

An index of industrial production for Wales

The first publication ⁽¹⁾ this autumn of an index of industrial production for Wales in one sense completed the set for the constituent countries of the United Kingdom. This article describes briefly the method of compilation of the index, highlights the particular difficulties encountered during the compilation and goes on to look at some of the more interesting trends revealed in the final figures.

METHOD OF COMPILATION

It was clearly desirable that the form of the Welsh index should be kept as closely comparable to that of the United Kingdom index as possible. Thus the chosen base year was 1963 and the weights allocated to the various industrial groupings were derived from their respective net outputs in the Census of Production for that year. The only SIC order where the weighting was not a straightforward procedure based on published information was 'construction' where more elaborate estimates had to be made from unpublished sources.

The Welsh weights shown in Table 1 illustrate the structural peculiarities of the Welsh economy; thus 'mining and quarrying' has a weight of 142 compared with 56 in the UK index and, even more striking, 'metal manufacture' has a weight of 227 compared with 60 in the UK index. The reverse is best illustrated by 'engineering and allied industries' with a weight of only 167 in Wales compared with 313 in the UK index. The effects of these structural differences are discussed later.

The 1968 Standard Industrial Classification (SIC) has been used in the compilation of the index whenever possible but in many cases assumptions have had to be made in converting earlier figures based on the 1958 Classification. These assumptions are unlikely to have changed the general pattern of any of the component indices but might well have influenced their detailed behaviour at the point of transition. All current figures are obtained on the 1968 basis so that this difficulty will not recur.

INDICATORS USED

The usual difficulties of definition, changes in product mix, timeliness, etc., encountered in the computation of an index for a 'complete' economy such as the UK economy were also met in the case of a 'partial' economy such as the Welsh economy; but extra problems arose due to the way in which information on industrial production in some industries has been available only on an enterprise rather than an establishment basis. This left large gaps in the coverage necessary for a comprehensive Welsh index. Thus, while reliable information was available from within Government sources for the output of mining and quarrying, ferrous metal manufacture, coal and petroleum products, construction,

gas, electricity and water, there was only partial information readily available on the remaining industries. Three main types of information were used to extend the coverage: information on particular industries collected by the Business Statistics Office; information obtained direct from firms or trade associations; and information on employment within certain minimum list headings. This last type of information was used only when no other source was available and efforts are being made to reduce the number of employment indicators which are necessary.

Eighty-six separate sub-indices were calculated in the course of compilation of the overall Welsh index and these were combined into sixteen published indices as shown in Table A. The reasons for this combination were twofold (a) in order to maintain comparability with the published UK index and (b) in some cases to preserve confidentiality. The way in which the indicators are divided between output and employment series is also indicated in this table. It should be noted that six of the

TABLE A

Index	Output indicators		Employment indicators	
	Number	Weight per 1,000	Number	Weight per 1,000
Mining and quarrying ..	4	142	—	—
Food, drink and tobacco ..	2	13	7	28
Coal and petroleum products	2	16	—	—
Chemicals and allied industries	4	45	1	2
Ferrous metal manufacture	2	192	1	6
Non-ferrous metal manufacture	1	20	1	9
Mechanical and instrument engineering	—	—	9	48
Vehicles (including aircraft)	1	10	2	20
Other engineering and metal goods NES ..	4	11	3	23
Textiles, leather and fur, clothing and footwear	5	48	9	22
Bricks, pottery, glass, cement	2	10	2	11
Timber, furniture, paper, printing and publishing	4	14	5	21
Other manufacturing industries	1	5	4	21
Construction	1	128	—	—
Gas, electricity and water	3	80	—	—
All manufacturing industries	28	384	50	265
Total all industries ..	36	734	50	265

⁽¹⁾ *Digest of Welsh Statistics* No. 16, 1969

indicators which are listed as 'output indicators' in fact combine both employment and output data—these six indicators have a combined weight of sixty-nine per thousand. It is seen that, even though 50 of the 86 sub-indices are employment series, output series account for over 70 per cent of the overall weight of the All Industries index for Wales. This percentage will be steadily raised as more output indicators become available from the new quarterly inquiries initiated by the Business Statistics Office.

Some of the output indicators are in terms of physical volume of output and others are in terms of value. These value series were deflated by the most appropriate price index available. UK price indices were used for this purpose but it is considered unlikely that the lack of separate Welsh indices for this purpose causes any distortion. The crude employment series needed to be adjusted for productivity changes. This again was done on a UK basis and much less confidence is felt in this type of estimate—there would, however, seem to be no better alternative available.

The index is calculated on a quarterly basis and, at present, only figures unadjusted for seasonal effects are given for the sixteen published industrial groupings. For the All Industries index and for the Manufacturing Industries index, however, seasonally adjusted figures are also given. These seasonal adjustments are made using the same method as that employed for the adjustment of the UK index. Because most of the series given in Table 1 are not seasonally adjusted the presentation is such as to make comparisons between similar quarters more convenient. This, of course, makes it more difficult in this table to follow the trend in the two seasonally adjusted series; figures 1 and 2 are more useful for this purpose.

MOVEMENT OF WELSH INDEX 1963-70

Figure 1 shows the quarterly movement of the All Industries index for Wales compared with the All Industries index for the UK. Until the third quarter of 1968 the Welsh index rose at a faster rate than the UK index and at that date was seven points higher [127 to 120]. Since then, however, a rise of four points in the UK index has not been matched in Wales, where there has been a drop of five points leaving the Welsh index currently [first quarter of 1970] two points below the UK index. A contributory factor to this fall was the relatively steep decline in the heavily-weighted mining sector during 1969. Figure 2 which plots the Manufacturing Industries index quarterly over the same period shows however a similar overall pattern—the Welsh index having reached a maximum excess over the UK index of twelve points [136 to 124] in the fourth quarter of 1968, since when the lead has fallen to four points [131 to 127] in the first quarter of 1970.

Figures 3-18 give the less detailed annual movements of the UK and Welsh indices for the sixteen industrial groupings. In no case is the overall trend substantially different, but the fluctuations are generally more violent in Wales than in the UK as a whole—as expected for a smaller economy more influenced by individual movements of particular products and particular firms. A particular feature is the performance of the ferrous metal index shown in Figure 7: because of its weight in

the Welsh economy, the comparative stagnation of this sector reduces the buoyancy of the All Industries index to a great extent. Chemicals and mechanical engineering, two of the sectors which helped the Welsh index to rise rapidly over the period 1963-68 did not maintain the same rate of progress in 1969 [see figures 6 and 9] and this, together with a down-turn in construction, was a major factor in the overall decline observed over the last year.

REGIONAL AND STRUCTURAL EFFECTS

One of the purposes of an index of production such as the Welsh index is to measure economic changes of a peculiarly regional nature. The observed differential changes in the Welsh index *vis-à-vis* the UK index can be considered as being due to two main causes. Firstly, even if each sector of the economy grew at the same rate in Wales as in the UK as a whole, the overall growth rate would be different due to the different initial weights of each sector. The difference between the observed Welsh index and that which would have emerged by using UK weights is defined as the structural effect. Secondly, even if UK weights are used to calculate an adjusted Welsh index, there is usually still a difference between this adjusted index and the UK index. This difference is defined as the regional effect. The observed difference between the Welsh index and the UK index is therefore the sum of these two components.

It is interesting to carry out these calculations for each year separately; the results are shown in Table B. One notable feature is that over the period 1963-68, the cumulative regional effect of +17.5 was substantially in excess of the cumulative structural effect correction of -11.7 giving a Welsh index approximately 6 points above the UK index by 1968. By 1969, however, the position had changed so that the cumulative structural and regional effects over the whole period were in balance leaving the Welsh index and the UK index fortuitously at the same level.

TABLE B

Period	Structural effect	Regional effect
1963-4	-1.7	+4.3
1964-5	-2.7	+2.8
1965-6	-2.7	+2.5
1966-7	-1.3	+2.0
1967-8	-3.3	+5.9
1968-9	-3.0	-2.8
Total 1963-9	-14.7	+14.7

Over the six-year period the structural effect has been remarkably consistent, implying that the industrial structure of Wales holds back growth as measured by the index to the extent of approximately 2½ points per annum. The regional effect was also fairly consistent in the opposite direction until 1968-9 when, for the first time, it reversed its sign. It will be interesting to see if this is a temporary phenomenon; calculations suggest that only a small part of the negative regional effect observed over that period could be accounted for by the

extended local stoppage in the steel industry in the summer of 1969.

