Economic Perspective 1

ELECTRONICS EMPLOYMENT IN SCOTLAND

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Introduction

Constructing an accurate record of electronics employment in Scotland faces four difficulties of definition. There is first the problem of which SIC divisions or classes to include. Microelectronic technology is now a feature of a wider range of goods than before. Secondly, there is the problem of assigning whole establishments to SIC headings when their products are heterogeneous. In practice whole establishments may be reclassified on the basis of less than complete changes in the nature of their production. Thirdly, SIC classifications have themselves changed, reflecting the evolution of technology and products in industry itself. Fourthly, time series data on establishments (chiefly SCOMER) usually classifies past employment of establishments to their current activity. This final problem has been partly overcome by the development of data classifying establishments to their activity in each particular year by the Industry Department for Scotland (see IDS 1986b). These qualifications should thus be borne in mind when discussing electronics employment.

They do not, however, prevent us developing a general picture of trends in electronics employment in Scotland which is relevant both to the formulation of economic and industrial policy and to the wider public debate about economic change and its impact on society. Electronics has been seen as very important in Scotland because it has been identified as a new, high technology industry which has the prospect to replace the wealth creation, skill generation and employment lost as a result of the decline of older staple industries like coal mining, steel manufacture, shipbuilding and heavy engineering. It is therefore interesting to compare aspects of employment in electronics with manufacturing as a whole in Scotland, to examine just what the absolute contribution of electronics has been, and how it compares with other industries.

Net employment growth

Table 1 shows various (differing) estimates of electronics employment. It can be seen that the growth of electronics employment has tended to occur in waves of development: the 1960s saw the growth of the industry from a relatively minor activity, accounting for about 1% of manufacturing employment to one employing over 30,000 (over 40,000 according to the SCOMER classification) workers: around 5% of manufacturing employment. During the 1970s employment stagnated and probably fell, but any fall was less rapid than that occuring in manufacturing employment generally. At some point in the late seventies, before 1978, electronics employment picked up again. Between 1980 and 1982 employment faltered once again, falling from a peak of 43,100 in 1980 to 39,700 in 1982 according to the IDS 'consistent' series. Since then there has been renewed growth.

In each of these periods of expansion overseas investment has been important, so that almost half the industry, in terms of employment is overseas owned, mostly by US, enterprises. In the late 1960s, companies such as Motorola, National Semiconductors, General Instruments, Hughes Microelectronics and Hewlett

Packard arrived. Figures from the 1973 Scottish Council Database suggest that by then 37% of electronics employment was US owned. IDS estimates for 1978 put the figure at 33%. Between 1978 and 1985 US owned employment increased by over one third, while UK owned employment decreased slightly so that by 1985 42% of electronics employment in Scotland was US owned (IDS, 1986b, p11).

Table 1 Estimates of electronics employment 1945-1985 (thousands)

Date	A Survey & Censuses	B Industry Dept for Scotland Consistent Series (SCOMER) (SIC 1980)	C SCOMER, Latest Classification 1966-1978(1968 SIC), 1978-1985 (1980 SIC)
1945	3		
1959	7		
1966			41
1968			48
1971	37		48
1973			49
1978	34) *	39	48
	37)		45
1979		42	48
1981	38	41	43
1983		43	41
1984	42	45	43
1985		44	44

Sources:

A 1945, 1959 see Crawford (1984); 1971, 1978: Census of Employment on the 1968 SIC basis; 1978, 1981, 1984: Census of Employment on 1980 SIC basis. See also Table 9.1 Firn and Roberts (1984).

B IDS based on SCOMER using 1980 SIC classification of establishment at relevant employment year. See IDS (1986b) (ie plants which **at the time** produce(d) electronics goods).

C SCOMER 1968 or 1980 SIC definition based on latest known establishment classification (ie plants which **now** produce electronics goods).

* The two figures for 1978 are based on Census of Employment results calculated on 1968 SIC (34,000) and 1980 SIC (37,000).

Definition of Electronics:

1968 Minimum list headings 354, 363-367
1980 Activity Headings 3302, 3433, 3441-3444, 3453, 3454, 3710, 3732.

Table 1 columns B and C show that employment in establishments **currently** classified to electronics has **fallen** from around 48 thousand in 1979 to its 1985 level of 44 thousand. On the other hand electronics employment (ie employment in establishments classified to electronics in the relevant year has grown from around 39 thousand in 1978 to a peak of nearly 45 thousand in 1984. These differences arise because of the two different ways employment change came about: from the change in the nature of establishment's production, so that they become part of the electronics industry, and through changes in the employment levels of establishments in the industry. Thus, while employment in electronics activity was growing between 1979 and 1985, employment in the establishments where that activity was now taking place had fallen over the period. For example, watch and clock manufacture, previously seen as instrument engineering, is now clearly part of the electronics industry due to the extensive use of microchips. The reclassification has boosted electronics employment despite the fact that many watch and clock manufacturers have cut their labour force. These two distinct employment trends suggest that growth in electronics employment is associated with the loss of other forms of employment which are displaced by technological innovation. In other words, growth in electronics jobs is not a simple net gain.

