TECHNOLOGY TRANSFER THROUGH STAFF MOBILITY: II

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In our previous article we examined staff who had left the Irish subsidiaries of a major multi-national company, to see how far they might possess the capacity to transfer technology when they moved [Onyenadum and Tomlin, 1984]. We showed that leavers could be divided into three groups: those with technician-level qualifications or lower, graduates with prior experience, and graduates who were recruited direct from university. Each group, for different reasons, was regarded as having ample potential for technology transfer.

In this article we examine the organizations they worked in after leaving, to see how far they might possess the capacity to receive technology. Our next article will deal with the extent to which the executive positions taken up by leavers facilitate transfer. It will be remembered from the previous article that only 116 out of 155 could be traced (and that only 82 of those traced could be interviewed). It is probable that a substantial proportion of those who could not be traced are now overseas. Our study is therefore confined to those who either remained in Ireland or returned to it.

Initial and Current Organisations

Table 1 shows their destinations immediately on leaving the company. Most went to manufacturing industry, split about 50/50 between electronic and non-electronic fabrication. The scope for technology transfer here is clear. A small proportion went into state-sponsored bodies and educational institutions, which makes is possible for them to 'broadcast' technology, if not to apply it directly to their new organization. A fairly high percentage (31%) went direct to Irish organizations, though few started their own company. Many entered their new firms at start-up, which would give them many opportunities to apply the manufacturing techniques practised in the source company. The companies they went to were spread widely across different size ranges and over different parts of the country. We can see, therefore, that in terms of the industrial similarity of their new firms to the source company, in their substantial propensity to go to Irish companies,

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IBAR – Journal of Irish Business and Administrative Research, Volume 6, No. 2, October, 1984, pp 15-26.

and in their dispersal throughout the country, these movers should be in a good position to transfer and diffuse technology.

Table 1: *Characteristics of First Recipient-Organization*

INDUSTRY GROUPING												N = 82 [a]			
Electronic Manufacturing		Non-Electronic Manufacturing		Process		Service		State Sponsored		Educational Institution		Other	
No.	% [b]	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
31	38	28	34	8	10	7	9	5	6	2	2	1	1

NATIONALITY						N = 82	
Irish		Foreign		Went abroad	
No.	%	No.	%	No.	%
25	31	51	62	6	7

OWN COMPANY?				N = 83
Yes		No	
No.	%	No.	%
1	1	82	99

SIZE (No. of Employees)						N = 67
Small (1-99 employees)		Medium (100-499)		Large (500+)	
No.	%	No.	%	No.	%
22	33	32	48	13	19

STAGE AT ENTRY				N = 60
Start-Up		Regular Production	
No.	%	No.	%
23	38	37	62

REGIONAL LOCATION								N = 76
Leinster		Munster		Connaught		Ulster	
No.	%	No.	%	No.	%	No.	%
30	39	35	46	9	12	2	3

[a] Differences in N are caused by missing data.

[b] In all tables, some percentage totals may not add up due to rounding.

Obviously, many leavers will have moved on from their first company. Table 2 shows the characteristics of their current organizations at the time of the study.

Table 2: *Characteristics of Current Organizations*

INDUSTRIAL GROUPING												N = 82
Electronic		Non-Electronic		Process		Service		State-sponsored body		Educational and Other		
No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
34	41	18	22	6	7	10	12	11	13	4	5	

NATIONALITY				N = 83
Irish		Foreign		
No.	%	No.	%	
33	40	50	60	

OWN COMPANY				N = 83
Yes		No		
No.	%	No.	%	
8	10	75	90	

SIZE OF COMPANY						N = 82
Small (1-99)		Medium (100-499)		Large (500+)		
No.	%	No.	%	No.	%	
34	41	28	34	20	24	

STAGE AT ENTRY				N = 82
Start-Up		Regular Production		
No.	%%	No.	%	
37	45	45	55	

REGIONAL LOCATION						N = 83
Leinster		Munster		Connaught & Ulster		
No.	%	No.	%	No.	%	
36	43	38	46	9	11	