DIVERSIFICATION OF THE WELSH ECONOMY

One reason given for the economic problems which have affected Wales and other development areas is their over-dependence on a few industries and one aim of regional policy under successive governments has been to reduce this dependence by means of diversification. The existence of a Welsh index enables one to obtain a crude measure of the effect of this policy.

Let us define δ_i as being the excess of the Welsh weight over the UK weight for the i 'th industrial grouping in the base year. Then $\sqrt{\frac{1}{k}\sum(\delta_i)^2}$ is one measure of the deviation of Welsh structure from UK structure where k is the number of industrial groupings. Now if we assume that the net output of a particular industry grows at the same rate as its output as measured by its index, we can define new Welsh and UK weights for any subsequent period as follows

$$\text{Welsh weight for } i\text{'th industry is } w'_i = \frac{w_i n_i}{\sum w_i n_i}$$

$$\text{UK weight for } i\text{'th industrial grouping is } W'_i = \frac{W_i N_i}{\sum W_i N_i}$$

We can further define the new Welsh excess for the i 'th industry as being

$$\delta'_i = w'_i - W'_i$$

At this time therefore we can also obtain a new measure of deviation i.e. $\sqrt{\frac{1}{k}\sum(\delta'_i)^2}$. The results of these calculations are shown in Table 4 where the units used are the root mean square deviations in parts per thousand. It must be emphasized that the new weights obtained by the above method are only very rough estimates of the 'true' weights for any year. Differential price changes and differing relationships between gross and net output in different sectors are not taken into account.

TABLE C

Date	Root mean square deviation
1963	51
1964	49
1965	47
1966	46
1967	44
1968	42
1969	39

The above table shows that the structure of the Welsh economy as defined in this way is becoming more similar to that of the overall UK economy. The sectors mainly responsible for the change are once again ferrous metal manufacture for which the δ values were 152 in 1963 and 119 in 1969, 'mining and quarrying' down from 86 to 54 and 'mechanical and instrument engineering' up from -51 to -26. These trends are to some extent confirmed by the provisional figures from the Census of Production for 1968⁽²⁾ which show a decline in the contribution to net output of metal manufacturing and a rise in the contribution of the engineering industries.

FUTURE DEVELOPMENTS

As information from the new-style quarterly inquiries becomes more comprehensive it will become possible to increase the proportion of the Welsh economy which is represented by output indicators and progressively to dispense with the less satisfactory employment indicators. In addition to the annual publication of the full index in the *Digest of Welsh Statistics* it is hoped to publish summarized information quarterly in the periodical *Trade and Industry* (incorporating the *Board of Trade Journal*). More detailed information on quarterly progress is available on request from the Welsh Office, Cardiff.

⁽²⁾ *Board of Trade Journal*, 2 September 1970

Welsh Office

APPENDIX

Table		Page
	Index of industrial production	42—43
 Charts		
Fig.1	All industries (seasonally adjusted)	44
Fig.2	Manufacturing industries (seasonally adjusted)	45
Fig.3	Mining and quarrying	46
Fig.4	Food, drink and tobacco	46
Fig.5	Coal and petroleum products	46
Fig.6	Chemicals and allied industries	46
Fig.7	Ferrous metal manufacture	47
Fig.8	Non-ferrous metal manufacture	47
Fig.9	Mechanical and instrument engineering	47
Fig.10	Electrical engineering	47
Fig.11	Vehicles (including aircraft)	48
Fig.12	Other engineering and metal goods n.e.s	48
Fig.13	Textiles, leather, fur, clothing and footwear	48
Fig.14	Timber, furniture, paper, printing and publishing	48
Fig.15	Bricks, pottery, glass and cement	49
Fig.16	Other manufacturing	49
Fig.17	Construction	49
Fig.18	Gas, electricity and water	49

APPENDIX

Index of industrial production (1)

TABLE 1

Average 1963=100

	Total all industries	Total all industries seasonally adjusted(2)	Mining and quarrying	Manufacturing industries								
				Total all manufacturing industries(2)	Total all manufacturing industries: seasonally adjusted(2)	Food, drink and tobacco	Coal and petroleum products	Chemicals and allied industries	Metal manufacture			
									Total	Ferrous	Non-ferrous	
Weights(3)	1000	1000	142	650	650	41	16	47	227	198	29	
<i>Annual indices</i>												
1964	111		105	113		100	113	132	108	107	114	
1965	114		94	119		105	120	147	113	113	114	
1966	115		93	120		106	129	145	109	109	112	
1967	117		91	121		105	123	156	104	104	105	
1968	125		89	132		109	130	162	108	108	109	
1969	123		78	131		108	148	160	101	100	109	
<i>Quarterly indices</i>												
Jan./Mar.	1964	110	107	113	109	106	100	110	133	100	97	114
	1965	119	116	101	124	121	101	117	146	119	119	116
	1966	118	115	92	123	120	108	132	136	115	115	117
	1967	119	115	94	122	118	104	129	157	105	105	110
	1968	126	122	97	131	127	114	122	166	100	98	113
	1969	130	125	84	139	135	108	152	167	117	117	115
	1970	126	122	78	135	131	109	156	156	107	107	106
Apr./June	1964	113	110	109	115	111	104	114	138	111	111	122
	1965	114	111	90	120	116	108	119	151	114	114	113
	1966	119	116	97	125	121	113	130	153	116	116	119
	1967	121	118	99	126	121	108	126	162	109	108	112
	1968	127	124	95	135	130	109	132	161	113	114	109
	1969	125	121	80	135	130	106	148	163	110	110	111
July/Sept.	1964	105	113	92	107	115	100	111	123	109	110	102
	1965	106	115	82	110	119	102	119	137	109	109	105
	1966	107	116	82	113	122	100	126	136	105	106	99
	1967	108	117	82	111	121	98	112	145	98	99	92
	1968	116	127	80	123	133	102	129	154	106	107	98
	1969	111	120	70	116	127	102	144	145	84	82	98
Oct./Dec.	1964	116	114	106	119	118	98	116	135	111	110	118
	1965	118	116	101	122	121	111	123	153	111	109	121
	1966	115	114	99	119	117	104	129	153	98	95	113
	1967	120	119	91	126	124	111	125	157	105	104	105
	1968	129	127	85	138	136	109	137	170	114	113	116
	1969	126	124	77	134	132	114	149	164	94	92	110

(1) The index measures changes in the volume of industrial production in Wales and is based on the year 1963 as 100.

(2) The All Industries index and the Manufacturing Industries index are given unadjusted and with seasonal adjustments; the other component indices are only given unadjusted for seasonal effects.

(3) The weights used are derived from the net outputs of the industries as given in the Census of Production for 1963.