Gross components of employment change

Nor is electronics employment a process of steady expansion. Net changes in electronics employment result from two contradictory components which make up that change: that is the addition of new electronics employment and the loss of established electronics jobs. It is a simple but important point that overall employment change within manufacturing is not caused just by old industries losing jobs, and new industries creating them. Rather, it is the balance between job losses and gains in each type of industry which is important. The fact that this is not always appreciated perhaps leads to too much optimism when new electronics establishments are opened, and conversely too much pessimism when they are shut. Neither event necessarily means the industry as a whole is gaining or losing jobs. This process can be understood

better by examining the components of change of electronics employment in Scotland, and comparing it with other industries.

Table 2 Components of change of electronics employment, Scotland 1978-85

1978 Stock of employment		38,190
Openings 1978-85	+	6,763
Expansions 1978-85	+	13,480
Contractions 1978-85	-	7,650
Closures 1978-85	-	8,370
1985 stock		42,410

Source: IDS Consistent Data Series: IDS 1968b, Table 3.

Notes

1) Components of change netted across two periods 78-81 and 81-85
2) excludes four establishments and associated employment which opened and closed between 1981 and 85
3) includes changes due to reclassification of establishments.

Table 2 shows components of change between 1978 and 1985, during which period electronics employment grew by 11%. In order to do so new jobs equivalent to over half the industry's stock of 1978 employment were added, meanwhile the equivalent of two-fifths were lost. This suggests that the components of employment change are very substantial.

Table 3 Gross components of employment change 1968-77, Scotland: manufacturing

	Openings & expansions as % of 1968 stock	Closures & contractions as % of 1968 stock	1968 stock (000s)
Electronics	101	98	45
Staple industries	46	74	167
Greater Glasgow	49	81	167
All manufacturing	63	77	667

Source: SCOMER, 1968 SIC definition, classified to latest known activity; components summed on an annual basis.

Table 3 compares components of employment change in electronics and all manufacturing for the period 1968-77, using data from SCOMER. It shows that the components of employment change are fairly large for manufacturing as a whole but that for electronics they are substantially greater. Indeed in this period gross job loss in electronics was proportionately greater than in staple industries, or in declining conurbation areas like Glasgow! However, gross job creation was **also** much higher proportionate to its employment stock, electronics added twice as many new jobs as staples or establishments in Glasgow. This suggests quite a volatile 'boom and bust' employment pattern for electronics.

These figures cover a period when electronics employment was hardly growing. Table 4, based on quinquennial components

Table 4 Components of change over 5 year periods, as % of stock at start of period

	Instrument engineering	Electrical engineering	All engineering
1953-1958			
Openings	3	11	5
Expansions	47	37	12
Contrations	2	5	10
Closures	3	6	5
1958-1963			
Openings	7	18	8
Expansions	36	32	10
Contractions	3	6	13
Closures	1	4	9
1963-1968			
Openings	13	22	10
Expansions	32	26	14
Contractions	7	8	9
Closures	1	9	10
1968-1973			
Openings	11	12	8
Expansions	13	23	12
Contractions	16	18	12
Closures	9	9	14
1973-1978			
Openings	5	3	3
Expansions	7	16	10
Contractions	13	18	13
Closures	9	8	10

Source: Randall (1985), Table 1

of change calculated by Randall (1985)), confirms high levels of contraction and closures in electrical and instrument engineering (a broader industrial group, embracing about two thirds as much employment again as electronics alone) in the period 1968 to 1978, but show lower levels for earlier years.

Employment profiles

Another way of examining components of employment change is to look at employment profiles of groups of establishments. We can take the employment size of a group of establishments on opening, measure their subsequent employment performance (including those which have closed and therefore have zero employees) and then express this as a percentage over time of their initial employment. This gives us a good measure of the subsequent impact on employment of the growth of new establishments.

Analysis of profiles for various periods between 1960 and 1978 for electronics and other plants showed that all types of plant tend to generate employment growth for about the first four years as young establishments' growth outstrips the loss of jobs from establishments which decline and fail. After this peak these two components tend to roughly balance out, and ultimately job loss in declining and closing establishments leads to a net loss of jobs. However, the employment growth of electronics establishments was about three times greater than other establishments. In the late 1960s and early 1970s new electronics plants doubled their original employment, while others grew by less than one third, but electronics establishments shared the tendency with other establishments for employment growth to become weaker in the course of the 1970s. By the mid 1970s plants in the early expansion phase were adding only half the employment that plants at a similar stage in their development had added in the late 1960s and early 1970s.

Table 5 looks at some of these profiles in greater depth. It appeared that strong employment growth in electronics establishments came from a combination of factors: they were about twice the size of other opener establishments, the survivors grew faster than other establishments, and they were also less likely to close. When we recall the finding in Table 3 about the large negative component of change in electronics employment, this suggests that when contractions and closures do occur in electronics, they tend to involve large numbers of jobs at any one time. Analysis of the figures for components of change for the period 68-77 found that the average employment loss per contraction in the period was 89 for electronics establishments, and only 22 for all establishments. The average employment size of closing electronics establishments was 86 compared to 51 for all establishments.