It is obvious by comparison with Table 1 that these later movements have been in a direction even more favourable to technology transfer. There has been a small relative shift toward electronics and a more marked shift toward state-sponsored bodies such as AnCO (The Training Authority) and I.I.R.S. (Institute for Industrial Research and Standards) which, as we suggested above, provide the opportunity to broadcast technology. There has been a greater tendency toward Irish companies and a rather marked trend toward entry at start-up, including a definite increase in own-business start-ups. There has been no tendency to move toward the Dublin region, so the industrial policy of regional dispersal is achieving its aim.

So far, then, the picture is quite heartening, suggesting a substantial and increasing potential for technology transfer. Moreover, the analysis so far understates the ultimate potential. For these executives are by no means finished moving. Having answered the questions "Where did they go?" and "Where are they now?", we must therefore address the question "Where will they end up?".

Likely Ultimate Destinations

In the context of examining the capacity of the country to benefit from attracting multi-national corporations, we are particularly interested in the extent to which ex-employees enter indigenous companies and bring technology with them. As a subsidiary issue we are interested in the extent to which they start their own companies. Obviously our analysis of likely future movements cannot be as conclusive as that of movements already made. However, we believe a convincing case can be made for the proposition that future movements will show an even greater tendency for executives to enter indigenous companies or to start their own.

To shed light on this question we divided leavers into three cohorts of roughly equal size: those who left before 1973 (i.e. before the real boom in electronic start-ups), those who left between 1973 and 1979, and those who had left in the two years preceding the study. It was also necessary to examine, within each cohort, those who had changed jobs at different rates.

Table 3: *Mobility by Time-Cohort*

	Number of Organizations Since Leaving			
Number of Years Since Leaving	1 Only	2 Only	3 Or More	Total
Over 8	5	8	11	24
3 – 8	13	12	5	30
1 – 2	25	3	0	28

We shall argue below that the first cohort is probably finished moving. Clearly, unless some drastic change occurs, the other cohorts, especially the last, have a great deal of moving to do before they catch up with the first. We will argue that there is good reason to expect their behaviour to resemble that of the first cohort, and that the current locations of this cohort therefore provide a good forecast of where the others will finish.

Table 4: *Present Organizations of First Cohort*

Nationality of Present Organization	Number of Organizations Since Leaving			
	1 Only	2 Only	3 Or More	Total
Irish	2	7	6	15
Foreign	3	1	5	9
	5	8	11	24

The most striking fact in Table 4 is that over 60% of those left more than eight years are working in Irish organizations. Even if there were to be further movement in this cohort, which is unlikely, this percentage would not diminish. Those with only one or two jobs since leaving are unlikely to move again. We say this because of their length of tenure in their current jobs, and because almost all those in Irish organizations are in state-sponsored bodies. It could be argued that some at least of the highly mobile group will move again. This may be so, but the proportion working for Irish companies is unlikely to fall: this mobile group had already moved heavily into the indigenous sector on their second job, and remained in it on their third and later moves. Furthermore, four of them own their companies. Before leaving this cohort we should remark that it was only the highly-mobile group who showed any tendency to start their own businesses: none of the less-mobile ones had done so. We should also point out that the cohort had *not* shown a marked tendency to move directly to Irish organizations (eight out of twenty-four did so). The big move came on their second job.

If we now examine the second cohort, we shall see that there are grounds for expecting the above pattern to repeat itself, but only after a greater number of job-changes. Table 5 shows that 40% of the second cohort are already in Irish organizations. Unlike the first cohort, virtually none are in state-sponsored bodies. It could be argued that the proportion working in Irish companies will not rise with further movement. There is some force to this argument. Employment opportunities with multinational companies were much greater for this cohort than for the preceding one: they were much more likely to go to start-ups (particularly

in electronics) on both their first and second moves. It may be that the greater availability of start-up opportunities, and their attractiveness, will tend to 'trap' this cohort in the multi-national sector. Against this, however, we can set the behaviour of the small number who have already moved three times or more. They were not at all likely to work for Irish firms on their first or second move, but currently work for them almost exclusively. To the extent that their peers mirror their behaviour when they in turn move, we may expect an increase in employment in Irish companies. The effect of greater opportunities in the multi-national sector may therefore be to delay this movement into Irish firms from the second to the third or later job-change, rather than to prevent it altogether.

