THE ECONOMIC AND SOCIAL RESEARCH INSTITUTE

SHIFTS IN THE DEMAND FOR SKILLED LABOUR IN THE IRISH MANUFACTURING SECTOR: 1979-1990

Ide Kearney

April 1997

Working Paper No. 83

Shifts in the Demand for Skilled Labour in the Irish Manufacturing Sector: 1979-1990

Ide Kearney

4 March, 1997

1. Introduction

Throughout the 1980s the Irish manufacturing sector, both in terms of output and employment, underwent a radical structural transformation. Together with a dramatic increase in the importance of foreign-owned, high-technology, export-oriented industries there has been a marked shift in the composition of employment towards more so-called "skilled" workers. During this period unemployment and emigration rose strongly and the proportion of long-term unemployed, especially among the "unskilled", increased.

This chapter describes the aggregate and sectoral changes in the composition of employment in Irish manufacturing which occured in the 1980s. I use data on employment, wages and output for 72 sectors from the annual *Census of Industrial Production* covering the period 1979-1990. This is the only time-series source of data available which provides information on both employment and wages for different categories of worker. These data has not previously been used to examine the skill composition of employment at a sectoral level. The central purpose of this exercise is to describe what has happened to the demand for skilled and unskilled workers in the Irish manufacturing sector over the 1980s.

1.1. What causes shifts in the demand for skilled labour?

Modern growth theory emphasises the key roles of technological progress and the stock of human capital to the growth of an economy[1]. These are intimately linked. Firstly there have been extraordinarily rapid developments in existing and new technologies which have transformed the structure of modern economies. As production processes and competition on goods markets get increasingly more complicated, firms, particularly multinationals, are investing heavily in research and development and require more highly skilled employees. Secondly there has been a large and broad-based

[1]In neoclassical growth models technology is the only factor which explains observed wide differences in income levels and growth rates between trading countries. By introducing human capital accumulation, which serves as an additional factor influencing productivity, growth models can generate permanent differentials in per capita incomes between countries which is a better characterisation of observed patterns of development (see Lucas (1988)).

increase in the level of public and private investment in education and training. This has led to substantial increases in the relative demand for and supply of so-called "skilled" workers.

This observed shift in employment towards more skilled workers in developed economies has spawned a large literature internationally. While there is a general consensus that these shifts have indeed occured, there is much disagreement as to the likely causes of these shifts. This disagreement can be broadly characterised as distinguishing between two separate effects. Abstracting from general increases in skill levels in the workforce as a whole (which increase the relative supply of skilled labour) there are two competing demand-side explanations for why there has been a relative increase in the employment of skilled labour. One theory suggests that reductions in trade barriers and the globalisation of goods markets has caused production of low-skill intensive goods to shift to low-wage countries (Wood (1994)). This theory is centrally based on the factor-content theory of trade. Countries which are relatively skill-abundant will, given a reduction in trade barriers, shift towards producing more skill-intensive goods resulting in an expansion of production in skill-intensive sectors and a contraction in low–skill intensive sectors. As a first round effect this will increase the employment of skilled workers and reduce the relative wage of unskilled workers. The fall in the price of unskilled workers will in turn lead to an increase in the proportion of unskilled workers employed both in the expanding skill-intensive sectors and in the contracting labour-intensive sectors.

The second theory argues instead that skill-biased technological change[2] has increased the productivity of skilled workers more than unskilled thereby causing an outward shift in the relative demand curve for skilled labour (see Berman, Bound and Griliches (1994)). (Although the net effect of a skill-biased technology shock on the relative employment of skilled workers in ambiguous[3] it is generally assumed that positive output effects will outweigh negative substitution effects and shift the relative demand curve for skilled workers rightwards.) In this case we would observe an increase in the proportion of skilled workers employed in all sectors and an increase in the wage gap between skilled and unskilled workers or, in the presence of labour market rigidities, an increase in unemployment of unskilled workers.

A commonly used empirical technique to distinguish between these two effects is to decompose the increase in skilled employment into a) the proportion due to an increase *within* sectors which, it is argued, is evidence in favour of skill-biased technological change because it does not alter the type of goods produced but rather their production process, and b) the proportion due to shifts in relative employment *between* sectors, with a consequent change in the type of goods produced, which is taken as evidence of a trade effect. Empirical research has shown that the within sector effect dominates in the manufacturing sector for most developed countries (Bound, Berman and

[2]Skill-biased technological change refers to changes in existing technologies or the introduction of new technologies with an unskilled-labour-saving bias. Typically it refers to the widespread introduction of microprocessor-based technologies in recent decades.

[3]The ambiguity arises as follows. A skill-biased technology shock increases the productivity of skilled workers. This has two separate effects. For an unchanged level of output it reduces the employment of skilled workers - the *substitution effect.* For an unchanged level of skilled employment it increases the level of output - the *output effect.*

Machin (1994), OECD (1996)).

Of course these two effects are not mutually exclusive, rather the debate focusses on which is relatively more important. In addition the *ceteris paribus* assumption is clearly unrealistic. Trade may cause technological advances, where firms faced with tougher international competition are forced into what is termed "defensive innovation". Technological progress, rather than being factor biased, may be sector biased in favour of skill-intensive sectors causing a shift between sectors. Alternatively firms may outsource the less skill-intensive parts of their production process e.g. moving assembly to a low-wage country, which would show up as a shift within sectors (Wood (1995)).

Finally this analysis is confounded by the fact that the general increase in skill levels has altered the relative supply of skilled labour. Whether this general increase in skill levels was driven by demand or supply factors is an open question, since increased education levels are clearly central to the improvements of existing and the development of new technologies. However the fact that both the relative demand and supply curves for skilled labour have shifted makes causality difficult to determine.

Regardless of whether the increased demand for skilled labour is largely attributable to a technology, trade or supply-side effect it is clear that such an increase has indeed occured in most developed countries. The following quotation neatly summarises the international empirical evidence to date:

> "There has been a substantial shift in demand away from unskilled workers toward skilled workers. This shift has outweighted supply shifts in the same direction. In countries where wages are flexible, such as the United States, ths demand shift generates substantial declines in the relative wages of the unskilled. In countries where wage relativities are fixed, as in Europe, the consequence is a large rise in unemployment among the unskilled, which is enough to explain much of the overall rise in unemployment." Nickell and Bell (1996, p.302)

1.2. The Irish Experience

The Irish experience in relation to the evolution of employment by skill is particularly interesting. Widespread public investment in education only began in the late 1960s, so that this cohort of more highly educated workers came on stream in the 1980s. During the 1980s average education levels of Irish workers continued to rise.[4] It is generally accepted (OECD (1995)) that one of the main engines behind the high growth levels in Ireland over the past three decades has been a strong improvement in average education levels. At the same time Ireland still has one of the highest rates

[4]From 1981 to 1991 the percentage of all workers who left full-time education at the age of 14 or less fell from 27% to 17% while the percentage who were still in full-time education at the age of 19 or more increased from 15% to 20% (see Table B.2).

of long-term unemployment in the OECD with high unemployment rates among the unskilled.[5]

In this chapter I analyse the changes in the composition of employment in Irish manufacturing using data on 72 individual sectors over the period 1979-1990. The data indicate that there has been a persistent trend toward the employment of relatively more skilled workers over this period. This is consistent with trends in skilled manufacturing employment in most developed economies (Berman, Bound and Machin (1994)). However the data also highlight the extent to which skill usage varies across sectors, high growth sectors have the most skill-intensive production processes, these are also the sectors where skill-intensity is increasing fastest, while low-growth or declining sectors have the lowest.

While the Irish wage gap between skilled and unskilled workers in 1979 was sizeable, it did not, on average, increase in proportion with the increase in relative employment in the 1980s. Indeed in the 12 sectors with the highest growth rates, relative wages narrowed over the period. This contrasts with the experience in the UK and the US, where increased wage dispersion occured through the 1980s, but is similar to the experience in other European economies where there was instead an increase in unemployment. This slower increase in the wage gap in Ireland is due both to an effective ceiling on skilled wage levels caused by a very elastic labour supply and an effective floor on unskilled wage levels due to the replacement ratio offered by the Irish social welfare system. On the one hand, because of high rates of emigration among skilled persons throughout the 1980s, there exists a substantial pool of skilled and mobile emigrants who monitor employment conditions in Ireland for evidence of emerging skill shortages.[6] These emigrants essentially represent an additional pool of potential workers keeping Irish labour supply relatively elastic at high wage levels. In addition labour force participation rates have been rising, especially among women[7]. On the other hand replacement ratios increased substantially through the 1980s in Ireland[8] so that labour supply is inelastic at low wage levels.

Given these structural characteristics of the Irish labour market the effect of an increase in the relative demand for skilled workers can be posited as follows. The supply of skilled workers rises due to increased participation and immigration. This increased supply chokes off some of the upward pressure on skilled wages. The relative decline in the demand for unskilled workers leads to downward pressure on unskilled wages. This increases the replacement ratio for the unskilled and causes an increase in unskilled unemployment. Given a continuous shift in relative demand towards skilled workers through time this will cause unemployment among the unskilled to rise and persist.

[5]In 1991 the unemployment rate for those with only primary education completed was 22.4% as compared with an average of between 4 and 5% for those with some third level qualifications (Canny, Hughes and Sexton, 1996).

[6]Between 1980 and 1990 the gross population outflow was approximately 350,000. An estimated 28,000 of this was in the "professional/technical" occupational category, with an estimated inflow of 20,000 in the same category. Data on graduate emigration suggest that the pace of these flows has increased significantly in recent years (see NESC (1991), p.274, footnote 15).

[7]The female labour force participation rate in the 25-64 age group rose from 26% in 1979 to 35% in 1990.

[8]For example, over the period 1977 to 1994 net average earnings in manufucaturing rose by 18% in real terms while the real value of Unemployment Assistance rose by 48% over the same period. (Sexton and O'Connell, 1996 p145)

This latter is effectively what occured. Through the 1980s in Ireland long-term unemployment rose dramatically from an estimated 34.5% in 1983 to 63.5% in 1990 (see Sexton and O'Connell (1996, Table 3.4). These long-term unemployed are concentrated in older age groups and groups with low educational qualifications (see Table B.2 in Appendix B for details).

The remainder of this chapter is structured as follows. Section 2 looks at movements in the composition of employment and wages in the aggregate manufacturing sector. The employment and wage data I use are also defined in this section. In Section 3 I formulate stylised categories of skilled and unskilled workers from these data. Clerical workers are separately identified as a third category of worker. This section also includes a discussion of definitions used in the international literature. Section 4 looks in more detail at the sectoral data on employment, wages and output. In this section I identify three broad groups of sectors which exhibit diverse output and employment growth patterns over the period. These correspond to a 'high-growth' group of sectors which has more than doubled in importance both in output and employment terms over the period, a 'medium-growth' group of sectors and a low-growth or 'declining' group of sectors which has shrunk in size over the period. Section 5 decomposes the change in both employment and wages for these three groups of sectors into the relative importance of within and between group shifts in skilled employment over the period. While most of the increase in skilled employment has been within sectors, sectoral growth has been highest among the skill-intensive sectors. There has been a significant restructuring of the Irish manufacturing sector through the 1980s with the emerging dominance of a few high-growth, largely foreign-owned, skill-intensive high-technology sectors in overall growth performance. These sectors account for most of the increase in the relative demand for skilled labour.

2. Aggregate Trends in Composition of Labour 1979-1990

This section describes the trends in the aggregate manufacturing sector's output and employment performance over the period 1979 to 1990. The *Census of Industrial Production* gathers data on the employment and wages of five different categories of employee. These data are described briefly in Section 2.1 and more fully in Appendix A. Analysis of these data, reported in Section 2.2, reveals that until 1986 aggregate employment in the manufacturing sector fell dramatically, this was during a period of relatively low growth in output. Since 1987 output growth has picked up strongly and employment growth has also risen. There has been a significant and persistent shift towards employing more administrative and technical workers over this period while relative wage increases for these workers have been modest. An interesting trend has been the increase in clerical employment and wages which, I argue, reflects an increase in the demand for computer skills in manufacturing.

2.1. Data on the Composition of Manufacturing Employment

I have received some unpublished data from the CSO[9] which, together with the data published in the *Census of Industrial Production* (CIP) provide a five-way disaggregation of employment and wages at the NACE 3-digit sector level for a total of 72 individual sectors. These data cover the period 1979-1990 and are as detailed as the original CIP questionnaire allows. (For full details on the data set see Appendix A.) This five-way disaggregation is as follows:

	Employee Category	**Description**
1	*Administrative and Technical Staff*	All managerial, technical and other salaried staff.
2	*Clerical Staff*	Clerical and other office staff, including clerical supervisors.
	Industrial Workers comprising:	
3	Supervisors	Manual supervisory staff, e.g. foremen and production supervisors.
4	Operatives	All manual workers with the exception of apprentices and outside piece workers.
5	Apprentices	All apprentices

In addition I have data on value added, volume output and the cost of capital for each of the 72 sectors as described in Appendix A.

There are two problems with the definitions of the wage bill and employment[10]. The first is that these data include both full-time and part-time workers. This means that the calculated wage rates per worker will be understated to the extent that numbers employed include part time workers. The correct denominator in calculating wage rates is full-time equivalent numbers employed. Unfortunately there is no way round this problem; as can be seen from the CIP questionnaire this information is not asked of the firms. However in Ireland the rates of part-time work (8% in 1990 for the workforce as a whole, 17% for women and 3% for men) are much lower that the EC average although they rose rapidly in the 1980s (from 58,000 in 1979 to 92,000 in 1990). It is estimated that three quarters of this employment (70,000) is in the services sector (Corcoran et al. (1992)). This would suggest that the importance of part-time work for manufacturing was relatively small over the 1980s [11] although there is evidence that it has been increasing since then.[12] In fact Drew (1990, p.22) points out that between 1983 and 1987 the proportion (and absolute number) of part time workers employed in industry declined.

The second problem with the definition of wages and employment is that the employment figures

[9] I am grateful to Richard Maher of the CSO for providing me with these data.

[10] I am grateful to John Micklewright for pointing these out to me.

[11] The 1990 Labour Force Survey data estimate that 7,500 workers (equivalent to 3% of all workers) in "Other Production Industries" (all production industries except for agriculture, forestry, fishing and building and construction) were in part-time jobs.

[12] The Forfas survey of manufacturing industries estimates that 13,000 (5.8%) workers were employed in the category "part-time, temporary and short-term employment" in 1990, this figure has risen to 24,000 (9.5%) by 1995 (Forfas (1996)).

are measured in the second week of September in each year while all other data, including the wage bill data, are measured at the end of firms' financial year (which for over three quarters of all firms is the end of calendar year). Thus the numerator and the denominator of the calculated wage rates do not relate to the same time period. This problem will be more distortionary for sectors with high and changing seasonality in employment over the sample period. Quarterly total employment data, which could be used to get an annual average estimate of employment, are only collected for 34 "broad" industrial sectors so this is not possible for the 72 "detailed" sectors used here[13].

2.2. Trends in the Aggregate Manufacturing Sector Data

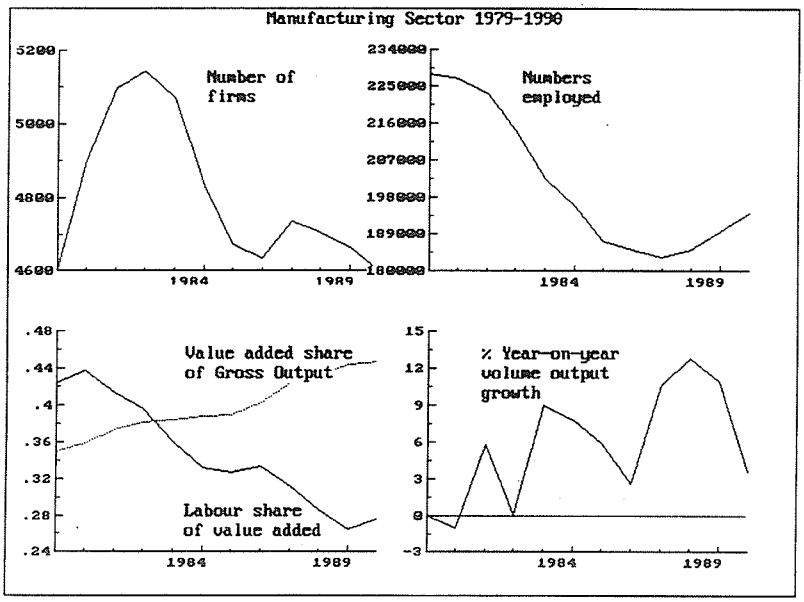

Figure 2.1: Output, Employment and Number of Firms in the Irish Manufacturing Sector 1979-1990

Figure 2.1 plots some key variables for the Irish manufacturing sector. For the manufacturing sector as a whole there are three distinct sub-periods in overall output growth performance: the three year period 1979-82 where growth was virtually stagnant, (annual average growth was 1.5%), the four year period 1982-86 when growth picked up (annual average growth was 6.3%), and the four year period 1986-90 when there was a rapid expansion in growth (annual average growth was

[13]In addition, because the wage data measure average annual earnings rather than hourly wages they are influenced by hours worked. This may introduce a spurious positive correlation between wages and employment because hours are procyclical (see Nickell and Wadwhani, 1991).

9.4%). This pattern is mirrored in the behaviour of aggregate employment, albeit with a one-year lag. Employment fell continuously at a rate of -2.7% per annum until 1987 (with the highest single year decrease recorded in 1983 at 5.5%), from then it increased at a rate of 1.9% per annum. The overall decline in manufacturing employment from 1979 to 1990 was close to 34,000, almost 15% of the 1979 level.

Over this period the aggregate data indicate that there has been a marked change in the production of manufacturing output. The ratio of value added to gross output, that is the amount of value added embodied in each unit of output, rose from 0.35 to 0.45. Abstracting from potential biases due to transfer pricing distortions[14], this is indicative of a significant improvement in productive efficiency. At the same time labour's share of value-added (measured by the wage bill relative to net output) fell from 0.42 to 0.28. Both of these trends are suggestive of structural and/or technological change in production in the manufacturing sector.

Finally Figure 2.1 plots the number of firms in the manufacturing sector over the period 1979-1990.[15] While the number of firms has fallen by only 3 between 1979 and 1990 it is clear from the graph that within the period there were substantial births and deaths of firms with a *net* increase of 538 firms (an increase of 11.7%) set up in the early 1980s, this peaked in 1982 after which the number of firms contracted until 1987 when there was another more modest increase of exactly 100 firms. From 1987 onwards firm closures dominated and the total number of firms in 1990 was 4602 as compared with 4605 in 1979.

Since employment did not rise in tandem with the increase in the number of firms in the early 1980s this would suggest that these were mainly small firms. This is in fact the case. In a longitudinal study of unpublished CIP firm-level data, Keating and Keane (1989) show that all of the increase in the number of firms between 1979 and 1982 was in firms employing less than 30 workers. In addition the rate of firm closure was highest for small firms.[16] Notably the average size of firms fell so that while in 1979 the average firm employed 50 workers, by 1990 this had fallen to 42 (see Tables B.6 and B.7). This is in line with international trends towards a fall in the average size of firms (Haskel (1996b, p.3)).

[14]The term 'transfer pricing' is used throughout this chapter in a rather loose sense to refer to the propensity of subsidiaries of foreign multinationals to overstate reported profits originating in Ireland, so-called "profit-switching transfer pricing" (see Stewart (1989) for a full discussion). The existence of zero-rated corporation tax on manufacturing exports until 1980 (and until 1990 for firms in place before Jan. 1 1980) and a reduced rate of 10% on all manufacturing profits from 1980 onwards means that branch plants located in Ireland have an incentive to engage in such profit-switching transfer pricing. That is, they artificially underprice their imported inputs (imported from other subsidiaries located outside of Ireland) and overprice their output prices to inflate reported profits earned in Ireland. The measured statistics are thereby distorted (see Murphy (1995)). A substantial portion of these profits are then repatriated to their home country. This is not an insignificant issue since profit outflows (including profts, dividends and royalties) rose from 2.8% of GDP in 1980 to 9.4% of GDP in 1990 (O'Malley and Scott (1994)).

[15]In these Census of Industrial Production data a firm is defined on an establishment basis where an establishment is defined as "a single economic activity conducted at a particular location." (CSO 1990, p9) In this chapter where I use the term 'firm' I am refering to an establishment as defined on this basis.

[16]Between 1979 and 1985 59% of firms with less than 5 employees closed, 38% of those with 5-9 employees closed while the overall closure rate was 35% (Keating and Keane, p10).

Part of the explanation for the high closure rate in the period 1982-1985 may lie in the fact that in 1979 the census was revised and updated and "includes some establishments which ... were included at an early stage of their development" (Keating and Keane (1989, p.11)). In addition, given that a lot of the firm turnover occured in firms with 3-5 employees, it may be that firm 'closures' merely reflect a decline in firm size below the lower cut-off point of three or more persons engaged which is used in the census. In sum, the analysis in the paper by Keating and Keane highlights that the summary data on number of firms in each year mask considerable volatility in start-ups and closures in each year. This will be of crucial importance in modelling factor demands in the next chapter.

	% Share of Total Employment						**Employment**		
	Male		*Female*		*Total*		*Male*	*Fem.*	*Total*
	1979	*1990*	*1979*	*1990*	*1979*	*1990*	*1990 as % of 1979*		
Supervisors	3.6	3.6	0.6	0.6	4.1	4.2	86.2	94.5	87.3
Operatives	52.1	47.1	21.3	23.2	73.4	70.2	77.3	93.1	81.9
Apprentices	2.5	1.7	0.7	0.3	3.2	2.0	56.7	38.3	52.8
Industrial	58.1	52.3	22.6	24.1	80.7	76.4	77.0	91.5	81.0
Clerical	3.4	4.5	5.6	6.4	9.0	10.8	113.1	96.6	102.8
Admin/Tech.	9.3	10.9	1.0	1.9	10.3	12.8	99.8	162.4	105.8
Total	70.8	67.7	29.2	32.4	100.0	100.0	81.7	94.9	85.6

Table 2.1: Manufacturing Employment Shares By Sex and Category of Worker

Table 2.1 gives details on the shares of each type of worker in total manufacturing employment in 1979 and 1990. It can be seen that Operatives are by far the largest group of workers represented, accounting for 73% of total manufacturing employment in 1979, this share dropped to 70% in 1990. Apprentices are the smallest group with a share of under 2% in 1990 and Supervisors are the next smallest group (approximately 4%). The share of Clerical Staff (CL) rose by almost 2 percentage points over the period while the share of Admin/Tech (AT) Staff rose by two and a half percentage points. These are the only two groups where the absolute number employed has risen, by almost 6% for AT workers and almost 3% for CL workers. By contrast the level of Industrial Workers (IW) employment in 1990 fell by 19% relative to 1979, the biggest percentage fall was in the employment of Apprentices which almost halved over the period. Figure B.1 gives an overview of the relative share of CL, AT and IW workers in total manufacturing employment over the period. This visually confirms that the decline in manufacturing employment was due to a dramatic decline in IW employment.

Interestingly the increase in employment in the AT category was exclusively due to a massive increase in female employment, while in all other categories, and indeed in absolute terms, the level of female employment fell marginally (dramatically in the case of Apprentices). Since the data do not distinguish between part-time and full-time employment, it is not possible to infer how

much of this increase in female AT employment is in part-time work. General trends in female employment[17] over the period suggest it may account for some, but not all, of the increase.

