

ECONOMIC PERSPECTIVE

COMPONENTS OF EMPLOYMENT CHANGE IN THE TAYSIDE MANUFACTURING SECTOR: A SPATIAL ANALYSIS

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1. Introduction

This paper reports the findings from the analysis of employment change in the manufacturing sector in Tayside Region in East Central Scotland during the 1980s. National level studies which have examined job generation in all sectors of the UK economy during the 1980s find strong evidence that small firms played a significant role. For example, Daly, Campbell, Robson and Gallagher (1991) found that between 1987 and 1989, firms employing less than 10 people created around half a million jobs, almost as many jobs as all other firm sizes grouped together, despite comprising only a quarter of the original stock of firms in 1987.

This provides support for an earlier study, which finds that firms with less than 20 employees created around half a million jobs during the period 1985-87, when the economy was emerging from a period of recession (Gallagher, cited in Employment Department, 1992). In the study reported here, the employment impact of small manufacturing firms in Tayside is examined, and the findings compared with other studies which have sought to analyze the process of job generation, principally at the regional rather than national level.

2. Research Design

The employment impact of small manufacturing firms in Tayside during the period 1981-90 is investigated using components of employment change analysis. This is an employment accounting procedure which derives the net job gain or job loss created by firm openings, expansions, closures and contractions, over a period of time. Net employment change is thus the result of larger gross flows. New jobs may be created by either new firm openings or existing firms expanding; job losses may be caused by either firms closing, or existing firms contracting. The components of employment change procedure is one way of analysing the constituent parts of the job generation process. The procedure is illustrated in Figure 1.

The seminal study of this nature was undertaken by Birch (1979) who found that firms with less than 20 employees account for 66% of the net job gain in the US economy over the period 1969-76. Birch's analysis is conducted for all sectors in the economy, however, whereas most other studies of this type have been limited to an examination of the manufacturing sector. Subsequent studies at the regional level in the UK, which have concentrated on the manufacturing sector have broadly supported Birch's findings that the smallest firms in the economy are net employment generators, while the largest firms have shed labour. These findings, however, are typically qualified by the fact that in terms of gross employment flows, it is the largest firms which are the most important players (Fothergill & Gudgin, 1982; Cross, 1981; Storey, 1981; Dobson, 1989).

Furthermore, these large employers are typically branch plants of companies owned outside the local economy. Large scale branches have been closed and relocated by parent companies leaving a huge impact on local economies. Many economists have argued that locally founded firms are more likely to provide a sound basis for regional development. Economies dominated by large branches may also foster a culture of dependency, an employee culture, which serves to suppress indigenous entrepreneurship (Storey, 1981). In branches, managerial labour is typically imported, thus limiting the transfer of managerial skills into the local labour market.

Previous studies, such as Dobson (1989) have also examined the hypothesis that rural areas are better generators of employment than urban areas. The rationale behind this hypothesis is derived from the core-periphery theory of regional development (Dobson, 1989). In this theory, it is suggested that the urban centres of regions will develop first because of advantages firms derive from internal and external economies of scale gained from an urban location. Closeness to factor and product markets, and the building up of an effective

business network serve to make urban locations particularly attractive to firms. However, after some point diseconomies of scale must set in, increased demand in factor markets bids up prices and thus costs, and the accumulation of externalities such as congestion and pollution serve to act against the urban centre of a region, and to force the growth of business activity into peripheral areas. These may not only be rural areas, but also suburban locations.

Peripheral locations may not only be more attractive to new firms seeking to set up in business, but also to existing firms in the urban core who are unable to expand because of physical space constraints. Thus investment may be diverted to the rural periphery. Dennis (1980) argues that the process of decentralisation of economic activity from the centre to the periphery of a region is not directly influenced by firms redirecting their activities from the centre to the periphery. Instead, the process is mediated by less direct means, via differences in the opening and closure rates of firms, and differences between firm expansions in different locations.

