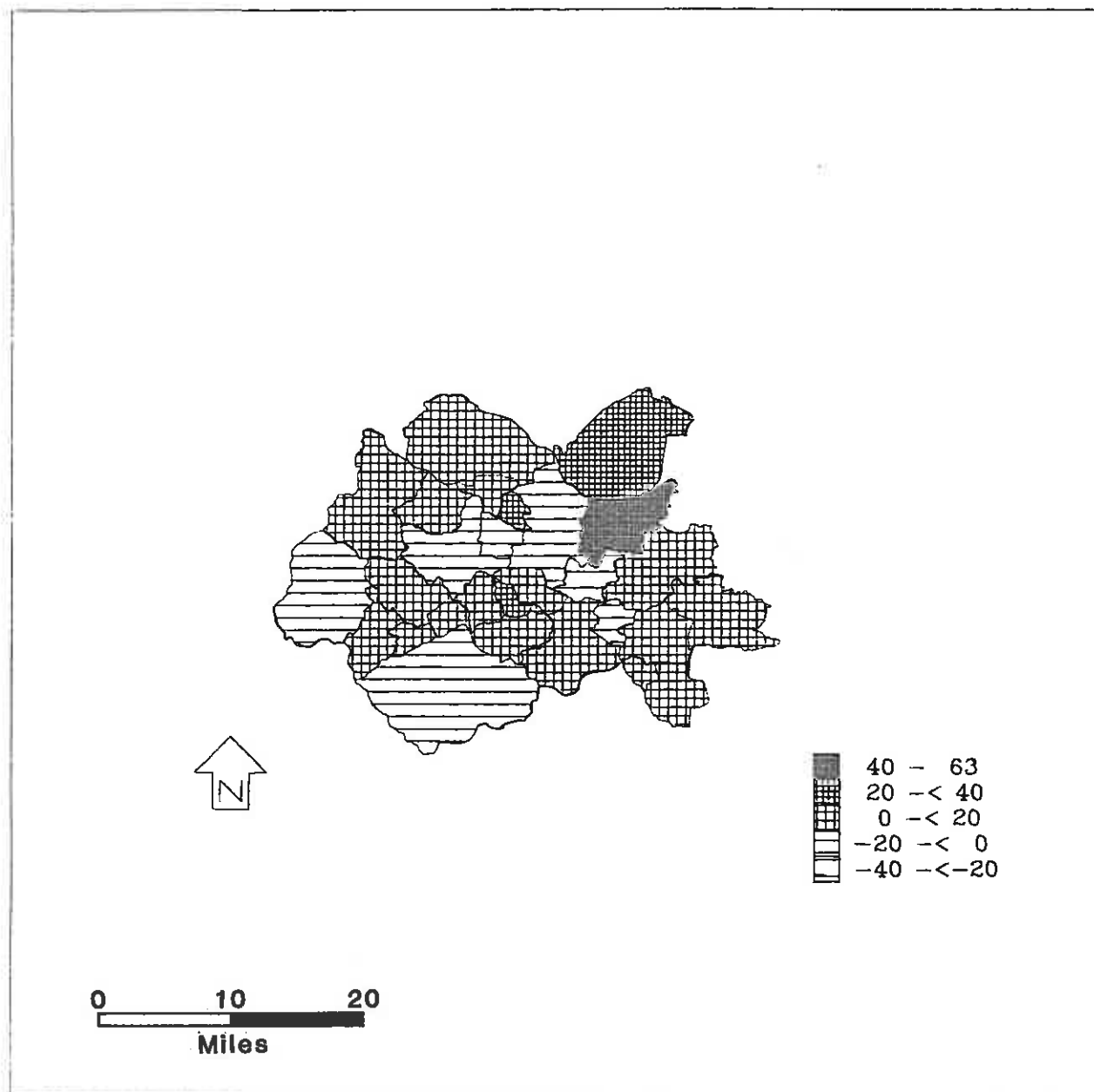the assessment of several potential localities, have 'differentially',

Figure 6

Change in the Differential Component of Total Employment Change for AOA's in West Yorkshire, 1971-1981.

favoured the AOA's in these TTWA's over the decade 1971 to 1981.
Explanation of why particular areas are favoured may be found in the
examination of those industries whose investment decisions have
generated positive differential components.