Figure B.2 shows the numbers of male and female workers employed for each of the years 1979 to 1990 for AT, IW and CL workers. Besides a sizeable fall of over 30,000 in male IW employment which, given the importance of this category, has led to an overall fall in manufacturing employment of almost 33,000 over the period, the other categories of employment are relatively stable. The growth in female AT employment is clearly from a very low base.

The increase in CL employment is interesting. Perhaps surprisingly the increase in clerical employment in manufacturing is due to an increase in male employment with a marginal fall in female clerical employment. By contrast a recent study by Canny et al.(1996) found that between 1981 and 1991 male clerical employment for the economy as a whole fell by 13% and female clerical employment rose by almost 7%. Within their detailed occupation groups, male clerical employment rose in three occupational groups, namely typists and key-punch operators, computer operators and clerical supervisors. The increase in employment of computer operators was approximately 280% (220% for females), while the biggest decline was the employment of telephone operators. This would suggest that the increase in CL male employment for manufacturing reflects a large increase in the employment of computer operators. Indeed if we look at the manufacturing sectors where male clerical employment increased by 200% or more over the period 1979-1990 they are Office and Data Processing (sector 33, 247%), Insulated wires and cables (sector 341, 243%), Equipment for telecommunications, electronic recording, etc (sector 344, 460%) and Radio and television receivers[18], etc (sector 345, 423%). These are all sectors where computer skills are likely to be important. Therefore I am assuming that the increase in CL male employment is due to a) advances in information technology increasing the demand for computer skills and b) the classification of computer operators as clerical staff by firms in answering the Census questionnaire.

	1979	**1990**	**1990 as % of 1979**
Supervisors	0.79	0.78	99.0
Apprentices	0.30	0.29	96.8
Operatives	0.57	0.54	94.9
Industrial Workers	0.57	0.54	96.0
Clerical	0.57	0.63	111.2
Admin/Tech	1.00	1.00	100.0

Table 2.2: Ratio of Wage Rates to Admin/Tech Wage Rates in Manufacturing Sector

[17]Both female labour force participation rates and the proportion of part-time work in total female employment have risen between 1979 and 1990 in the economy as a whole (the former from 35.1% to 38.5%, the latter from 12.7% to 17.1%).

[18]Bizarrely this sector which is defined by the CSO as 'Radio and television receivers, sound reproducing and recording equipment' includes 'reproduction of computer media' and 'software consultancy and supply'.

Table 2.2 gives details of relative wages (where the wage rate for Admin/Tech Staff is the denominator) for each category of worker in the manufacturing sector. Unfortunately the wage data are not broken down by sex. Relative wages have fallen somewhat for Industrial Workers and risen strongly for Clerical Staff. (Arguably the AT wage data may be understated if the increase in female employment is mainly due to part time work and the CL wage data overstated if the increase in male employment has increased total full-time CL employment.) Interestingly Clerical relative wages start at the same level as Industrial wages but while there is no catchup in the IW/AT wage, Clerical wages move from 57% to 63% of AT wages over the period. The net effect is that from close to parity in 1979 Clerical wages had increased by 17% relative to Industrial wages by 1990. Supervisors wages are well above the IW (and indeed CL) average although there is no persistent evidence of catchup over the period.

These relative wage ratios indicate clearly that the level of AT wages is far above the others. In 1990 Apprentices on average earned just 29% of the average AT wage, Clerical workers 63%. Figure B.3 shows labour costs per worker for the years 1979 to 1990. AT wage rates are higher than all other wages and the wage gap is sizeable and persistent.

The increase in Clerical relative wages, given an increase in CL relative employment, would suggest an outward shift in the demand curve for clerical workers. I interpret this as an information technology shock raising the productivity of workers with computer skills.[19] A recent paper by Krueger(1993), in a micro study of US workers over the 1980s, found that workers who use computers at work earn on average 10 to 15% more than similar workers who do not use a computer at work. Both Machin(1994) and Haskel (1996a) found that the introduction of computers had a positive effect on "skilled" employment. Also Timothy Bresnahan, in commenting on Lawrence and Slaughter's (1993) paper, argued that the most important factor behind the shift in demand towards skilled labour in the US was the computerisation of white collar work.

3. Definition of Skilled and Unskilled Labour

This section describes how I map the Census of Industrial Production data on employment categories into stylised "skilled" and "unskilled" employment categories. I have chosen to distinguish three separate categories of worker, namely Administrative and Technical Staff as a proxy for "skilled" workers, Industrial Workers as a proxy for "unskilled" workers and Clerical workers as a third category which is of separate interest due to the impact of computerisation on the demand for these workers.

[19]Unfortunately there are no data for Irish manufacturing on computer usage however there is strong anecdotal evidence that there has been a dramatic increase in investment in information technology. (see Fitz Gerald and Breathnach, 1994)

3.1. Definition of Skilled and Unskilled Workers in International Studies

The burgeoning international literature on labour demand heterogeneity typically defines two broad categories of worker which are intended to approximate to a skilled/unskilled distinction and are measured variously as nonproduction/production, white-collar/blue-collar, salaried/waged etc. This distinction is then used to investigate observed shifts in the relative demand for skilled workers so defined. For example Bresson et al. (1992) disaggregate their employment variable into skilled and unskilled workers where the skilled workers category includes engineers, technicians, skilled production workers, administrative and commercial staff and the unskilled workers category includes unskilled production workers. Berman et al. (1994) disaggregate employment into production and non-production workers where "production workers are "workers (up through the working foreman level) engaged in fabricating, processing, assembling, inspecting and other manufacturing." Non-production workers are "personnel, including those engaged in supervision (above the working foreman level), installation and servicing of product, sales, delivery, professional, technological, administrative, etc." [U.S. Bureau of the Census 1986, p. D-16]"(p. 369) In the only Irish study of this type, Boyle and Sloane(1982) disaggregate employment into wage-earners and salaried-workers, (these correspond broadly to production and non-production workers) where the former includes clerical staff. There are numerous other examples of studies of this type; Hamermesh (1993, pp108-118) documents a broad range of studies on the demand for heterogenous labour, citing twenty one studies which use a blue-collar/white-collar disaggregation.

Hamermesh (1993, p.112) is very critical of the "production" and "non-production" proxies for skilled/unskilled which are used in many studies of labour demand. "Part of the problem is that studies using aggregate data on the nonproduction-production worker distinction are comparing groups whose skills overlap greatly. While there is on average less human capital embodied in production workers, the distinction between the two groups is not sharp,..." He argues that it would be more meaningful to disaggregate employment by age and experience because "the huge literature on human capital makes it clear that this is also an aggregation by skill."(p.66)

There are many potential inconsistencies with the production/nonproduction distinction.[20] For instance they abstract from changes in the skill composition of the workforce as a whole. This point is particularly relevant for Ireland where the introduction of free education in the late 1960s meant that there was a general increase in skill levels in the cohort of workers entering the labour force in the 1980s. A potentially more worrying definitional problem, raised by Davis and Topel (see Lawrence and Slaughter, 1993), is that relative skill levels within production/nonproduction categories may vary between firms, across industrial sectors and over time. If this were the case then examining underlying trends in different worker categories, however defined, would be meaningless. In a different vein Caves and Krepps (1993) argue that much of the increase in white-collar workers employment reflects an increase in "fat" or bureaucracy within many companies rather than an increased demand for skilled workers.

[20]Robert Hall points out that the US definition of nonproduction workers includes airline pilots while production workers includes co-pilots (see Caves and Krepps, 1993).

Several recent studies have tried to address some of these definitional difficulties. Machin, Ryan and Van Reenan (1996) examined the correlation between education based definitions of skill and the production/nonproduction distinction for four countries, the UK, the US, Sweden and Denmark, and found that they were highly correlated. Similarly Berman et al. (1993) found that nonproduction workers and white-collar workers had consistently more years of education than production and blue-collar workers. Significantly they found that this was also true for clerical nonproduction workers. Table B.2 gives some details on education by broad occupational groups from the Irish *Census of Population* for those in employment. In 1991 more than 80% of professional workers had continued full-time education up to the age of 19 plus. This contrasts with less than 5% for labourers, and 5% for skilled production workers. The majority of those in clerical occupations completed secondary education (ceased education at age 17-18) as compared with less than 30% of skilled production workers. More than three quarters of managers, professional workers, associate professional workers and clerical occupations continued in full-time education beyond the age of 16 compared with an overall average of 55% for all occupational groups, 38% for production operatives and 34% for skilled production workers. These data suggest that those in the administrative and technical staff category are likely to have more years education than the industrial workers category.

Despite their limitations the production/nonproduction categories are now widely used, mainly because they are identified in the annual census in most countries and are therefore available over time across a broad range of industries. Irish data are no exception to this, the data I have sourced are the closest time-series approximation to a skilled/unskilled distinction currently available in Irish data. In disaggregating the data I define Administrative and Technical Staff as "skilled workers" and Industrial Workers as "unskilled workers". It is important to remember that these categories are defined by the firms themselves in answering the questionnaire, the CSO do not provide a listing of occupational classifications to be used by firms beyond the broad definitions given in Section 2.1. The Admin/Tech Staff category is defined to include all "salaried staff" which would in general be a proxy for staff hired with some educational qualification. And the Industrial Workers category refers to "manual" workers which, arguably, would be more closely associated with lower levels of educational qualifications. But here I am surmising; the variables, as we will see, however poor a proxy they may be to a skilled/unskilled definition, do indicate interesting and distinctive trends over time.

3.2. "Unskilled Workers" = Industrial Workers

The Industrial Worker category is an aggregation of three separate categories in the CIP questionnaire, namely Apprentices, Manual Workers (also defined as "Operatives") and Manual Supervisory Staff (also defined as "Supervisors"). Manual Supervisory Staff includes both foremen and production supervisors. In this it differs for the US Annual Survey of Manufactures which defines foremen as production workers and supervisors as non-production workers. This separation is not possible with the Irish data because they are not separated in the census questionnaire.

The two individual categories, Apprentices and Supervisors, are very small. Operatives account

for 90.9% of *IW* manufacturing sector employment in 1979 and 91.9% in 1990, Supervisors for 5.1% in 1979 and 5.5% in 1990 and Apprentices for 4% in 1979 and 2.6% in 1990. The numbers for separate categories on "Supervisors" and "Apprentices" are very small and for some industry groupings are zero (esp. for "Apprentices"). At a sectoral level the domination of Operatives employment is also apparent, e.g. in the Wool sector (NACE 431) on average Operatives accounted for 93% of *IW* employment, in the Pharmaceuticals sector (NACE 257) the corresponding figure is 91%. The Operatives category, relating as it does to manual workers, is likely to cover most of the unskilled or lower-skilled workers employed in a given firm so that its dominance within the *IW* category does lend some credence to my *IW* = unskilled proxy.

3.3. "Skilled Workers" = Administrative and Technical Staff

The discussion of the aggregation to the Industrial Workers category raises a related point in the definition of Admin/Tech Staff, namely why I chose not to include Supervisors in the *AT* category. Essentially it is a moot point whether Supervisors should more properly be included with Administrative and Technical Staff. As mentioned above, in the CSO data Supervisors includes both foremen and production supervisors where in the US Survey of Manufactures foremen are defined as production workers and production supervisors as nonproduction workers so the appropriate classification of this Supervisors category as between production and nonproduction workers is unclear.

Manufacturing sector employment of Supervisors as a percentage of *IW* barely changed over the period 1979-1990 while the level of Supervisors employment fell by almost 13% over the period (*IW* fell by almost 19%) in contrast to the 6% increase in *AT* employment (Table 2.1). So in employment terms Supervisors are losing ground relative to *AT* workers. However Supervisors' wages are far higher than average Industrial Worker wages. On average *AT* wages are 25% higher than Supervisors' while *IW* wage rates are 28% lower, thus Supervisors wages are approximately half-way between *IW* wages at the lower end and *AT* wages at the upper end (see Figure B.3). Furthermore Supervisors wages have risen relative to the *IW* average over the period. I finally opted to group Supervisors within Industrial Workers by recourse to the likely nature of the firms classification in the questionnaire. This is because in the CSO questionnaire the question on Supervisors relates to "Manual supervisory staff", and the question on Administrative and Technical Staff relates to "Managerial, technical and *other salaried staff*". Therefore I suspect (of course one cannot be sure how such questions are treated by firms themselves without asking them) that firms would answer these questions with reference to salaried vs. waged staff, a distinction which exists in a lot of Irish firms. I would hazard that "waged" or "manual" staff within a firm are less likely to have high levels of education, assuming education is an indicator of skill levels. Thus I felt it better to leave Supervisors in the general unskilled category.

3.4. Clerical Workers: A Third Category

I keep the category Clerical Staff separate. It is a relatively large category, accounting for almost 11% of manufacturing employment in 1990, and along with AT it is the only other category where employment grew, albeit slowly, over the period. It is also the only category where wage rates, relative to AT, grew significantly over the period, by over 6 percentage points. However its wage levels are so far below AT levels, even in 1990, that I felt it should be kept separate from AT.

As mentioned above, clerical employment has undergone enormous change as rapid growth in the use of computer technology has swept across all industrial sectors. This led to widespread predictions that there would be major job losses for clerical workers with information technology leading to the "deskilling" of workers. This does not appear to have happened in Irish manufacturing, instead wages relative to 'skilled' workers have risen[21] and (male) clerical employment has risen, two factors which taken together would suggest an outward shift in the demand for clerical workers.[22]

The fact that the nature of clerical employment is changing, with big shifts in occupations within the clerical employment category as documented in Canny et al. (1996) and adverted to earlier, makes it a fundamentally different category of worker from the other two. In defining workers as "skilled" or "unskilled" the motivation is to identify two distinct but internally homogenous groups of workers and to look at shifts which have taken place between the two groups. However the major changes in the clerical workers category seems to have occured within the category with an increase in the skill-intensity of clerical work. Although such internal changes may have also occured within the skilled and unskilled employment categories, the very evident idiosyncratic effect which computerisation has had on clerical occupations makes it impossible to ignore.

Finally a more prosaic reason why I separate out Clerical staff is that the CL wage data for certain sectors behave somewhat erratically. This is because in the CSO dataset I had to calculate the Clerical wage bill as a residual. (Appendix A gives more details on this.) For example in the Furs and fur goods sector (NACE 456) clerical wages as measured increased by 450% in 1988. This is the largest outlier in the CL wage data.Within this sector between 1987 to 1988 two firms closed down, clerical employment halved and the actual level of clerical employment was very small (4 employees in 1988). So, in a small number of cases, the CL data are bedevilled by a small numbers problem coupled with the effect of discrete changes within small sectors. Also because the wage bill data are calculated as a residual, small numbers can be seriously distorted by rounding and revisions.

[21] Entorf and Kramarz (1994), in a panel study of Frence labour force data over the period 1985-87, found that the higher the skill level of the employee the less the use of modern new technologies is compensated. "Managers, technicians, engineers are not compensated for their use of modern NT; it is part of the definition of their job" [p25].

[22] It is possible that the increase in male employment may have caused an increase in *full-time* clerical employment so that the observed increase in wages merely reflects a shift from part-time to full-time employment. However even if this were the case it still indicates that there has been a change in the demand for clerical workers.

3.5. Comparison with International Definitions

How do these definitions of skilled and unskilled workers compare with those used in international studies? Table 3.1 contains data on the wage share and employment share of nonproduction workers in manufacturing for four countries, the UK, the US, Denmark and Sweden. These are compared with three alternative definitions of skilled workers from the Irish data, respectively AT, $AT+CL$ and $AT+CL+IW(Supervisors)$. The first of these is the narrowest definition of skilled employment, this is the definition which I use in this chapter. The second includes clerical workers in the definition of skilled employment, typically clerical workers are included as skilled workers in international data although, as seen earlier, clerical wages are substantially lower than average non-clerical skilled wages, at least for Ireland. The third definition includes manual supervisors from my unskilled IW category.

	Wage Share			**Employment Share**		
	1973	1979	1989	1973	1979	1989
US	0.34	0.35	0.42	0.25	0.26	0.31
UK	0.32	0.35	0.41	0.26	0.29	0.33
Denmark	0.34	0.33	0.40	0.25	0.27	0.32
Sweden	0.36	0.39	0.40	0.27	0.29	0.30
Ireland:						
AT		0.17	0.20		0.10	0.13
$AT+CL$		0.25	0.32		0.19	0.24
$AT+CL+IW(Supervisors)$		0.31	0.37		0.23	0.28
International data on nonproduction workers in manufacturing taken from Machin, Ryan and Van Reenan (1996), Table 1 and Figure 4						

Table 3.1: Nonproduction Workers Share of Total Employment and Wage Bill In Four Countries: A Comparison With Different Measures of Irish Nonproduction Workers

Looking at the table it is clear that under even the widest definition of skilled labour, Irish employment and wage bill shares for skilled workers were lower in 1989 than the equivalent measures for any of the other four countries. This is not surprising since education levels in Ireland have only recently begun to catch up with those of the US and Europe. Nonetheless the Irish skilled employment and wage shares had the highest annual average growth rates of all the countries listed. Thus there is evidence that the skill composition of the Irish manufacturing sector's labour market is increasing in line with similar international trends in OECD economies and, given these higher growth rates, should catch-up with international levels.

Under the second definition of Irish skilled employment Irish relative skilled/unskilled wages have risen over the period. However under all three definitions Irish relative wage rates have not changed by much. This is in contrast to the US and UK experience during the 1980s (see Figure

2 in Machin et al. (1996)) but similar to average European trends. Rapidly widening wage gaps in the US and UK between skilled and unskilled employment have fuelled much of the recent interest in analysing the composition of employment in those countries. By contrast in mainland European countries wage differentials have in some cases narrowed (Draper and Manders (1996) for the Netherlands). It is argued (Saint-Paul (1996)) that this is due to labour market institutional rigidities, which prevent relative unskilled wages from falling in many European countries thus causing a spill-over of this relatively expensive unskilled labour into unemployment. This means that given a fall in demand for unskilled labour, the net result for the UK and the US has been a widening wage gap[23] while the net result in Europe has been an increase in unemployment. The Irish experience, where there is also evidence of an increase in the demand for skilled labour relative to unskilled, seems to lie closer to the European experience. The large and persistent increase in long-term unemployment in Ireland in the early 1980s was mainly among those with relatively few educational qualifications (see Table B.2).

4. Sectoral Trends in Composition of Labour 1979-1990

In this section I look at some indicators of growth in output, employment and wages for the 72 individual sectors in order to piece together a picture of the structure of the manufacturing sector and its evolution over the period 1979-90. The data in general reveal the extent to which the manufacturing sector is an aggregation of many very different types of production activities. I look at indicators of output growth, employment growth, changes in the number of firms in each sector, shifts in employment ratios and corresponding wage ratios. In Appendix B Tables B.3, B.4 and B.5 show the annualised growth rates in these variables for all 72 sectors. In addition Tables B.6 and B.7 give the levels of output and employment shares and unit labour costs in 1979 and 1990 respectively. In each of these tables the sectors are ranked from 'highest' to 'lowest' based on the individual sector's average output growth over the period 1979-90.

Table 4.1[24] summarises the population correlation coefficients[25] covering the period 1979-1990 between the employment levels, labour costs per employee (referred to here as 'wages'), number of firms and volume output. These are calculated for all 72 sectors. In addition Figures B.4 and B.5 in Appendix B plot these correlations computed recursively from 1979 to 1990.

The correlation between volume output and employment is highest for skilled (LAT) employment and weakest for unskilled (LIW) employment. Figure B.4 shows that the correlation of volume output with both clerical (LCL) and unskilled employment has fallen substantially over

[23] For an analysis of the UK skilled/unskilled wage premium see Haskel (1996b), he argues that more that 50% of the increase in the UK premium over the 1980s is due to the introduction of computers).

[24] LAT is AT Employment, LIW is IW Employment, LCL is CL Employment, $CLAT$ is AT Labour Costs per employee, $CLIW$ is IW Labour Costs per employee, $CLCL$ is CL Labour Costs per employee, NO is Number of firms, Q is Volume Output.

[25] The reported correlation coefficients between any two variables x and y were calculated as follows:
$\sum_i \sum_t (x_{it} - \overline{x})(y_{it} - \overline{y}) / \sqrt{\sum_i \sum_t (x_{it} - \overline{x})^2 \sum_i \sum_t (y_{it} - \overline{y})^2}$ where $t = 1979...1990$, $i = 1..72$.

	LAT	LIW	LCL	CLAT	CLIW	CLCL	NO	Q
LAT	1.0							
LIW	0.74	1.0						
LCL	0.82	0.69	1.0					
CLAT	0.10	-0.08	0.13	1.0				
CLIW	0.13	-0.09	0.14	0.90	1.0			
CLCL	0.12	-0.06	0.14	0.86	0.84	1.0		
NO	0.54	0.70	0.41	-0.21	-0.17	-0.16	1.0	
Q	0.73	0.52	0.58	0.21	0.22	0.19	0.19	1.0

Table 4.1: Correlation matrix of sectoral variables

the period while that with skilled employment has risen gradually. Unskilled employment has the weakest correlation with the other employment levels and its correlation with skilled employment has fallen over the period.

The correlation between own wages and employment for all categories of worker is relatively weak and for unskilled employment it is negative (Figure B.4). The cross correlation between skilled employment and clerical wages has been rising while all other cross correlations between employment levels and wage levels have fallen (see Figure B.5). Skilled and unskilled wages are strongly correlated (0.9 in 1990) and the correlation of both with clerical wages has risen strongly over the period (from approximately 0.2 in 1979 to 0.8 in 1990).

There is a strong and stable correlation between employment and the number of firms in a sector, especially for unskilled employment. Because these data refer to industrial sectors rather than individual firms observed changes in employment will reflect the births or deaths of firms within a sector as well as increases or decreases in employment within firms themselves. A detailed examination of the sectoral data reveals that this does indeed occur in certain sectors. For example the Non-ferrous metals sector (NACE 224) more than halved its unskilled employment in 1983 (from 526 employees to 196 employees), in that year this sector had one (net) firm closure. This can explain the strong correlation between the number of firms and unskilled employment. A recent paper by Barry, Strobl and Walsh. (1996) analysed data on job creation and job destruction in the Irish manufacturing sector over the period 1974-94. They found that job creation rates were less volatile than job destruction rates with approximately one quarter of job creation due to firm births and 34% of job destruction due to firm deaths. This would tend to confirm the trends in the data reported here, that changes in the number of firms have a strong link with changes in employment. (Of course this is not surprising.) Keating and Keane (1989) show that firms closures from 1979 to 1985 account for a fall of 60,000 in manufacturing employment with contractions in existing firms accounting for a further reduction of 40,000. This is relative to an overall fall of 40,000 in employment in this period. This is a very important point for formulating demand for labour models for econometric estimation, it would suggest that changes in the number of firms be included as an additional explanatory variable in explaining changes in employment.

Interestingly the period when the total number of firms expanded rapidly (1979-1982) exactly coincides with the period when output growth was at its lowest (the correlation between output and the number of firms is low and declining gradually). Further perusal of Table B.5 indicates that in this low-growth period the four sectors with the largest increases in the number of firms accounted for almost half of the overall increase in firm numbers. These four sectors, namely Structural Metal Products (NACE 314, +81 firms), Wood Furniture (NACE 467, +74 firms), Finished metal products (NACE 316319, +65 firms) and Carpentry (NACE 463, +46 firms), were all sectors which recorded negative output growth rates in 1979-1982 (see Table B.3). Furthermore all of these sectors recorded net decreases in the number of firms in the subsequent period 1982-1986. The analysis in Barry, Strobl and Walsh (1996) indicates that the plant birth rate is negatively correlated with overall net *employment* growth. Taken in conjunction with the decline in average plant size, these counter-cyclical movements suggest that many of the net 'new' firms set up in this recessionary period were small firms set up by ex-employees as a result of redundancies and layoffs.