Table 5: *Present Organizations of Second Cohort*

Nationality of Present Organization	Number of Organizations Since Leaving			
	1 Only	2 Only	3 Or More	Total
Irish	5	3	4	12
Foreign	8	9	1	18
	13	12	5	30

The cohort which left most recently has of course had little time in which to move: as Table 3 shows, all but three are still in their first organization. It is therefore impossible to construct a very strong argument about the extent and direction of their future movements. As far as extent goes, it could be argued that the recession of the early 1980's will at least have delayed their movement, if not halted it completely. As far as direction goes, we can say only that their pattern of first jobs mirrors that of the immediately preceding cohort: about 25% of both cohorts went direct to Irish organizations, while their other first-job characteristics are very similar, as we shall see below. It does not seem unreasonable, therefore, to assume that their pattern of later jobs will also mirror that of preceding cohorts. Thus, we can argue that the extent to which the study population is currently employed in Irish organizations significantly understates the extent to which they will ultimately be so. This percentage could go as high as 60%, and will almost certainly approach 50%. Furthermore, we have seen that at least some of the population move around within the indigenous sector, thereby increasing the potential for transfer.

Indigenous Employment

Before leaving this topic we should say something about the nature

of the indigenous firms in which they took up employment. Eight, i.e. about 10%, of the total interviewed had started their own businesses. This probably underestimates the number who will eventually do so: as Table 6 shows, most start-ups were by people who had left the source organizations for some time *and* who had changed jobs frequently.

Table 6: *Own-Company Start-Ups, by Years Left Source and Number of Moves*

	Number of Moves			
Years Left Source	1 Only	2 Only	3 Or More	Total
Over 8	–	–	4	4
3–8	1	–	2	3
1–2	–	1	–	1
	1	1	6	8

It would not be unreasonable to expect the ultimate percentage among those included in the study to approach 15% rather than 10%. Admittedly, this exaggerates somewhat the rate of company foundations in Ireland by leavers: many of those who left are not included in the study because they are abroad. Nevertheless, if even 10% of all executives leaving multi-national corporations were to start their own companies, they would have a significant impact on Irish business.

We should not exaggerate the 'quality' of these start-ups. All are still small: three provide services, while five are in manufacturing. (Two of these are in electronics). None of the companies are themselves so-called 'hi-tech' enterprises. We should not worry unduly about this: as Bullock (1983) has shown, the development of a substantial high-technology sector is a lengthy, uncertain and difficult process, even under the most favourable circumstances. Furthermore, a fully-fledged electronics industry cannot exist without the network of support services and sub-contracting facilities which firms such as these start-ups have been set up to provide.

What of the great majority of those in Irish organizations who have *not* started their own companies? It must be admitted that their potential for technology transfer is ambiguous. Few are employed in industry (3 out of 25). The bulk are in services (7 out of 25, mostly from the two later cohorts) or in state-sponsored bodies (11 out of 25, mostly from the first cohort). The remainder are in educational organizations. On the one hand, it could be argued that this limits the scope for direct transfer of technology. On the other hand, it could be argued that it

broadens the scope for indirect transfer: that services such as consulting, state-sponsored bodies such as AnCO, and educational institutions, provide an opportunity to pass on technology on a wider scale than could be achieved within a single manufacturing company.

Staffing Incoming Multinationals

We have concentrated so far on the extent to which the country might benefit from multi-nationals by the outflow of staff to indigenous companies. But this of course is only one potential benefit. The country is also attempting to attract multi-nationals on a continuing basis, as an important component of industrial policy. We might therefore ask how far the presence of existing companies can facilitate the attraction of later arrivals.