4.4 Postitive differential components by AOA and industrial order.

Most of the industrial orders which had postive differential
components, have experienced employment gains in AOA's within the
county. It should be recognised, however, that positive
differential components may also indicate areas in which employment
loss in a particular industry has been less than one might expect,
and therefore the difference between expected and actual change
yields a positive differential component.

The decision to focus on positive differential components of
employment change relects several considerations. Firstly, there
has been a tendency in recent years to analyse the causes of
employment decline within conurbations, because decline has been the
dominant form of employment change, but to neglect the analysis of
employment growth within the the sub-regions of conurbations, and in
particular employment growth in manufacturing industries. In West
Yorkshire work has been carried out on the declining textile
industry (Hardhill 1982), and on the industrial characteristics of
redundancy notifications (Green and Foley, unpublished), but no
analyses have dealt with increasing employment in the food industry,
or the pattern of sub-regional concentrations of employment growth
within the overtly declining mechanical engneering industry for
example. Some notable exceptions do exist, including work by Walker
and Green (1982), who have investigated employment growth in the
small firms sector in Leeds.

In West Yorkshire a total of sixteen AOA's had positive differential components of male employment change, and twenty-two had positive differential components of female employment change. The analysis of industrial orders within these AOA's has been refined to focus on employment change in the primary and manufacturing industrial orders, which had positive differential components in at least half of the AOA's (Tables 14 and 15). Although a 50% cut off point is somewhat arbitrary, alternative analyses which focussed on industrial orders with large differential components rather than their spatial representation, have proved corroborative. That is, those industrial orders with high differential components, were also represented in over half of the AOA's. Each value in Tables 14 and 15 represents the difference between the number of jobs one would expect to find in the industrial order in each AOA, given the level of employment change in that industrial order in West Yorkshire over the decade, and the number of jobs which do actually occur. The larger the differential component, the more influential employment change in that industrial order has been in the AOA.

Eleven industrial orders in the primary and manufacturing sectors had positive differential components of male employment change in over half of the AOA's represented (Table 14), whereas eight industrial orders had positive components for female employment change in over half of the AOA's (Table 15). Although we are interested in the factors which have created positive differential components in employment change for all of the industrial orders identified, some industries have a more important role in the county than others and hence warrant more detailed consideration. For instance, the only industrial orders in the

Table 14

Selected Positive Male Differential Components by Industrial Order and AOA in West Yorkshire, 1971-1981.

SELECTED INDUSTRIAL ORDERS (I.O's)

AOA	Mining (2)	Food (3)	Chem. (5)	Mech. Eng(7)	Instrum. Eng(8)	Vehicle (11)	Metal NES(12)	Clothing (15)	Bricks (16)	Timber (17)	Paper (18)	TOTAL IN 11 I.O's	TOTAL IN AOA
Halifax	19	374	122		16	632	238	17	341	710	9	2478	1513
Elland			127	474	20	8				71	86	786	648
Brighouse		137		555	66	14	12		178			962	473
Horsforth	17	95	41	312		1109					305	1879	1789
Morley	32	9	129	231								401	1494
Seacroft		155	155	2112	15	245	126		43	202		3053	4551
Yeadon		5		118	36	756	20		3	66	126	1130	1126
Wetherby			19	286	161		10		26	188	68	758	889
Keighley	16	199			164	12	7	432				830	1540
Wakefield	255		20	83		266	93	239	167		73	1196	1951
Hemsworth	23	18							13	2		56	31
S. Elmsall	199			14			139	55		7		414	701
Dewsbury		179	133			62	93	47	155		39	708	583
Batley	34	68	211	64	7	13	138	9	89	141	81	855	2207
Castleford	807	51	238	290		7	29	117	17	69	51	1676	2185
Knottingley	840	1	107	15		2	2		141	16		1124	1846
TOTAL	2242	1291	1302	4554	485	3125	907	916	1173	1472	838	18,305	23,527

Source: DOE Statistics (NOMIS)

Table 15

Selected Positive Female Differential Components by Industrial Order and AOA in West Yorkshire, 1971-1981.