Tables B.6 and B.7 in Appendix B show the share of each sector in total industrial employment $LTOT$, value added YV and gross output QV in both 1979 and 1990. Clearly there have been some significant changes in the structure of the manufacturing sector over the period. The three sectors with the highest share of employment in both 1979 and 1990 were Printing and Publishing (sector 473474, 5.3% in 1990), Clothing and Accessories (sector 453454, 5.25% in 1990) and Generation and Distribution of Electric Power (sector 161, 5.22% in 1990). The three sectors with the highest share of gross output were Slaughtering, Preparing and Preparation of Meats (sector 412, 9.55% in 1990), Manufacture of Dairy Products (sector 413, 9.85% in 1990) and again Generation and Distribution of Electric Power with 4.73% in 1979, the latter was supplanted in the top three ranking in 1990 by Office and Data Processing (sector 33) with a share of 9.89% in 1990. Finally, the three sectors with the biggest share of value added were Pharmaceuticals (sector 257, 11.73% in 1990), again Generation and Distribution of Electric Power with a share 6.25% in 1979 and Non-metallic Mineral Products (sector 241246) with a share of 5.46% in 1979, these two latter sectors were also supplanted in the top three ranking by Office and Data Processing, with a share of 10.43% in 1990, and Miscellaneous Foodstuffs (sector 417823) with a share of 7.68% in 1990.

4.1. Cross Section and Time Series Variation in the Panel

Table 4.2 provides some summary statistics on the (unweighted) annual growth rates in some key variables for the 72 sectors.[26] These statistics describe both the time-series and cross-section variation in the panel dataset.

In the table $\overline{x}$ is the mean value of the *level* of each variable, σ_x is the standard deviation of x, y is the annual growth rate of x and σ_y is the standard deviation of y. These means and standard deviations which relate to the entire sample and are reported in the first four columns of the table

[26]This section uses the techniques adopted in Frankel and Rose (1996) to describe their panel dataset.

	Levels		Annual Growth Rates (in %)					
	Total Sample		*Total Sample*		*Time Series Variation*		*Cross Section Variation*	
	$\overline{x}$	σ_x	$\overline{y}$	σ_y	$\sigma_{\overline{y}_i}$	$\overline{\sigma}_{y_i}$	$\sigma_{\overline{y}_t}$	$\overline{\sigma}_{y_t}$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Volume Output, Total Employment and No. of Firms:								
Q (£'000)	219,040	356,768	2.34	14.96	6.61	10.98	2.60	13.92
$LTOT$	3,017	2,921	-1.83	11.47	4.51	8.51	2.92	10.46
NO	68	83	.42	10.18	3.60	8.06	3.15	9.09
Value Added per unit of Gross Output:								
YV/QV	0.441	0.147	1.65	12.49	2.66	9.25	1.84	11.60
Value added per Firm and Employment per Firm:								
YV/NO (£'000s)	2,436	3,993	10.98	23.01	6.22	17.72	3.52	21.10
$LTOT/NO$	91	185	-1.77	12.02	3.03	9.75	3.57	10.83
Employment by Category of Worker:								
LAT	347	354	0.33	17.35	5.59	13.65	3.35	16.09
LIW	2,323	2,284	-2.11	12.18	4.54	9.11	3.03	11.13
LCL	329	452	0.47	19.34	5.92	15.15	2.67	18.07
Relative Employment and Wages by Category of Worker:								
LAT/LIW	0.169	0.102	3.08	17.62	4.20	13.93	2.00	16.46
LCL/LIW	0.146	0.089	3.01	18.41	4.23	14.76	2.08	16.87
$CLAT/CLIW$	1.741	0.321	0.76	12.22	1.49	10.14	1.34	11.57
$CLCL/CLIW$	1.058	0.307	2.75	25.84	4.89	17.11	2.78	22.14
Labour Share of Value Added by Category of Worker:								
$YWAT/YV$	0.096	0.037	1.87	21.47	3.79	18.41	3.25	20.24
$YWIW/YV$	0.409	0.192	-0.89	16.23	3.04	13.28	2.22	15.30
$YWCL/YV$	0.052	0.026	4.14	35.33	6.91	26.07	3.23	31.64

Table 4.2: Descriptive Statistics on panel

are computed as follows:

$$(1)\ \overline{x} = \frac{1}{864}\sum_t\sum_i x_{it},$$

$$(2)\ \sigma_x = \sqrt{\frac{1}{864}\sum_t\sum_i (x_{it}-\overline{x})^2},\ i=1\ldots72,\ t=1\ldots12\ (1979-1990)$$

$$(3)\ \overline{y} = \frac{1}{792}\sum_t\sum_i y_{it},\ \text{where } y_{it}=(\Delta x_{it}/x_{it-1})\cdot 100$$

$$(4)\ \sigma_y = \sqrt{\frac{1}{792}\sum_t\sum_i (y_{it}-\overline{y})^2},\ i=1\ldots72,\ t=1\ldots11\ (1980-1990)$$

For example the data on total employment ($LTOT$) in the table indicate that mean employment in a sector over the period 1979-1990 year was 3,017 with a standard deviation across the panel of $\pm$2921. Mean annual sectoral growth rates in employment were -1.8% with a very large standard deviation of $\pm$11.5.

The panel structure of the dataset means that the total sample includes both time-series and cross-sectional variation. To analyse the time-series dimension I compute the mean *sectoral* growth rates and measure their variation both across sectors and over time. To analyse the data over the cross-section dimension I compute the mean *temporal* growth rates and measure their variation both across sectors and over time.

- *Time Series Variation*

In columns (5) and (6) of the table I calculate the mean of y for each of the 72 sectors over *time* denoted $\overline{y_i}$. If these 72 mean growth rates vary a lot from the overall sample mean $\overline{y}$ then this is an indication of substantial variation across the different sectors of the panel. I measure this using the standard deviation of $\overline{y_i}$, denoted $\sigma_{\overline{y}_i}$ in column (5).

$$(5)\ \sigma_{\overline{y}_i} = \sqrt{\frac{1}{72}\sum_i (\overline{y_i}-\overline{y})^2},\ \text{where}\ \overline{y_i}=\frac{\sum_t y_{it}}{11}$$

Conversely if the 72 temporal standard deviations of these 72 mean growth rates are relatively high then this indicates that each sector's growth rate varies a lot over time. I measure this by calculating the mean of these 72 standard deviations $\overline{\sigma_{y_i}}$.

$$(6)\ \overline{\sigma_{y_i}} = \frac{1}{72}\sum_i \sigma_{y_i},\ \text{where}\ \sigma_{y_i}=\sqrt{\frac{1}{11}\sum_t (y_{it}-\overline{y_i})^2}$$

If this is high then on average individual sector's growth rates vary a lot over time. Continuing with employment and reading columns (5) and (6) of the table we see that the variation over time of the 72 sectoral employment growth rates ($\pm$8.5%) is greater than the variation across sectors ($\pm$4.5%).

- *Cross Section Variation*

In the final two columns (7) and (8) of the table I calculate the mean growth rate in each of the 11 years of the panel. $\overline{y_t}$ is the mean value of y in each year, if this varies a lot from the overall panel mean $\overline{y}$ then this is an indication of substantial variation over time in the panel. I measure this by calculating the standard deviation of $\overline{y_t}$ denoted $\sigma_{\overline{y_t}}$. Finally if the 11 individual standard deviations of $\overline{y_t}$ are high then this is an indication that in each year there is considerable variation across sectors in the data, I measure this by calculating the mean of these 11 standard deviations $\overline{\sigma_{y_t}}$.

$$(7)\ \sigma_{\overline{y_t}} = \sqrt{\frac{1}{11}\sum_t (\overline{y_t} - \overline{y})^2},\ \text{where } \overline{y_t} = \frac{\sum_i y_{it}}{72}$$

$$(8)\ \overline{\sigma_{y_t}} = \frac{1}{11}\sum_t \sigma_{y_t},\ \text{where } \sigma_{y_t} = \sqrt{\frac{1}{72}\sum_i (y_{it} - \overline{y_t})^2}$$

The data in columns (7) and (8) for employment indicate that the variation across sectors of the 11 temporal employment growth rates $\pm 10.5\%$ is substantially greater than the variation over time $\pm 2.9\%$.

Looking at Table 4.2 we can see that the mean standard deviation of the cross section variation (column (8)) is higher than that for time series variation (column (6)) for all of the variables listed. Similarly the standard deviation of the 72 sectoral means (column (5)) is in all but one case ($LTOT/NO$) higher than the standard deviation of the 11 yearly means (column (7)). These results indicate that there is greater variability in the cross section dimension of the data (although the variation in the time dimension is also high). This is an indication of the considerable heterogeneity across sectors in the panel.

The panel mean (column (3)) for output growth was 2.3% per annum while mean employment growth was -1.8% per annum. This fall in sectoral employment is due to a mean decline in sectoral unskilled employment of -2.1% per annum, while sectoral skilled and clerical employment increased at mean growth rate of 0.3% and 0.5% per annum respectively.

The standard deviations (column (4)) for all the variables are very high and indicate that in all cases the growth rates are distributed to include both positive and negative growth, another indication of the degree of heterogeneity in the panel.

Two interesting indicators point to a significant change over time and across sectors. Firstly sectoral labour share of value added declined for unskilled workers while it rose for skilled and clerical workers. This reflects a decline across sectors in both relative employment and wages for unskilled workers. Clearly unskilled workers are being replaced by skilled and clerical workers. Secondly sectoral value added per unit of gross output has grown at a mean annual rate of 1.7%. While this latter is an indication of a more efficient use of intermediate inputs the value-added data must be treated with some caution because of possible distortionary effects from profit-switching

	High Growth		Medium Growth		Declining	
	1979	*1990*	*1979*	*1990*	*1979*	*1990*
	Percentage Share in Total:					
Employment	11.6	22.4	51.5	51.4	36.9	26.2
Value Added	23.9	48.3	50.6	39.7	25.4	12.0
Gross Output	15.0	35.4	59.6	51.3	25.5	13.3
	Levels:					
Number of Firms	342	583	2194	2287	2169	1825
Employment	28,396	46,656	124,839	106,802	88,851	54,311

Table 4.3: Some Summary Statistics on the Increase in Importance of the High Growth Sector Relative to the Declining Sector from 1979 to 1990

transfer pricing. (This latter distortion may be partly reflected in the very large increase in value-added per firm at a mean annual growth rate of almost 11%.) Notably sectoral firm size has been falling, employment per firm has fallen at an average rate of -1.77% per annum. This decline in average firm size is in line with trends internationally (See Haskel (1996b)).

4.2. Identifying Three Diverse Groups of Sectors

All of these indicators confirm, unsurprisingly, that the Irish manufacturing sector is compositionally extremely heterogenous in terms of output growth, net change in firm births and deaths, employment growth and wage growth. In this section I divide the data into three stylised groups of sectors based on their output growth performance over the period. Similar work on grouping of sectors by Neven and Wyplosz (1996) defines homogenous groups in terms of factor intensity. However I am interested in investigating what has influenced the increase in the demand for skilled labour so in these groupings I want to introduce some control for output effects. This grouping links into the analysis in the next chapter where I estimate demand for labour functions conditional on output.

My division of the sectors into three groups is essentially arbitrary at the margin[27]. The first group, labelled group H (High Growth), includes 12 sectors which recorded average annual growth above 7% (see Table B.3). This group is dominated by foreign-owned firms[28]. Therefore

[27]The groups are designed with an eye to the factor demand estimation in the next chapter. I wanted firstly to separate out the high growth sectors where technical change has been very rapid. The remaining sectors are then split into two groups of equal size because the DPD program which I use for estimation in the next chapter requires groups to be of equal size for joint estimation.

[28]O'Malley and Scott (1994) report that 86% of foreign-owned manufacturing firms profits in 1983 were accounted for by the following sectors: Pharmaceutricals (NACE code 257), Office and Data Processing Machinery (NACE code 33), Electrical Engineering (NACE code 34), Instrument Engineering (NACE code 37) and soft-drink concentrates which is part of "Misc. Foods" (NACE 411, 414, 417/8 amd 423). All of these sectors are represented in my High Growth group.

it is within this group that there is the largest potential distortion in the value-added data due to profit-switching transfer pricing distortions. The second group of sectors, labelled group M (Medium Growth), covers 30 medium-growth sectors where average annual growth was between 0.49% and 7% per annum. The third group, labelled D (Declining), covers 30 declining or low-growth sectors, where average annual growth was below 0.49%. For all but two of these sectors the average annual growth rate was negative.

Table 4.3 presents some summary statistics relating to these three groups of sectors. The High Growth group almost doubled its employment share and more than doubled its output share between 1979 and 1990. By 1990 this group of 583 firms accounted for almost half of total manufacturing value added. The Medium Growth group maintained its employment share although its share of gross output fell from 59.6% in 1979 to 51.3% in 1990. The Declining group of sectors suffered a sharp decline in both employment and the number of firms. This group includes many so-called "traditional" industries (for example clothing, footwear, jewellery) which are those identified as being most vulnerable to import competition from low-wage countries (Wood (1994, p.97)). From the table it can be calculated that the High Growth group of sectors has above average firm size (83 in 1979 and 80 in 1990) while the Declining group has below average firm size (41 in 1979 and 30 in 1990) although for each group average firm size has fallen.

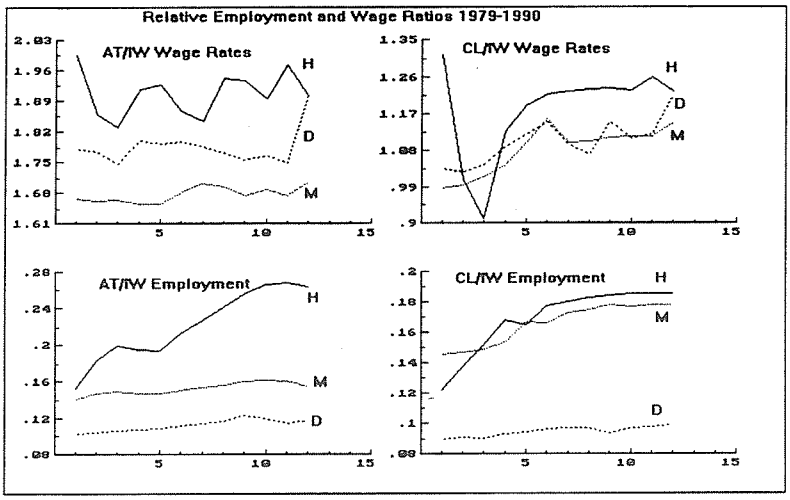

Figure 4.1: Ratio of AT/IW and CL/IW Employment and Wage Rates, 1979-1990, for High Growth (H), Medium Growth (M) and Declining (D) Sectors.

Figure 4.1 plots relative employment and wage ratios for each of these groups of sectors. The ratio of skilled to unskilled employment in 1979 at 0.153 was highest in the High Growth group and during the 1980s it increased rapidly to a level of 0.264 in 1990. The ratio of skilled to unskilled

workers was lowest in the Declining group increasing marginally from 0.103 in 1979 to 0.116 in 1990 while the ratio in the Medium Growth group also increased at a slow pace from 0.14 in 1979 to 0.155 in 1990. Relative skilled wages are also higher in the High Growth group. Note that the fact that relative skilled wages in the Declining group are higher than in the Medium Growth group is because the gap between skilled and unskilled wages is higher in the Declining group although the level of wages is lower for both in the Declining group (see Figure 4.2).

A similar pattern emerges in Figures B.6 and B.7 which plot employment and wage bill shares for the three groups of sectors. The Medium Growth group is the largest and maintains its share of total employment and wages throughout the 1980s while the High Growth group increases its share at the expense of the Declining group.

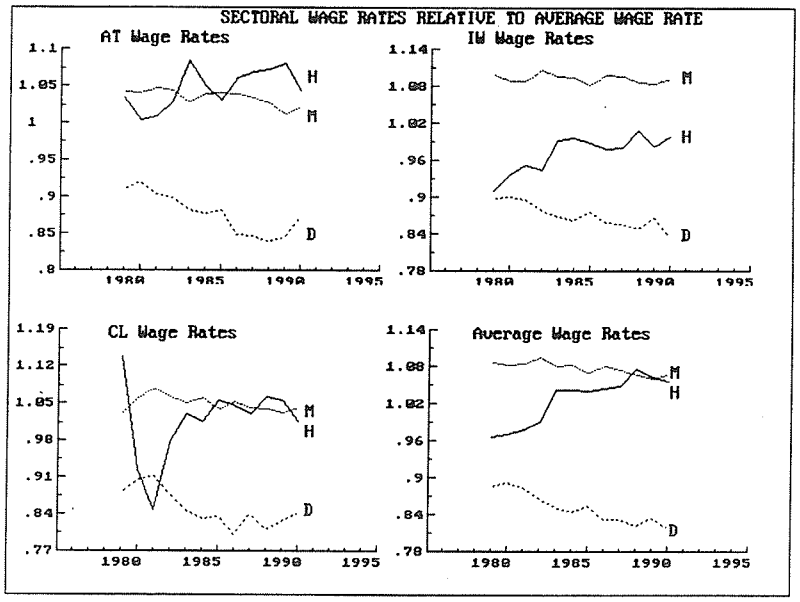

Figure 4.2: Wage Rates in High Growth, Medium Growth and Declining Groups Relative to Average Manufacturing Wage Rates for Skilled (AT), Unskilled (IW), and Clerical (CL) and all workers.

The Declining group of sectors has very low wage levels relative to the average manufacturing wage and these fell further from 89% of the average in 1979 to 82% of the average in 1990. Figure 4.2 plots sectoral wage rates relative to the average manufacturing wage rate for skilled, unskilled and clerical workers. In 1990 the average wage for a skilled worker in the Declining group was £18,157 while in the High Growth group it was £21,738, almost 20% higher. Nevertheless it is in the High Growth group that employment of skilled workers has risen sharply as shown in Figure 4.1. Clearly the Declining group of sectors are concentrated in low-skill production. However this

story is complicated by the available evidence on reported skilled and unskilled labour shortages from a monthly survey of manufacturing firms given in Kearney (1997). This evidence indicates that reported skilled and unskilled labour shortages in the late 1980s (the data begin in September 1984) were highest in the Declining group especially skilled shortages. There were little or no reported shortages in the High Growth group. This would suggest that the Declining group of sectors, although seeking to employ more skilled workers, cannot compete on the labour markets for skilled and unskilled workers with the High Growth (and also Medium Growth) sectors at the going wage rates.

The Medium Growth group had the highest average wage levels in 1979, however the average wage in the Medium Growth and High Growth groups had converged by 1990. Interestingly unskilled wages are substantially higher in the Medium Growth group than in the High Growth group (this explains this group's higher average wage) although they have been rising in the High Growth group. Despite this convergence unskilled wages in 1990 in the Medium Growth group were £12,482, 9% higher than unskilled wages in the High Growth group and 31% higher than in the Declining group (at £9,548).

5. Shift-share Analysis of Sectoral Data and Grouped Data

The discussion in Section 1.1 at the beginning of this chapter outlined the debate on demand-side causes of the observed increase in skilled employment. Many recent studies have used 'shift-share analysis' to decompose the increase in the share of skilled employment into the proportion due to an increase in skilled employment *within* sectors or firms and the proportion due to an increase in employment *between* sectors or firms. Section 5.1 shows that, in line with the results from international studies, the within component dominates the between component in explaining shifts in the share of skilled and unskilled employment in Irish manufacturing. The following subsection 5.2 decomposes changes in the *levels* of employment and the wage bill for unskilled, skilled and clerical employment. This decomposition includes an estimated 'scale' effect reflecting the underlying expansion or contraction of total employment in different sectors .

5.1. 'Between' and 'Within' Effects

In this section I decompose the change in the share of skilled, unskilled and clerical workers in total employment and wages into within sector and between sector changes. This analysis is based on that used in Berman, Bound and Griliches (1994) as follows:

$$\Delta P_j = \sum_i \Delta S_i \overline{P}_{j_i} + \sum_i \Delta P_{j_i} \overline{S}_i$$

where P_{j_i} is the proportion of type j employment in sector i, S_i is the share of employment in sector i and a bar denotes a mean over time. This is effectively an examination of the cross-sectional variation in the panel. The total change in type j employment is decomposed into a

weighted change in employment shares *between* industries (the first term on the right hand side) and a weighted change in the proportion of j employment *within* sectors (the second term on the right hand side). This type of analysis is now used extensively. Changes in employment shares between sectors are interpreted as evidence of an international trade effect shifting employment from one sector to another. Changes in employment shares within sectors are interpreted as evidence of factor-biased technological change altering relative employment shares.

This interpretation is predicated on a number of assumptions. Probably the most important one in using sectoral rather than firm level data is the assumption that changes within sectors are uniform and do not reflect structural change within the sector itself. Also this analysis focuses only on substitution effects. If technology is skill-biased then firms will demand more skilled labour (the substitution effect), however they will also require fewer skilled workers to produce the same amount of output (the income effect) so that the net within sector effect may be ambiguous. Finally aggregation over industries obviously reduces the importance of the between component so the analysis is not invariant to the level of disaggregation used.

Tables B.8, B.9 and B.10 report the results of this decomposition for skilled, unskilled and clerical workers for the sample as a whole and also for the three groups of sectors High Growth, Medium Growth and Declining. The between and within decompositions are reported for both the employment share and the wage bill share. I have performed the analysis for the entire sample period and also for two sub-periods, 1979-1987 and 1987-1990.

Looking at Table B.8 it can be seen that for the total sample the increase in skilled employment's share averaged 1.93% per annum while the wage bill share increased by 1.88% per annum. The sub-period analysis highlights that almost all of this increase occured in the period 1979-1987. This can be seen in Figure B.8, most of the increase in the skilled and clerical employment shares (and the consequent decrease in unskilled share) occured in this period. From 1987 onwards, when growth picked up, there was very little change in relative employment shares.

The within component dominates in both sub-periods. In fact the central result of this analysis is that the within component dominates in all periods for all sectoral groups and for all three categories of employment. Notably the High Growth group of sectors has the largest increase in the proportion of skilled employment while both the Declining and Medium Growth group of sectors recorded below average growth. This is an extremely important point. Because general skill levels within the workforce have risen anyway, a more important indicator of an increase in the demand for skills is where there has been an increase *relative to the average*. This has only been true for the High Growth group of sectors. Figure B.9 plots the employment and wage shares of each of the three groups of sectors for skilled, unskilled and clerical employment. The High Growth group has had the most dramatic movements with the Declining and Medium Growth group shares virtually unchanged.

This analysis suggests that there has been a large increase in the relative demand for skilled and clerical labour within high-growth sectors of Irish manufacturing. Notably virtually all of this increase has occured in a period of relatively low growth. This would suggest that the increase in skill intensity has *ceteris paribus* improved growth performance, which rose strongly in the

subsequent period.