Index of industrial production

TABLE 1 (continued)

Average 1963=100

Manufacturing industries (continued)											
Engineering and allied industries											
Total	Mechanical and instrument engineering	Electrical engineering	Vehicles (including aircraft)	Other engineering and metal goods n.e.s.	Textiles leather, fur, clothing and footwear	Timber, furniture, paper, printing and publishing	Bricks, pottery, glass, cement, etc.	Other manufacturing industries	Construction	Gas, electricity and water	Weights
167	48	54	30	34	70	35	21	26	128	80	
											<i>Annual indices</i>
114	119	113	112	109	109	113	135	118	114	104	1964
124	145	109	122	120	108	117	148	124	114	110	1965
134	158	117	147	115	103	124	146	123	115	113	1966
133	167	121	124	114	107	135	171	130	126	115	1967
151	204	133	132	122	126	147	183	150	134	124	1968
155	207	142	141	115	128	163	163	156	127	129	1969
											<i>Quarterly indices</i>
110	113	111	113	103	113	111	128	115	108	112	1964
132	161	118	123	120	116	119	149	129	108	122	1965
134	159	118	143	117	111	125	152	131	116	128	1966
136	162	122	142	116	112	128	144	132	126	126	1967
155	206	138	136	126	130	148	208	151	135	135	1968
160	215	144	144	121	132	162	172	162	118	151	1969
154	195	146	147	115	138	167	157	164	125	155	1970
											1964
115	117	116	96	111	111	116	135	119	113	106	1965
125	141	113	121	123	108	117	154	128	113	110	1966
138	161	125	144	120	102	128	150	132	114	115	1967
141	171	127	145	120	108	139	161	135	124	118	1968
151	203	135	131	123	126	144	213	159	134	120	1969
156	204	146	143	116	131	164	164	158	124	121	1969
											1964
103	101	104	101	105	99	103	130	109	117	93	1965
110	126	95	111	110	94	108	137	112	118	98	1966
124	146	107	143	104	93	114	140	107	115	98	1967
118	151	108	102	103	93	128	182	114	125	100	1968
137	187	120	119	111	117	135	145	132	136	105	1969
139	188	125	127	104	112	154	157	140	131	105	1969
											1964
128	144	123	120	120	113	122	147	128	118	107	1965
130	152	111	133	129	114	125	151	127	118	112	1966
140	167	120	157	118	106	130	142	123	117	112	1967
138	185	126	107	117	116	146	196	139	128	118	1968
160	221	138	141	129	130	163	163	158	132	136	1969
164	219	151	150	120	138	171	161	164	135	137	1969

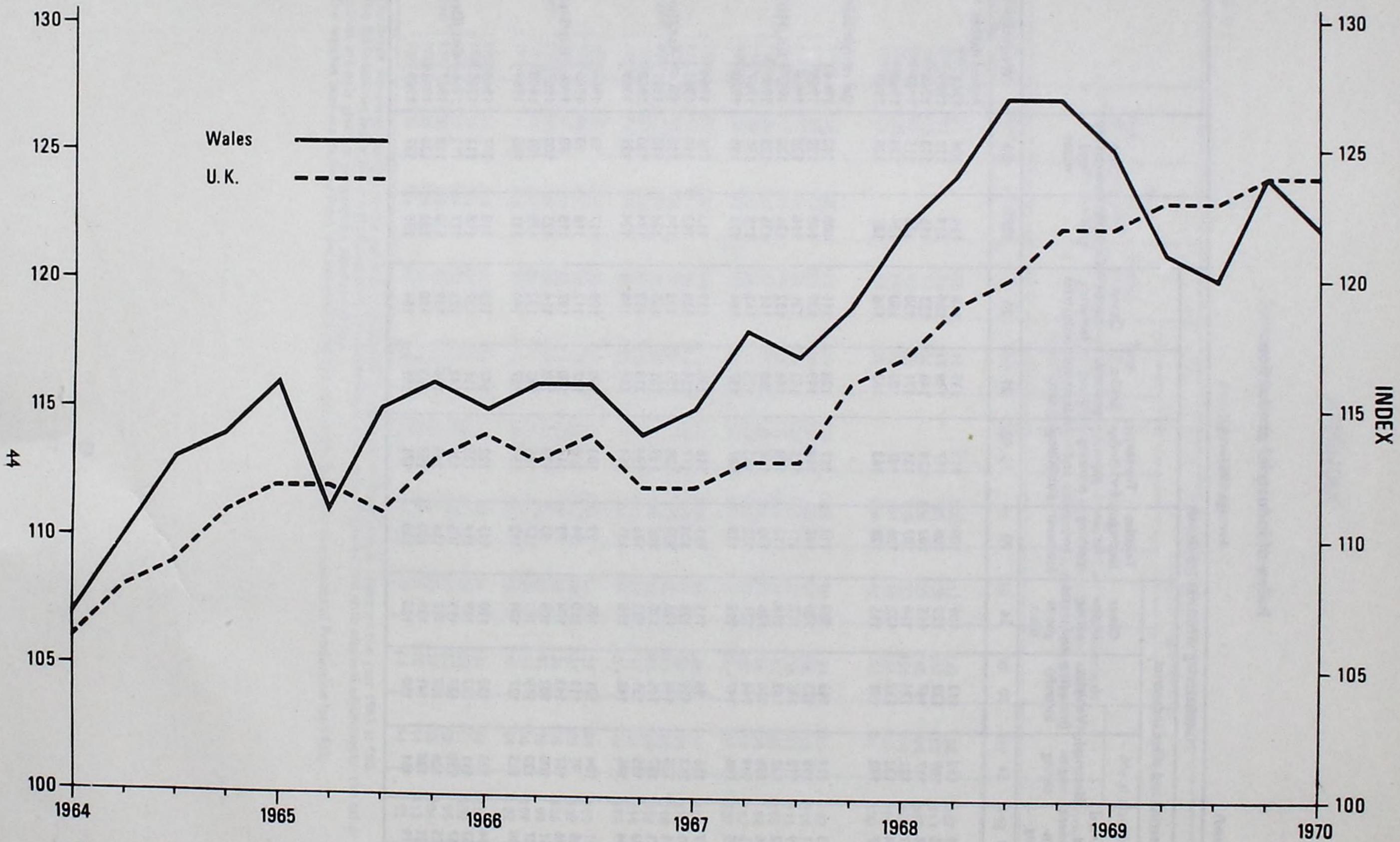


Fig.1 Index of Industrial Production : All Industries (seasonally adjusted)

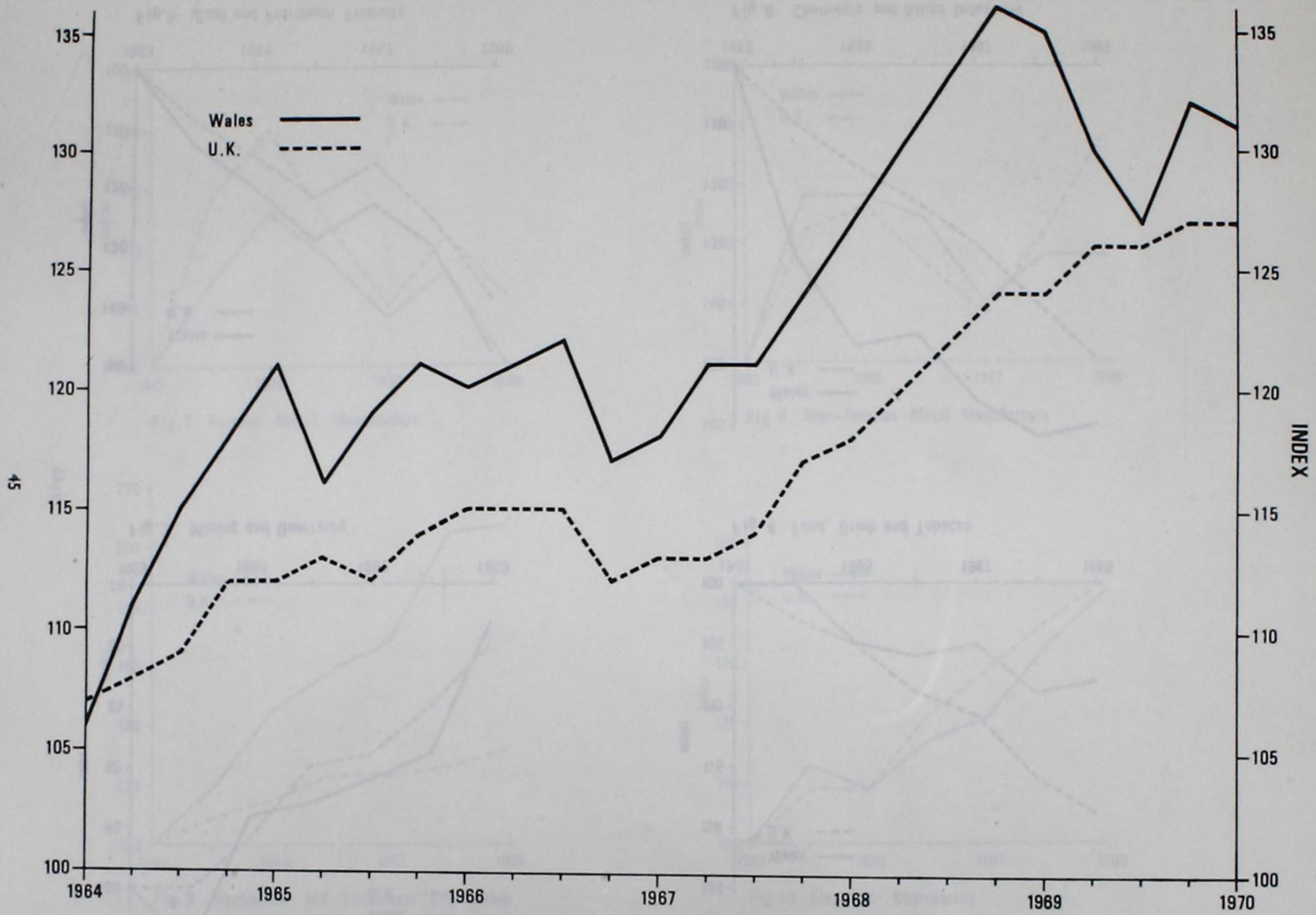


Fig.2 Index of Industrial Production: Manufacturing Industries (seasonally adjusted)