SELECTED INDUSTRIAL ORDERS (I.O's)

AOA	Food (3)	Chemical (5)	Mech. Eng. (7)	Instrum. Eng. (8)	Metal NES (12)	Clothing (15)	Timber (17)	Paper (18)	TOTAL IN 8 I.O's	TOTAL IN AOA
Halifax		9	151	2	56	381	92	60	598	539
Elland	5	43	17	95	38	37	20	4	300	337
Sowerby		8	53	43	19	37			176	201
Brighouse	33		94		10				139	184
Horsforth	5	5	50	10	58			105	267	1152
Morley	52	11	257		76	48		71	308	877
Seacroft	26	282			36		54		665	3113
Bramley		20			18	66	134		238	502
Otley	27	40	67	28	1	41	5	8	217	868
Wetherby		25	78	61	11		51	42	268	739
Keighley	215		63	109	37	864			1288	2366
Wakefield		85	12		9	11		62	179	1751
Hemsworth	76					45			121	72
S. Elmsall			2		5	344	13	2	366	225
Dewsbury	319	21		17	27	161	27	70	642	2222
Batley	180	96	19	1	54	85	29	16	480	240
Spen Valley	17	48	33			129		25	252	521
Shipley		49	50	17	24	154	75		319	953
Castleford	443	5			13	565	22	46	1144	1727
Normanton	86				13	30	57		186	180
Pontefract	317	78	18	1		563	1		977	1130
Knottingley		13			2				16	188
TOTAL	1801	838	964	384	507	3561	580	511	9146	20,087

Source: DOE Statistics (NOMIS)

manufacturing sector which increased employment between 1971 and
1981 were the food industry (order 3), for both males and females,
and the instrument engineering industry (order 8) for females only.
This means that AOA's with positive differential components in these
industries have been more successful than other AOA's in attracting
or maintaining employment within an overall context of growth.
Conversely, AOA's which had positive differential components in say
the mechanical engineering industry (order 7), the second largest
manufacturing order in West Yorkshire in both 1971 and 1981, were
successful in maintaining better employment levels than other areas
of the county within an overall context of declining employment, as
total employment in mechanical engineering decreased by 29% over the
decade. Before discussing these industries though, positive
differential component changes in other primary and manufacturing
industrial orders are examined.

It is important to note, however, that in some industrial
orders, positive differential components of employment change in an
AOA, are associated with changes occurring within Minimum List
Heading (MLH) categories of the industrial order, and that
confidentiality restrictions prevent their publication. Information
from Kompass (1983) and WYMCC (1976-84), has therefore been used to
explain the patterns of employment change identified by the
differential component.

Differential components of male employment change were high in
the mining industrial order in the Wakefield (+255 i.e. 255 more
jobs in the mining industrial order were located in Wakefield than
we would expect), South Elmsall (+199), Castleford (+807) and
Knottingley (+840) AOA's. These were earlier shown to be the main
areas within the coal mining zone in West Yorkshire in which the

National Coal Board invested, especially in the earlier years of the decade. In contrast, marked dis-investment occurred in the Normanton area as, for example St. Johns Colliery was closed in the mid-1970's.