In an analysis of the Leeds engineering sector, Dobson (1989) finds no evidence to support this hypothesis, concluding that there was evidence of spatial uniformity in the job generation process between core and periphery locations. This contrasts with other work which does find evidence in support of a core-periphery pattern, with peripheral locations proving to be better job generators than urban locations (Cross, 1981; Gudgin, 1978; Cameron, 1973; Keeble, 1993; Smallbone, North & Leigh, 1993). These studies generally note that peripheral locations also display greater dependency upon the opening of new branch plants in the creation of employment. Keeble (1993) indicates that one possible cause of rural industrialization may be reflected in the practices of large companies, who have been restructuring their operations into rural locations in order to exploit new supplies of labour in the search for higher profits. The development of rural regions into branch economies may be detrimental in the long term for reasons already outlined.

It has also been argued, however, that rural locations may be more attractive to indigenous small firms because they may offer a better quality of life, which may be the most important factor in the location decision for some people (Keeble, Tyler, Broom & Lewis, 1992). Keeble et al also find that rural new firm formation is characterised by a much larger amount of inward migration by

entrepreneurs, rather than by indigenous entrepreneurship. A general consideration of the literature therefore reveals that the process of polarization of economic development between core and periphery locations in a region may be highly complex, with several factors impinging upon the relationship between sub-regions.

Thus, two clear hypotheses emerge from the preceding literature review: first, that smaller firms are better job generators than larger firms; second, that rural locations are better job generators than urban locations. These hypotheses form the basis of the examination of employment change in the Tayside manufacturing sector reported in this paper.

3. Sources of Data

The data for the analysis reported here were provided by Tayside Regional Council Planning Department (TRC) who have maintained a comprehensive register of manufacturing establishments in Tayside Region since 1981. TRC use a variety of data collection methods to update this database annually, including a blanket postal survey of all registered establishments, visits to establishments, searches through commercial company databases and through the databases maintained by other business support agencies in Tayside, such as the Chamber of Commerce. Basic information is kept for each establishment on the register, namely employment size, address, contact name, SIC code, and nature of the establishment's activity.

The key limitation of the above data is the use of establishment rather than firm size. While sole traders and partnerships are likely to be single establishment organizations, companies are a different matter. As indicated earlier, a company establishment may be one of several branches or plants, with the headquarters based outside of Tayside Region. This limitation, however, is commonly reported in similar studies (for example, Dobson, 1989). Most studies have relied on secondary data sources which were compiled for some other purpose, and few databases have identified the ownership status of establishments.

There is, however, an advantage of the approach adopted by TRC, in that each establishment is coded by the nature of its activity, thus all establishments on the register are manufacturing plants, and not, for example, sales outlets or distribution depots. Additionally, there is evidence to suggest that new enterprise formation may be a

function of local labour markets, with higher formation rates of new indigenous enterprises associated with higher levels of small scale economic activity, regardless of the nature of ownership (Cross, 1981). Thus, the opening of small branch plants may be beneficial to the long term supply of indigenous firms.

For the purposes of the analysis, an opening was defined as an establishment which appeared on the later register, but not the earlier one; an expansion was defined as an establishment which appeared on both registers, and which had increased in employment size; a closure was defined as an establishment which appeared on the earlier register, but not on the later one; a contraction was defined as an establishment which appeared on both registers and which had decreased in employment size. For the purposes of the research, Tayside Region was split into two spatial areas, the urban centre of Tayside, Dundee City (as defined by TRC) and the predominantly rural periphery.

If an establishment had relocated from Dundee City to the rest of Tayside, or vice versa, this was treated as a closure in the first location, and an opening in the second. This method was followed whether or not the establishment had expanded or contracted in the process of migration. This was done to control for the effects of migration between the core and periphery in Tayside region, and to limit the impact of expansions and contractions to those establishments remaining in the same location throughout the period, following Dennis (1980). As indicated earlier, analyses were conducted for the periods 1981-90, and the two halves of the decade, 1981-85 and 1985-90. The findings reported in this paper are those for the whole decade 1981-90, though insights will be incorporated from the other two analyses where appropriate.

4. Components of Employment Change

The findings from the components of employment change analysis are now considered. Before disaggregating the analysis to examine the employment impact of different establishment sizes, the components of employment change determined by all manufacturing establishments are summarized below in Figures 2 to 4, which show the components of employment change for the period 1981-90 for all Tayside, Dundee, and the rest of Tayside respectively.