The regional share of electronics employment

Table 6 compares electronics employment in Scotland and Britain as a whole, using the 1984 Census of Employment. it shows that Scotland's proportion of electronics employment is roughly similar to that of the UK as a whole. If there is such a thing as 'Silicon Glen' then there are also silicon valleys and silicon dales south of the Border. Indeed, the region with the greatest concentration of electronics employment is the South East, excluding Greater London, which has over a third of Britain's electronics employment and about double the average share.

Employment and productivity

Table 7 compares electronics employment and output in Scotland between 1978 and 1984. It shows that there has been very rapid growth in labour productivity, and that when output growth has faltered, employment has fallen. The latest output figures, which show an 11% fall in output in the first quarter of 1986 and a further fall of 4% in the second quarter must therefore give cause for concern about current employment prospects unless output recovers.

Discussion

A range of factors can be cited to partly explain the large components of change in electronics employment. Probably the

Table 5 Opener establishment employment performance, electronics and all manufacturing 1950–69 and 1966–75

	Electronics		All manufacturing	
	1950–69	1966–75	1950–69	1966–75
Main opener employment size	79	82	42	38
Total opener employment	7,900	9,200	144,800	91,900
Total employment growth year 5	219%	87%	35%	26%
% Survivors year 5	80%	77%	70%	72%
Mean survivor employment size year 5	314	203	80	66

Source: SCOMER, 1968 SIC definition, all establishments classified to latest known activity.

Table 6 1984 Electronics Employment: Scotland, South East England and Great Britain (in thousands)

	Scotland	South East England (excluding Greater London	Great Britain	Scotland as % of Great Britain	South East England (excluding Greater London) as % of Great Britain
Electronics	41.6	160.4	470.2	8.8	34.1
Manufacturing	433.7	917.1	5,326.6	8.1	17.2
All	1,903.9	3,755.2	20,845.9	9.1	18.0
Electronics as % of all	2.18	4.27	2.26		

Source: Census of Employment 1984; Department of Employment Gazette January 1987; 1980 SIC definitions.

Table 7 Employment, output and productivity

Electronics in Scotland (1980 SIC definition) 1978–1984. Indices 1980=100

Year	1978	1979	1980	1981	1982	1983	1984
Employment	91	97	100	94	92	99	104
Output	83	89	100	102	115	143	187
Productivity	91	92	100	109	125	144	180

Source: Employment: IDS (1986b), Output: (IDS 1986a)

most important is that Scottish electronics is mainly a capital goods industry. This means that fluctuations in demand for final products translate into larger swings in demand for the products of the electronics industry itself. The SDA Industry Database reported that 25% of companies had 50% plus spare capacity in 1985.

The nature of many of the jobs in the industry may also contribute to the fluctuation in numbers. Scottish electronics is not all about secure, interesting, highly paid jobs in factories on greenfield sites. The industry produces a range of jobs, some are highly skilled but many are relatively less skilled, repetitive and liable to be automated in the next few years (see the Economic Perspective by Walker in this issue of the **Commentary**). A worrying aspect of the industry in Scotland is the disappointingly low level of R & D expenditure outside the defence sector. The reduction or closure of a manufacturing facility is less costly to a company if their investment in training has not been extensive and if highly skilled and scarce R & D teams are not being broken up. The SDA Industry Database noted that 74% of reported R & D expenditure was undertaken by UK companies (in which defence sector activity is very important) while US companies accounted for only 24% of R & D despite these same companies accounting for over 70% of the turnover in the industry.

The multi-national enterprises (both UK and foreign-based) that are so important in the industry normally adopt global production and marketing strategies. In the face of changing market conditions or technology they choose from a wide range of options, from rationalisation via complete closure of selected branch sites to opening entirely new plant with substantial numbers of new jobs being created. It may be that where foreign ownership and low reliance on R & D go together then employment is made more vulnerable. This situation, in conjunction with above average plant size in the industry suggests a greater likelihood of major job losses or gains than would occur in indigenously controlled industries.

The electronics industry is very important in Scotland, but it is not a magic wand that can cure Scotland's industrial ills. it is essential that it is promoted and helped as an industry. The positive electronics image of Scotland and its ability to attract inward electronics investment, often through SDA and Locate in Scotland initiatives, benefits the Scottish economy. But in employment terms it is a small industry and its existence is no excuse for ignoring the plight of Scotland's traditional industries. From June 1979 to June 1986, Scottish manufacturing employment fell by 216,000, a figure that represents a loss of over 130 jobs every working day for seven years. Electronics is an important manufacturing industry but for every one job it gained in this period the rest of Scottish manufacturing lost over 50. An industrial policy that promotes our traditional as well as newer industries is essential to re-establish the health of the Scottish economy. Relying on sunrise industries like electronics is not enough.

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