5.2. 'Scale' Effects

The analysis in the previous sub-section examines changes in the *share* of employment and the wage bill. However it is also instructive to examine changes in the *level* of these variables. For example while the share of unskilled employment has fallen in the High Growth group of sectors the actual level of unskilled employment has risen because these sectors have been growing strongly over the period. The following decomposition of changes in the level of employment and the wage bill can be used to separately identify 'scale' effects, 'sector' effects and 'occupation' effects as follows[29]:

$$\underbrace{\sum_i \Delta E_{ijt}}_{\substack{\text{Change in } j \\ \text{employment}}} = \sum_i [\underbrace{(g_t \cdot E_{ijt-1} - E_{ijt-1})}_{\substack{\text{Scale} \\ \text{effect}}} + \underbrace{(gi_t \cdot E_{ijt-1} - g_t \cdot E_{ijt-1})}_{\substack{\text{Sector} \\ \text{effect}}} + \underbrace{E_{it-1}(\frac{E_{ijt}}{E_{it}} - \frac{E_{ijt-1}}{E_{it-1}})}_{\substack{\text{Occupation} \\ \text{effect}}} + \underbrace{r_{it}}]$$

where g_t is the growth rate of total employment, gi_t is the growth rate of employment in sector i, E_{ijt} is employment of worker j in sector i and E_{it} is total employment in sector i. Thus the scale effect measures what the change in employment j would have been if it had grown at exactly the same rate as total employment. The sector effect measures what the change in employment j would have been if there were no scale effect and if employment j had grown at the same rate as total employment in sector i. The occupation effect measures what the change in employment j would have been if there were no scale or sector effect and if employment in occupation j had grown at the same rate as the growth in the share of occupation j in sector i. Finally r_{it} measures a residual interactive effect.

The results of this decomposition are given in Tables B.11, B.12 and B.13 respectively for skilled, unskilled and clerical employment and wage bill. If we look first at the results for skilled employment we can see that sector effects are negligible. In the period 1979-87 it is estimated that the 'pure' occupation effect would have increased total skilled employment by 2%, this was offset by a negative scale effect of -2.5% so that the net effect was a very modest increase of 0.1% in total skilled employment. In the period 1987-90 these effects were reversed, the scale effect turned positive and the occupation effect was negative but close to zero. Turning to the same analysis for sectoral groups we can see that a 'scale effect' of 4.6% accounted for more than half the total increase in skilled employment in the High Growth group with the occupation effect accounting for most of the rest. For the Medium Growth and even more for the Declining group of sectors the scale effect was negative and dominated the occupation effect. The same pattern emerges for unskilled and clerical employment. Occupation effects are strongest in the High Growth group (strongly positive for clerical employment and negative for unskilled employment), sector effects are unimportant and scale effects dominate.

[29] See Corcoran et al. (1992) Appendix III for details.

The decomposition of the changes in the nominal wage bill indicates that the wage bill rose much more rapidly in the High Growth group of sectors for each type of worker than in the Medium Growth or Declining groups. While skilled and clerical wages also show a positive occupation effect the scale effect is strongly dominant in the change in wage bill for each type of worker.

6. Conclusions

The data on the Irish manufacturing sector analysed in this chapter reveal that there is a growing trend towards more skill-intensive production. Evidence suggests that the skill-intensity of clerical workers is also rising. In addition there have been significant changes in the structure of the manufacturing sector with a decline in low-skill sectors. Sectors with the strongest growth were those with the highest skill-intensity in employment. This occured against a backdrop of rising long-term unemployment among unskilled workers in the 1980s.

Although the dataset does not permit of an exact quantification of the relative importance of technology shocks and trade shocks the analysis of this chapter does indicate that both have played a role in the restructuring of the Irish manufacturing sector. There has been a marked increase in the skill-intensity of high-growth sectors - evidence of a technology effect - together with a relative and absolute decline in the importance of sectors traditionally identified as being exposed to competition from low-wage countries - evidence of a trade effect.

The most consistent result to emerge from the decompositions reported in Section 5 is that most of the action in relation to changes in relative employment shares occured in the High Growth group of sectors. Further it appears that the period 1979-87, when output growth was at its lowest, was the period when most of these changes occured. And finally the analysis reveals that at least half of the increase in skilled employment in the High Growth group of sectors was due to a general increase in employment in these industries while most of the rest was due to an increase in skill intensity.

Within the Declining group of sectors both skilled and unskilled wage rates were significantly below the average and have declined. These are the sectors which are most vulnerable to import competition from low-wage countries. They are also increasingly facing competition in the domestic labour market from the High Growth and Medium Growth group of sectors, especially in the market for skilled labour.

Unskilled wages are highest in the large Medium Growth group of sectors. Nevertheless there has not been a marked shift towards employing more skilled workers in these sectors. Indeed there has not been any marked restructuring within this group. The demand for labour within this group should therefore prove the easiest to model (in terms of being the most stable).

Despite the fact that relative skilled wages are highest in the High Growth group it is in this group that we observe the biggest shift towards skilled workers. This in itself is clear evidence in favour of skill-biased technological change. However the emerging dominance of this small group of sectors in Irish manufacturing also reflects in part the explicit courting of foreign direct investment

(FDI) through both fiscal and financial incentives by Irish industrial policy. This 'FDI effect' is also evident in the increase in high-tech foreign owned industry.

On balance do these results support the view that the increase in the demand for skilled labour is due to skill-biased technological change? There are a number of factors which muddy the waters in relation to answering this question. Firstly there has been a general increase in skill levels through the supply side of the labour market. Secondly the increase is concentrated in a group of high-growth sectors during the period 1979-1987. In this period the number of firms in the high-growth group of sectors increased from 346 to 536 so the rising skill-intensity may not reflect changes in the existing stock of firms in 1979 but rather the introduction of more skill-intensive firms during that period. Thirdly the Medium Growth and Declining groups of sectors (who account jointly for 78% of total employment in 1990) have not significantly increased their demand for skilled labour (as evidenced in Figure B.9).

Berman Bound and Machin (1994) found that the within industry changes for nine developed countries were positively correlated. In their dataset four industries (Printing and Publishing, Iron and Steel, Machinery (incl. computers) and Electrical Machinery) accounted for most of the within industry shift towards skills. They argue that this "is consistent with the observed shifts being due to the portability and relatively fast adoption of new technologies that replace unskilled labour in similar industries across the world." The Irish data would support this view. The industries with the biggest increase in skills are concentrated in sectors where there has been rapid technological change. However it is also clear from the data that those 'traditional' sectors which are identified by *inter alia* Wood (1994) as being vulnerable to import penetration have suffered secular decline in both output and employment growth through the 1980s (the Declining group of sectors). This would suggest that the so-called trade effect has also played a key role in the restructuring of Irish manufacturing industry away from low-wage, low-skill industries.

References

[1] Van Ark, B. and E. Monnikhof, (1996) "Size Distribution of Output and Employment: A Data Set for Manufacturing Industries in Five OECD Countries, 1960s -1990", OECD Working Paper No 166.

[2] Barry, F. and A. Hannan, (1996) "Education, Industrial Change and Unemployment in Ireland", Centre for Economic Research Working Paper No. 96/18, UCD, July.

[3] Barry, F. Strobl, E.A. and Walsh, P., (1996) *Aggregate Job Creation, Job Destruction and Job Turnover in the Irish Manufacturing Sector*, mimeo.

[4] Berman, Bound and Griliches, (1994) "Changes in the Demand for Skilled Labor Within US Manufacturing: Evidence from the Annual Survey of Manufactures" *Quarterly Journal of Economics*, May.

[5] Berman, Bound and S. Machin, (1994) "Implications of Skill Biased Technological Change : International Evidence", October, mimeo.

[6] Booth, A.L. and Snower, D. (1995) eds. *Acquiring Skills: Market Failures, Their Symptoms and Policy Responses,* Centre for Economic Policy Research: Cambridge.

[7] Boyle, G.E. and P.D. Sloane, (1982) "The Demand for Labour and Capital Inputs in Irish Manufacturing Industries, 1953-1973", *The Economic and Social Review*, 13,3,153-170.

[8] Bresson, G., Kramarz, F. and Sevestre, P., (1992) "Heterogenous Labor and the Dynamics of Aggregate Labor Demand: Some Estimations Using Panel Data, *Empirical Economics*, 17:153-168

[9] Broer, D.P. and G. van Leeuwen, (1994) "Investment Behavour of Dutch Industrial Firms: A Panel Data Study", *European Economic Review*, October, 38, 8, 1555-1580

[10] Canny, A., G. Hughes and J. Sexton, (1995) "Occupational Employment Forecasts 1998", FAS/ESRI Manpower Forecasting Studies, Report No. 4, ESRI: Dublin, March.

[11] Canny, A., G. Hughes and J. Sexton, (1996) "Changing Profiles in Occupations and Educational Attainment", unpublished, ESRI: Dublin, July.

[12] Caves, R.E. and M.B. Krepps, (1993) "Fat: The Displacement of Nonproduction Workers from US Manufacturing Industries", *Brookings Papers on Economic Activity, Mciroeconomics*, 2, 227-288.

[13] CSO (1993), *Census of Industrial Production 1990*, Government Publications: Dublin, July.

[14] Corcoran, T., J.J. Sexton and D. O'Donoghue, (1992) *A Review of Trends in the Occupational Pattern of Employment in Ireland 1971-90*, FAS-ESRI Manpower Forecasting Studies Report No. 2, July.

[15] Draper, N. and T. Manders (1996) "Structural Changes in the Demand for Labour", CPB Netherlands Bureau for Economic Policy Analysis, Research Memorandum No. 128, June.

[16] Drew, E., (1990) "Part Time Working and The Service Sector", Service Industries Research Centre, Working Paper No. 5, November.

[17] Entorf, H. and F. Kramarz, (1994) "The Impact of New Technologies on Wages: Lessons from Matching Panels on Employees and on Their Firms", INSEE WP No 9407, January.

[18] Fitz Gerald, A. and M. Breathnach, (1994) "Technological Innovation in Irish Manufacturing Industry", Evaluation and Statistics Unit, Forfas, November.

[19] Frankel, J. and A. Rose, (1996) "A Panel Project on Purchasing Power Parity: Mean Reversion Within and Between Countries", *Journal of International Economics*, 40, 209-224.

[20] Forfas (1996) *1995 Employment Survey*, Dublin: Forfas.

[21] Hamermesh, D., (1993) *Labor Demand*, Princeton University Press.

[22] Haskel, J., (1996a) "The Decline in Unskilled Employment in UK Manufacturing", CEPR Discussion Paper No. 1356, February.

[23] Haskel, J., (1996b) "Small Firms, Contracting-Out, Computers and Wage Inequality: Evidence from UK Manufacturing", CEPR Discussion Paper No. 1490, October.

[24] Haskel, J. and R. Jukes, (1995) "Skilled and Unskilled Employment in UK Manufacturing Over the 1980s", International Journal of Manpower, 16, 2, 36-52.

[25] Henry, E., (1989) *The Capital Stock of Ireland 1950-84*, Dublin: ESRI General Research Series No. 145.

[26] Kearney, I. (1997) "Note on Evidence of Labour Shortages in Irish Manufacturing", ESRI mimeo, February.

[27] Keating, W. and T. Keane, (1989) "Irish Industrial Structures 1979-1985: A Longitudinal Analysis", Paper presented to the Statistical and Social Inquiry Society of Ireland, May:

[28] Krueger, (1993) "How Computers have Changed the Wage Structure: Evidence from Micro-data, 1984-89", *Quarterly Journal of Economics*, Vol. CVIII (February), 33-60.

[29] Lawrence, R.Z. and M. J. Slaughter, (1993) "International Trade and American Wages in the 1980s: Giant Sucking Sound or Small Hiccup?", *Brookings Papers on Economic Activity, Microeconomics*, 2, 161-226.

[30] Lucas, R., (1988) "On the Mechanics of Economic Development". *Journal of Monetary Economics*, 22, 3-42.

[31] Machin, S., (1994) "Changes in the Relative Demand for Skills in the UK Labour Market", Chapter 7 in Booth, A.L. and Snower, D. (1995) eds. *Acquiring Skills: Market Failures, Their Symptoms and Policy Responses,* Centre for Economic Policy Research: Cambridge.

[32] Machin, S., A. Ryan and J. Van Reenen, (1996) "Technology and Changes in Skill Structure: Evidence from an International Panel of Industries", CEPR Discussion Paper No. 1434, July.

[33] Murphy, A., (1995) "The Two Faced Economy", in *Proceedings of Conference on Measuring Economic Growth*, Central Statistics Office, November.

[34] National Economic and Social Council, (1991) *The Economic and Social Implications of Emigration*, Dublin: March, No. 90.

[35] Neven, D. and C. Wyplosz, (1996) "Relative Prices, Trade and Restructuring in European Industry", CEPR Discussion Paper No 1451, August.

[36] Nickell, S.J.(1986) "Dynamic Models of Labour Demand" in *Handbook of Labour Economics*, Ashenfelter and Layard, (eds.), Vol. 1, Ch. 9

[37] Nickell, S. and B. Bell, (1996) "Changes in the Distribution of Wages and Unemployment in OECD Countries", *American Economic Review: Papers and Proceedings*, Vo. 86, No. ", pp. 302-308.

[38] Nickell, S. and B. Bell, (1995) "The Collapse in Demand for the Unskilled and Unemployment Across the OECD", *Oxford Review of Economic Policy*, Vol. 11, No. 1, Spring, pp. 40-62.

[39] Nickell, S., and Wadhwani, S., (1991) "Employment determination in British Industry: Investigations Using Micro-Data", *Review of Economic Studies* , 58, 955-969.

[40] OECD, (1995) *OECD Economic Surveys: Ireland*, OECD.

[41] OECD, (1996) Technology, Productivity and Job Creation: Unemployment: Vol 2: Analytical report, Chapter 4: Technology, Wages and Skills.

[42] O'Malley, E., K. Kennedy and R. O'Donnell, (1992) *The Impact of the Industrial Development Agencies*, Report to the Industrial Policy Review Group, January.

[43] O'Malley, E. and S. Scott, (1994) "Profit Outflows Revisited", in Cantillon, S., J. Curtis and J. Fitz Gerald (eds.) *Economic Perspectives for the Medium-Term*, ESRI, March.

[44] Romer, P., (1994) "The Origins of Endogenous Growth", *Journal of Economic Perspectives*, p3-22.

[45] Ruane, F. and H. Goerg, (1996) "Aspects of Foreign Direct Investment in Irish Manufacturing since 1973: Policy and Performance", Paper presented to the Statistical and Social Inquiry Society of Ireland, November.

[46] Saint-Paul, G., (1996) "Are the Unemployed Unemployable?", *European Economic Review*, 40, 1501-1559.

[47] Sexton, J. J. and P. O'Connell, (1996) eds. *Labour Market Study: Ireland*, ESRI, November.

[48] Shadman-Mehta, F. and H. Sneesens, (1995) "Skill Demand and Factor Substitution", CEPR Discussion Papers No 1279, November.

[49] Stewart, J., (1989) "Transfer Pricing: Some Empirical Evidence from Ireland", *Journal of Economic Studies*, 16, 3, pp. 40-56.

[50] Walsh, B., (1993) *"The Contribution of Human Capital Formation to Post-war Economic Growth in Ireland"*, CEPR Discussion Paper 819.

[51] Wood, A., (1995) "How Trade Hurt Unskilled Workers", Journal of Economic Perspectives, Vol. 9, No. 3 ,Summer, 57-80.

[52] Wood A., (1994) North-South Trade, Employment and Inequality: Changing Fortunes in a Skill-Driven World, Oxford: Clarendon Press.

A. The Panel Data Set

The data are from the annual *Census of Industrial Production* (CIP) which is published by the Irish Central Statistics Office (CSO). This census has 90% coverage of Irish industry and has been published since 1953. In 1973 a move to the NACE sectoral classification system, on accession to the EC, led to major revisions and changes in the definitions of sectors which makes a comparison with the earlier data virtually impossible at a detailed sectoral level. (A similar major classification change was introduced in 1991 and affects comparison with earlier years.) The CIP provides data on the value of gross output, intermediate inputs, net output, persons engaged, wages and salaries and remainder of net output for 75 detailed industrial sectors. With the exception of the employment figures, all of these data are based on the financial accounting year nearest to the reference calendar year, in most cases (77% in 1990) this coincides with the calendar year. These data are used by the CSO to calculate sectoral volume of production index numbers. The panel data set begins in 1979 because the disaggregated employment and wage data, which are not published in full, were not provided to me by the CSO before this date.

A.1. NACE Sectoral Classification of Industrial Activity

The NACE (Nomenclature Générale des Activités Economiques dans les Communautés Européennes) sectoral classification system for industrial activity has been in use in Ireland since 1973.[30] This system classifies industries at three levels of disaggregation:

1. **major** industrial sector - disaggregates industry into 12 sectors.
2. **broad** industrial sector - disaggregates industry into 34 sectors.
3. **detailed** industrial sector - disaggregates industry into 75 sectors.

A frequent point of confusion is the correct definition of "manufacturing" industry and its distinction from "transportable goods" industry and "total" industry. Transportable goods refers to all industrial activity with the exception of the so-called utilities "Electricity, Gas and Water", NACE 13,16,17. Manufacturing industry excludes both utilities *and* "Mining, Quarrying and Turf", NACE 11,21,23. The inclusion of "utilities" in a definition of industrial activity is questionable, arguably they would be more properly defined as a service activity.

Table B.1 lists the 72 detailed industrial sectors included in the panel data set. This excludes three of the 75 sectors detailed industrial sectors, these three sectors together form the major sector "Mining, Quarrying and Turf" (NACE 11,21,23). They are excluded because the data for them are incomplete.

[30] This is based on the 1970 edition of NACE classification - NACE 70. In 1991 the CSO changed to NACE Rev. 1 which is a special European extension of ISIC Rev. 3.

A.2. The Disaggregated Employment and Wage Data

These data distinguish five categories of worker for both employment and wages (see copy of CIP questionnaire in Appendix B):

1. Managerial, technical and other salaried staff
2. Manual supervisory staff
3. Manual workers
4. Apprentices
5. Industrial workers = (2) + (3) + (4)
6. Clerical and other office staff

The employment figures are disaggregated into male and female workers, unfortunately this disaggregation is not available for the wage data.

These employment data are published by the CSO. However they do not publish a full disaggregation of the wage bill data, they simply distinguish between the Industrial Workers wage bill and Other Employees wage bill. The CSO supplied me with a disaggregation of these unpublished wage data for the categories listed above from 1979 to 1990.

These employment and wage data exclude Proprietors and Outside Piece Workers. Outside Piece Workers are in general excluded from measures of aggregate employment (=Total Persons Engaged). However there is a minor difference between these disaggregated data and the figures I use for aggregate employment which includes Proprietors. These differences are negligible. For example in 1990 total persons engaged in manufacturing industries was 194,177 of which 590 were Proprietors (in addition there were 1,707 Outside Piece Workers). There is a similar minor discrepancy in the aggregate wage data I use. Proprietors earnings do not form a part of the wage bill (in fact they are not recorded in the CIP) but the aggregate wage bill figures do include Outside Piece Workers. In 1990 the total wage bill for manufacturing industries was £2,449,023 of which £2,200 was paid to Outside Piece Workers so again the discrepancy is a very minor one.

I made some adjustments to the disaggregated data I received on disk from the CSO. Since the CSO did not provide me with the Clerical Staff wage bill numbers these had to be calculated as a residual. Because the total wage bill data have been revised more frequently than the disaggregated numbers this led in a few cases to some strange calculations of the Clerical wage rate. Therefore I made a full comparison of the published data in each year with the revised data on disk to check for consistency and adding-up. In almost all cases the revisions to the published data were minor. In a few cases it was necessary to use the unrevised data where rounding up in the revised data was distorting the residual numbers for the clerical wage bill for small sectors (e.g. sector 433434) or where there were clear typos on disk (sectors 411 and 412). In the other cases where I used the

unrevised numbers the revised figures varied by more than 70% of the original number. Also in three cases I used the unrevised Industrial employment data to avoid negative numbers for Proprietors in individual sectors. In total the adjustments included three (sector 161 in 1984, sector 251 in 1984 and sector 422 in 1982) adjustments to the "Industrial Workers" employment category and also three (sector 411 in 1990, sector 412 in 1990 and sector 422 in 1982) adjustments to the "Industrial Workers" wage bill category. I also made nine adjustments to the total wage bill (sector 256 in 1990, sector 33 in 1979, sector 312 in 1987, sector 343 in 1990, sector 422 in 1982, sector 424 in 1988, sector 433434 in 1982 and 1983 and sector 456 in 1986). All of these adjustments used the published data.

In all cases where the CSO have made revisions to the aggregate employment and wage data (and there are often a lot, some quite substantial!) I have no choice but to use the disaggregated data totals because I don't have the corresponding revisions for the disaggregated data. The aggregate employment data $LTOT$ has been substantially revised by the CSO for the early years of the sample in twelve sectors (33, 343, 344, 345, 419, 463, 467, 34278, 241246, 316319, 453454, 473474) and there are minor revisions for many others. $LTOT$ is not used to compute any of the variables I use in modelling, but I do report it in the tables and graphs in the appendix. This means that Table B.3 must be read with care. For example sector 343 reports growth in each of LAT, LIW and LCL but total employment $LTOT$ falls because the aggregate data were substantially revised upwards for the early years of the sample period. I can only assume that the revisions do not imply a change in employment ratios.

A.3. The Variables Used

Six variables are defined - namely employment L_j, cost of labour $P_{\mathrm{L_j}}$, value added YV, labour share of value added $S_{\mathrm{L_j}}$, gross output QV and volume production Q.

1. **Employment** L_j

   This variable measures the numbers employed (excluding outside piece workers) in each sector. It is measured at the second week of September in each year. It is disaggregated into five worker categories by sex as described in Section A.2.

2. **Cost of Labour** $P_{\mathrm{L_j}}$

   This variable measures the annual end-of-payroll-year wage bill per worker including non-wage labour costs. It is also disaggregated by "type" of worker as described in Section A.2. Because non-wage labour costs are not reported in the Census of Establishments in the CIP I use the ratio of non-wage labour costs to wages and salaries as reported in the smaller Census of Enterprises to adjust my wage data. These data are only available at the broad NACE sector level for aggregate employment numbers so the adjustment does not alter relative wage measures but provides a more accurate measure of labour share of value added.

3. **Value Added YV**

   The variable YV measures annual *net* output.

4. **Volume Production Q**

   The variable Q measures annual gross output at constant 1985 prices.

5. **Labour Share of Value Added $S_{\mathrm{L_j}}$**

6. This is defined as

$$\frac{L_j \cdot P_{\mathrm{L_j}}}{YV}$$

   Note that the discrepancies between the aggregate and disaggregate wage and employment data mentioned above clearly do not affect calculations of the AT, IW and CL wage rates. However in calculating labour share of value-added, the fact that the AT, IW and CL wage bills do not sum to the total wage bill means that the difference, which is a measure of capital services, includes the wage bill of Outside Piece Workers. But the difference is negligible (Outside Piece Workers wage bill was less than 0.1% of the total wage bill in 1990).

7. **Cost of Capital P_K**

   The *pre-tax cost of capital* is measured as

$$P_{Kt} = p_{It}\frac{(1-g_t)}{(1-\tau_t)}(i_t - \gamma_t + \delta) \tag{A.1}$$

   where p_I is the price of investment goods, γ is the rate of change of investment goods prices, δ is the rate of economic depreciation, i is the nominal rate of interest, g is an average measure of the present value of tax allowances and investment grants and τ is the rate of corporation tax.

The data series used are in contructing the cost of capital are

1. p_K: Monthly Wholesale Price Index of Capital Goods.