In the vehicle industry (order 11), differential components of male employment change were greatest in the AOA's of Halifax, Seacroft, Yeadon and Wakefield. The differential component in the Halifax AOA was +632, part of which can be explained by the growth of motor vehicle industry employment (MLH 381) in the Holdsworth Road Services Company Ltd. which employed approximately 250 people in the early 1970's (Kompass, 1983). In Yeadon AOA however, the differential component (+756) reflects growth over the decade in aerospace related employment (MLH 383), particularly in A.E. Turbine Components Ltd., which is located near to the Leeds Bradford airport (Kompass, 1983), although in more recent years this company has shed labour (WYMCC, 1983). Positive change in differential components in Wakefield AOA (+266) can be related to the decision by Procor Ltd. and British Rail to locate a railway repair and maintenance depot (MLH 384/385) in Wakefield rather than Dewsbury, because the Wakefield site offered more scope for expansion (WYMCC, 1979). Large positive differential components of male employment change have therefore been related to change in a variety of different types of industries within the broad vehicle industrial order.

The brick industry (order 16), which includes the pottery (MLH 462), glass (MLH 463) and cement (MLH 464) industries, had significant differential components of male employment change in the Brighouse, Halifax, Dewsbury, Knottingley and Wakefield AOA's. In several of these areas positive changes in the differential component were connected with the production of glass, as areas of

Millstone Grit near the coal seams, were originally mined to produce
sand for the glass industry (Doyle 1979). In the Brighouse AOA, for
example, the differential component (+178) can in part be attributed
to the construction of a new wet processing plant for glass
production by the Regina Glass Fibre Co. Ltd. at Liversedge, which
generated new employment. The differential component of male
employment change in Wakefield AOA (+167) can also be related to the
glass industry as Corning Glassware Ltd. developed warehouses and
offices in the area creating 80-90 new jobs. Since the period
covered in this analysis however, Corning Glass has closed its
factory and moved its operations to the firms homebase in Sunderland
(WYMCC, 1982). Employment growth also occurred in the glass
industry and the abrasives and building materials industry (MLH 469)
in the AOA's of Halifax and Dewsbury, where the differential
components were +341 and +155 respectively, although it has not been
possible to relate changes in the differential components, to
particular firms operating in the area.

In Knottingley AOA, the differential component (+141) is
associated with employment declines in the glass industry, mainly
because the Rockware Group of glass manufactures, which employed
over 2000 people in the mid-1970's, began to reduce its labour
force, despite making several 'job-saving' investments over the
decade (WYMCC, 1977). Job loss also occurred in the White Rose
Glass Company, which closed in 1976. However employment increased
in the abrasives and building materials industries, but again it has
not been possible to relate this to the operations of particular
firms.

The mechanical engineering industrial order employed over
66,000 people in West Yorkshire in 1971, but only slightly more than

47,000 in 1981, a decline of 29%. Its importance in the economy is underlined by the fact that every AOA in the county except Hemsworth had some of its workforce engaged in mechanical engineering in 1981. The industry covers employment in fourteen MLH categories (331-349), which have each experienced different degrees of employment growth or decline. In Castleford AOA the differential component of male employment change was +238 and +50 for female employment change. This reflects employment growth in MLH 339 as firms engaged in the mining machinery industry, and in the production of printing related machinery, increased their employment bases. The differential component of male and female employment change in Elland AOA (+474 and +151 respectively) can also be related to increases in employment in MLH 339, whilst in Batley AOA, the differential components of male employment change (+64), and female employment change (+19) reflects increases in employment in MLH 349; this may be attributed to the opening of a new factory in the Batley area which produced cast-iron patterns for the glass bottle industry, (WYMCC, 1977), although employment also increased in MLH 339.

Substantial employment growth in the Brighouse AOA, where the differential component of employment change was +555 for males and +53 for females, took place in MLH 333, which covers firms producing pumps valves or compressors, and a proportion of this may be explained by the expansion of Introl Valve Ltd, particularly towards the latter part of the decade (WYMCC, 1977, 1978). In Morley AOA the differential component was +231 for male employment change and +50 for female employment change, as employment increased in several MLH's. The most significant employment growth took place in MLH 333, as over 70 new jobs were created, and in MLH 337 (mechanical handling equipment) in which employment increased by more than 100.

In Seacroft AOA, the differential components of employment change were +2112 for male employment and +257 for female employment, mainly because a Royal Ordanance factory was established near Seacroft, which in 1981 employed approximately 1700 people. Partly as a result of this employment in Seacroft has grown in several mechanical engineering firms but particularly in MLH's 337 and 339.