Figure 2 shows that over the decade, for the whole of Tayside, there was a net loss of 1,706 jobs. By

far the most important component of job gains is firm expansions, and the most important component of job losses is firm closures. Firm expansions comprise 72% of all gross job gains in Tayside manufacturing during the decade, with firm closures accounting for 65% of gross job losses. However, as Figures 3 and 4 reveal, the pattern of the relative importance of the different components is not consistent between the two sub-regions under consideration, i.e. Dundee and the rest of Tayside.

Figure 3 shows that there was a net loss of nearly 3,000 jobs in Dundee over the period, while Figure 4 shows there to be a small net gain of just under 600 jobs in the rest of Tayside. The most important component in the job loss account in Dundee is firm closures, comprise 63% of gross job losses. Firm expansions created the majority of jobs in Dundee, comprising 65% of the gross total. The pattern of employment change in the rest of Tayside is much more biased towards the relative importance of these two components. Firm expansions account for 80% of gross job creation in the rest of Tayside, while closures are by far the most important component of job losses, accounting for 69% of the gross total. Overall, the absolute figures for Dundee are higher than those for the rest of Tayside, with the exception of firm expansions, suggesting a more dynamic process of employment change in Dundee.

These findings provide support for the hypothesis that rural areas are better net job generators than urban areas. They also provide support for Dennis (1980) in that the differences in employment change are due to relative differences in the components of employment change within each spatial area. The greater absolute figure for firm expansions in the rest of Tayside, and the much higher relative proportion of gross job creation, also suggests that there were less constraints on *in situ* firm growth in the rural periphery than in the urban centre.

Turning now to an analysis of the impact of establishment size on employment change, in addition to location. The components of employment change for each establishment size band for all Tayside over the period 1981-90 is given in Table 1, which provides clear support for the hypothesis that smaller establishments are better job generators than larger ones. Establishments with less than 10 employees created a net gain of 5,220 jobs over the period, which is by far the biggest contribution to job generation, though all size bands representing establishments with less than 50 employees experienced a net job gain.

Only establishments with more than 50 employees experienced a net job loss, with the biggest contribution to job losses, by far, coming from the very largest establishments (501+ employees), which shed nearly 4,500 jobs over the decade. These job losses, along with a combined 2,500 losses from the second and third largest size bands outweighed the positive performance of establishments in the three smallest size bands. An inspection of the make-up of the 5,220 net job gain created by the smallest establishments shows that the most important component is expansions, accounting for 5,404 gross jobs, which comprises 55.2% of the 9,781 gross jobs created by expansions in total.

Overall, the 0-10 employee size band accounts for 42.7% of all gross job creation in Tayside in the 1980s. No clear pattern emerges for all other size bands, the next best performer in gross job creation is 101-200 employees, though this also experienced the second highest gross job loss. There is also no distinct pattern in the relative importance of openings and expansions for all other size bands. The most important component of gross job losses overall is establishment closures, which accounts for by far the largest proportion of gross job losses in all size bands, with the exception of 501+ employees, in which contractions account for the largest proportion. Job losses through the largest establishments contracting represents 59% of all jobs lost through contractions.

This analysis therefore identifies clear differences between the smallest and the largest establishments in Tayside manufacturing during the 1980s, providing strong evidence in support of the job generating capability of the smallest establishments, which played a key role in helping to compensate for the large number of jobs shed by the largest establishments. As noted before, the analysis does not identify the nature of ownership in establishments, therefore the relative importance of branch plants versus independent firms in the process of job generation in this size band is not known.

Storey (1981) notes that jobs created through firm expansions in his study of North East England were concentrated in a few exceptionally high growth firms. Given the specific managerial and financial constraints placed on small firm growth (Glancey, 1993), it may be that a sizeable proportion of jobs created were created in Tayside by a small number of firms, or through branch plant, rather than indigenous firm, expansions, though there is no

evidence in support of these claims. It is clear, however, that if were not for the exceptional *in situ* expansion performance of the smallest size band, the net job loss in Tayside manufacturing would have been much higher in the 1980s.

Therefore previous studies, which generally have not been able to disaggregate the size distribution sufficiently to permit a detailed analysis of the smallest establishments, i.e. 0-10 employees, may have underestimated their relative importance. In this analysis, establishments with 11-25 employees performed significantly less well as job generators than their smaller counterparts, and although they were net job generators, they were no more fertile than other larger size bands, and experienced a net job loss if establishments openings are removed from the analysis. As noted in the introduction, recent UK level studies have also found the 0-10 employee size band to be the most significant job generator in the economy. Furthermore, these establishments have also been found to display exceptionally high levels of job creation through establishment expansions (Daly et al 1991).