2. g: *Grants to Industry.* This measures the level of direct subsidies and capital grants to enterprises (Table 23, NIE). It includes grants by the IDA (Industrial Development Authority), SFADCo (Shannon Free Area Development Co.), IIRS (Institute for Industrial Research and-Standards) and Udaras na Gaeltachta to industrial enterprises. The grant rate is estimated as the ratio of these grants to total manufacturing investment in each year.

3. τ: *Corporate Tax Rates.* This measures the rate of corporation or company taxation in the industrial sector. It includes the rate of income tax payable by companies.

4. i: *Interest Rate.* The interest rate used is the AAA category overdraft rate. This is the rate charged by commercial banks to Government, local authorities and large scale companies. Movements in this rate are broadly tracked in all short-term lending rates. In calculating the cost of capital we include it as a 12-month moving average.

5. γ: The inflation rate of $p_K t$ averaged forward over a 12-month period.

6. δ: These are fixed depreciation rates for different industrial sectors calculated based on data from Henry (1989).

The real interest rate $(i - \gamma)$ used is a 12-month moving average. The estimated cost of capital series are a weighted average of the cost of capital calculated using τ_x and using τ_{nx}, where the weights used are from the 1985 input-output tables, exports as a percentage of total output. This weighting assumes that the profits earned from exports are proportional to the share of output exported. The sectoral series do not differ very much, the ony sector-specific components of the estimated cost of capital are the depreciation rate and the export weights.

B. Tables and Graphs

11. Employment and gross earnings

	Persons engaged in week ended 15 September 1990			Gross earnings during year	
	Males	Females	Total	£	3
(a) Proprietors and members of family working in the business not paid a fixed wage or salary				Nil	(1-15)
(b) Managerial, technical and other salaried staff					(16-40)
(c) Clerical and other office staff *(incl. clerical supervisors)*					(41-65)
(d) Manual supervisory staff *(e.g. foremen, production supervisors)* ..					(66-90)
(e) Manual workers *except apprentices and outside piece-workers* ..					(91-115)
(f) Apprentices					(116-140)
(g) Outside piece-workers *(i.e. home workers)*					(141-165)
Total ..					(166-190)

41

Extract from CIP Questionnaire

SECTION 11: Earnings

These should be the gross amounts paid to all employees on the payroll in the year, before deduction of tax, PRSI etc.

Include - overtime, service pay, shift and other allowances
- commissions and bonuses
- holiday and sick pay
- earnings of trainees (even if recouped in whole or in part from AnCO, etc.)

Exclude - redundancy payments, pensions to former employees
- payment of travelling expenses
- other labour costs not forming part of employee earnings (e.g. employer's PRSI and pension fund contributions, payments in kind, etc.).

Mnemonic and Sector		Mnemonic and Sector	
132162	Gas: Gasworks	414	Fruit & veg
161	Electricity	415	Fish
170	Water Supply	416	Grain
241246	Non-met Minerals:prdn	417823	Misc. Food
247	Glass	419	Bread etc.
248	Ceramics	420	Sugar
251	Basic Chemicals	421	Cocoa, etc
255	Paints etc.	422	Animal foods
256	Chemicals: ind and agr	424	Spirits
257	Pharmaceuticals	425268	Wine etc
258	Soap, perfumes etc	427	Brewing & malting
259260	Other chemicals	429	Tobacco
221223	Iron and Steel	431	Wool
224	Non-ferr metals: prdn	432	Cotton
311	Foundries	433434	Silk etc
312	Forging etc of metals	436	Knitting
313	Treatment etc. of metals	437439	Misc Textiles
314	Struct. metal products	438	Carpets etc
315	Boilermaking etc	44	Leather
316319	Finished metal products	451	Footwear
32	Mech. engineering	453454	Clothing
33	Office & data process.	455	Household goods
341	Insulated wires & cables	456	Furs
34278	Elec & lighting equip.	461462	Semi-finished wood
343	Elec apparatus	463	Carpentry
344	Telecomm. equip.	464465	Wood products
345	Radio & TV	466	Cork, brooms etc
346	Domestic elec.	467	Wood furniture
35	Motor Vehicles	471472	Paper
361	Shipbuilding	473474	Printing & Publishing
362	Railway rolling stock	14	Mineral oil refining
363365	Cycles & other transp.	481482	Rubber Products
37	Instrument Engin.	483	Plastics
411	Oils & Fats	491	Jewellery
412	Meat	494	Toys etc
413	Dairy products	492935	Other Manuf

Table B.1: 72 Detailed Industrial Sectors In Panel Data Set: Table lists numeric mnemonics used

Educational Profile of Detailed Occupational Groups in 1981 and 1991

Census Broad Occupational Groups:		Unemp. Rate (1)	% of total Employ't (2)	% employed in Industry (3)	Age at which full-time education ceased: 14 or less % (4)	15-16 % (4)	17-18 % (4)	19+ % (4)
Agricultural Workers	1981	1.6	15.7	0.1	55.7	29	12.1	3.2
	1991	3.1	12.7	0.5	43.7	32.3	18.9	5.1
Managers	1981	3.1	5		8.6	20.6	42.8	28
	1991	4.9	6.3		5.8	17.8	45.5	30.9
Proprietors (Services)	1981	1.8	3.3		24.9	33.6	32.4	9.1
	1991	2.7	3.8		17.2	31.8	38.3	12.7
Managers and Proprietors	1981			17.5				
	1991			16.6				
Professional Workers	1981	2.2	9.4	7.4	1.5	4.3	13.5	80.8
	1991	3.7	11.5	8.5	1.2	4.5	14.1	80.1
Associate Professional Worker	1981	4	4.3	13.4	3.5	12.4	58.4	25.7
	1991	4.9	5.2	15.0	2.1	8.8	50.5	38.5
Clerical Occupations	1981	5	13.9	19.2	6.1	19.2	61.8	13
	1991	8.1	13.9	16.7	3.9	15.8	62	18.3
Skilled Maintenance Workers	1981	8.9	4.8	43.7	12.5	46.4	33.6	7.5
	1991	12.4	4.6	44.8	9.1	39.7	38.2	12.9
Skilled Production Workers	1981	16.5	9.6	52.0	31.1	46.8	19.2	2.9
	1991	22.9	8.7	52.0	19.8	46	29.1	5
Production Operatives	1981	17.9	8.7	88.6	39	40.6	17.8	2.5
	1991	23.6	7.8	86.7	21.7	40.8	32.2	5.4
Transport and Communication	1981	13.8	4.4	21.5	47.7	36.4	13.8	2
	1991	18.1	4	17.8	33.8	39.9	22.8	3.6
Sales Workers	1981	10.1	6.5	10.0	15.5	40.3	37	7.2
	1991	16	7.3	8.2	9.4	32.1	47.4	11.1
Security Workers	1981	7.2	2.7	4.8	27.7	33.7	32.2	6.4
	1991	10	2.9	3.2	19	31.6	41.4	7.9
Personal Service Workers	1981	12	5.3	2.6	36.6	37.7	21.4	4.2
	1991	16.6	6.8	2.1	23.1	35.6	33.4	7.9
Labourers	1981	40.6	6.3	19.4	57.6	31.4	9.6	1.4
	1991	42.6	4.5	23.9	34.2	38.5	23.6	3.7
Total	1981	10.5		23.2	27.4	29.7	28.3	14.6
	1991	13.1		21.6	16.8	27.3	35.8	20.2

Sources:
Canny, Hughes and Sexton (1995), (1996)
(1) Table 3.6: Unemployment Rates for Occupational Groups, (1996)
(2) Table 3.5: Distribution of Persons and Work by Occupational Groups. (1996)
(3) Data for industrial sectors: unpublished detail on employment by industry groups. Source: J. Sexton.
(3) Data for Totals by occupational category fromTable 2.2:Employment by Occupation 1971-98 (1995)
(4) Table 4.6: Educational profiles for persons at work in occupational groups in terms of age at which full-time education ceased for 1981 and 1991. (1996)

Table B.2

		Vol Output: Annual Avge Growth Rates					Employment: Annual Avge Growth Rates						
		Ranked by Volume Output Growth 1979-1990					*Ranked by LTOT growth 1979-1990*						
	Sector:	*Rank*	*1979-1982*	*1982-1986*	*1986-1990*	*1979-1990*	YCL/YV in 1990 **	*Rank*	LTOT *1979-1987*	LTOT *1987-1990*	LTOT *1979-1990*	LAT *1979-1990*	LIW *1979-1990*	LCL *1979-1990*
Group H: Very High Growth, Largely Foreign-Owned Sectors														
33	Office &data process.	1	38.69%	25.80%	15.42%	25.21%	0.15	2	9.10%	6.78%	8.46%	11.22%	5.02%	9.42%
345	Radio & TV	2	18.39%	18.45%	34.67%	24.09%	0.10	13	-2.13%	11.74%	1.47%	18.58%	-1.42%	15.25%
344	Telecomm. equip.	3	20.67%	11.22%	9.40%	13.04%	0.40	3	8.52%	4.75%	7.48%	11.82%	4.90%	12.39%
341	Insulated wires & cables	4	8.79%	13.93%	13.53%	12.36%	0.65	1	9.06%	12.15%	9.89%	4.28%	10.40%	11.60%
258	Soap, perfumes etc	5	14.93%	8.70%	11.21%	11.29%	0.21	14	0.04%	4.87%	1.33%	1.28%	1.59%	0.25%
257	Pharmaceuticals	6	-0.73%	13.88%	14.99%	10.08%	0.12	4	7.34%	7.38%	7.35%	10.74%	6.19%	6.68%
417823	Misc. Food	7	3.27%	11.20%	13.93%	9.94%	0.07	11	0.63%	5.10%	1.83%	3.91%	0.82%	4.15%
132162	Gas: Gasworks	8	20.83%	-1.05%	13.29%	9.76%	0.24	50	-4.78%	-2.32%	-4.12%	-0.73%	-7.58%	3.69%
415	Fish	9	10.09%	2.41%	14.78%	8.87%	0.35	5	7.44%	2.38%	6.03%	8.90%	6.36%	3.37%
37	Instrument Engin.	10	5.09%	7.93%	11.31%	8.36%	0.33	10	1.30%	4.59%	2.19%	3.43%	1.75%	5.92%
346	Domestic elec.	11	9.91%	4.52%	8.59%	7.45%	0.50	6	2.58%	4.67%	3.14%	4.58%	3.26%	-0.61%
424	Spirits	12	17.68%	1.94%	5.32%	7.28%	0.11	9	6.43%	-5.69%	2.98%	8.44%	1.61%	4.97%
Group M: Moderate or High Growth sectors														
492935	Other Manuf	13	5.07%	1.63%	13.95%	6.91%	0.40	12	-2.23%	12.16%	1.50%	2.31%	0.81%	6.88%
251	Basic Chemicals	14	4.24%	9.94%	4.69%	6.45%	0.57	40	-2.97%	-1.62%	-2.61%	-6.03%	-2.31%	-0.16%
363365	Cycles & other transp.	15	1.88%	10.32%	4.03%	5.67%	0.67	7	2.08%	5.91%	3.11%	8.82%	2.92%	1.17%
483	Plastics	16	1.82%	9.16%	5.15%	5.66%	0.48	8	1.77%	6.68%	3.09%	2.50%	2.97%	4.57%
259260	Other chemicals	17	4.19%	2.31%	8.95%	5.20%	0.48	32	-3.50%	2.11%	-2.00%	-0.73%	-2.98%	4.02%
412	Meat	18	-1.93%	8.23%	5.76%	4.48%	0.43	26	-2.50%	3.75%	-0.83%	-0.82%	-0.76%	-1.90%
473474	Printing & Publishing	19	-1.28%	2.81%	10.31%	4.31%	0.59	23	-1.29%	2.53%	-0.26%	-0.98%	-0.60%	2.03%
464465	Wood products	20	2.03%	0.17%	9.01%	3.82%	0.49	41	-5.72%	5.97%	-2.66%	-1.76%	-2.51%	-3.69%
425268	Wine etc	21	2.36%	2.55%	4.78%	3.31%	0.78	51	-6.41%	1.72%	-4.26%	-5.81%	-4.94%	0.11%
221223	Iron and Steel	22	-7.00%	6.67%	7.70%	3.11%	0.53	27	-3.32%	3.55%	-1.49%	-0.31%	-2.07%	2.71%
343	Elec apparatus	23	-3.20%	3.84%	7.11%	3.03%	0.39	22	-3.28%	9.12%	-0.05%	1.13%	4.54%	5.66%
466	Cork, brooms etc	24	-7.36%	17.64%	-3.04%	2.73%	0.56	35	-3.48%	1.60%	-2.12%	-2.22%	-2.04%	-0.74%
161	Electricity	25	0.82%	2.00%	4.86%	2.70%	0.41	25	-0.29%	-2.17%	-0.81%	0.62%	-1.82%	1.24%
413	Dairy products	26	3.40%	2.80%	1.96%	2.66%	0.38	39	-2.94%	-1.35%	-2.51%	1.84%	-3.35%	-2.47%
34278	Elec & lighting equip.	27	3.04%	-0.95%	5.86%	2.57%	0.61	15	-0.43%	4.01%	0.76%	-0.56%	0.92%	-2.31%
32	Mech. engineering	28	-3.91%	4.11%	5.91%	2.49%	0.51	21	-1.63%	4.63%	0.04%	2.66%	-0.28%	-0.13%
461462	Semi-finished wood	29	-8.53%	8.33%	4.57%	2.12%	0.43	36	-4.51%	3.96%	-2.27%	-2.83%	-2.38%	0.29%
421	Cocoa, etc	30	-4.11%	2.08%	7.03%	2.10%	0.52	52	-6.46%	1.53%	-4.35%	-3.42%	-4.56%	-3.56%
422	Animal foods	31	-2.20%	6.46%	0.06%	1.71%	0.34	47	-4.46%	-1.72%	-3.72%	-1.56%	-4.71%	-0.42%
427	Brewing & malting	32	-1.01%	1.27%	4.08%	1.65%	0.30	58	-5.10%	-7.03%	-5.63%	-8.27%	-5.41%	-2.95%
256	Chemicals: ind and agr	33	0.92%	1.34%	2.18%	1.53%	0.48	29	-2.37%	0.52%	-1.59%	3.26%	-2.44%	-5.01%
313	Treatment etc. of metals	34	-3.90%	2.57%	4.55%	1.47%	0.90	18	-1.06%	4.19%	0.35%	1.83%	-0.04%	3.18%
170	Water Supply	35	1.81%	3.61%	-1.43%	1.26%	0.81	20	0.16%	-0.18%	0.06%	3.38%	-0.36%	1.07%
432	Cotton	36	10.84%	-6.58%	2.56%	1.26%	0.61	62	-8.14%	-3.57%	-6.91%	-7.13%	-6.90%	-6.84%
494	Toys etc	37	7.42%	-17.02%	18.02%	1.20%	0.37	24	-1.87%	2.85%	-0.61%	-1.48%	-0.45%	-0.41%
241246	Non-met Minerals:prdn	38	-6.50%	0.88%	7.40%	1.09%	0.36	44	-4.13%	-0.09%	-3.04%	-0.92%	-3.52%	-0.99%
455	Household goods	39	-0.79%	-5.53%	9.66%	1.08%	0.61	17	-0.72%	3.93%	0.53%	1.41%	0.20%	3.91%
436	Knitting	40	-4.81%	-0.44%	7.24%	1.04%	0.72	34	-5.08%	6.38%	-2.08%	-7.91%	-1.90%	2.77%
481482	Rubber Products	41	0.92%	-3.24%	5.16%	0.89%	0.56	30	-4.10%	4.70%	-1.77%	-2.00%	-1.46%	-5.82%
471472	Paper	42	-8.21%	2.28%	5.67%	0.49%	0.50	48	-5.77%	1.55%	-3.83%	-1.61%	-4.22%	-3.25%
Group D: Declining or Low Growth Sectors														
316319	Finished metal products	43	-2.65%	-1.21%	4.60%	0.46%	0.56	28	-3.63%	4.35%	-1.52%	-1.25%	-1.72%	1.46%
453454	Clothing	44	0.19%	-0.78%	0.71%	0.03%	0.70	42	-2.94%	-2.82%	-2.91%	-3.48%	-2.90%	-2.06%
414	Fruit & veg	45	0.29%	-4.56%	4.27%	-0.10%	0.60	54	-6.83%	0.68%	-4.84%	-5.10%	-5.32%	-1.97%
14	Mineral oil refining	46	-19.31%	15.06%	1.17%	-0.33%	0.51	16	-0.75%	4.83%	0.74%	-1.53%	0.20%	7.02%
311	Foundries	47	-18.58%	6.46%	7.51%	-0.70%	0.58	45	-6.06%	4.80%	-3.22%	-1.83%	-2.94%	-6.11%
467	Wood furniture	48	-1.87%	-6.56%	5.74%	-0.95%	0.56	38	-3.05%	-0.80%	-2.44%	1.71%	-2.33%	-2.22%
247	Glass	49	-3.13%	4.08%	-4.70%	-1.15%	0.79	31	-0.50%	-5.38%	-1.86%	0.87%	-2.16%	-0.33%
44	Leather	50	-10.58%	-2.46%	7.72%	-1.25%	0.45	67	-12.57%	-2.11%	-9.83%	-5.65%	-10.42%	-8.32%
255	Paints etc.	51	2.96%	-2.34%	-3.90%	-1.50%	0.44	37	-2.98%	-0.77%	-2.38%	-2.58%	-2.21%	-2.34%
429	Tobacco	52	-0.66%	-2.77%	-1.90%	-1.88%	0.36	56	-3.71%	-9.60%	-5.36%	-4.09%	-5.93%	-4.41%
362	Railway rolling stock	53	4.56%	8.08%	-15.27%	-1.96%	0.74	43	-0.46%	-9.35%	-2.97%	-0.32%	-2.86%	-7.18%
315	Boilermaking etc	54	-12.35%	-1.37%	5.19%	-2.23%	0.50	46	-6.57%	5.79%	-3.35%	-0.31%	-3.47%	-5.44%
419	Bread etc.	55	1.93%	-5.30%	-2.19%	-2.24%	0.61	55	-4.22%	-6.52%	-4.85%	-3.83%	-4.88%	-3.55%
491	Jewellery	56	-0.13%	-6.58%	0.61%	-2.27%	0.51	19	-0.37%	2.11%	0.30%	-0.28%	0.85%	-2.03%
438	Carpets etc	57	-12.10%	-2.64%	4.32%	-2.91%	0.60	57	-9.01%	4.44%	-5.53%	-10.71%	-5.60%	0.00%
463	Carpentry	58	-3.45%	-7.11%	1.33%	-3.11%	0.62	33	-4.00%	3.42%	-2.03%	1.98%	-1.99%	-1.63%
437439	Misc Textiles	59	-0.81%	-11.50%	4.20%	-3.12%	0.58	53	-6.70%	0.65%	-4.75%	-2.46%	-5.22%	-3.41%
416	Grain	60	-2.75%	-4.48%	-2.78%	-3.40%	0.47	64	-6.63%	-10.79%	-7.78%	-8.09%	-8.22%	-5.56%
314	Struct. metal products	61	-5.72%	-8.59%	2.28%	-3.97%	0.53	49	-4.79%	-2.09%	-4.06%	-2.84%	-4.25%	-3.70%
411	Oils and Fats	62	-0.32%	-6.13%	-4.78%	-4.08%	0.46	66	-6.05%	-14.52%	-8.44%	-4.36%	-10.38%	-5.18%
433434	Silk etc	63	-13.12%	1.33%	-4.44%	-4.88%	0.84	59	-5.28%	-8.29%	-6.11%	-6.32%	-6.00%	-7.75%
420	Sugar	64	-6.83%	0.42%	-9.36%	-5.21%	0.59	61	-6.02%	-9.12%	-6.88%	-4.71%	-7.23%	-7.96%
431	Wool	65	-14.40%	-0.15%	-2.96%	-5.25%	0.70	63	-9.98%	-1.24%	-7.68%	-6.30%	-7 85%	-6.50%
312	Forging etc of metals	66	-17.69%	-10.04%	2.63%	-7.88%	0.46	71	-17.81%	-0.29%	-13.36%	-12.02%	-13.63%	-11.84%
224	Non-ferr metals: prdn	67	-11.60%	-4.65%	-10.24%	-8.63%	0.42	70	-11.32%	-14.08%	-12.08%	-11.05%	-12.46%	-10.45%
361	Shipbuilding	68	-15.08%	-27.00%	19.37%	-9.03%	0.68	68	-17.72%	9.03%	-11.15%	-8.71%	-10.85%	-16.84%
35	Motor Vehicles	69	-3.85%	-20.06%	-0.81%	-9.07%	0.83	60	-10.98%	6.92%	-6.42%	-7.11%	-6.49%	-7.81%
248	Ceramics	70	-7.72%	-15.51%	-4.10%	-9.37%	0.51	65	-11.26%	-0.20%	-8.37%	-2.36%	-9.29%	-2.32%
451	Footwear	71	-6.12%	-14.59%	-12.01%	-11.41%	0.64	72	-13.93%	-13.03%	-13.69%	-9.63%	-14.31%	-10.44%
456	Furs	72	0.44%	-15.59%	-18.91%	-12.77%	0.62	69	-7.82%	-19.85%	-11.27%	-4.54%	-11.24%	-15.84%
	Manufacturing		1.5%	6.3%	9.4%	6.1%	0.34		-2.69%	1.92%	-1.45%	0.51%	-1 89%	0.25%

Note: LTOT = Total Employment, LAT = Admin/Tech Emp, LIW = Industrial Workers Emp, LCL = Clerical Emp, CLAT = Admin/Tech unit cost of labour, CLIW= Industrial Workers unit cost of labour, CLCL = Clerical Workers unit cost of labour, YV= Value-added, QV = Gross Output, Q = Volume Output, YCL =Total cost of labour,, YWAT=Admin/Tech wage bill, YWIW = Industrial Workers wage bill, YWCL=Clerical workers wage bill.

** YCL/YV measures labour share of value-added. If this is low, this may be an indicator of transfer pricing. The figure reported in the table is for 1990.