Some light can be shed on this question by examining the first jobs of those who moved, to see whether the established companies acted as a direct source of high-level managerial and technical manpower to incoming firms. Table 7 shows that they did so to a considerable and increasing extent. Three things emerge from this table, all reflecting the influx of multi-national companies from 1973 onwards. The first is the apparent increase in the rate of movement out of the source companies: 28 left in cohort 3, which spans only two years; 30 left in cohort 2 (28 for jobs in Ireland) which spans five years; while only 24 left in cohort 1 (20 for jobs in Ireland) which spans eight years. These figures probably exaggerate the rate of increase, for two reasons. First, only one of the two source companies had been established for as long as sixteen years. Second, the figures relate only to traceable (and contactable) movers, and most of those not traceable

Table 7: *First Jobs by Cohort (a)*

	Time Cohorts			
Nature of Organization	Cohort 1 (N = 20)	Cohort 2 (N = 28)	Cohort 3 (N = 28)	Total (N = 76)
Irish	8	9	8	25
Foreign	12	19	20	51
Electronic	3	8	13	
Other Mfg.	7	11	7	
Non-Mfg.	2	–	–	
Start-Up	4	9	9	
Full Prodn.	8	2	11	
D.K.	–	8	–	

(a) Some leavers went abroad for their first job, before returning to Ireland. They are not included in this table.

would have been members of the first cohort. Nevertheless, there was an overall increase in outward movement over the period.

The second fact is the drop in the extent to which those who left the source organization went abroad on leaving. Four of those traced in the first cohort did so, two in the second cohort, and none in the third. If we add to this the fact that most of those untraceable belonged to the earlier cohorts, and that their being untraceable is probably due to their being overseas, it is reasonable to suggest that the inflow of multi-nationals greatly increased employment opportunities in Ireland for mobile executives.

This hypothesis is borne out by the figures in the body of the table. We see an increased tendency, beginning with the second cohort, to take a first job with foreign companies. (This is offset to an extent, as we saw above, by a tendency to move later to Irish firms). The growth in electronics employment is especially marked, with the tendency to move to start-ups peaking in the second cohort. This reflects the fact that there were few established electronics companies for this cohort to go to, whereas their start-ups provided an avenue for the later cohort to enter at the full production stage. In fact, many of the third cohort followed the earlier 'pioneers' into the same companies. The substantial proportion of the third cohort still going to start-ups reflects the continuing inflow of electronics companies in the early 1980's. Interestingly, these opportunities were increasingly outside Dublin: whereas the first cohort had moved mainly to companies in Leinster, the two later ones moved mainly to Munster.

It may be a little too optimistic to say definitively that we are getting the best of both worlds from an industrial policy viewpoint: that we are meeting the needs of later-arriving multi-nationals by direct recruitment from the source companies, while meeting the needs of indigenous firms both by direct recruitment and by later movement out of other multi-nationals. Nevertheless the figures are strongly suggestive, and give grounds for optimism that this is indeed so.

Movement By Different Sub-Groups

We shall conclude this article by referring back to the previous one, in which we identified three sub-groups of movers. Their patterns of movement are examined below.

Some interesting facts emerge from this analysis, although their causes and implications are obscure. Those with technician-level qualifications or less are more heavily represented in the later than in the earlier co-

horts: (Remember that those with technician-level qualifications did not leave from technician-level jobs: over half were in positions above supervisory level.) This probably reflects the demand from incoming electronics companies for experienced managers, so that the experience of these movers outweighed their lack of higher qualifications, which would not have been the case in the tighter job-market before 1973.

Table 8: *Movement by Sub-Groups Over Time*

	Time Cohort			
Sub-Group	Cohort 1	Cohort 2	Cohort 3	Total
Technician Qual	7	13	11	31
Graduates				
Experienced	9	7	10	26
Direct Recruit	8	10	7	25
	24	30	28	82

Table 9 shows that non-graduate movers were substantially less mobile than graduates after leaving the source company. This is true for every potentially-mobile cohort, so the fact that non-graduates left later does not affect this picture.