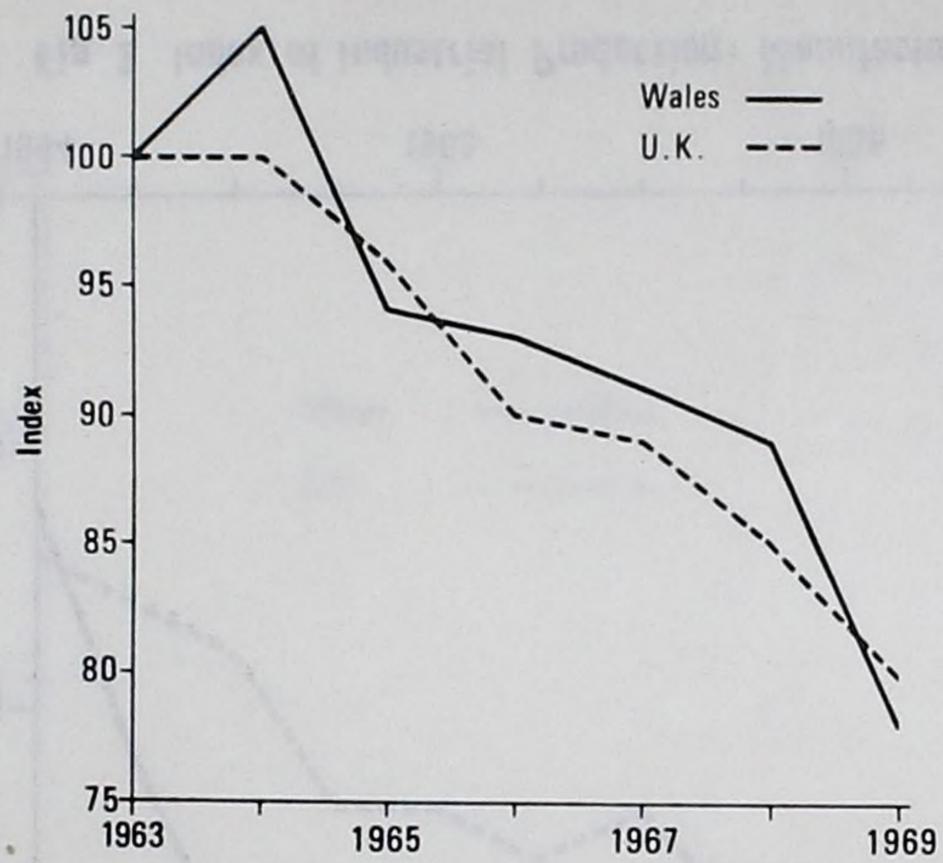


Fig.3 Mining and Quarrying

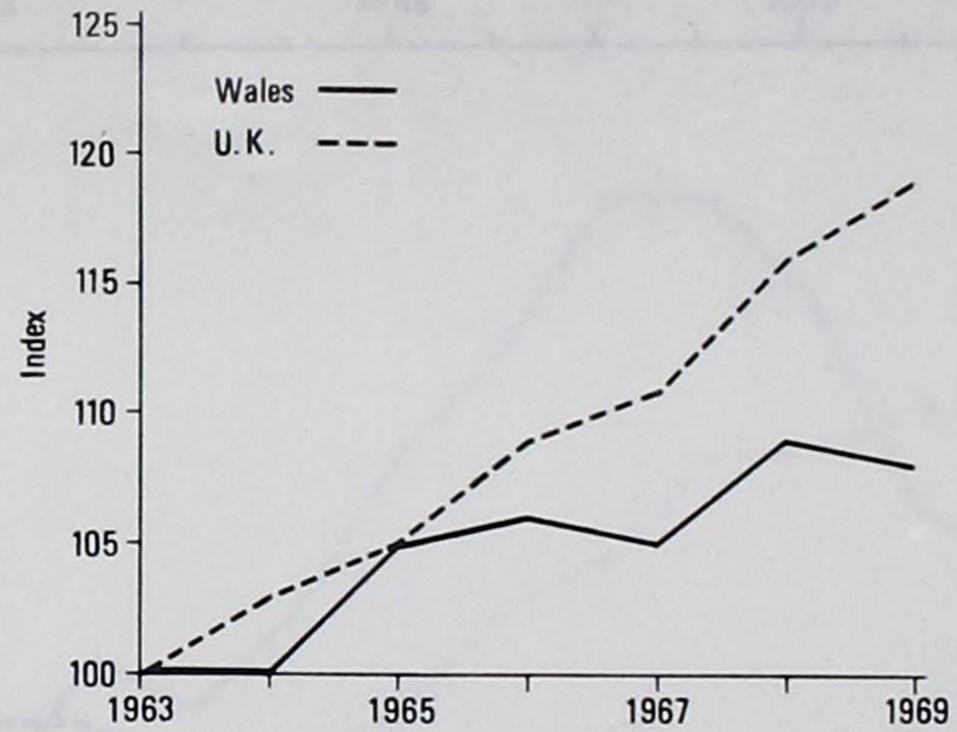


Fig.4 Food, Drink and Tobacco

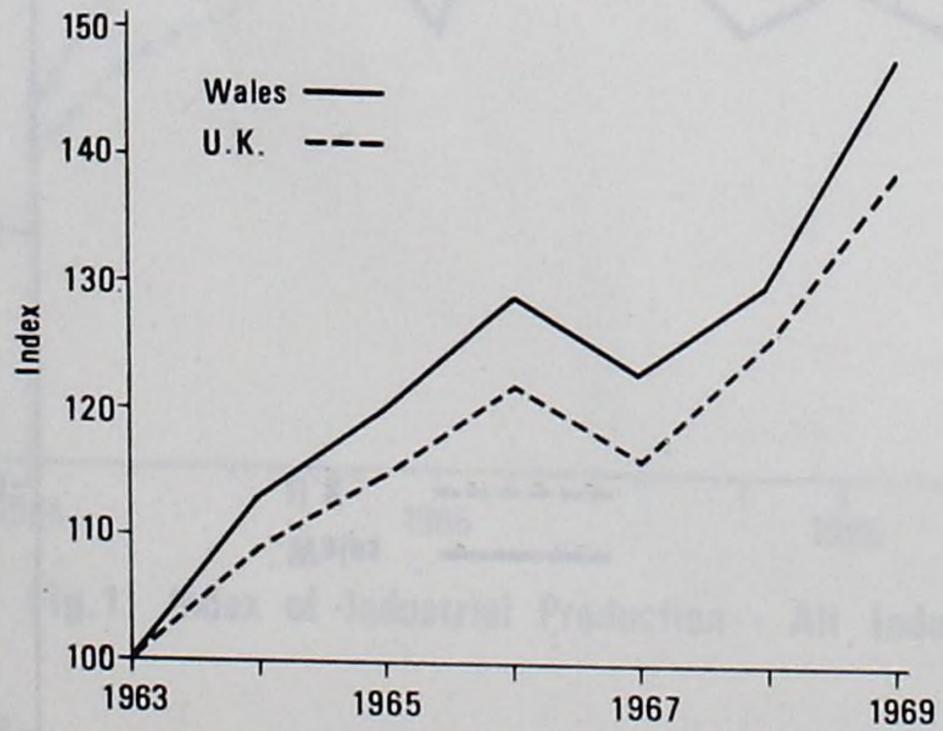


Fig.5 Coal and Petroleum Products

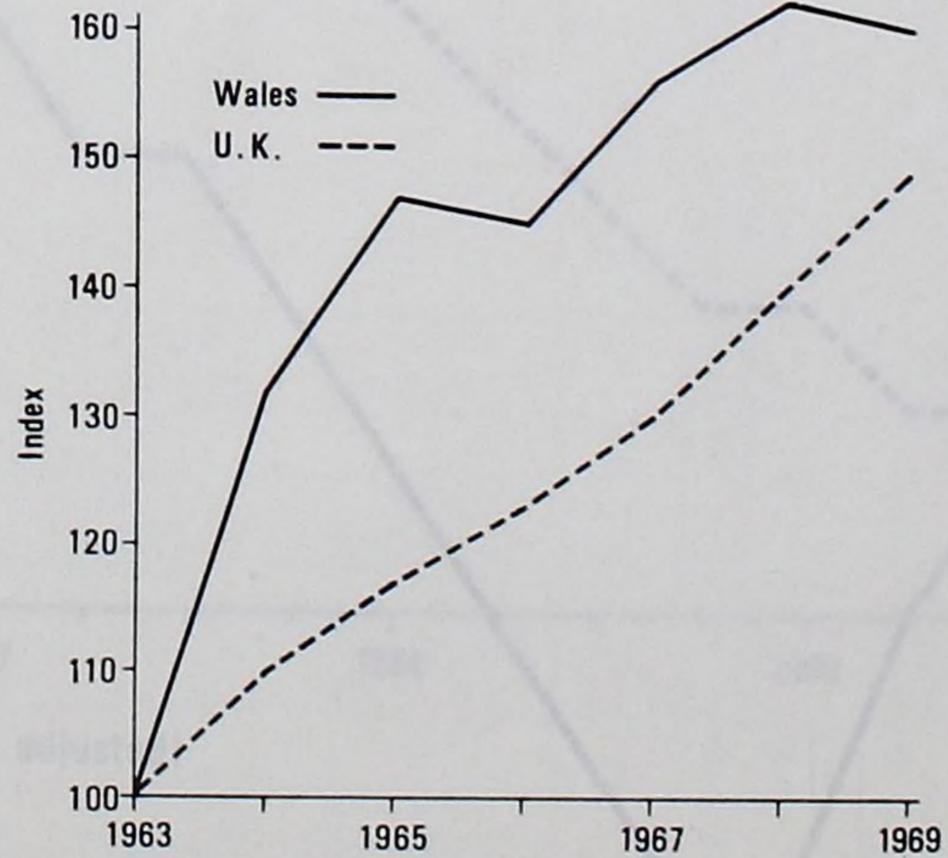