Table B.3

Employment Ratios: Average Annual Growth Rates

Wage Ratios: Annual Average Growth Rates

		Ranked by LAT/LIW 1979-90				*Ranked by LCL/LIW 1979-90*				*Ranked by CLAT/CLIW 1979-1990*				*Ranked by CLCL/CLIW 1979-90*		
			LAT/LIW				LCL/LIW				CLAT/CLIW				CLCL/CLIW	
Sector:	*Rank*	*1979-1987*	*1987-1990*	*1979-1990*	*Rank*	*1979-1987*	*1987-1990*	*1979-1990*	*Rank*	*1979-1987*	*1987-1990*	*1979-1990*	*Rank*	*1979-1987*	*1987-1990*	*1979-1990*
Group H: Very High Growth, Largely Foreign-Owned Sectors																
33 Office &dat	8	8.81%	-1.47%	5.90%	15	7.83%	-4.95%	4.19%	64	-1.31%	-1.75%	-1.43%	61	-1.02%	-1.13%	-1.05%
345 Radio & TV	1	26.57%	5.00%	20.28%	1	20.87%	6.94%	16.90%	53	-0.32%	-1.70%	-0.70%	72	-18.07%	-1.32%	-13.81%
344 Telecomm.	7	6.81%	6.04%	6.60%	5	8.24%	4.25%	7.14%	40	-0.02%	0.40%	0.10%	53	0.36%	-1.05%	-0.03%
341 Insulated w	71	-5.99%	-4.33%	-5.54%	41	-0.75%	6.18%	1.09%	60	-0.74%	-2.07%	-1.11%	56	-0.19%	-0.21%	-0.19%
258 Soap, perfu	53	-1.64%	3.33%	-0.31%	58	-3.55%	4.85%	-1.33%	15	1.70%	-0.46%	1.11%	6	3.03%	5.51%	3.70%
257 Pharmaceu	14	6.39%	-1.16%	4.28%	48	1.17%	-1.40%	0.46%	55	-1.47%	0.99%	-0.80%	40	1.36%	-0.70%	0.80%
417823 Misc. Food	21	1.21%	8.18%	3.07%	19	3.28%	3.36%	3.31%	27	-0.18%	2.69%	0.60%	33	-0.08%	4.41%	1.13%
132162 Gas: Gasw	4	7.31%	7.66%	7.41%	2	15.89%	2.89%	12.19%	69	0.04%	-6.63%	-1.82%	65	-1.01%	-2.52%	-1.42%
415 Fish	30	0.11%	8.72%	2.39%	64	-5.22%	3.89%	-2.81%	56	-0.75%	-1.20%	-0.87%	32	-1.04%	7.40%	1.19%
37 Instrument	37	3.90%	-4.11%	1.65%	16	4.33%	3.50%	4.10%	49	-1.32%	1.62%	-0.53%	49	-1.13%	3.95%	0.23%
346 Domestic el	41	3.48%	-4.37%	1.28%	68	-3.87%	-3.42%	-3.75%	20	-3.01%	12.01%	0.87%	13	3.59%	1.97%	3.15%
424 Spirits	5	14.61%	-11.75%	6.72%	20	10.79%	-14.29%	3.30%	63	-0.50%	-3.51%	-1.33%	4	7.72%	-3.85%	4.43%
Group M: Moderate or High Growth sectors																
492935 Other Man	39	4.19%	-5.38%	1.49%	7	1.17%	20.12%	6.02%	6	4.02%	-3.36%	1.96%	50	5.19%	-12.19%	0.13%
251 Basic Che	69	-6.50%	3.75%	-3.81%	31	2.54%	1.26%	2.19%	26	-0.28%	3.00%	0.60%	26	1.07%	2.30%	1.40%
363365 Cycles & ot	10	3.99%	10.52%	5.73%	60	-0.18%	-5.66%	-1.71%	71	-2.60%	-2.10%	-2.46%	22	-1.00%	9.30%	1.71%
483 Plastics	57	0.56%	-3.11%	-0.46%	36	1.90%	0.63%	1.55%	39	0.58%	-1.18%	0.10%	29	-1.33%	8.95%	1.38%
259260 Other che	31	0.82%	6.45%	2.33%	4	9.22%	2.05%	7.22%	25	0.81%	0.25%	0.66%	16	3.87%	-0.46%	2.67%
412 Meat	50	0.21%	-0.77%	-0.06%	56	-0.15%	-3.78%	-1.15%	29	-0.37%	2.90%	0.51%	45	0.79%	-0.39%	0.46%
473474 Printing &	56	0.52%	-2.78%	-0.39%	26	4.56%	-2.28%	2.64%	52	-1.35%	1.31%	-0.63%	17	2.19%	3.21%	2.46%
464465 Wood prod	46	1.79%	-1.89%	0.77%	57	-0.46%	-3.17%	-1.21%	31	0.10%	1.35%	0.44%	43	1.31%	-1.32%	0.59%
425268 Wine etc	62	-0.14%	-2.96%	-0.92%	10	3.42%	10.51%	5.31%	10	0.40%	3.96%	1.36%	21	1.69%	1.79%	1.72%
221223 Iron and St	35	2.60%	-0.29%	1.80%	11	9.26%	-5.95%	4.88%	68	-1.58%	-2.40%	-1.80%	70	-8.00%	0.09%	-5.86%
343 Elec appar	68	-4.26%	-0.57%	-3.27%	42	-2.62%	11.61%	1.07%	1	3.44%	3.18%	3.37%	18	2.38%	1.77%	2.21%
466 Cork, broo	51	-3.86%	10.32%	-0.19%	40	1.88%	-0.16%	1.32%	66	3.33%	-13.77%	-1.65%	41	3.27%	-5.65%	0.76%
161 Electricity	28	5.43%	-4.98%	2.48%	23	2.79%	3.99%	3.12%	48	0.77%	-3.76%	-0.49%	23	2.98%	-1.80%	1.65%
413 Dairy produ	12	4.26%	8.40%	5.37%	45	-0.11%	3.70%	0.91%	47	-0.89%	1.20%	-0.32%	51	1.13%	-2.48%	0.13%
34278 Elec & lighti	65	2.42%	-11.13%	-1.47%	66	1.09%	-13.77%	-3.20%	24	1.33%	-1.09%	0.66%	1	9.50%	-1.04%	6.52%
32 Mech. engi	22	2.93%	3.02%	2.95%	50	0.48%	-0.71%	0.15%	16	1.66%	-0.71%	1.01%	57	0.61%	-2.52%	-0.25%
461462 Semi-finish	58	-1.06%	1.14%	-0.46%	25	0.43%	9.15%	2.74%	59	-0.59%	-2.34%	-1.07%	39	1.23%	-0.25%	0.82%
421 Cocoa, etc	43	0.38%	3.39%	1.19%	43	0.50%	2.50%	1.04%	4	1.23%	5.03%	2.26%	34	0.44%	2.94%	1.11%
422 Animal foo	18	4.68%	-0.28%	3.30%	14	3.38%	7.52%	4.49%	18	-0.07%	3.56%	0.90%	36	-0.02%	3.71%	0.98%
427 Brewing &	67	-4.92%	2.20%	-3.03%	28	2.50%	2.85%	2.60%	33	-0.92%	4.07%	0.41%	10	2.93%	4.28%	3.29%
256 Chemicals:	9	3.98%	10.95%	5.84%	63	-2.35%	-3.40%	-2.64%	37	0.95%	-1.77%	0.20%	27	1.64%	0.70%	1.39%
313 Treatment	33	-0.22%	7.69%	1.87%	22	1.19%	8.81%	3.22%	28	-2.12%	8.19%	0.59%	8	2.72%	5.33%	3.43%
170 Water Sup	17	5.61%	-1.05%	3.75%	38	0.23%	4.71%	1.43%	62	-0.92%	-2.08%	-1.24%	60	-0.73%	-1.20%	-0.86%
432 Cotton	52	-3.69%	9.52%	-0.26%	52	-0.82%	2.44%	0.06%	14	3.04%	-3.77%	1.14%	62	4.62%	-14.74%	-1.06%
494 Toys etc	63	2.14%	-9.03%	-1.03%	53	-0.45%	1.36%	0.04%	57	-1.12%	-0.61%	-0.98%	67	-4.04%	4.12%	-1.88%
241246 Non-met Mi	26	6.01%	-5.65%	2.70%	27	4.42%	-2.02%	2.63%	35	0.37%	-0.03%	0.26%	25	2.86%	-2.04%	1.50%
455 Household	42	1.30%	0.98%	1.21%	17	2.13%	8.01%	3.70%	30	1.18%	-1.38%	0.47%	64	-0.70%	-2.97%	-1.33%
436 Knitting	72	-0.09%	-20.52%	-6.13%	12	5.54%	2.71%	4.76%	34	-2.12%	7.47%	0.41%	19	-2.07%	14.43%	2.18%
481482 Rubber Pro	59	-0.12%	-1.67%	-0.55%	69	-4.77%	-3.53%	-4.43%	61	0.76%	-6.05%	-1.14%	14	5.19%	-3.50%	2.74%
471472 Paper	24	3.52%	0.63%	2.72%	44	1.70%	-0.81%	1.01%	50	0.12%	-2.24%	-0.53%	66	-0.92%	-4.38%	-1.87%
Group D: Declining or Low Growth Sectors																
316319 Finished m	47	2.21%	-4.00%	0.48%	21	3.46%	2.62%	3.23%	41	-1.25%	3.78%	0.10%	42	0.96%	-0.01%	0.70%
453454 Clothing	60	0.16%	-2.60%	-0.60%	46	-1.05%	6.15%	0.86%	44	-0.69%	1.33%	-0.14%	35	2.35%	-2.47%	1.01%
414 Fruit & veg	48	0.21%	0.26%	0.23%	18	4.74%	0.38%	3.53%	43	-2.22%	6.12%	-0.01%	48	0.71%	-0.92%	0.26%
14 Mineral oil r	66	-2.65%	0.79%	-1.73%	6	3.96%	14.74%	6.80%	3	2.17%	3.52%	2.53%	3	3.58%	9.70%	5.21%
311 Foundries	44	5.00%	-8.49%	1.14%	67	-3.09%	-3.74%	-3.26%	9	0.67%	3.49%	1.43%	63	0.07%	-4.51%	-1.20%
467 Wood furnit	15	7.78%	-4.96%	4.14%	51	0.94%	-2.05%	0.12%	54	-1.69%	1.84%	-0.74%	59	-0.10%	-1.22%	-0.41%
247 Glass	20	0.60%	10.05%	3.10%	34	1.31%	3.39%	1.87%	13	1.03%	1.63%	1.19%	52	-0.85%	2.20%	-0.02%
44 Leather	13	3.56%	10.19%	5.33%	29	6.91%	-8.89%	2.35%	17	1.93%	-1.53%	0.97%	5	10.01%	-11.15%	3.79%
255 Paints etc.	55	0.38%	-2.36%	-0.38%	54	-0.22%	0.08%	-0.14%	23	0.52%	1.23%	0.72%	11	0.52%	10.97%	3.27%
429 Tobacco	32	2.33%	0.96%	1.96%	35	1.66%	1.50%	1.61%	2	1.05%	7.51%	2.77%	12	3.54%	2.12%	3.15%
362 Railway roll	27	2.00%	4.26%	2.61%	70	-8.54%	7.41%	-4.44%	8	7.91%	-13.83%	1.49%	58	-0.01%	-1.23%	-0.34%
315 Boilermakin	19	6.49%	-4.81%	3.28%	62	2.16%	-12.40%	-2.04%	45	-0.46%	0.65%	-0.16%	30	1.81%	-0.05%	1.30%
419 Bread etc.	45	-0.08%	4.31%	1.09%	39	-0.09%	5.46%	1.39%	42	-0.59%	1.78%	0.05%	7	2.70%	6.04%	3.60%
491 Jewellery	64	2.45%	-10.07%	-1.13%	65	-7.15%	9.58%	-2.86%	70	-0.63%	-7.09%	-2.44%	20	6.64%	-9.11%	2.09%
438 Carpets etc	70	-4.99%	-6.54%	-5.42%	8	8.17%	0.18%	5.93%	21	0.02%	3.11%	0.86%	24	2.97%	-2.27%	1.51%
463 Carpentry	16	7.61%	-4.86%	4.06%	49	0.18%	0.87%	0.37%	19	-0.39%	4.39%	0.89%	28	2.13%	-0.59%	1.38%
437439 Misc Textil	23	7.13%	-7.55%	2.91%	33	2.02%	1.61%	1.91%	11	1.34%	1.27%	1.32%	38	2.67%	-3.78%	0.87%
416 Grain	49	-0.67%	2.37%	0.15%	24	2.33%	4.44%	2.90%	32	-0.79%	3.72%	0.42%	44	2.34%	-3.99%	0.57%
314 Struct. met	40	3.41%	-3.54%	1.47%	47	1.85%	-2.79%	0.57%	46	0.05%	-0.83%	-0.19%	47	0.17%	1.13%	0.43%
411 Oils and Fa	6	13.52%	-9.51%	6.71%	9	-3.43%	34.94%	5.80%	51	-3.62%	7.85%	-0.62%	54	-0.70%	1.74%	-0.04%
433434 Silk etc	54	-3.16%	7.59%	-0.34%	61	-1.47%	-2.90%	-1.86%	7	1.17%	2.71%	1.59%	69	-1.70%	-12.71%	-4.83%
420 Sugar	25	0.75%	8.14%	2.72%	55	4.13%	-12.80%	-0.79%	12	1.48%	0.82%	1.30%	31	-0.08%	4.99%	1.28%
431 Wool	36	3.66%	-3.43%	1.68%	37	1.11%	2.41%	1.46%	38	-1.32%	4.36%	0.19%	46	0.55%	0.22%	0.46%
312 Forging etc	34	3.55%	-2.52%	1.86%	32	2.72%	0.35%	2.07%	5	0.28%	6.65%	1.98%	71	-12.63%	-15.01%	-13.29%
224 Non-ferr m	38	11.10%	-19.93%	1.61%	30	1.20%	5.26%	2.29%	22	-0.54%	4.57%	0.82%	68	2.78%	-17.17%	-3.09%
361 Shipbuildin	29	4.76%	-3.66%	2.39%	72	-3.07%	-15.80%	-6.72%	65	-5.41%	9.85%	-1.47%	55	-5.64%	16.33%	-0.10%
35 Motor Vehi	61	1.11%	-5.22%	-0.66%	59	-2.75%	2.26%	-1.41%	58	-1.22%	-0.42%	-1.00%	9	-0.68%	14.95%	3.36%
248 Ceramics	2	11.24%	-1.39%	7.65%	3	13.42%	-6.25%	7.68%	36	0.29%	0.04%	0.22%	2	5.71%	4.48%	5.38%
451 Footwear	11	6.13%	3.67%	5.45%	13	2.59%	9.82%	4.51%	72	-4.06%	-2.41%	-3.61%	15	2.90%	2.18%	2.70%
456 Furs	3	13.60%	-7.03%	7.56%	71	-2.87%	-11.08%	-5.18%	67	-2.49%	0.64%	-1.65%	37	-5.48%	20.26%	0.94%
Manufacturing		3.22%	0.42%	2.45%		2.66%	0.93%	2.19%		0.05%	1.23%	0.37%		1.63%	0.60%	1.35%

Note: LTOT = Total Employment, LAT = Admin/Tech Emp, LIW = Industrial Workers Emp, LCL = Clerical Emp, CLAT = Admin/Tech unit cost of labour, CLIW= Industrial Workers unit cost of labour, CLCL = Clerical Workers unit cost of labour, YV= Value-added, QV = Gross Output, Q = Volume Output, YCL =Total cost of labour,, YWAT=Admin/Tech wage bill, YWIW = Industrial Workers wage bill, YWCL=Clerical workers wage bill.

Table B.4

Productivity Measures: Ann Avge Growth Rates 1979-1990 | Number of Firms: Absolute changes

Ranked by overall change 1979 - 1990

	Sector:	YV/QV 1979-1990	YV/YCL 1979-1990	Q/LAT 1979-1990	Q/LIW 1979-1990	Q/LCL 1979-1990	YV/YWAT 1979-1990	YV/YWIW 1979-1990	YV/YWCL 1979-1990	Rank	1979-1982	1982-1986	1986-1990	1979-1990
Group 1: Very High Growth, Largely Foreign-Owned Sectors														
33	Office &data process.	0.93%	3.78%	12.57%	19.22%	14.43%	2.56%	7.08%	-6.98%	5	18	1	15	34
345	Radio & TV	3.88%	15.60%	4.65%	25.87%	7.67%	0.95%	20.58%	19.66%	10	1	4	13	18
344	Telecomm. equip.	-0.99%	-0.06%	1.09%	7.76%	0.58%	-4.01%	2.42%	-4.38%	2	42	22	22	86
341	Insulated wires & cable	1.73%	0.38%	7.75%	1.78%	0.68%	6.61%	-0.41%	-1.29%	12	5	6	4	15
258	Soap, perfumes etc	1.22%	7.24%	9.88%	9.54%	11.01%	7.02%	7.87%	5.42%	28	2	-5	5	2
257	Pharmaceuticals	0.10%	-3.23%	-0.59%	3.66%	3.19%	-5.30%	-2.04%	-3.27%	7	8	11	10	29
417823	Misc. Food	1.61%	4.84%	5.80%	9.05%	5.56%	2.73%	6.51%	1.96%	16	5	1	5	11
132162	Gas: Gasworks	8.49%	11.33%	10.57%	18.76%	5.86%	8.61%	14.53%	3.56%	34	0	2	-1	1
415	Fish	1.67%	1.71%	-0.02%	2.36%	5.33%	0.30%	1.80%	3.51%	8	5	10	8	23
37	Instrument Engin.	1.81%	1.92%	4.77%	6.50%	2.30%	1.39%	2.52%	-1.74%	11	19	5	-8	16
346	Domestic elec.	-0.28%	1.08%	2.74%	4.06%	8.11%	-0.83%	1.31%	2.05%	25	4	1	-1	4
424	Spirits	2.17%	3.94%	-1.08%	5.57%	2.20%	0.68%	6.02%	-1.73%	31	6	-1	-3	2
Group M: Moderate or High Growth sectors														
492935	Other Manuf	0.34%	1.10%	4.50%	6.05%	0.03%	-1.03%	2.41%	-3.54%	32	13	-13	1	1
251	Basic Chemicals	-0.83%	0.85%	13.27%	8.96%	6.62%	3.98%	0.62%	-2.91%	19	6	-1	4	9
363365	Cycles & other transp.	-1.32%	2.47%	-2.89%	2.67%	4.46%	-0.32%	2.80%	2.82%	23	4	-2	3	5
483	Plastics	2.11%	1.24%	3.08%	2.61%	1.04%	1.82%	1.45%	-1.46%	1	41	10	37	88
259260	Other chemicals	0.21%	-0.33%	5.97%	8.43%	1.13%	-1.84%	1.11%	-8.15%	50	4	-10	1	-5
412	Meat	0.74%	2.18%	5.34%	5.28%	6.50%	1.72%	2.18%	2.89%	20	10	0	-2	8
473474	Printing & Publishing	-0.40%	0.18%	5.35%	4.94%	2.23%	1.84%	0.80%	-4.16%	4	12	-15	40	37
464465	Wood products	-0.90%	1.42%	5.68%	6.49%	7.80%	0.22%	1.44%	2.08%	45	1	-9	4	-4
425268	Wine etc	-2.33%	-3.36%	9.67%	8.67%	3.19%	-2.72%	-2.30%	-8.79%	61	1	-16	-1	-16
221223	Iron and Steel	-0.03%	1.55%	3.43%	5.30%	0.40%	1.45%	1.94%	-2.15%	24	-1	1	5	5
343	Elec apparatus	3.28%	2.67%	1.88%	-1.45%	-2.50%	2.92%	2.91%	-0.39%	27	1	0	1	2
466	Cork, brooms etc	1.85%	0.96%	5.07%	4.87%	3.51%	2.79%	0.92%	-1.14%	54	-2	-2	-3	-7
161	Electricity	2.55%	2.62%	2.07%	4.61%	1.45%	2.09%	4.12%	-0.67%	39	0	0	-1	-1
413	Dairy products	2.61%	2.84%	0.80%	6.22%	5.26%	-1.02%	3.96%	2.89%	56	-15	-9	14	-10
34278	Elec & lighting equip.	0.36%	0.54%	3.15%	1.63%	5.00%	1.36%	0.54%	-2.49%	22	16	8	-18	6
32	Mech. engineering	0.93%	0.65%	-0.16%	2.79%	2.63%	-2.55%	1.55%	-0.20%	3	35	20	22	77
461462	Semi-finished wood	0.07%	2.18%	5.10%	4.62%	1.83%	4.03%	2.44%	-1.10%	69	2	-20	-25	-43
421	Cocoa, etc	2.92%	3.04%	5.72%	6.97%	5.87%	0.46%	3.94%	1.74%	52	-6	-2	2	-6
422	Animal foods	2.14%	1.41%	3.32%	6.73%	2.14%	-1.28%	2.90%	-2.49%	68	-17	-7	-12	-36
427	Brewing & malting	1.31%	4.10%	10.82%	7.46%	4.74%	6.88%	4.07%	-1.80%	37	1	-1	0	0
256	Chemicals: ind and agr	0.08%	-1.49%	-1.68%	4.06%	6.89%	-5.58%	0.13%	1.44%	18	5	6	-2	9
313	Treatment etc. of metal	-3.40%	-4.83%	-0.36%	1.51%	-1.66%	-6.24%	-3.92%	-10.00%	42	5	-2	-5	-2
170	Water Supply	3.96%	9.18%	-2.05%	1.62%	0.19%	7.01%	9.65%	9.04%	53	1	-4	-4	-7
432	Cotton	0.94%	1.38%	9.04%	8.76%	8.70%	0.58%	1.46%	2.49%	59	-5	-2	-4	-11
494	Toys etc	1.85%	1.01%	2.72%	1.66%	1.62%	2.55%	0.49%	2.38%	17	5	-5	9	9
241246	Non-met Minerals:prdn	0.84%	1.09%	2.03%	4.78%	2.10%	-0.84%	2.09%	-1.99%	67	17	-32	-16	-31
455	Household goods	1.51%	0.36%	-0.33%	0.88%	-2.73%	-0.75%	0.92%	-1.37%	14	4	-13	22	13
436	Knitting	-0.29%	0.76%	9.73%	3.00%	-1.68%	6.44%	0.32%	-6.27%	65	-7	-9	-12	-28
481482	Rubber Products	1.00%	1.67%	2.94%	2.38%	7.13%	3.17%	1.43%	3.30%	15	10	-2	5	13
471472	Paper	-0.11%	1.39%	2.14%	4.92%	3.87%	-0.54%	1.62%	2.53%	9	11	-3	10	18
Group D: Declining or Low Growth Sectors														
316319	Finished metal product	-0.58%	1.12%	1.73%	2.22%	-0.98%	0.90%	1.48%	-2.37%	13	65	-59	9	15
453454	Clothing	-0.35%	-0.14%	3.64%	3.01%	2.13%	0.60%	-0.15%	-2.00%	72	-21	-68	-11	-100
414	Fruit & veg	2.66%	3.71%	5.27%	5.51%	1.91%	3.99%	4.21%	0.39%	41	0	-8	6	-2
14	Mineral oil refining	3.76%	-3.36%	1.22%	-0.53%	-6.86%	-2.56%	-1.81%	-12.62%	33	1	1	-1	1
311	Foundries	-0.86%	0.82%	1.16%	2.31%	5.76%	-1.78%	0.76%	5.43%	48	-1	-5	1	-5
467	Wood furniture	0.03%	0.73%	-2.62%	1.42%	1.30%	-2.13%	1.17%	1.47%	70	74	-78	-41	-45
247	Glass	-0.56%	-0.67%	-2.01%	1.03%	-0.83%	-4.20%	-0.06%	-1.87%	21	14	-7	-1	6
44	Leather	-2.24%	1.40%	4.67%	10.25%	7.72%	-3.69%	2.43%	-3.57%	62	1	-13	-6	-18
255	Paints etc.	0.92%	-0.52%	1.11%	0.73%	0.86%	-0.20%	0.13%	-2.91%	29	8	-1	-5	2
429	Tobacco	2.39%	2.05%	2.30%	4.30%	2.64%	-0.52%	4.24%	-0.55%	38	1	-1	0	0
362	Railway rolling stock	0.11%	3.26%	-1.64%	0.93%	5.62%	-0.87%	3.23%	8.40%	36	0	0	0	0
315	Boilermaking etc	1.05%	1.27%	-1.93%	1.29%	3.40%	-1.40%	1.67%	2.45%	43	9	-10	-2	-3
419	Bread etc.	0.82%	1.72%	1.66%	2.78%	1.37%	1.07%	2.22%	-2.68%	71	-3	-43	-48	-94
491	Jewellery	3.12%	1.35%	-1.99%	-3.09%	-0.24%	4.50%	0.81%	1.65%	30	1	2	-1	2
438	Carpets etc	0.98%	-0.81%	8.74%	2.85%	-2.91%	4.03%	-0.77%	-7.72%	51	0	-5	-1	-6
463	Carpentry	-0.90%	0.09%	-4.99%	-1.14%	-1.50%	-3.90%	0.89%	-0.85%	63	46	-25	-40	-19
437439	Misc Textiles	1.98%	-2.28%	-0.68%	2.21%	0.30%	-5.37%	-1.33%	-4.01%	57	-2	-4	-4	-10
416	Grain	0.45%	-0.43%	5.10%	5.26%	2.29%	-0.38%	0.18%	-3.20%	58	0	-8	-3	-11
314	Struct. metal products	-0.10%	0.52%	-1.16%	0.29%	-0.28%	-0.44%	0.82%	-0.17%	6	81	-36	-14	31
411	Oils and Fats	6.41%	0.37%	0.29%	7.03%	1.16%	-3.08%	2.79%	-2.81%	35	2	-1	0	1
433434	Silk etc	0.53%	-1.57%	1.53%	1.18%	3.11%	-2.91%	-1.70%	5.26%	44	-1	-2	0	-3
420	Sugar	1.25%	-1.81%	-0.53%	2.17%	2.99%	-4.68%	-0.82%	-1.29%	40	0	0	-2	-2
431	Wool	-0.08%	-1.38%	1.13%	2.82%	1.34%	-2.89%	-1.07%	-2.94%	64	-10	-4	-10	-24
312	Forging etc of metals	1.91%	2.53%	4.70%	6.65%	4.49%	-1.26%	2.57%	15.89%	47	-2	-1	-1	-4
224	Non-ferr metals: prdn	-3.02%	2.36%	2.72%	4.37%	2.04%	0.29%	2.75%	3.66%	26	3	-1	1	3
361	Shipbuilding	5.60%	4.29%	-0.35%	2.04%	9.39%	2.93%	3.84%	11.44%	60	4	-12	-4	-12
35	Motor Vehicles	4.05%	1.34%	-2.11%	-2.76%	-1.37%	3.08%	1.38%	-0.51%	66	4	-37	4	-29
248	Ceramics	4.28%	3.60%	-7.18%	-0.09%	-7.21%	-1.82%	5.91%	-6.66%	46	0	0	-4	-4
451	Footwear	0.12%	0.60%	-1.96%	3.38%	-1.08%	-0.19%	1.45%	-5.48%	55	-3	-4	-2	-9
456	Furs	-3.63%	-1.31%	-8.63%	-1.72%	3.65%	-6.12%	-0.68%	3.77%	49	1	-2	-4	-5
	Manufacturing	2.26%	3.52%	5.52%	8.10%	5.79%	1.54%	4.42%	0.82%		538	-507	-34	-3

Note: LTOT = Total Employment, LAT = Admin/Tech Emp, LIW = Industrial Workers Emp, LCL = Clerical Emp, CLAT = Admin/Tech unit cost of labour, CLIW= Industrial Workers unit cost of labour, CLCL = Clerical Workers unit cost of labour, YV= Value-added, QV = Gross Output, Q = Volume Output, YCL =Total cost of labour,, YWAT=Admin/Tech wage bill, YWIW = Industrial Workers wage bill, YWCL=Clerical workers wage bill.