If the size distribution of employment change is disaggregated into the two spatial areas considered in this study, there is clear evidence of differences between Dundee and the rest of Tayside. Table 2 shows the components of employment change for Dundee over the decade, while Table 3 shows the analysis for the rest of Tayside.

A comparative analysis of the two tables shows that there are clear differences between the performance of small and large establishments in the two spatial areas. All establishments with less than 50 employees account for 3,994 jobs in the rest of Tayside, which represents 88% of the total number of jobs created through expansions in the area. On the other hand, these establishments account for 2,809 jobs in Dundee, which represents 61% of the total number of jobs created through expansions in the area. Thus 39% of these jobs were created by establishments with more than 50 employees, with the largest establishments (501+ employees) accounting for 817 jobs, or 17.9% of the total. However, in both Dundee and the rest of Tayside, the performance of establishments with 0-10 employees is clearly the best, accounting for over 50% of the total in both areas. While the absolute number of jobs created through expansions in these establishments is higher in the rest of Tayside, the proportionate number of jobs created through expansions is similar (51.3 in Dundee, 58.7% in the rest of Tayside).

Establishment openings played a much greater role in employment creation in Dundee, where all size bands experienced significantly greater job creation through openings rather than expansions, with the exception of the smallest and the largest size bands, where expansions are the most important component of gross job generation. The greater importance of openings in Dundee may be a reflection of government policies aimed at regenerating depressed urban areas through new firm formation. There are greater levels of assistance for new firms locating in Dundee, than in the rest of Tayside, such as capital allowances, soft loans and grants. Additionally, all but one of the seven enterprise zones in Tayside are located in Dundee City District. It may also be that some new firms prefer to locate in Dundee to be closer to their markets.

No clear differences are evident with respect to the job loss components, with closures accounting for the largest number of job losses for all size bands in both spatial areas, with the one exception of establishments with 501+ employees in the rest of Tayside, where all job losses were accounted for by contractions. When the net employment change figures are considered, it is clear that the two largest size bands had the greatest impact in Dundee over the decade, shedding over 5,000 jobs between them, with the bulk of these job losses accounted for by the largest establishments (4,296 jobs).

By comparison, these size bands played a relatively minor role in the process of net job change in the rest of Tayside, accounting for a combined net loss of 582 jobs. The 101-200 employee size band accounts for the largest net job loss (1,454 jobs) in the rest of Tayside. Clearly then, Dundee was particularly hard hit by the job losses from the largest establishments, all other size bands in Dundee experienced a net job gain, with the exception of the 26-50 size band, in which there was a slight net job loss. In the rest of Tayside, only those size bands representing establishments with less than 50 employees experienced a net job gain, though the pattern of net job losses was much more evenly distributed among the larger size bands than in Dundee. This analysis provides further evidence in support of the distinct trends in employment change between Dundee and the rest of Tayside observed earlier, and thus provides further support for Dennis (1980) in that these trends are the result of differences in the components of employment change, shown here with respect to size distribution, between the core and periphery

locations.

Cross (1981) finds in an earlier study of Tayside manufacturing that the most important component of employment change is *in situ* contractions, though the general pattern of employment change is not consistent between the Dundee and Outer Tayside, which is assumed to be comparable to the rest of Tayside definition employed in the present study. For the period 1968-77, Cross also finds that expansions played a more significant role in the peripheral areas of Tayside than in the urban centre, though the patterns are not as distinct as in the present study.

The same trends are reported in Dobson's study of West Yorkshire (Dobson 1989), though again the trends are not as distinct. Dobson, however, finds no differences in net job change between the core and peripheral sub-regions of Leeds and the rest of West Yorkshire respectively. Cross, however, finds in accord with the study reported here that the urban centre, Dundee, showed by far the worst employment performance, though a comparison of his study with the present one must be qualified by the fact that he uses different data sources, namely Department of Employment, Scottish Council (Development and Industry), which are not as comprehensive as that of TRC.