Fig.6 Chemicals and Allied Industries

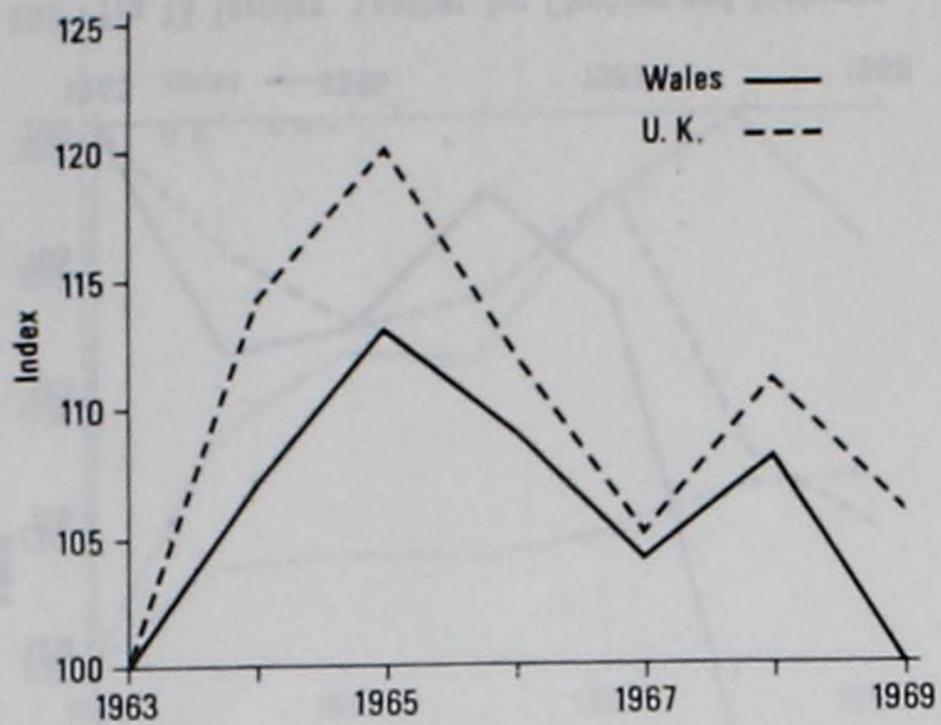


Fig.7 Ferrous Metal Manufacture

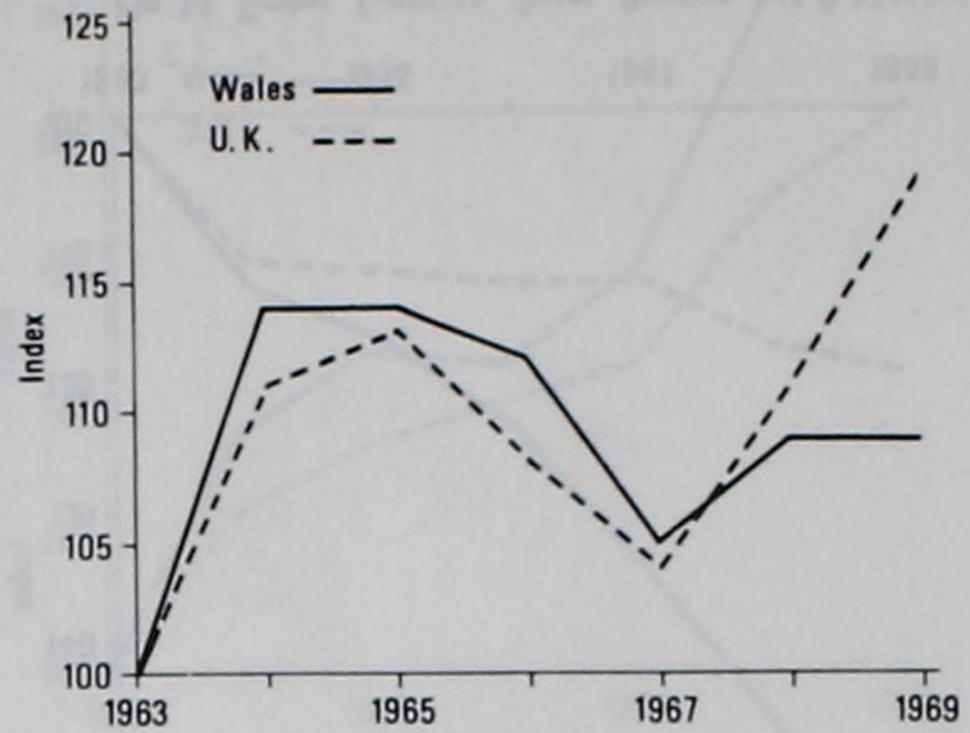


Fig.8 Non-Ferrous Metal Manufacture

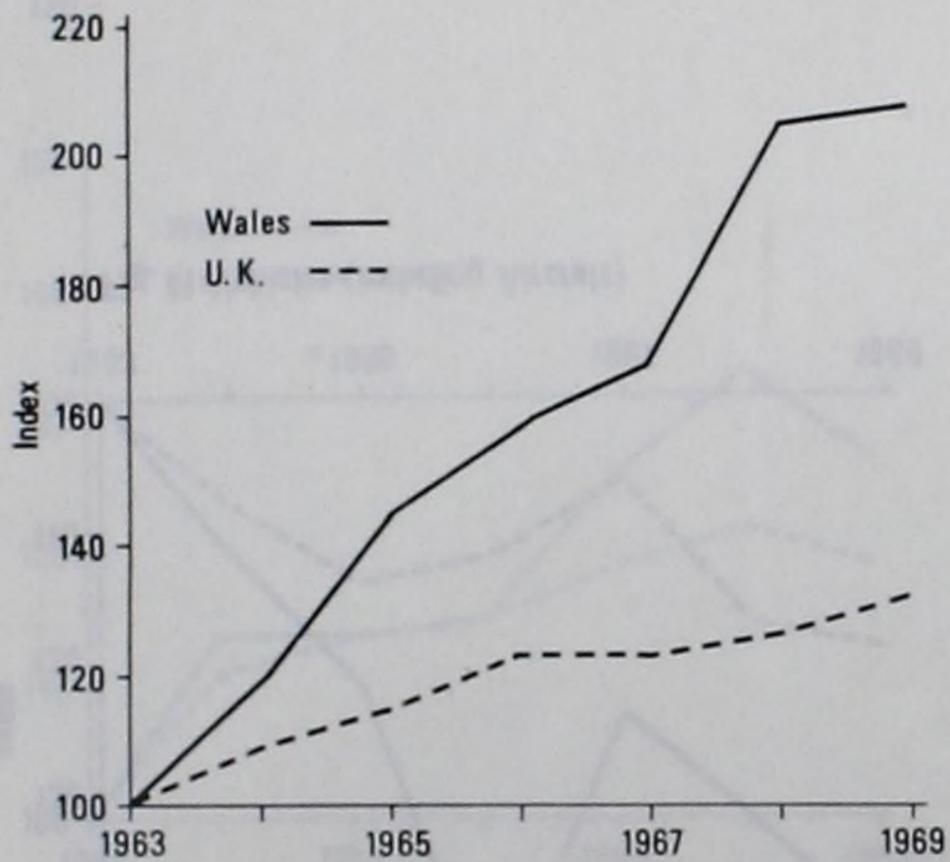


Fig.9 Mechanical and Instrument Engineering