Table 3.5

Selected Indicators for 1979

		Percentage Shares in Total:			Size of Sectors:			Unit Labour Costs:		
		LTOT	*YV*	*QV*	*QV/NO* (in £'000)	*YV/NO* (in £'000)	*LTOT/NO*	*CLAT* (in £'000)	*CLIW* (in £'000)	*CLCLER* (in £'000)
Group H: Very High Growth, Largely Foreign-Owned Sectors										
33	Office &data process.	1.25%	3.23%	2.64%	8,750	3,791	138	11.147	4.854	6.600
345	Radio & TV	1.26%	1.11%	0.83%	3,344	1,594	171	8.261	4.212	25.646
344	Telecomm. equip.	1.22%	1.40%	0.87%	1,994	1,131	93	7.601	4.044	4.775
341	Insulated wires & cables	0.64%	0.40%	0.45%	3,000	936	141	9.440	4.004	6.076
258	Soap, perfumes etc	0.43%	0.48%	0.39%	926	403	34	8.291	4.856	4.711
257	Pharmaceuticals	1.17%	8.59%	4.04%	6,544	4,929	63	9.244	5.925	5.125
417823	Misc. Food	0.85%	3.81%	1.99%	4,154	2,809	59	8.528	4.715	4.574
132162	Gas: Gasworks	0.67%	0.45%	0.52%	4,233	1,289	182	8.120	5.303	4.413
415	Fish	0.48%	0.42%	0.46%	591	191	21	7.727	3.801	3.855
37	Instrument Engin.	2.55%	2.80%	1.78%	1,998	1,111	96	8.650	4.118	5.229
346	Domestic elec.	0.88%	0.65%	0.50%	4,011	1,856	238	8.659	4.149	4.012
424	Spirits	0.16%	0.57%	0.47%	4,313	1,825	50	10.204	5.578	4.389
Group M: Moderate or High Growth sectors										
492935	Other Manuf	0.35%	0.31%	0.19%	526	296	32	8.029	3.804	3.838
251	Basic Chemicals	1.43%	1.74%	2.16%	6,296	1,792	139	10.240	7.950	6.096
363365	Cycles & other transp.	0.79%	0.75%	0.42%	4,400	2,757	274	14.457	9.051	5.967
483	Plastics	2.07%	1.83%	1.79%	1,005	362	39	8.384	4.743	4.826
259260	Other chemicals	0.79%	0.81%	0.75%	2,491	955	88	7.952	4.856	3.741
412	Meat	4.81%	4.35%	11.84%	6,907	898	94	8.873	4.998	4.761
473474	Printing & Publishing	4.66%	4.42%	2.35%	552	368	37	9.243	5.751	4.910
464465	Wood products	0.31%	0.20%	0.16%	256	116	17	6.751	3.718	4.307
425268	Wine etc	1.10%	1.12%	0.83%	1,260	600	56	8.592	5.304	4.747
221223	Iron and Steel	0.75%	0.62%	0.64%	1,730	596	68	8.253	4.934	8.572
343	Elec apparatus	0.50%	0.29%	0.27%	924	362	58	6.203	4.845	4.437
466	Cork, brooms etc	0.16%	0.09%	0.07%	385	185	29	7.547	3.687	3.783
161	Electricity	4.88%	6.25%	4.73%	12,325	5,757	425	12.295	7.183	6.600
413	Dairy products	4.14%	4.34%	11.43%	7,790	1,046	94	8.285	5.618	4.215
34278	Elec & lighting equip.	1.23%	0.87%	0.67%	704	326	43	7.893	4.326	2.488
32	Mech. engineering	3.45%	2.80%	2.35%	854	360	42	6.912	4.459	5.076
461462	Semi-finished wood	0.86%	0.60%	0.58%	430	157	21	6.919	3.829	4.150
421	Cocoa, etc	2.16%	1.54%	2.06%	3,579	945	126	9.210	5.011	4.674
422	Animal foods	1.24%	1.72%	3.78%	2,172	349	24	8.312	5.677	4.525
427	Brewing & malting	1.96%	3.40%	1.95%	7,105	4,390	239	11.477	8.214	6.168
256	Chemicals: ind and agr	0.61%	0.99%	0.68%	1,896	985	57	9.599	6.694	6.061
313	Treatment etc. of metals	0.48%	0.43%	0.26%	525	311	32	7.828	4.908	3.691
170	Water Supply	0.92%	0.18%	0.16%	189	73	36	8.282	4.061	4.115
432	Cotton	1.60%	0.86%	1.04%	3,450	1,014	177	6.702	3.808	3.894
494	Toys etc	0.45%	0.35%	0.32%	755	294	35	6.722	3.023	4.541
241246	Non-met Minerals:prdn	3.74%	5.46%	4.41%	1,173	514	33	9.527	5.961	5.988
455	Household goods	0.45%	0.24%	0.28%	427	131	23	6.126	3.381	4.251
436	Knitting	2.32%	1.06%	0.82%	578	265	55	7.242	3.298	3.913
481482	Rubber Products	1.21%	1.05%	0.83%	2,083	931	102	11.148	5.872	4.900
471472	Paper	2.15%	1.96%	1.73%	1,830	735	76	8.419	5.355	5.356
Group D: Declining or Low Growth Sectors										
316319	Finished metal products	2.99%	2.04%	1.60%	423	191	26	7.117	4.354	3.949
453454	Clothing	6.20%	2.67%	1.97%	409	196	43	6.873	2.911	3.686
414	Fruit & veg	0.88%	0.49%	0.52%	1,800	605	102	8.733	4.513	4.557
14	Mineral oil refining	0.16%	0.33%	2.32%	21,188	1,075	49	10.065	7.284	5.147
311	Foundries	0.41%	0.30%	0.19%	636	355	45	6.950	4.839	5.024
467	Wood furniture	1.68%	0.88%	0.70%	199	89	16	6.164	3.396	3.391
247	Glass	1.98%	1.60%	0.94%	1,676	1,010	118	9.886	6.070	6.093
44	Leather	0.64%	0.49%	0.65%	1,002	270	33	5.657	4.241	2.508
255	Paints etc.	0.41%	0.52%	0.45%	1,495	609	46	7.697	5.152	4.030
429	Tobacco	0.97%	1.47%	0.97%	8,800	4,738	295	10.598	6.349	6.396
362	Railway rolling stock	0.64%	0.32%	0.15%	10,600	8,300	1561	7.370	5.461	6.683
315	Boilermaking etc	0.58%	0.46%	0.38%	724	313	37	7.144	4.707	4.056
419	Bread etc.	3.86%	2.13%	1.87%	425	171	29	7.062	4.261	3.695
491	Jewellery	0.35%	0.24%	0.22%	533	207	29	8.467	4.174	3.022
438	Carpets etc	0.77%	0.66%	0.62%	2,528	944	104	7.157	4.720	4.331
463	Carpentry	1.01%	0.60%	0.49%	258	112	18	6.186	4.094	3.594
437439	Misc Textiles	0.98%	0.98%	0.94%	1,586	591	56	7.031	4.544	4.002
416	Grain	0.67%	0.93%	1.54%	2,955	634	43	7.483	6.592	5.613
314	Struct. metal products	2.23%	1.77%	1.50%	596	248	30	7.164	4.479	4.381
411	Oils and Fats	0.27%	0.32%	0.56%	8,120	1,660	131	9.259	5.698	4.823
433434	Silk etc	0.25%	0.16%	0.17%	1,220	410	61	8.383	4.404	5.174
420	Sugar	0.83%	1.15%	1.13%	16,500	5,940	406	9.388	6.779	6.238
431	Wool	1.63%	1.10%	1.16%	1,594	538	75	7.336	4.076	4.107
312	Forging etc of metals	0.23%	0.19%	0.15%	1,200	544	62	7.028	5.161	6.445
224	Non-ferr metals: prdn	0.33%	0.32%	0.37%	2,730	820	81	8.267	5.170	4.827
361	Shipbuilding	0.88%	0.45%	0.63%	1,251	314	58	10.449	5.589	5.926
35	Motor Vehicles	2.70%	1.63%	2.31%	1,517	378	59	9.225	5.879	6.179
248	Ceramics	0.73%	0.40%	0.39%	1,410	520	89	9.589	4.148	4.305
451	Footwear	1.52%	0.75%	0.55%	1,250	603	116	9.408	3.243	3.067
456	Furs	0.11%	0.07%	0.05%	292	142	21	6.641	3.683	2.519
	Manufacturing Industries				1,498	522	50	8.514	4.834	4.851

Note: LTOT = Total Employment, NO = number of firms in a sector, QVf = Gross Output produced by foreign owned firms, CLAT = Admin/Tech unit cost of labour, CLIW= Industrial Workers unit cost of labour, CLCL = Clerical Workers unit cost of labour, YV=value-added, QV = Gross Output.

Table B.6

Selected Indicators for 1990

		Percentage Shares in Total:				Size of Sectors:			Unit Labour Costs:		
		LTOT	*YV*	*QV*	*QVf/QV 90*	*QV/NO* (in £'000)	*YV/NO* (in £'000)	*LTOT/NO*	*CLAT* (in £'000)	*CLIW* (in £'000)	*CLCLER* (in £'000)
Group H: Very High Growth, Largely Foreign-Owned Sectors											
33	Office &data process.	3.56%	10.43%	9.89%	97.88%	37,070	17,782	133	31.282	15.957	19.315
345	Radio & TV	1.74%	6.31%	3.96%	87.50%	23,092	16,742	101	23.995	13.214	15.694
344	Telecomm. equip.	3.17%	2.59%	2.31%	87.50%	4,118	2,093	56	23.806	12.531	14.752
341	Insulated wires & cables	2.10%	0.92%	1.11%	87.50%	8,965	3,381	169	25.118	12.044	17.893
258	Soap, perfumes etc	0.58%	0.95%	0.87%	86.63%	5,515	2,745	36	24.765	12.852	18.598
257	Pharmaceuticals	2.98%	11.73%	7.01%	96.26%	19,881	15,145	84	27.698	19.402	18.311
417823	Misc. Food	1.22%	7.68%	4.34%	78.92%	19,798	15,954	55	31.037	16.075	17.641
132162	Gas: Gasworks	0.49%	1.09%	0.67%		14,010	10,450	103	31.964	25.554	18.164
415	Fish	1.07%	0.67%	0.79%	78.92%	2,074	805	28	17.292	9.367	10.821
37	Instrument Engin.	3.79%	3.86%	2.59%	96.51%	6,725	4,551	98	26.181	13.209	17.203
346	Domestic elec.	1.44%	0.77%	0.78%	87.50%	12,577	5,638	231	25.470	11.089	15.076
424	Spirits	0.26%	1.31%	1.11%	80.68%	23,300	12,490	55	33.229	21.047	26.690
Group M: Moderate or High Growth sectors											
492935	Other Manuf	0.49%	0.29%	0.22%	29.80%	1,679	982	36	24.050	9.207	9.427
251	Basic Chemicals	1.25%	1.23%	2.16%	37.67%	13,353	3,468	77	34.781	25.276	22.594
363365	Cycles & other transp.	1.29%	1.04%	0.88%	13.19%	15,358	8,317	224	30.575	25.177	20.000
483	Plastics	3.38%	2.09%	2.10%	51.70%	2,024	917	32	22.257	12.455	14.730
259260	Other chemicals	0.74%	0.59%	0.69%	86.63%	8,506	3,335	91	28.529	16.209	16.688
412	Meat	5.13%	2.96%	9.55%	9.98%	15,068	2,126	80	20.271	10.793	10.818
473474	Printing & Publishing	5.30%	3.54%	2.52%	10.19%	1,527	974	32	24.998	16.674	18.603
464465	Wood products	0.27%	0.11%	0.12%	16.62%	620	254	14	16.024	8.405	10.388
425268	Wine etc	0.80%	0.48%	0.59%	80.68%	3,888	1,428	52	35.639	18.969	20.478
221223	Iron and Steel	0.74%	0.58%	0.77%	10.58%	5,041	1,731	48	25.069	18.308	16.372
343	Elec apparatus	0.58%	0.37%	0.30%	87.50%	2,778	1,552	52	18.780	10.188	11.866
466	Cork, brooms etc	0.14%	0.08%	0.07%	16.62%	2,300	1,350	50	24.074	14.115	15.732
161	Electricity	5.22%	5.47%	4.04%		31,441	19,367	403	29.668	18.287	20.128
413	Dairy products	3.66%	3.86%	9.85%	11.36%	21,322	3,802	79	25.002	17.570	13.375
34278	Elec & lighting equip.	1.56%	0.68%	0.64%	87.50%	1,785	860	43	20.727	10.567	12.174
32	Mech. engineering	4.06%	2.42%	2.35%	65.79%	1,778	830	30	21.951	12.682	14.042
461462	Semi-finished wood	0.79%	0.53%	0.66%	16.62%	2,475	907	29	20.151	12.556	14.893
421	Cocoa, etc	1.55%	1.15%	1.44%	70.60%	8,386	3,042	90	35.440	15.085	15.894
422	Animal foods	0.96%	0.97%	2.18%	0.00%	5,025	1,019	22	23.838	14.746	13.089
427	Brewing & malting	1.21%	2.98%	1.90%	80.68%	19,985	14,255	127	46.365	31.709	34.014
256	Chemicals: ind and agr	0.60%	0.57%	0.50%	86.63%	2,989	1,566	35	27.161	18.525	19.516
313	Treatment etc. of metals	0.58%	0.23%	0.26%	37.61%	1,597	647	36	25.566	15.026	16.374
170	Water Supply	1.08%	0.37%	0.28%		1,052	623	40	20.692	11.634	10.719
432	Cotton	0.85%	0.48%	0.67%	80.28%	12,764	4,155	161	29.107	14.602	13.281
494	Toys etc	0.49%	0.35%	0.33%	29.80%	1,745	830	26	21.913	10.985	13.389
241246	Non-met Minerals:prdn	3.12%	3.53%	3.34%	49.38%	2,890	1,388	27	27.726	16.861	19.953
455	Household goods	0.55%	0.19%	0.24%	29.06%	828	300	19	16.570	8.683	9.428
436	Knitting	2.15%	0.58%	0.59%	60.80%	1,665	740	60	18.346	7.988	12.012
481482	Rubber Products	1.16%	0.75%	0.68%	90.21%	3,400	1,695	58	26.037	15.564	17.496
471472	Paper	1.64%	1.18%	1.35%	32.99%	3,267	1,295	39	23.751	16.021	13.013
Group D: Declining or Low Growth Sectors											
316319	Finished metal products	2.96%	1.45%	1.56%	37.61%	1,125	475	21	19.452	11.775	11.528
453454	Clothing	5.25%	1.31%	1.29%	29.06%	1,076	497	44	17.209	7.405	10.477
414	Fruit & veg	0.60%	0.34%	0.35%	78.92%	3,847	1,726	66	26.082	13.499	14.031
14	Mineral oil refining	0.20%	0.19%	1.16%	29.80%	27,144	2,067	47	34.278	18.840	23.282
311	Foundries	0.33%	0.16%	0.14%	37.61%	1,741	882	41	19.969	11.889	10.802
467	Wood furniture	1.50%	0.54%	0.55%	16.62%	547	245	15	14.752	8.818	8.418
247	Glass	1.89%	0.91%	0.73%	49.38%	3,272	1,853	84	30.330	16.346	16.363
44	Leather	0.24%	0.13%	0.27%	5.00%	1,969	414	17	15.330	10.330	9.193
255	Paints etc.	0.37%	0.32%	0.33%	86.63%	2,867	1,292	32	24.276	15.026	16.746
429	Tobacco	0.62%	1.04%	0.68%	80.68%	17,875	12,475	161	46.772	20.742	29.389
362	Railway rolling stock	0.54%	0.23%	0.13%	13.19%	27,900	22,100	1121	22.400	14.106	16.625
315	Boilermaking etc	0.47%	0.28%	0.26%	37.61%	1,549	751	28	19.090	12.800	12.715
419	Bread etc.	2.62%	0.99%	1.03%	0.00%	949	418	24	16.684	10.013	12.809
491	Jewellery	0.43%	0.20%	0.17%	29.80%	1,088	591	28	16.401	10.608	9.643
438	Carpets etc	0.48%	0.24%	0.27%	80.28%	4,650	1,933	84	22.002	13.211	14.303
463	Carpentry	0.94%	0.35%	0.40%	16.62%	708	278	16	16.541	9.929	10.134
437439	Misc Textiles	0.67%	0.36%	0.35%	80.28%	2,248	1,039	42	22.901	12.810	12.409
416	Grain	0.32%	0.25%	0.51%	0.00%	3,944	889	25	19.654	16.538	14.998
314	Struct. metal products	1.66%	0.82%	0.91%	37.61%	884	364	16	17.705	11.302	11.585
411	Oils and Fats	0.12%	0.12%	0.14%	78.92%	4,900	1,983	41	30.604	20.158	16.990
433434	Silk etc	0.15%	0.05%	0.06%	80.28%	1,886	671	44	27.259	12.035	8.198
420	Sugar	0.44%	0.34%	0.38%	70.60%	26,400	10,900	309	29.750	18.642	19.730
431	Wool	0.79%	0.30%	0.41%	59.77%	2,990	1,000	57	21.088	11.470	12.157
312	Forging etc of metals	0.06%	0.04%	0.03%	37.61%	1,360	760	23	25.638	15.176	3.949
224	Non-ferr metals: prdn	0.09%	0.06%	0.13%	10.58%	2,154	462	15	21.233	12.131	8.015
361	Shipbuilding	0.28%	0.11%	0.11%	13.19%	912	416	23	18.579	11.699	12.270
35	Motor Vehicles	1.52%	0.57%	0.67%	29.08%	1,718	663	39	19.252	13.708	20.721
248	Ceramics	0.33%	0.18%	0.14%	49.38%	1,806	1,056	43	24.799	10.473	19.337
451	Footwear	0.35%	0.12%	0.11%	5.00%	996	487	32	16.983	8.774	11.128
456	Furs	0.03%	0.01%	0.02%	29.06%	486	157	10	14.341	9.546	7.234
	Manufacturing Industries					4,335	1,932	42	25.169	13.715	15.948

Note: LTOT = Total Employment, NO = number of firms in a sector, QVf = Gross Output produced by foreign owned firms, CLAT = Admin/Tech unit cost of labour, CLIW= Industrial Workers unit cost of labour, CLCL = Clerical Workers unit cost of labour, YV=value-added, QV = Gross Output.

