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 occurring 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 established factories in Scotland.
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 1966-1985 (thousands)

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>1966</td>
<td>3</td>
<td>41</td>
</tr>
<tr>
<td>1968</td>
<td>7</td>
<td>48</td>
</tr>
<tr>
<td>1971</td>
<td>37</td>
<td>48</td>
</tr>
<tr>
<td>1973</td>
<td>37</td>
<td>41</td>
</tr>
<tr>
<td>1978</td>
<td>341 * 39</td>
<td>48</td>
</tr>
<tr>
<td>1979</td>
<td>3</td>
<td>45</td>
</tr>
<tr>
<td>1981</td>
<td>3</td>
<td>48</td>
</tr>
<tr>
<td>1983</td>
<td>4</td>
<td>41</td>
</tr>
<tr>
<td>1984</td>
<td>42</td>
<td>43</td>
</tr>
<tr>
<td>1985</td>
<td>44</td>
<td>44</td>
</tr>
</tbody>
</table>

Sources:


B IDS based on SCOMER using 1980 SIC classification of establishment at relevant employment year. See IDS (1986b) (ie plants which at the time produced 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 (31,000) and 1980 SIC (37,000).

Definition of Electronics:

1968 Minimum list headings 354, 363-367
1980 Activity Headings 332, 343, 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

<table>
<thead>
<tr>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1978</td>
<td>38,190</td>
<td>+ 6,763</td>
<td>+ 13,480</td>
<td>- 7,650</td>
<td>- 8,370</td>
<td>42,410</td>
</tr>
</tbody>
</table>

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.

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

<table>
<thead>
<tr>
<th>Year</th>
<th>Openings &amp; Closures as % of 1968 stock</th>
<th>Expansions &amp; Contractions as % of 1968 stock</th>
</tr>
</thead>
<tbody>
<tr>
<td>1968-73</td>
<td>101 96 45</td>
<td>32 26 14</td>
</tr>
<tr>
<td>1973-77</td>
<td>16   81 167</td>
<td>16 18 12</td>
</tr>
</tbody>
</table>

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

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

<table>
<thead>
<tr>
<th>Period</th>
<th>Instrument Engineering</th>
<th>Electrical Engineering</th>
<th>All Engineering</th>
</tr>
</thead>
<tbody>
<tr>
<td>1953-1958</td>
<td>3 11 5</td>
<td>47 37 12</td>
<td>3 6 5</td>
</tr>
<tr>
<td>1958-1963</td>
<td>7 18 8</td>
<td>36 32 10</td>
<td>3 6 13</td>
</tr>
<tr>
<td>1963-1968</td>
<td>13 22 10</td>
<td>16 18 12</td>
<td>1 9 10</td>
</tr>
<tr>
<td>1968-1973</td>
<td>11 12 8</td>
<td>13 23 12</td>
<td>9 9 14</td>
</tr>
<tr>
<td>1973-1978</td>
<td>5 3 3</td>
<td>7 10 10</td>
<td>9 8 10</td>
</tr>
</tbody>
</table>

Source: Randall (1985), Table 1

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

<table>
<thead>
<tr>
<th></th>
<th>Electronics 1950-69</th>
<th>Electronics 1966-75</th>
<th>All manufacturing 1950-69</th>
<th>All manufacturing 1966-75</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main opener employment size</td>
<td>79</td>
<td>82</td>
<td>42</td>
<td>38</td>
</tr>
<tr>
<td>Total opener employment</td>
<td>7,900</td>
<td>9,200</td>
<td>144,800</td>
<td>91,900</td>
</tr>
<tr>
<td>Total employment growth year 5</td>
<td>219%</td>
<td>87%</td>
<td>35%</td>
<td>26%</td>
</tr>
<tr>
<td>% Survivors year 5</td>
<td>80%</td>
<td>77%</td>
<td>70%</td>
<td>72%</td>
</tr>
<tr>
<td>Mean survivor employment size year 5</td>
<td>314</td>
<td>203</td>
<td>80</td>
<td>66</td>
</tr>
</tbody>
</table>

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)

<table>
<thead>
<tr>
<th>Scotland</th>
<th>South East England (excluding Greater London)</th>
<th>Great Britain</th>
<th>Scotland as % of Great Britain</th>
<th>South East England (excluding Greater London) as % of Great Britain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electronics Manufacturing</td>
<td>41.6</td>
<td>160.4</td>
<td>470.2</td>
<td>8.8</td>
</tr>
<tr>
<td>All</td>
<td>433.7</td>
<td>917.1</td>
<td>5,326.6</td>
<td>8.1</td>
</tr>
<tr>
<td>Electronics as % of all</td>
<td>2.18</td>
<td>4.27</td>
<td>2.26</td>
<td>34.1</td>
</tr>
</tbody>
</table>


Table 7  Employment, output and productivity


<table>
<thead>
<tr>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Employment</td>
<td>91</td>
<td>97</td>
<td>100</td>
<td>94</td>
<td>92</td>
<td>99</td>
<td>104</td>
</tr>
<tr>
<td>Output</td>
<td>83</td>
<td>89</td>
<td>100</td>
<td>102</td>
<td>115</td>
<td>143</td>
<td>187</td>
</tr>
<tr>
<td>Productivity</td>
<td>91</td>
<td>92</td>
<td>100</td>
<td>109</td>
<td>125</td>
<td>144</td>
<td>180</td>
</tr>
</tbody>
</table>

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.

References


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