5. Conclusions

Despite the significant limitation of lacking ownership data, this study provides substantial support for the two hypotheses that both small firms and rural areas are the best creators of net job gains. Further light may be shed on the strong trends identified, when the sectoral make-up of Tayside manufacturing is considered. TRC statistics indicate that the Tayside manufacturing sector has not undergone a substantial degree of sectoral restructuring during the 1980s, as many other regions have, and is still very much dependent on the traditional industries of mechanical engineering, food manufacturing, textiles, and printing and publishing (TRC, 1991).

These figures also indicate that the rural periphery of Tayside is considerably more concentrated in these industries than Dundee. The mechanical engineering and food manufacturing sectors account for nearly 50% of manufacturing employment in the rest of Tayside. Of the four traditional sectors, these two are the most fragmented in terms of size distribution of establishments, with the other two, textiles and printing and publishing being heavily

skewed towards very large scale employers. The latter two industries are far more important employers in Dundee than in the rest of the region. Therefore, it may be, as Keeble (1993) finds, that rural areas are typified more by firms in growing sectors, filling specialist market niches, rather than the declining industries which are typical of urban areas. There is clearly scope for food manufacturing firms, for example, to exploit market niches in both local and export markets.

A greater preponderance of smaller scale employers in the mechanical engineering sector, however, may represent a fragmentation of the supply chain, with increased levels of subcontracting. This phenomenon has been observed in the engineering sector in other regions, and may be a consequence of large contractors seeking to make more flexible their operations by subcontracting rather than undertaking these activities in-house (Shutt & Whittington, 1987). In a sense, this may be less positive in that subcontracting networks represent hidden concentration, though it is positive in the respect that smaller independent firms should serve to increase the supply of potential entrepreneurs. Owner-managers of small engineering workshops, through managing their own firms may develop some business acumen. However, managerial and entrepreneurial skills, would not be fostered in employment as an operative in a large engineering branch plant.

This study has identified clear differences in the make-up of employment change between the urban and rural areas in Tayside, particularly with respect to the impact of establishment size. Dundee, which is much more dependent upon large scale employers, experienced large job losses from these employers. If it were not for the high net job gains arising from establishments with 0-10 employees, this impact would have been much more profound. The smallest establishments clearly performed the best in both Dundee and the rest of Tayside. Although the most important job creation component in both areas being *in situ* expansions, a greater number of jobs were created by establishment openings in Dundee, while the number of jobs created by expansions in the periphery was higher than in Dundee. There are clearly different forces in operation in the two areas, though these can only be speculated upon given the limitations of the data.

It may be that rural firms face less physical constraints on expansion, and find it easier to obtain suitably skilled workers, and that the jobs created

through expansions were concentrated in a few exceptionally high growth firms, operating in profitable and growing markets. There may also be a larger concentration of entrepreneurial and managerial talent in the rural periphery, given that it is structurally much less dependent upon very large scale employers than Dundee. Whatever the reasons for the better performance of establishments in the rest of Tayside, it is clear that the trends generally reported in the literature are particularly evident in Tayside. While the manufacturing sector has remained relatively stable overall in Tayside, there has clearly been a restructuring towards smaller scale economic activity in Dundee, which should have positive consequences in the longer term by helping to increase the supply of indigenous firms. The dynamic contribution made by small establishments in the 1980s may provide a stronger base for the future prosperity of the Tayside manufacturing sector.

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Table 1 Components of employment change by establishment size - Tayside 1981-90

SIZE BAND	OPENINGS		EXPANSIONS		GROSS JOB GAIN		CLOSURES		CONTRACTIONS		GROSS JOB LOSS		NET JOB CHANGE EMPS
	EMPS	%	EMPS	%	EMPS	%	EMPS	%	EMPS	%	EMPS	%	
0-10	398	10.4	5,404	55.2	+5,802	42.7	460	4.6	122	2.3	-582	3.8	+5,220
11-25	516	13.5	694	7.1	+1,210	8.9	757	7.6	178	3.3	-935	6.1	+275
26-50	580	15.2	698	7.1	+1,278	9.4	969	9.7	232	4.3	-1,201	7.9	+77
51-100	689	18.1	330	3.4	+1,019	7.5	1,207	12.1	134	2.5	-1,341	8.8	-322
101-200	1,328	34.8	974	10.0	+2,302	16.9	2,525	25.4	874	16.3	-3,399	22.2	-1,097
201-500	307	8.0	209	2.1	+516	3.8	1,271	12.8	651	12.2	-1,922	12.6	-1,406
501+	0		1,472	15.1	+1,472	10.8	2,768	27.8	3,157	59.0	-5,925	38.7	-4,453
TOTAL	3,818	100.0	9,781	100.0	+13,599	100.0	9,957	100.0	5,348	100.0	-15,305	100.0	-1,706