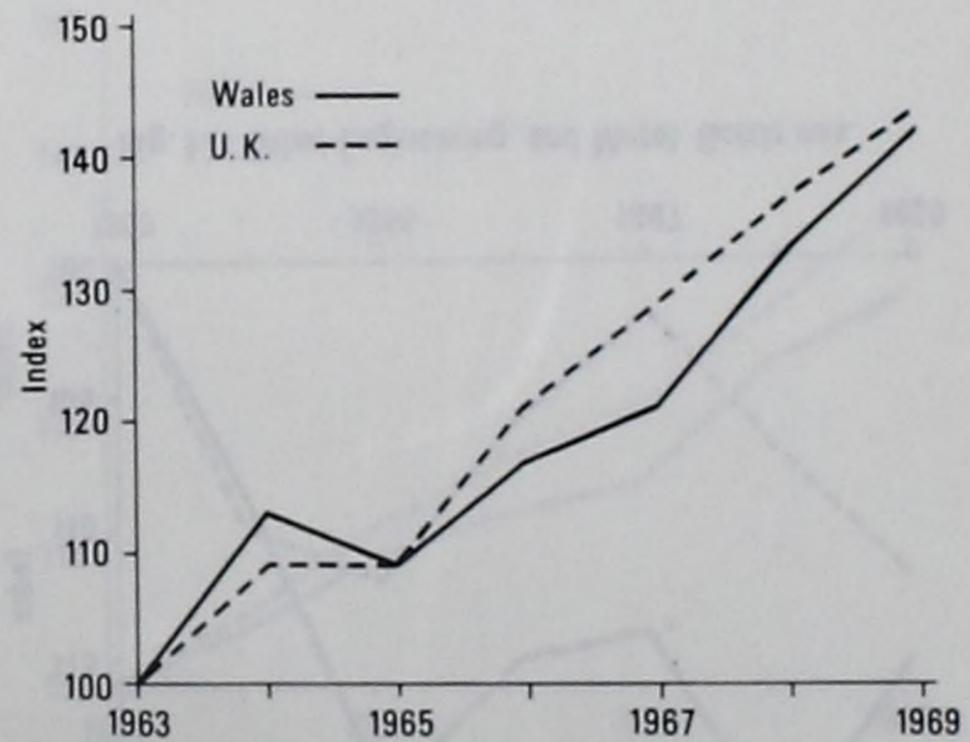


Fig.10 Electrical Engineering

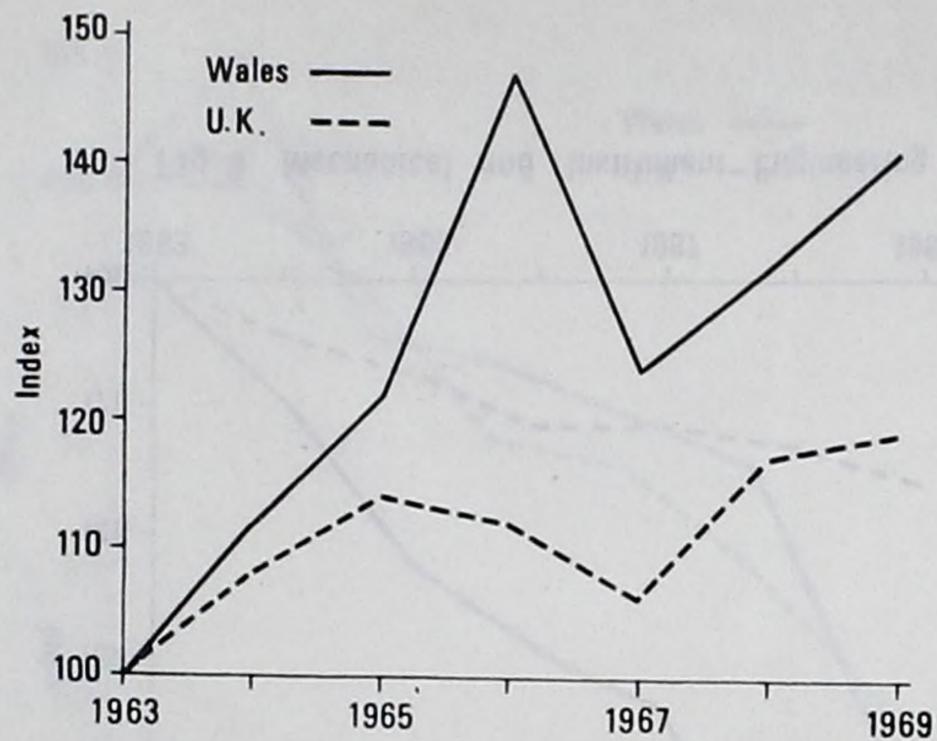


Fig. 11 Vehicles (including Aircraft)

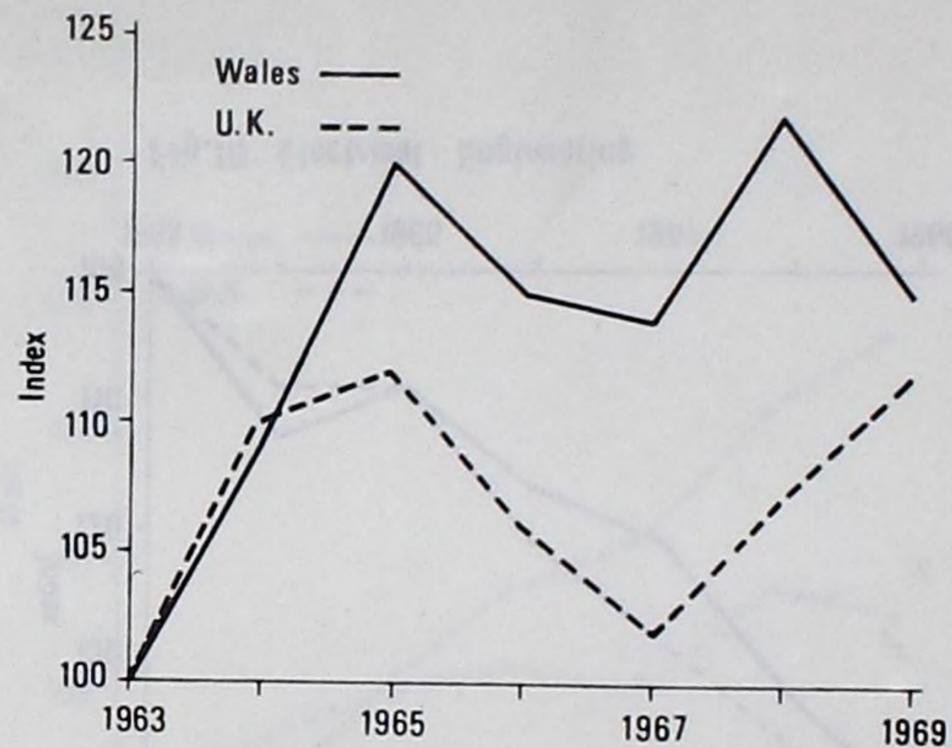


Fig. 12 Other Engineering and Metal Goods nes.