Finally, in the food industry the differential component of male employment change was most significant in the Halifax AOA (+374), and this reflects employment growth in biscuit (MLH 213), and confectionary (MLH 217) manufacture. The differential component of female employment change in Halifax AOA however, was negative, despite the fact that Rowntree Mackintosh, the main confectionery employer in the area, invested £4 million in a factory extention which created 300 new jobs in the Halifax area (WYMCC, 1977). The differential component of female employment change was negative because the relative increase in female food industry employment in Halifax AOA, was less than in West Yorkshire as a whole. Rowntree Mackintosh also invested in their factory in Castleford AOA, where the differential component of male employment change was +51, and female employment change was +443, however towards the end of 1981 approximately 300 jobs in the factory were under threat beacause increases in the rate of confectionery VAT undermined sales (WYMCC, 1981). Employment in the confectiorery industry also increased in Pontefract AOA, but only female employment change had a positive differential component (+317). This may be associated with the expansion of a large liquorice producing firm, which employed over 300 people in 1981 (Kompass, 1983).

Food industry employment in the Batley AOA, where the differential components of male and female employment change were

+68 and +180 repectively, was dominated by Fox's Biscuit Ltd., which

invested over £6.5 million on two factory extentions in the late

1970's (WYMCC, 1978, 1981). The differential componets of male and

female employment change in Keighley AOA, +199 and +215, can also be

related to employment growth in biscuit manufacturing, and bacon and

meat production (MLH 214). The main company involved in biscuit

manufacture was Yorkshire Biscuit Ltd., which was taken over by

another company in 1979 and then received a Regional Development

Grant of £34,000, in order to safegaurd jobs (WYMCC, 1981).

In Dewsbury AOA the differential component of male employment

change (+179), and female employment change (+319), can be

associated with employment growth in milk manufacturing (MLH 215)

and bread and flour confectionery production (MLH 212). However it

has not been possible to relate these changes to individual firms.

5. SUMMARY AND CONCLUSIONS

The characteristics of employment change in West Yorkshire have been investigated using shift-share analysis. The technique has been criticised however, because it fails to make allowance for the affects which employment changes in one industry, will have on employment levels in other industries in the economy. As the level of industrial linkage in West Yorkshire is high, it is more difficult to isolate the impact of the structural component when analysing employment change in the county. The technique does however, provide a useful method of disaggregating employment change into national, structural and differential components, which directs attention to industries or areas of the county where the form of employment change requires further explanation. It is a valuable research tool as long as changes in the structural and the differential components are not used to infer causal relationships, but rather to identify employment changes which do not accord with expectations and which thus require more detailed investigation.

Over the decade 1971 to 1981, the structural component in West Yorkshire has become more negative, primarily because the county has a high proportion of inter-related manufacturing industries which have experienced rapid rates of decline. The effect of structural change on total employment in West Yorkshire, is emphasised when total employment change in the county is compared with change in Great Britain. All the industrial orders in the primary, manufacturing and construction sectors had negative structural components for total employment change in West Yorkshire, whilst only four service sector industrial orders had positive components.

Analysis of structural components of male and female employment change reveals that the industrial structure of West Yorkshire had a more adverse effect on female employment than male employment, as the structural component was significantly more negative for females in 22 of the 27 industrial orders analysed, although in absolute terms more male jobs, then female jobs, were lost over the decade.

The differential component of total employment change in West Yorkshire between 1971 and 1981 was +1.0%. Both primary sector industrial orders had positive differential components, but only nine industrial orders were positive in the manufacturing sector of which the food, metal manufacture, instrument engineering and timber industries, had good relative differential components of employment change, whilst the coal, leather and clothing industrial orders had poor differential components. The majority of service sector industries had positive differential components, but employment change in professional and scientific services and in miscellaneous services had a negative differential component as it grew less in West Yorkshire than could be expected on the basis of national trends. The differential component of male employment change was positive (+1.8%), indicating that male employment decline in the county was less severe than one would expect on the basis of industrial structure only, however the differential component of female employment change was slightly negative (-0.2%), so that although female employment in the county increased, the increase was less than expected.