Source: compiled by author from TRC business establishment data

Table 2 Components of employment change by establishment size - Dundee 1981-90

SIZE BAND	OPENINGS		EXPANSIONS		GROSS JOB GAIN		CLOSURES		CONTRACTIONS		GROSS JOB LOSS		NET JOB CHANGE EMPS
	EMPS	%	EMPS	%	EMPS	%	EMPS	%	EMPS	%	EMPS	%	
0-10	226	9.0	2,337	51.3	+2,563	36.3	136	2.3	31	0.9	-167	1.8	+2,396
11-25	303	12.1	278	6.1	+581	8.2	282	4.8	34	1.0	-316	3.4	+265
26-50	325	13.0	187	4.1	+512	7.3	502	8.5	81	2.3	-583	6.2	-71
51-100	377	15.1	34	0.7	+411	5.8	276	4.7	103	3.0	-379	4.0	+32
101-200	966	38.6	698	15.3	+1,664	23.6	895	15.2	412	11.8	-1,307	14.0	+357
201-500	307	12.3	209	4.6	+516	7.3	1,024	17.4	473	13.6	-1,497	16.0	-981
501+	0		817	17.9	+2,768	11.6	2,768	47.1	2,345	67.4	-5,113	54.6	-4,296
TOTAL	2,504	100.0	4,560	100.0	+7,064	100.0	5,883	100.0	3,479	100.0	-9,362	100.0	-2,298

Source: compiled by author from TRC business establishment data

Table 3 Components of employment change by establishment size - rest of Tayside 1981-90

SIZE BAND	OPENINGS		EXPANSIONS		GROSS JOB GAIN		CLOSURES		CONTRACTIONS		GROSS JOB LOSS		NET JOB CHANGE EMPS
	EMPS	%	EMPS	%	EMPS	%	EMPS	%	EMPS	%	EMPS	%	
0-10	172	13.1	3,067	58.7	+3,239	49.6	324	8.0	91	4.9	-415	7.0	+2,824
11-25	213	16.2	416	8.0	+629	9.6	475	11.7	144	7.7	-619	10.4	+10
26-50	255	19.4	511	9.8	+766	11.7	467	11.5	151	8.1	-618	10.4	+148
51-100	312	23.7	296	5.7	+608	9.3	-931	22.9	31	1.7	-962	16.2	-354
101-200	362	27.6	276	5.3	+638	9.8	1,630	40.0	462	24.7	-2,092	35.2	-1,454
201-500	0		0		0		247	6.1	178	9.5	-425	7.2	-425
501+	0		655	12.6	+655	10.0	0		812	43.5	-812	13.7	-157
TOTAL	1,314	100.0	5,221	100.0	+6,535	100.0	4,074	100.0	1,869	100.0	-5,943	100.0	+592

Source: compiled by author from TRC business establishment data

Figure 1 Components of employment change analysis

Openings	=	Gross Job Gains	
+ Expansions			
		+	= Net Job Gain or Loss
- Closures			
+ Contractions	=	Gross Job Losses	

Figure 2 Components of Employment Change: Tayside 1981-90

Openings	=	3,818	Job Gains = 13,599
Expansions	=	9,781	
			Net Job Loss = 1,706
Closures	=	9,957	
			Job Losses = 15,305
Contractions	=	5,348	

Figure 3 Components of Employment Change: Dundee 1981-90

Openings	=	2,504	Job Gains = 7,064
Expansions	=	4,560	
			Net Job Loss = 2,298
Closures	=	5,883	
			Job Losses = 9,362
Contractions	=	3,479	

Figure 4 Components of Employment Change: Rest of Tayside 1981- 90

Openings	=	1,314	Job Gains = 6,535
Expansions	=	5,221	
			Net Job Gain = 592
Closures	=	4,074	
			Job Losses = 5,943
Contractions	=	1,869	