Table B.7

Table 3.8

49

Decomposition of change in share of AT workers in total employment and total wage bill

	Employment				Wage Bill			
	*Total **	*Between*	*Within*	*% contrib. of within component*	*Total **	*Between*	*Within*	*% contrib. of within component*
TOTAL: 72 SECTORS IN PANEL								
1979-90	1.93%	0.49%	1.45%	74.7%	1.88%	0.69%	1.19%	63.4%
1979-87	2.65%	0.51%	2.14%	80.8%	2.37%	0.81%	1.57%	66.0%
1987-90	0.05%	0.50%	-0.44%	-820.8%	0.58%	0.44%	0.14%	23.7%
GROUP H: 12 SECTORS HIGH GROWTH GROUP								
1979-90	3.88%	0.18%	3.69%	95.3%	3.07%	0.30%	2.77%	90.2%
1979-87	5.06%	0.24%	4.81%	95.2%	4.14%	0.51%	3.63%	87.6%
1987-90	0.80%	0.21%	0.59%	73.4%	0.29%	-0.21%	0.50%	171.5%
GROUP M: 30 MEDIUM GROWTH SECTORS								
1979-90	0.58%	-0.09%	0.68%	116.1%	0.53%	-0.01%	0.54%	101.0%
1979-87	1.16%	0.00%	1.16%	99.8%	0.93%	0.09%	0.84%	89.9%
1987-90	-0.94%	-0.30%	-0.65%	68.7%	-0.51%	-0.21%	-0.30%	59.2%
GROUP D: 30 DECLINING SECTORS								
1979-90	1.01%	-0.08%	1.09%	107.9%	1.31%	0.19%	1.13%	85.9%
1979-87	1.97%	-0.11%	2.08%	105.7%	1.57%	0.17%	1.40%	89.2%
1987-90	-1.51%	-0.09%	-1.42%	94.0%	0.64%	-0.04%	0.67%	105.9%

* Annualised Percentage changes

Table 8.9

Decomposition of change in share of IW workers in total employment and total wage bill

	Employment				Wage Bill			
	*Total **	*Between*	*Within*	*% contrib. of within component*	*Total **	*Between*	*Within*	*% contrib. of within component*
TOTAL: 72 SECTORS IN PANEL								
1979-90	-0.53%	-0.11%	-0.42%	78.6%	-0.89%	-0.24%	-0.66%	73.5%
1979-87	-0.68%	-0.14%	-0.54%	79.4%	-1.07%	-0.29%	-0.79%	73.4%
1987-90	-0.13%	-0.07%	-0.06%	44.8%	-0.42%	-0.12%	-0.30%	70.8%
GROUP H: 12 SECTORS HIGH GROWTH GROUP								
1979-90	-1.16%	-0.01%	-1.15%	99.3%	-1.49%	-0.11%	-1.38%	92.9%
1979-87	-1.51%	-0.04%	-1.47%	97.5%	-2.00%	-0.23%	-1.77%	88.7%
1987-90	-0.21%	0.01%	-0.22%	104.6%	-0.12%	0.23%	-0.35%	301.9%
GROUP M: 30 MEDIUM GROWTH SECTORS								
1979-90	-0.33%	-0.01%	-0.32%	98.1%	-0.58%	-0.01%	-0.57%	97.9%
1979-87	-0.50%	-0.07%	-0.43%	85.7%	-0.78%	-0.07%	-0.71%	91.5%
1987-90	0.14%	0.17%	-0.03%	-25.0%	-0.04%	0.16%	-0.21%	481.9%
GROUP D: 30 DECLINING SECTORS								
1979-90	-0.18%	0.03%	-0.21%	115.3%	-0.46%	-0.02%	-0.44%	95.1%
1979-87	-0.25%	0.05%	-0.29%	118.1%	-0.45%	-0.00%	-0.45%	99.6%
1987-90	0.01%	0.01%	0.00%	39.0%	-0.49%	-0.03%	-0.45%	93.1%

* Annualised Percentage changes

Table 3.10

51

Decomposition of change in share of CL workers in total employment and total wage bill

	Employment				Wage Bill			
	*Total **	*Between*	*Within*	*% contrib. of within component*	*Total **	*Between*	*Within*	*% contrib. of within component*
TOTAL: 72 SECTORS IN PANEL								
1979-90	1.83%	0.31%	1.51%	82.9%	2.68%	0.39%	2.29%	85.5%
1979-87	2.21%	0.49%	1.72%	77.7%	3.18%	0.55%	2.64%	82.8%
1987-90	0.80%	-0.06%	0.86%	107.8%	1.36%	-0.05%	1.41%	103.5%
GROUP H: 12 SECTORS HIGH GROWTH GROUP								
1979-90	2.65%	-0.19%	2.84%	107.3%	1.64%	-0.06%	1.70%	103.4%
1979-87	3.65%	-0.06%	3.72%	101.7%	2.32%	0.17%	2.15%	92.6%
1987-90	0.02%	-0.35%	0.37%	1781.3%	-0.13%	-0.57%	0.44%	-333.3%
GROUP M: 30 MEDIUM GROWTH SECTORS								
1979-90	1.51%	0.12%	1.38%	91.7%	2.64%	0.08%	2.56%	97.0%
1979-87	2.05%	0.45%	1.61%	78.3%	3.30%	0.26%	3.05%	92.2%
1987-90	0.07%	-0.70%	0.77%	1168.9%	0.90%	-0.54%	1.44%	160.2%
GROUP D: 30 DECLINING SECTORS								
1979-90	0.73%	-0.20%	0.93%	127.0%	1.92%	-0.14%	2.06%	107.1%
1979-87	0.34%	-0.36%	0.69%	206.5%	1.48%	-0.32%	1.80%	121.4%
1987-90	1.80%	0.05%	1.75%	97.1%	3.11%	0.37%	2.74%	88.0%

* Annualised Percentage changes

Table B.11

Decomposition of change in AT employment and wage bill

	Employment *					Wage Bill **				
	Total	*Scale*	*Sector*	*Occupation*	*Interactive*	*Total*	*Scale*	*Sector*	*Occupation*	*Interactive*
TOTAL: 72 SECTORS IN PANEL										
1979-90	0.5%	-1.4%	0.3%	1.3%	0.1%	10.3%	8.3%	1.3%	1.1%	2.2%
1979-87	0.1%	-2.5%	0.3%	2.0%	-0.1%	11.7%	9.1%	1.3%	1.4%	2.1%
1987-90	1.7%	1.6%	0.6%	-0.4%	-0.1%	6.7%	6.1%	0.6%	0.2%	-0.1%
GROUP H: 12 SECTORS HIGH GROWTH GROUP										
1979-90	8.7%	4.6%	0.4%	3.8%	2.5%	19.4%	15.8%	1.8%	2.8%	8.3%
1979-87	9.4%	4.1%	0.5%	4.9%	1.8%	22.5%	17.7%	2.1%	3.7%	8.2%
1987-90	6.9%	6.0%	0.2%	0.6%	0.1%	11.4%	11.0%	-0.3%	0.5%	0.3%
GROUP M: 30 MEDIUM GROWTH SECTORS										
1979-90	-0.8%	-1.4%	-0.1%	0.7%	-0.1%	8.7%	8.1%	-0.0%	0.5%	0.7%
1979-87	-1.5%	-2.6%	-0.0%	1.1%	-0.1%	9.8%	8.8%	0.2%	0.8%	0.8%
1987-90	0.9%	1.8%	-0.3%	-0.6%	-0.1%	5.5%	6.1%	-0.2%	-0.3%	-0.2%
GROUP D: 30 DECLINING SECTORS										
1979-90	-3.4%	-4.4%	0.0%	1.2%	-0.6%	5.6%	4.2%	0.3%	1.1%	0.7%
1979-87	-3.4%	-5.3%	-0.0%	2.2%	-1.0%	6.8%	5.2%	0.3%	1.4%	0.7%
1987-90	-3.5%	-2.0%	0.1%	-1.2%	-0.2%	2.4%	1.7%	0.2%	0.9%	-0.5%

* Results are expressed as a percentage of the number of AT workers employed at the beginning of the period.
** Results are expressed as a percentage of the AT wage bill at the beginning of the period.
All results are reported at annualised rates.

Decomposition of change in IW employment and wage bill

	Employment *					Wage Bill **				
	Total	*Scale*	*Sector*	*Occupation*	*Interactive*	*Total*	*Scale*	*Sector*	*Occupation*	*Interactive*
TOTAL: 72 SECTORS IN PANEL										
1979-90	-1.9%	-1.4%	-0.1%	-0.4%	-0.0%	7.3%	8.3%	-0.5%	-0.6%	-1.1%
1979-87	-3.1%	-2.5%	-0.1%	-0.5%	0.0%	4.8%	5.6%	-0.2%	-0.4%	-0.5%
1987-90	1.5%	1.6%	-0.1%	-0.1%	0.0%	4.9%	5.2%	-0.1%	-0.3%	-0.0%
GROUP H: 12 SECTORS HIGH GROWTH GROUP										
1979-90	3.4%	4.6%	-0.1%	-1.2%	-0.6%	14.1%	15.8%	-0.7%	-1.4%	-7.0%
1979-87	2.5%	4.1%	-0.1%	-1.5%	-0.4%	6.7%	8.0%	-0.2%	-0.5%	-1.5%
1987-90	5.8%	6.0%	0.0%	-0.2%	-0.1%	8.2%	8.3%	0.3%	-0.2%	-0.2%
GROUP M: 30 MEDIUM GROWTH SECTORS										
1979-90	-1.7%	-1.4%	-0.0%	-0.3%	0.1%	7.4%	8.1%	-0.0%	-0.6%	-0.8%
1979-87	-3.1%	-2.6%	-0.0%	-0.4%	0.1%	4.8%	5.4%	-0.1%	-0.4%	-0.4%
1987-90	2.0%	1.8%	0.2%	-0.1%	0.0%	5.1%	5.1%	0.1%	-0.2%	-0.0%
GROUP D: 30 DECLINING SECTORS										
1979-90	-4.5%	-4.4%	0.0%	-0.2%	0.1%	3.7%	4.2%	-0.0%	-0.4%	-0.3%
1979-87	-5.5%	-5.3%	0.0%	-0.3%	0.1%	3.4%	3.8%	0.0%	-0.3%	-0.2%
1987-90	-2.0%	-2.0%	-0.0%	-0.0%	0.1%	1.2%	1.6%	-0.1%	-0.5%	0.1%

Table B.12

5.3

* Results are expressed as a percentage of the number of IW workers employed at the beginning of the period.
** Results are expressed as a percentage of the IW wage bill at the beginning of the period.
All results are reported at annualised rates.

Decomposition of change in CL employment and wage bill

	Employment *					Wage Bill **				
	Total	*Scale*	*Sector*	*Occupation*	*Interactive*	*Total*	*Scale*	*Sector*	*Occupation*	*Interactive*
TOTAL: 72 SECTORS IN PANEL										
1979-90	0.4%	-1.4%	0.2%	1.5%	-0.1%	11.2%	8.3%	1.0%	2.3%	3.1%
1979-87	-0.3%	-2.5%	0.4%	1.7%	-0.2%	12.6%	9.1%	1.0%	2.6%	3.0%
1987-90	2.5%	1.6%	-0.0%	0.9%	-0.1%	7.6%	6.1%	-0.1%	1.4%	0.3%
GROUP H: 12 SECTORS HIGH GROWTH GROUP										
1979-90	7.4%	4.6%	0.2%	3.1%	1.1%	17.7%	15.8%	0.3%	1.8%	5.1%
1979-87	7.9%	4.1%	0.3%	4.0%	0.8%	20.4%	17.7%	0.3%	2.1%	5.6%
1987-90	6.1%	6.0%	-0.5%	0.3%	0.2%	10.9%	11.0%	-1.0%	0.3%	0.5%
GROUP M: 30 MEDIUM GROWTH SECTORS										
1979-90	0.1%	-1.4%	0.1%	1.4%	-0.3%	10.9%	8.1%	0.2%	2.6%	3.3%
1979-87	-0.6%	-2.6%	0.4%	1.6%	-0.3%	12.4%	8.8%	0.5%	3.0%	3.1%
1987-90	1.9%	1.8%	-0.7%	0.8%	-0.1%	7.0%	6.1%	-0.6%	1.5%	0.2%
GROUP D: 30 DECLINING SECTORS										
1979-90	-3.7%	-4.4%	-0.1%	0.9%	-0.4%	6.2%	4.2%	-0.3%	2.0%	1.3%
1979-87	-4.9%	-5.3%	-0.2%	0.8%	-0.4%	6.7%	5.2%	-0.6%	1.7%	1.1%
1987-90	-0.2%	-2.0%	0.1%	1.8%	-0.3%	4.9%	1.7%	0.3%	2.6%	0.4%

Table B.13

5.4

* Results are expressed as a percentage of the number of CL workers employed at the beginning of the period.
** Results are expressed as a percentage of the CL wage bill at the beginning of the period.
All results are reported at annualised rates.

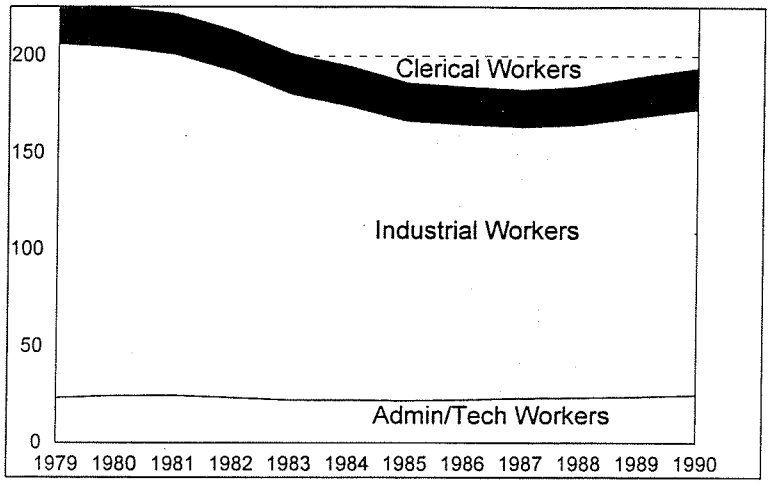

Figure B.1: Different Categories of Employment in Manufacturing Sector

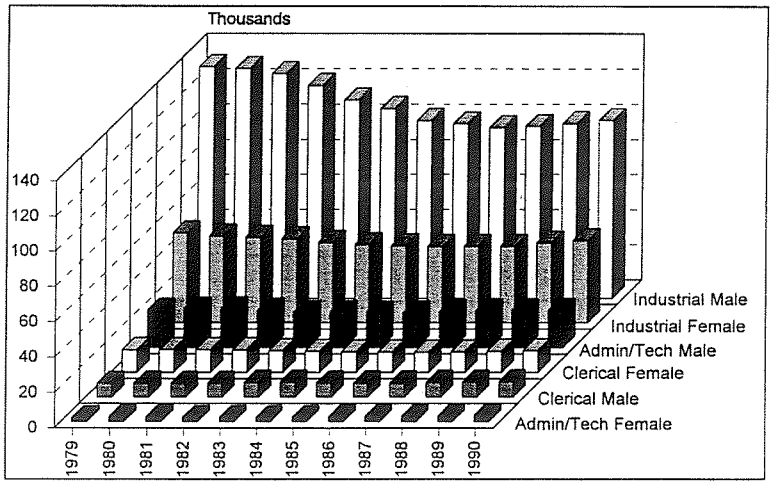

Figure B.2: Decomposition of Male and Female Employment in Manufacturing Sector

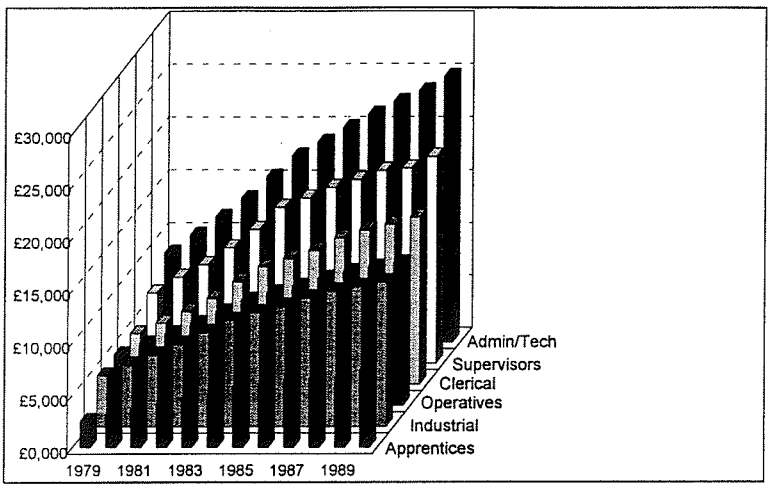

Figure B.3: Labour Costs Per Worker for different Types of Labour in Manufacturing Sector.

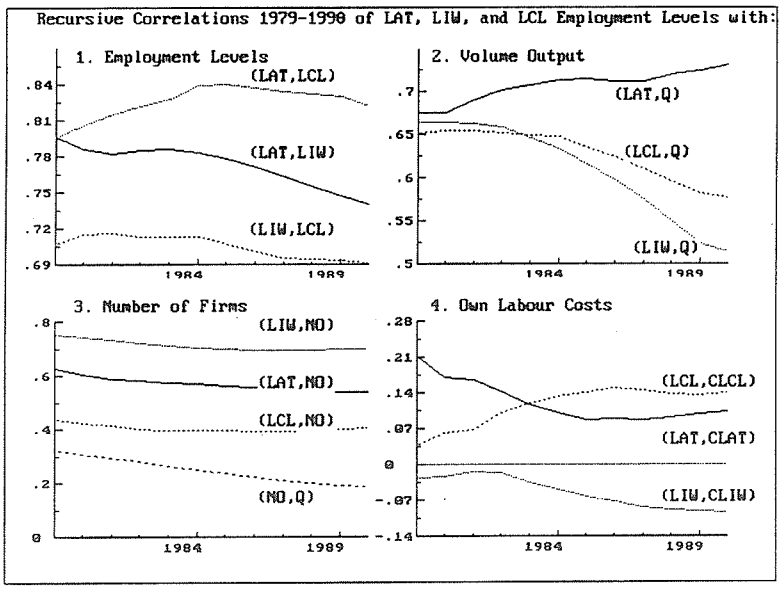

Figure B.4: Recursive Correlations 1979-1990 of LAT, LIW and LCL Employment Levels with Selected Variables

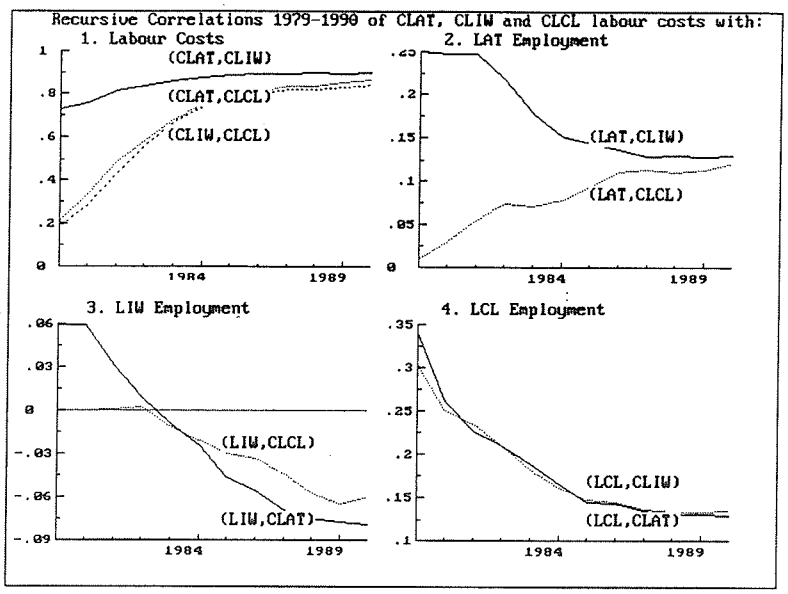

Figure B.5: Recursive Correlations 1979-1990 of CLAT, CLIW and CLCL Labour Costs with Selected Variables

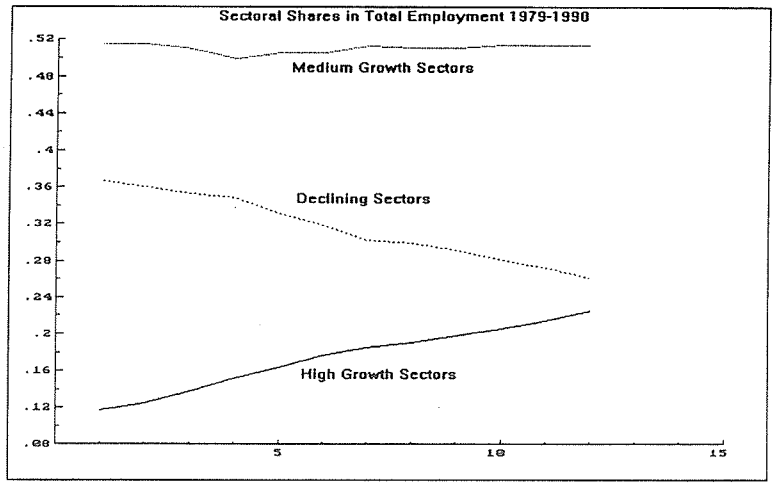

Figure B.6: Share of High Growth, Medium Growth and Declining Industries in Total Employment, 1979-1990

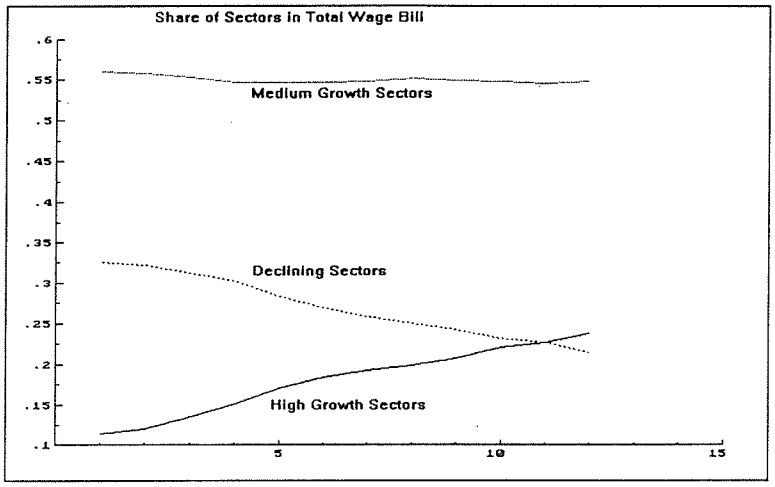

Figure B.7: Share of High Growth, Medium Growth and Declining Sectors in Total Wage Bill, 1979-1990.

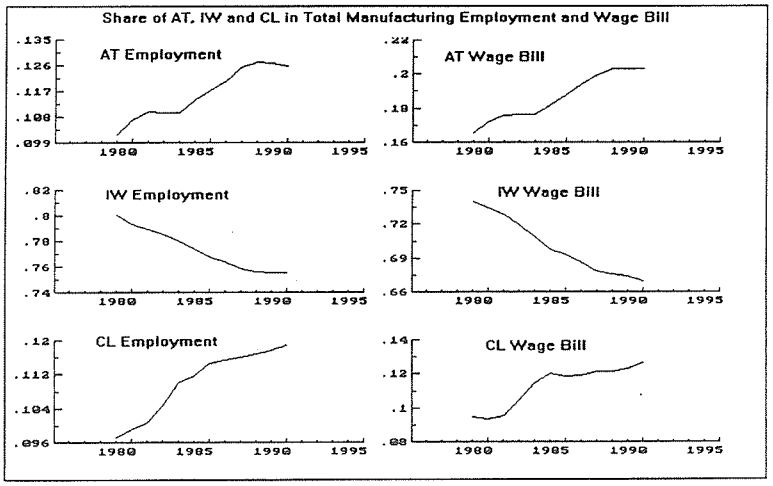

Figure B.8: Share of Admin/Technical, Industrial and Clerical Workers in Total Manufacturing Employment and Wage Bill

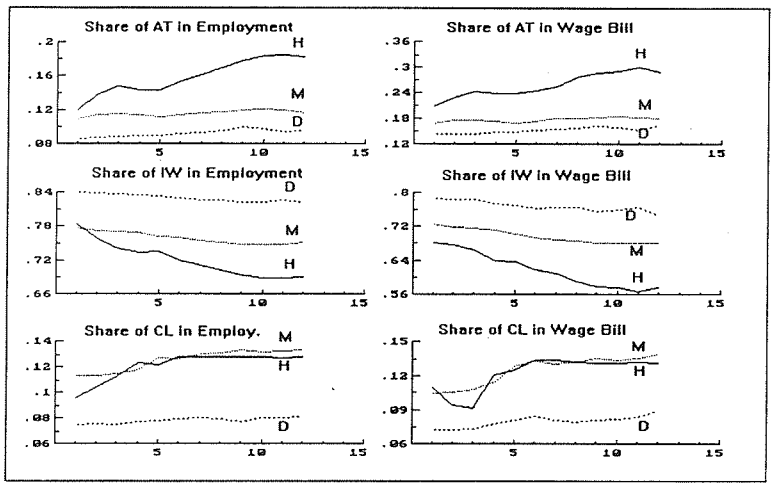

Figure B.9: Share of AT, IW and CL in High Growth, Medium Growth and Declining Sectors' Total Employment and Wage Bill.