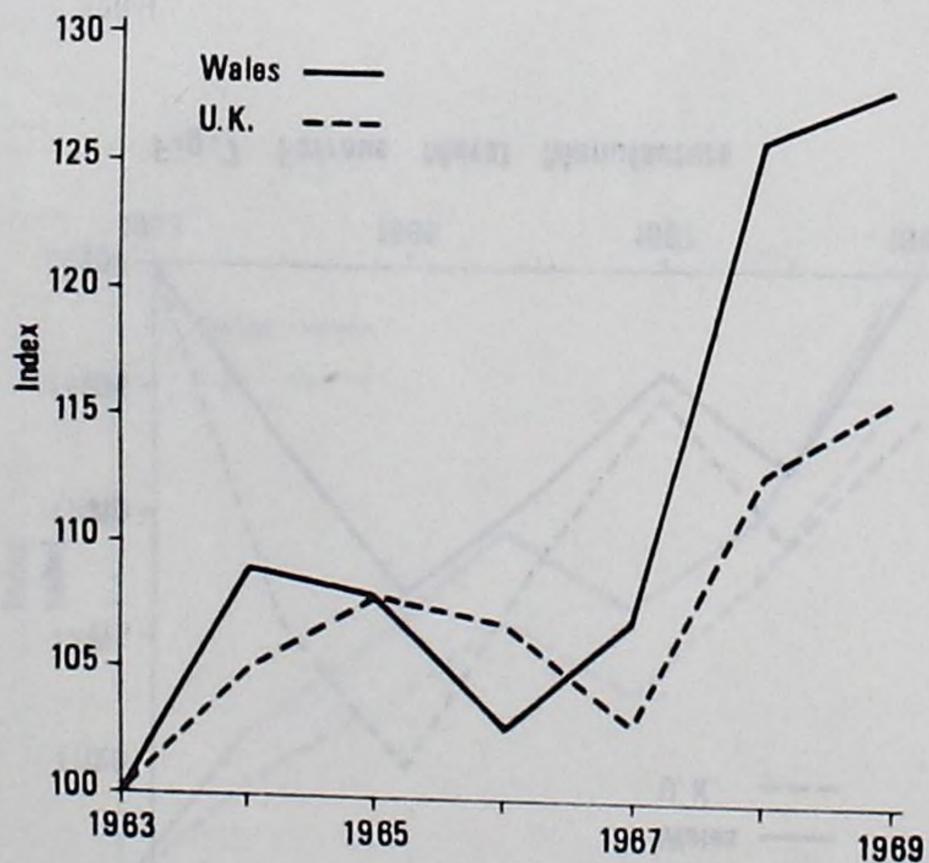


Fig. 13 Textiles, Leather, Fur, Clothing and Footwear

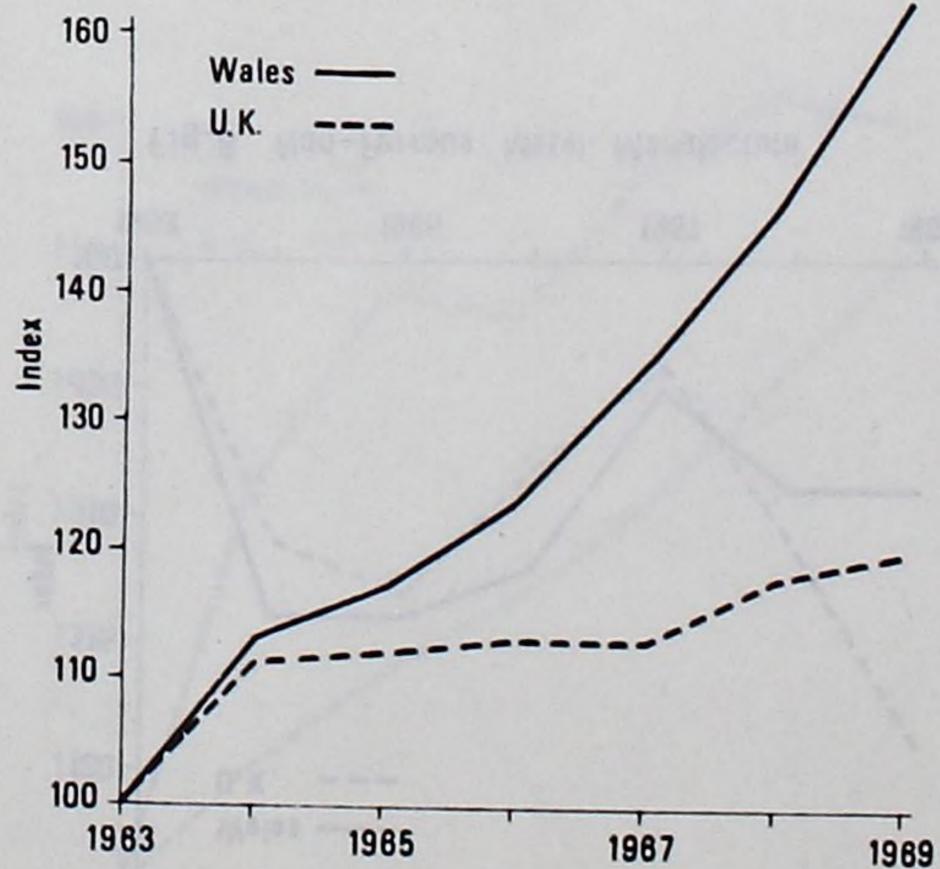


Fig. 14 Timber, Furniture, Paper, Printing and Publishing

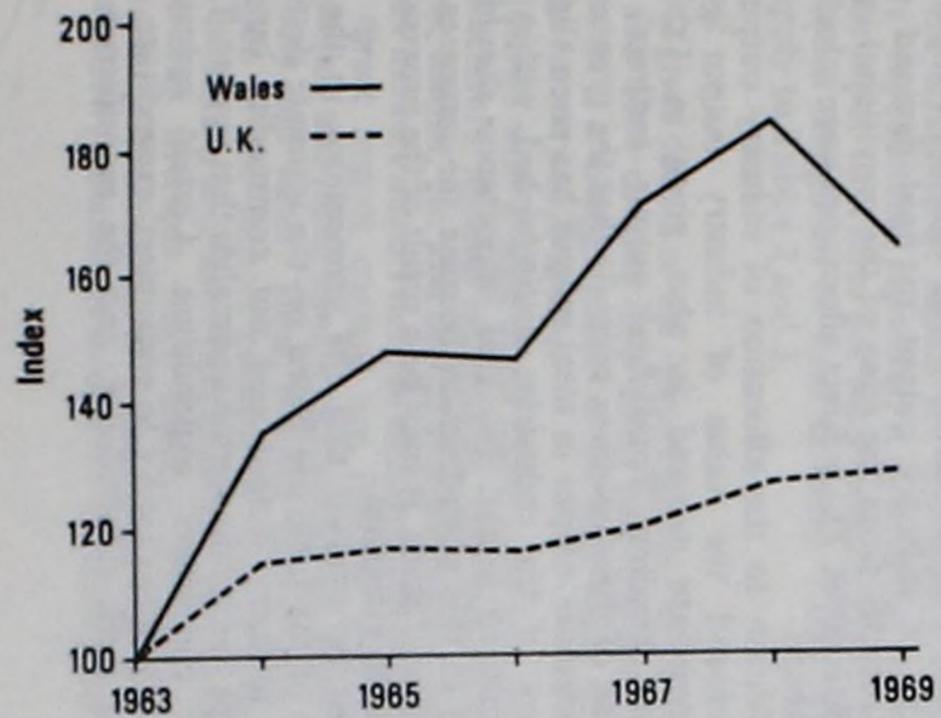