Table 9: *Number of Organizations Since Leaving Source, By Sub-Group*

Sub-Group	1 Only	2 Only	3 Or More	Total
Technician Qual.	20	9	2	31
Graduates				
Experienced	12	7	8	27
Direct Recruit	10 22	7 14	8 16	25 52
	42	23	18	83

We conclude by examining the ownership of the organizations to which the different sub-groups moved. The data in table 10 confirm our earlier hypothesis about technician-qualified leavers. They are least likely to work initially – or later – for Irish organizations (this tendency becomes most marked after 1979). The ones most likely to go initially to Irish firms are graduates with previous experience, but they show no tendency to move into them later. The most interesting sub-group are the direct-recruit graduates. They are unlikely to go first to an Irish company, but very likely to change later. Furthermore, this is true in every cohort.

We seem therefore to have a very stable and interesting pattern of movement. Executives with technician-level qualifications or less move to and stay in multi-national companies, who value their experience more than

Table 10: *Ownership of Destination-Organizations, By Sub-Group*

Sub-Group	First Organization (a)				Present Organization			
	Irish		Foreign		Irish		Foreign	
Technician Qual.	9		20		10		21	
Graduates								
Experienced	11		13		11		15	
Direct Recruit	4	15	17	30	13	24	12	27

(a) Some went abroad first and are not included.

their qualifications. Graduates with previous experience of work (often with other multi-nationals) go about 50/50 to Irish companies, and roughly maintain this balance as they move later. Graduates who come to the source company direct from university prefer to go first to other multi-nationals, and then move quite heavily into Irish organizations. Seven of the eight own-company start-ups were by graduates (three experienced, four direct-recruit). Though not all the own-companies are technical (five out of eight are), this particular finding agrees with some earlier studies which found that technical entrepreneurs tended to have College degrees up to the level of Master's [Roberts 1969, Sausbauer 1969, Cogan and Onyenadum 1981].

We may conclude that the source companies' revolving-door policy of hiring more graudates from university than they intend to keep is indeed bringing significant benefit to the country, initially in providing qualified manpower to incoming multi-nationals, and later in providing qualified and experienced personnel for Irish companies.

Conclusion

The pattern of movement out of the source companies shows a very positive picture for industrial policy and technology transfer. The companies have acted as a source of qualified and experienced management for later arriving multi-national companies. They are also acting as a source of potential technology input for indigenous companies, as executives show a marked tendency to transfer into the indigenous sector, quite often by starting their own companies. This move to the indigenous sector takes time, occuring after several job changes. We see in this, as in other cases (Bullock, 1983), that the benefits of a policy take a long time to materialise, and that the development of indigenous capabilities by attracting multi-nationals will require patience and perseverance before it pays off.

REFERENCES

Bullock, M., "Academic Enterprise, Industrial Innovation, and the Development of High Technology Financing in the United States". London: Brand Brothers, 1983.

Cogan, D.J., and E. Onyenadum, "Spin-Off Companies in the Irish Electronics Industry", *Journal of Irish Business and Administrative Research*, Vol. 3, Number 2, October 1981. pp. 3-15.

Onyenadum, E. and B. Tomlin, "Technology Transfer through Staff Mobility: I", *Journal of Irish Business and Administrative Research*, Vol. 6, Number 1, April 1984, pp. 3-11.

Roberts E.B., "Entrepreneurship and Technology", In W. Gruber and D. Marquis eds., *Factors in the Transfer of Technology*, Cambridge Mass.: The MIT Press, 1969.

Sausbauer J.C., "The Technical Company Formation Process: A Particular Aspect of Entrepreneurship", Ph.D. Dissertation, University of Texas, 1969. Cited in A.C. Cooper "Technical Entrepreneurship: What Do We Know?". In C.M. Baumback and J.R. Mancuso eds., *Entrepreneurship and Venture Management*, Englewood Cliffs N.J.: Prentice Hall Inc., 1975. p. 49.