The contribution of each component to total employment change, shows that in eight of the industrial orders experiencing employment decline, weak industrial structures were accentuated by poor differential employment performances. Thus in the mechanical

engineering industry for example, severe job loss occurred as national declines in the industry were exaggerated in West Yorkshire. A poor structural performance was also exacerbated by a negative differential component in the textile industry. In twelve of the industrial orders which experienced employment decline however, negative structural components of employment change, were tempered by positve differential components. In the brick industrial order for example, employment growth occurred in the glass and cement industries.

Different combinations of structural and differential components can also be associated with industrial orders that increased employment. The food industry for example, had a negative structural component of employment change, but a positive differential component, as significant employment growth occurred in West Yorkshire over the decade 1971-1981, particularly in firms engaged in biscuits, and chocolate and sugar confectionery manufactures, and also in the bacon and meat curing industries.

Positive structural components were offset by a negative differential component in two service industries (professional and miscellaneous services), whilst both structural and differential components were positive in the insurance and distribution industries.

The temporal stability of trends in the structural and differential component were analysed in order to identify how consistently the investment decisions of firms in West Yorkshire favoured or disfavoured the local economy in comparison with the national economy. The aggregate structural component of male employment change was negative in each of the three time periods, that is, between 1971-75, 1975-78 and 1978-81, although it did show

some improvement between 1975 and 1978. The textile and clothing
industries consistently had the worst structural component, and the
insurance, professional and miscellaneous services consistently had
the best. Aggregate structural components of female employment
change, were worse than those for male employment change in all
three time periods, although they also registered some improvement
between 1971-1975 and 1978-1981. The textile industrial order again
featured amongst the worst affected industries, whilst the same
service industries fared well for female employment change as for
male employment change.

Both male and female employment losses, attributed to the
industrial structure of West Yorkshire, were less severe between
1975 and 1978, as the structural component improved for all
manufacturing industries between the first and second time periods,
although it did worsen in some service industries. Between the
middle and final time period however, improvement in the structural
component was reversed in the majority of manufacturing sector
industrial orders.

In terms of change in the differential component, analysis
reveals that for male and female employment change, the differential
component was positive in the 1971-75 period only. It then
approximated the national level for male employment change, but
became more negative for female employment change in later time
periods.

The final sections of the paper examined spatial variations in
the shift-share components in West Yorkshire. Negative structural
components were associated with AOA's in the TTWA's to the West of
the county, particularly in areas with strong textile industry
associations, whilst AOA's in the TTWA's in the East of the county,

tended to have positive structural components. The differential component of employment change, however, exhibits a centre-periphery contrast, as the urban AOA's in the Leeds and Bradford TTWA's experienced negative differential components, whilst the majority of the surrounding AOA's had positive components.

A selection of industrial orders in AOA's which had positive differential components were investigated further, in order to generate a better understanding of the factors influencing employment change in specific areas of the county. In the vehicle industrial order for instance, although total employment declined by 21% over the decade, several AOA's experienced substantial growth in employment, including aerospace related employment in the Yeadon AOA, and employment in railway maintenance and repair in Wakefield AOA. Employment in the mechanical engineering industry also declined, however sixteen AOA's had positive differential components for total mechanical engineering employment change between 1971 and 1981, including Brighouse AOA, and Seacroft AOA, where industrial expansion occurred.

Using shift-share analysis to investigate employment change in West Yorkshire between 1971-1981 has therefore helped distinguish the national, structural and differential components of employment change, and draw attention to the industries in which change has been most influential. The analysis has highlighted several industrial orders that have experienced significantly different levels of employment change in West Yorkshire than in Great Britain. Efforts must now be directed towards the thorough investigation of employment change in these industries, in order to develop a better understanding of the factors influencing employment growth or decline in the West Yorkshire economy.

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