Fig. 15 Bricks, Pottery, Glass and Cement

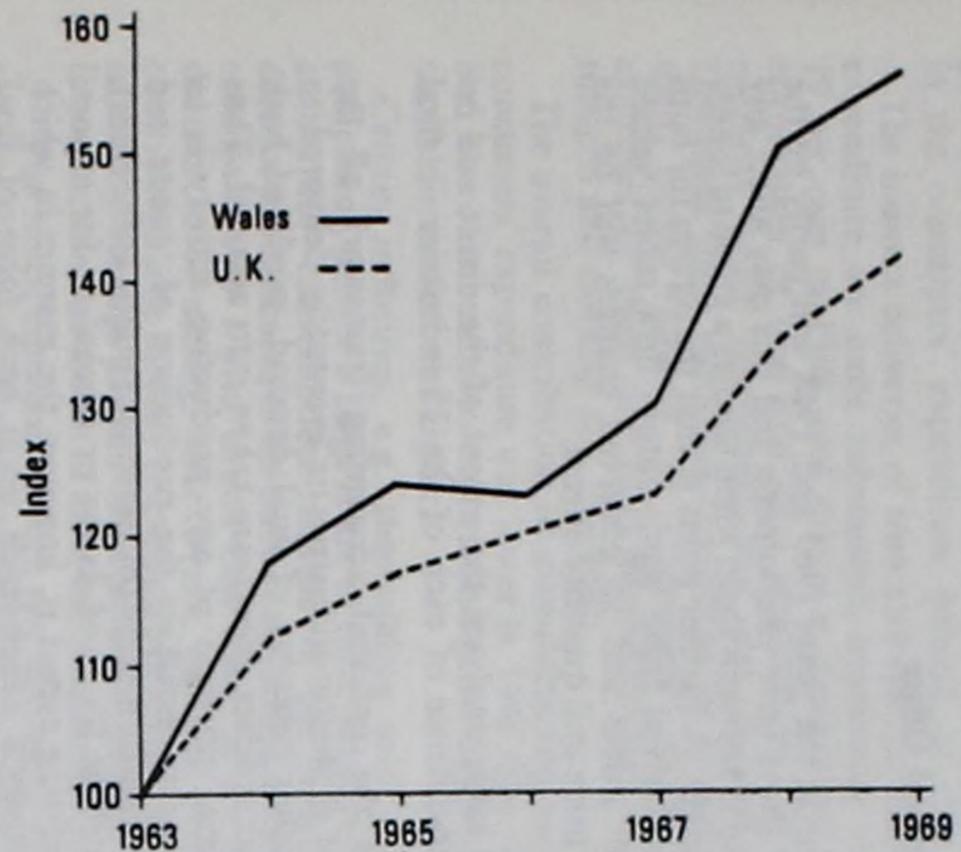


Fig. 16 Other Manufacturing

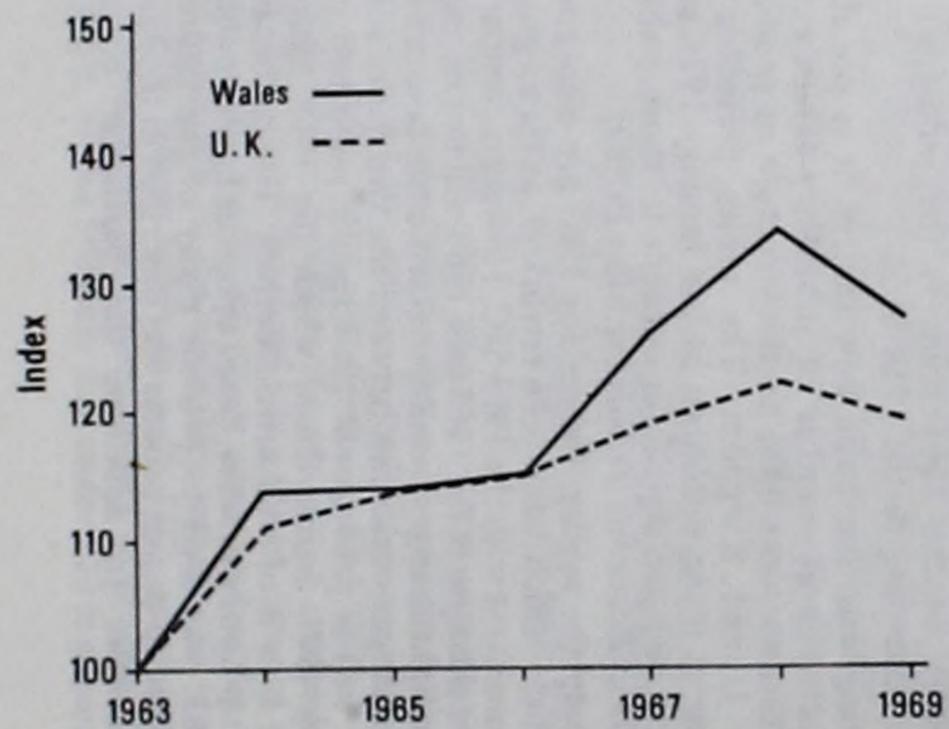


Fig. 17 Construction

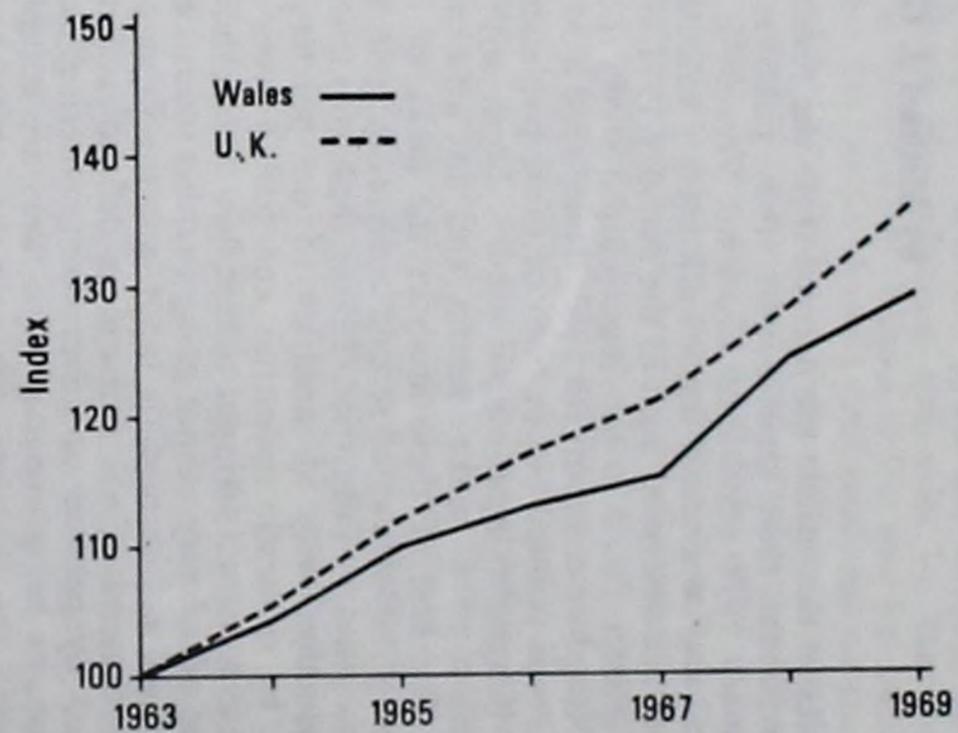


Fig. 18 Gas, Electricity and Water